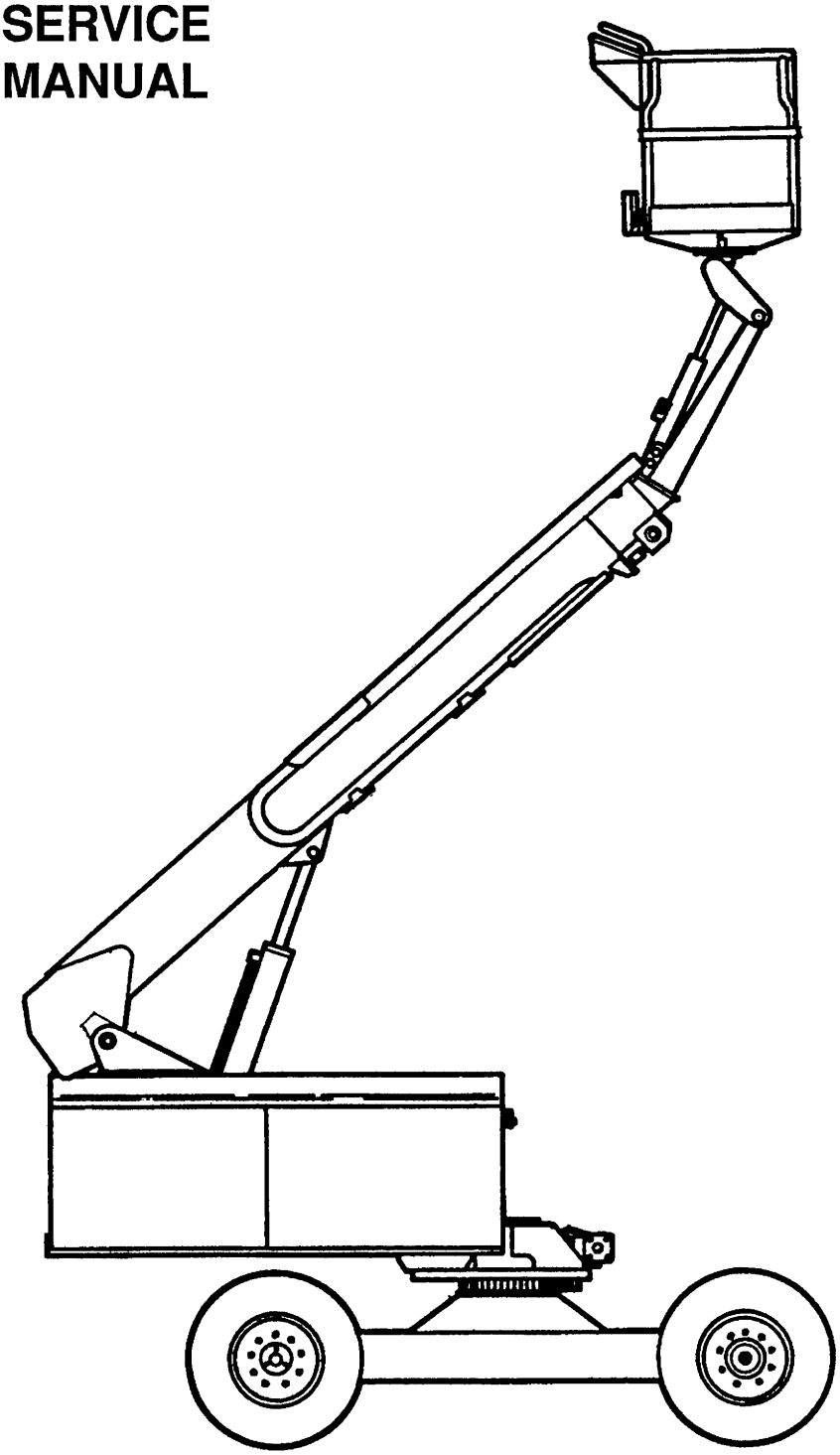
SIMON AERIALS INC.
10600 W. Brown Deer Road
Milwaukee, Wisconsin 53224
Phone (414) 355-0802
TWX: 910-262-2310 •
Cable: SIMON MIL

SIMON

MP SERIES MODEL HYDRAPORT

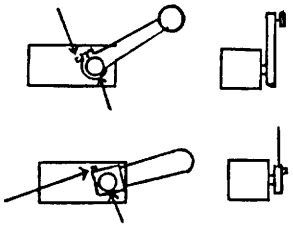
SERVICE MANUAL



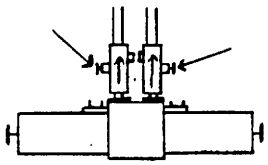
SERVICE MANUAL
TABLE OF CONTENTS

	SEC.
ADJUSTMENTS	M1
LUBRCATION	M2
HYDRAULIC FLUID RECOMMENDATIONS & MAINT.	M3
HYDRAULIC PUMP OPERATION (HYDRAPORT)	M4
TROUBLE SHOOTING CHARTS	M5
MISC. TROUBLE SHOOTING CHARTS	M6
HYDRAPORT CIRCUIT	M7
BOOM LIFT CIRCUIT	M8
BOOM EXTEND CIRCUIT	M9
SWING CIRCUIT	M10
VEHICLE DRIVE CIRCUIT	M11
VEHICLE STEER CIRCUIT	M12
PLATFORM LEVELING CIRCUIT	M13
PLATFORM ROTATE CIRCUIT	M14
EMER. PUMP & VALVE BANK MANIFOLD CIRCUIT	M15

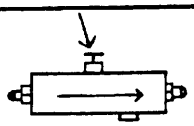
ADJUSTMENTS



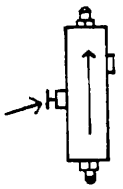
1) TWO-SPEED DRIVE LIMIT SWITCHES LOCATED AT THE BACK END OF THE BASE BOOM. ADJUST THE LIMIT SWITCHES' LEVER ARMS FOR PROPER OPERATION. PROPER OPERATION IS EXPLAINED IN SPECIFICATIONS - TWO SPEED DRIVE SYSTEM.



2) SLOW SPEED DRIVE TO ADJUST SLOW SPEED DRIVE, LOCATE THE TWO ADJUSTABLE FLOW CONTROL VALVES AT THE DRIVE VALVES. LOOSEN THE LOCK NUTS ON THE ADJUSTING KNOBS. TO INCREASE SPEED OF TRAVEL, TURN KNOBS OUT; TO DECREASE SPEED, TURN KNOBS IN.



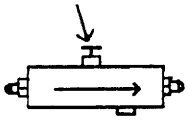
3) BRAKES FOR SHIPMENT, THE BRAKE METERING VALVE HAS BEEN OPENED TO 4 FULL TURNS FOR NORMAL GROUND OPERATIONS.



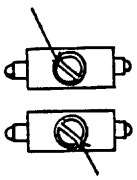
4) CAB ROTATE A VARIABLE FLOW CHECK VALVE (NEEDLE VALVE) LOCATED UNDER THE CAB CONTROL PANEL. CONTROLS THE SPEED OF CAB ROTATE AND LEVELING. THIS NEEDLE VALVE SHOULD BE SET FOR CAB ROTATE SPEED, WHICH IS APPROXIMATELY 20 SECONDS FROM ONE EXTREME POSITION TO THE OPPOSITE EXTREME POSITION. IF THIS FUNCTION IS SET TOO FAST, DAMAGE TO THE ROTATE LINKAGE WILL OCCUR.

5) ENGINE RPM

V465	65 HP WISCONSIN	2500 RPM
VH4D	30 HP WISCONSIN	2500 RPM
W4-1770	35 HP WISCONSIN	2500-2600 RPM
VH4D	37 HP WISCONSIN	2350 RPM
	DEUTZ DIESEL	2500 RPM
	DEUTZ DIESEL	IDLE 1800 RPM



6) H.P.C. BLEED-OFF FLOW VALVE THIS VALVE MUST REMAIN CLOSED AS UNIT THROTTLING WOULD BE LOST AS IT IS OPENED. THIS VALVE IS FOR PUMP TROUBLE SHOOTING ONLY.

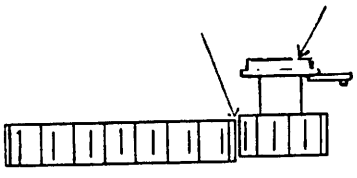


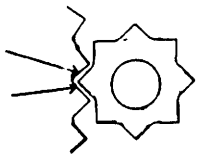
7) LEVELING RELIEF VALVES AT SYSTEM PRESSURE, THESE VALVES SHOULD BE JUST STARTING TO OPEN. TO ATTAIN SYSTEM PRESSURE AT THESE VALVES, IT WILL BE NECESSARY TO TILT THE PLATFORM TO ONE EXTREME POSITION, AND WHILE HOLDING THIS POSITION, WITH THE FOOT PEDAL FULLY DEPRESSED, ADJUST THE VALVE ADJUSTMENT, LOCATED UNDER THE DUST CAP, UNTIL FLUID STARTS TO FLOW FROM RETURN PORT; THEN SCREW THE ADJUSTMENT IN 1/4 TURN.

REPEAT THE PROCEDURE FOR THE OPPOSITE RELIEF VALVE TILTING THE PLATFORM IN THE OPPOSITE DIRECTION.

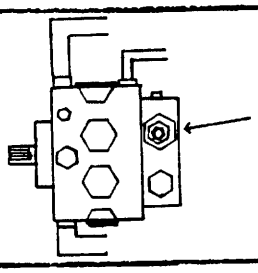
8) SOLENOID ACTUATORS: THROTTLE, CHOKE, RACK) THE MOST IMPORTANT THING TO REMEMBER IS THE ACTUATOR MUST BOTTOM OUT IN THE SOLENOID, OR THE HOLDING COIL IN THE SOLENOID WILL NOT ENGAGE AND THE PULLING COIL WILL BURN OUT. PROPER ALLIGNMENT IS ALSO REQUIRED TO KEEP THE ACTUATOR SHAFT FROM BINDING UP.

9) SWING TABLE BACKLASH ZERO BACKLASH AT PINION TO SWING GEAR; ALSO, NO PRELOAD OF THE PINION TO THE SWING GEAR IS ALLOWED. TO ADJUST, LOOSEN THE GEAR BOX SIDE LOCK BOLTS AND ADJUST THE FRONT LOCK BOLTS UNTIL PROPER BACKLASH IS ATTAINED. RETIGHTEN THE SIDE LOCK BOLTS AND RETORQUE THE FOOT MOUNT PLATE BOLTS. SOME SWING GEAR BOXES MAY HAVE AN ECCENTRIC BUSHING FOR ADJUSTING THE BACKLASH. THESE UNITS WILL NOT HAVE FRONT ADJUSTERS OR SIDE LOCKING BOLTS. TO ADJUST THIS BOX, THE ECCENTRIC BUSHING MUST BE TURNED, AFTER REMOVING THE LOCKING PLATE, LOCATED BELOW THE GEAR BOX MOUNTING PLATE AT THE PINION GUARD.

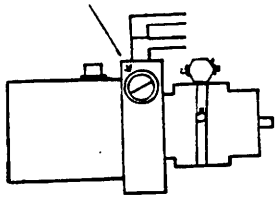




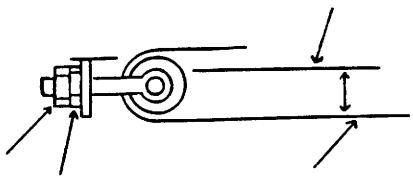
10) MAIN HYDRAULIC PUMP TO ADJUST PRESSURE ON THE PUMP, LOCATE THE ADJUSTING SCREW ON THE INWARD SIDE OF THE PUMP. LOOSEN LOCK NUT AND TURN SCREW IN TO INCREASE PRESSURE AND OUT TO DECREASE PRESSURE. PRESSURE SHOULD BE SET AT 1900 TO 2000 PSI.

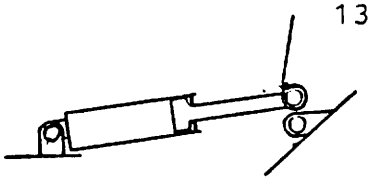


11) EMERGENCY PUMP TO ADJUST PRESSURE ON THE PUMP, LOCATE THE ADJUSTING SCREW ON THE INWARD SIDE OF THE ADAPTER PLATE OF THE PUMP. REMOVE THE CAP AND TURN THE ADJUSTING SCREW IN TO INCREASE PRESSURE AND OUT TO DECREASE PRESSURE. PRESSURE SHOULD BE SET AT 1900 TO 2000 PSI.

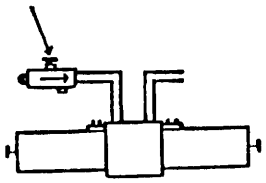


12) BOOM EXTEND CHAIN ROLLER = 1" DROOP FOR EACH 10' OF UNIT MODEL, IE, MP50 5", MP80 8". LINK CHAIN: ADD 2 TO 3 INCHES TO THE ROLLER CHAIN ADJUSTMENT CALCULATIONS. ADJUSTMENT IS ACCOMPLISHED BY TIGHTENING OR LOOSENING THE CHAIN EYE BOLTS AT THE FRONT OF THE MID BOOM, MAINTAINING EQUAL TENSION OF THE BOLTS TO THE CHAIN.

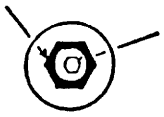




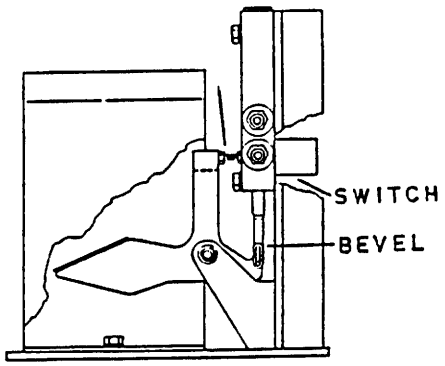
13) MASTER CYLINDER WITH THE BOOM LIFT CYLINDER FULLY RETRACTED (BOOM FULL DOWN), EXTEND THE MASTER CYLINDER TO FULL EXTENTION; INSTALL THE BLIND END AND THE MOUNTING PLATE. ADJUST THE ROD END TO DROP FIT THE THE ROD END PIN IN THE MOUNTING PLATE. SCREW THE ROD END OUT 1/2 TO1 TURN MORE AND REINSTALL CYLINDER.



14) BOOM DOWN FLOW VALVE LOCATED AT THE VALVE BANK, THIS VALVE CONTROLS BOOM DOWN SPEED AND SMOOTH OPERATION. IF OPENED TO FAR, THE BOOM WILL BOUNCE COMING DOWN WITH A FULL LOAD. IF THE BOOM BOUNCES COMING DOWN, ADJUST THE VALVE KNOB CLOCKWISE UNTIL THE BOUNCE DISAPPEARS.

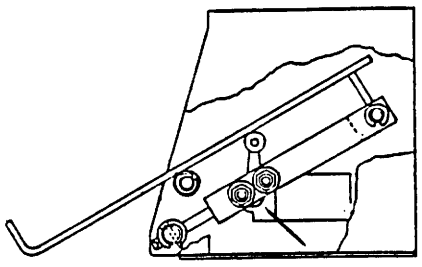


17) BOOM LIFT HOLDING VALVE WITH PLATFORM AT RATED WORK LOAD AND BOOM HORIZONTAL TO THE GROUND, EXTEND BOOM FULLY. INSURE THAT THE HYDRAULIC PRESSURE REMAINS AT ZERO BY SHUTTING DOWN THE ENGINE. WITH POWER TO THE CONTROLLERS, SELECT THE BOOM CONTROLLER TO THE DOWN POSITION. IF BOOMCREEPS DOWN, ADJUST THE ALLEN SCREW CLOCKWISE ON THE HOLDING VALVE UNTILL THE BOOM NO LONGER DRIFTS WHEN SELECTED.



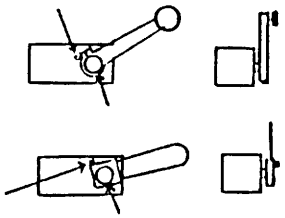
FOOT PEDAL ASS'Y. - LATE MODEL

18) FOOT STROKE VALVE THIS VALVE CONTROLS THE HYDRAULIC PUMP PRESSURE AND FLOW WHICH CONTROLS FUNCTION SPEED. FOR PROPER ADJUSTMENTS THE METERING SLOT MUST BE FACING THE PRESSURE AND RETURN PORTS, THIS CAN BE CHECKED BY INSURING THE BEVEL AT THE END OF THE PISTON IS ALSO FACING THE PRESSURE AND RETURN PORTS AT INSTALLATION. THE HOSE THAT IS COMMON TO THE PLATFORM FLOW CONTROL VALVE MUST BE CONNECTED TO THE PORT CLOSEST TO THE EXPOSED PISTON ROD, THIS IS THE PRESSURE PORT. WHEN CONNECTING THE OPERATOR PEDAL INSURE THE THE PEDAL DOES NOT COMPRESS THE PISTON ROD IN TNE UNACTUATED POSITION. ADJUST THE PUMP STROKE SWITCH TO ACTUATE JUST AS THE PISTON ROD STARTS TO MOVE. WITH THE PEDAL IN THE UNACTUATED POSITION THE SWITCH SHOULD BE SENDING VOLTAGE TO THE PUMP DESTROKE VALVE.

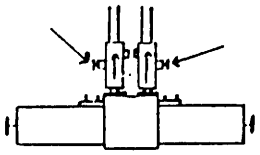


FOOT PEDAL ASS'Y. - EARLY MODEL

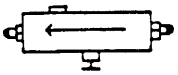
ADJUSTMENTS



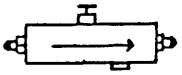
1) TWO-SPEED DRIVE LIMIT SWITCHES are located at the front end of the base boom. Adjust the limit switch lever arms for proper operation. Refer to the Drive System section for specs.



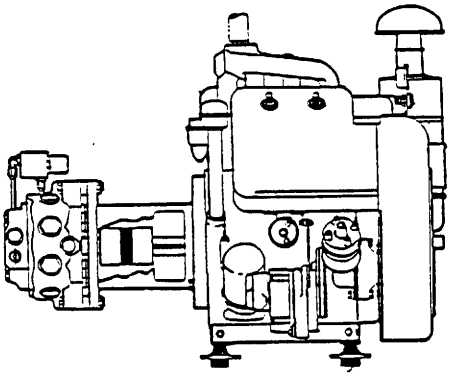
2) LOW SPEED DRIVE is adjusted by two adjustable flow control valves at the drive valves. By loosening the lock nuts on the adjustable valves, speeds can be increased or decreased as needed. To increase speeds, turn the adjusting valve out. To decrease speeds, turn the adjusting valve in.



3) BRAKES are set at the factory for the shipment of the unit only. They should be set for ground operation by adjusting the valve 1½ full turns from the closed position.



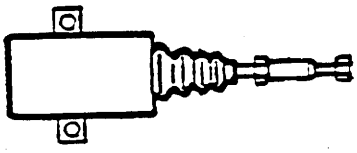
4) CAB ROTATE is controled by a variable flow check valve located under the basket control panel. This valve controls the leveling speed of the basket as well. The valve should be set for basket rotate speed, which should be approximately 20 seconds from one extreme position to the other.



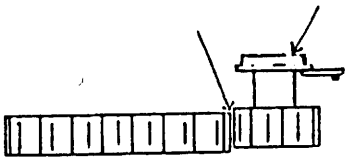
5) ENGINE RPM'S:

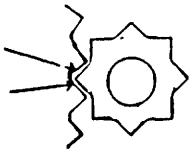
Wisconsin -	V465	65HP-------2500 RPM
	VH4D	30HP-------2500 RPM
	W4-1770	35HP-- 2500 -2600
	VG4D	37HP-------2350 RPM

Duetz Diesel -------- Idle Speed 1800
High Speed 2500

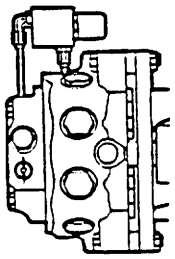


6) SOLENOID ACTUATORS: THROTTLE, CHOKE,ETC
The most important thing to remember is that the actuator MUST bottom out in the solenoid, or the holding coil will not activate and the pulling coil will burn out. Check for proper alignment so no binding will occur.

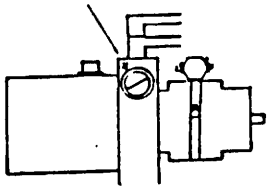




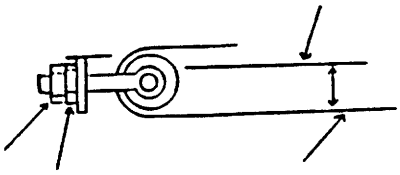
7) SWING GEAR & PINION BACKLASH should be set with zero backlash. Also, no preload of the pinion to the swing gear is allowed. To adjust, loosen the gear box side lock bolts and adjust the front lock bolts until the proper backlash is attained. Retighten the side lock bolts and retorque the foot mount plate bolts. NOTE: some swing gear boxes may have an eccentric bushing for adjusting the backlash. These units will not have front adjusters or side locking bolts. To adjust this box, the eccentric bushing must be turned, after removing the locking plate located below the gear box mounting plate at the pinion guard.



8) MAIN HYDRAULIC PUMP - JOHN DEERE : To adjust the pressure, locate the adjusting screw on the side of the adapter plate. Loosen the lock nut and turn screw in to increase system pressure or out to decrease system pressure. System pressure should be set at a pre - descibed setting depending on model. Consult unit specification chart for proper settings.



9) EMERGENCY PUMP pressure setting is located on the side of the adapter plate. To adjust the pressure on the pump, remove the cap and turn the adjusting screw in to increase pressure.To decrease pressure, turn adjusting screw out. Consult unit specification chart for proper settings.



10) BOOM EXTEND CHAIN ADJUSTMENT: Adjustment should be as follows- 1" of droop for each 10 feet of unit model. Example: MP50 = 5" MP80 = 8". Adjustment is accomplished by tightening or loosening the chain adjusting screw on the mid-boom section. Maintain equal tension on both chains when adjusting.

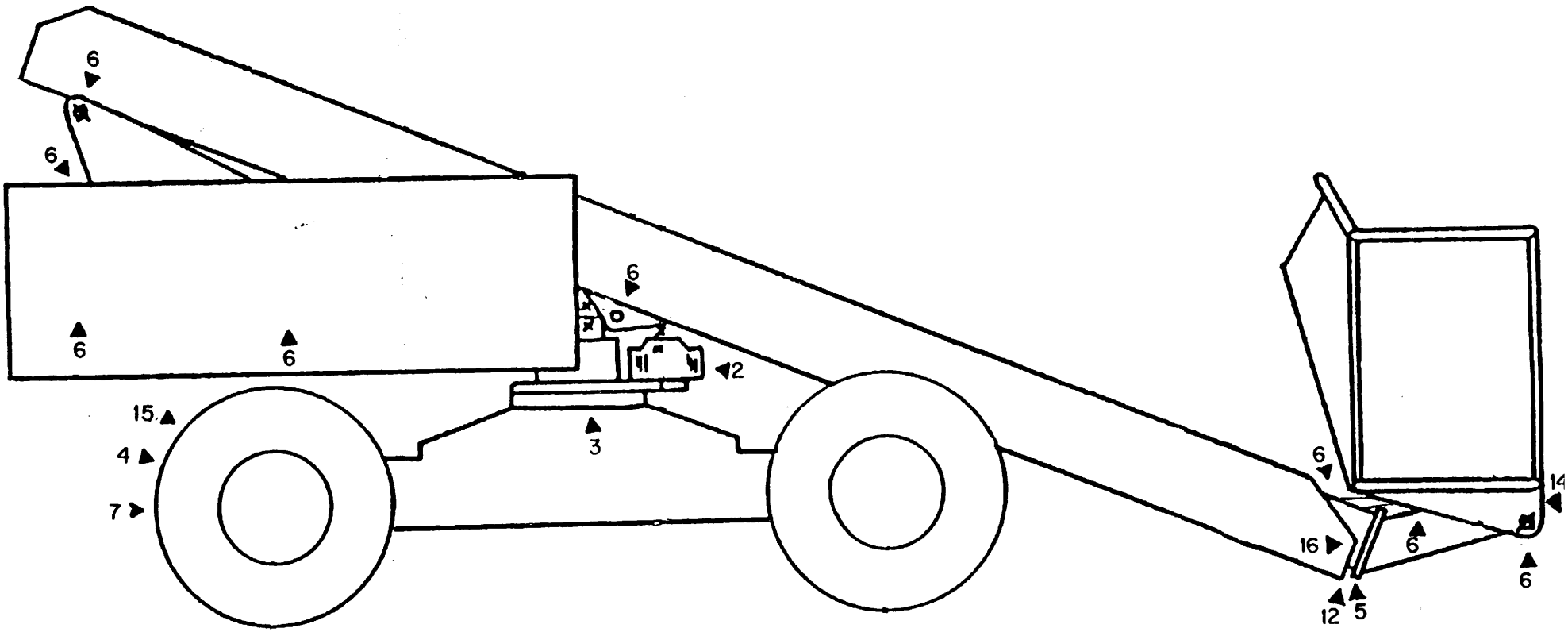
Lubrication Chart

2.1

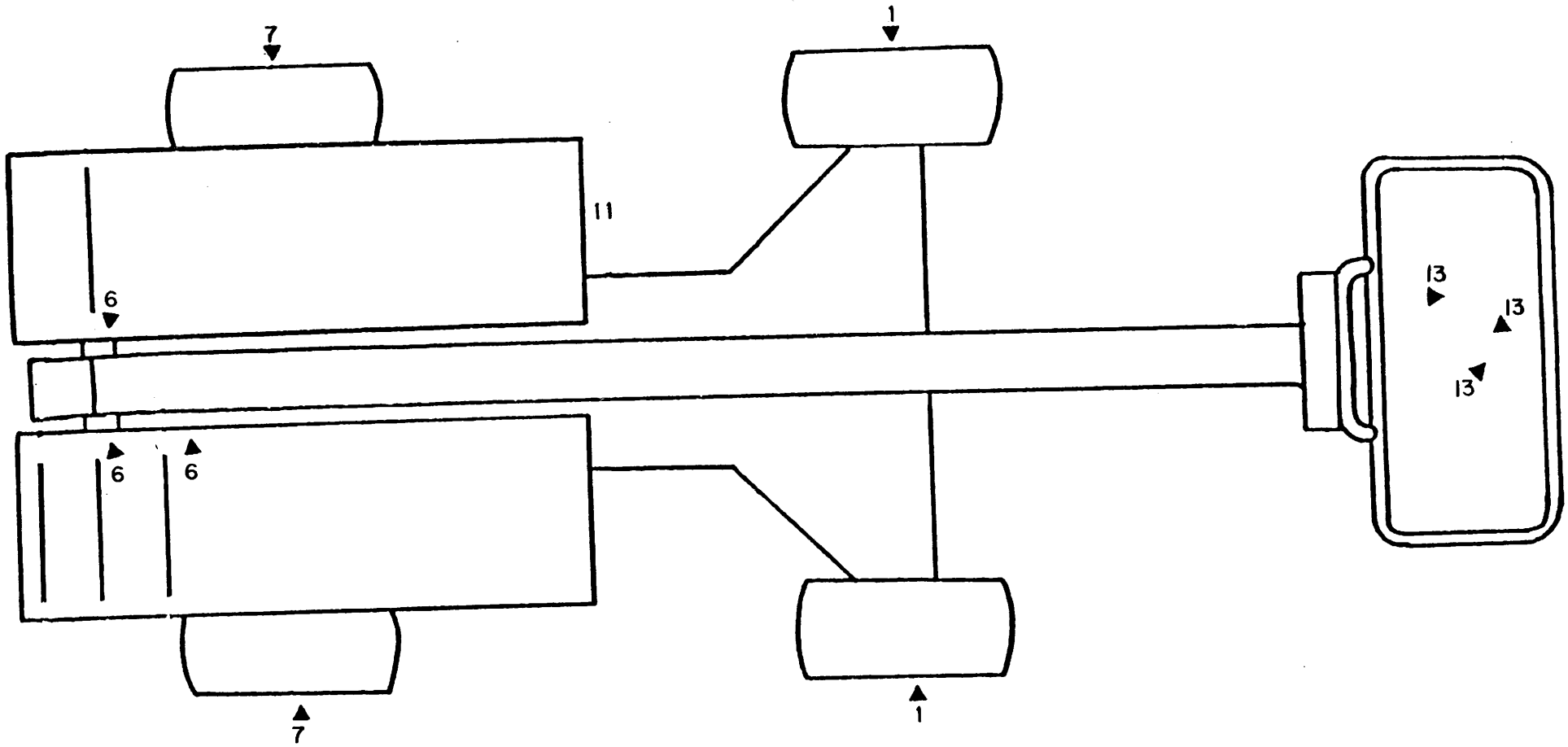
Nomenclature	Specification and Level Fill	Interval	Fig. Item
Drive Wheel Power Hubs	SAE 90 SAE 85-140 ½ Full	Initial 100 HRS. then yearly or 1000 HRS, whichever comes first	1
Engine Oil	Summer SAE 10W40 Winter SAE 10W30 To Full mark on Dip Stick	Initial 50 HRS. then every 100 HRS. or sooner if the oil is dirty	8
Hydraulic Fluid	To Full mark on gauge with boom down and retracted Mobil DTE-13 Petro Prod. DTE-13 after Aug.1983	Analysis for serviceability 6 months, change every year	11
Boom Wear Pads	Spray Silicone	Every 6 months	16
Turntable Swing Bearing	Til new grease comes out at 45° intervals EP N.L.G.i. #2	Monthly or 100 HRS. whichever comes first	3
Cylinder Pins	Til new grease comes out EP N.L.G.i.#2	Monthly or 100 HRS. whichever comes first	6
Gasoline	Regular		9
Diesel Fuel	Type II		10
Steering Spindles	Til new grease comes out EP N.L.G.i. #2	Monthly or 100 HRS. whichever comes first	4
Wheel Bearings	Clean and repack EP N.L.G.i. #2	Yearly or 1000 HRS. whichever comes first	7

Lubrication Chart

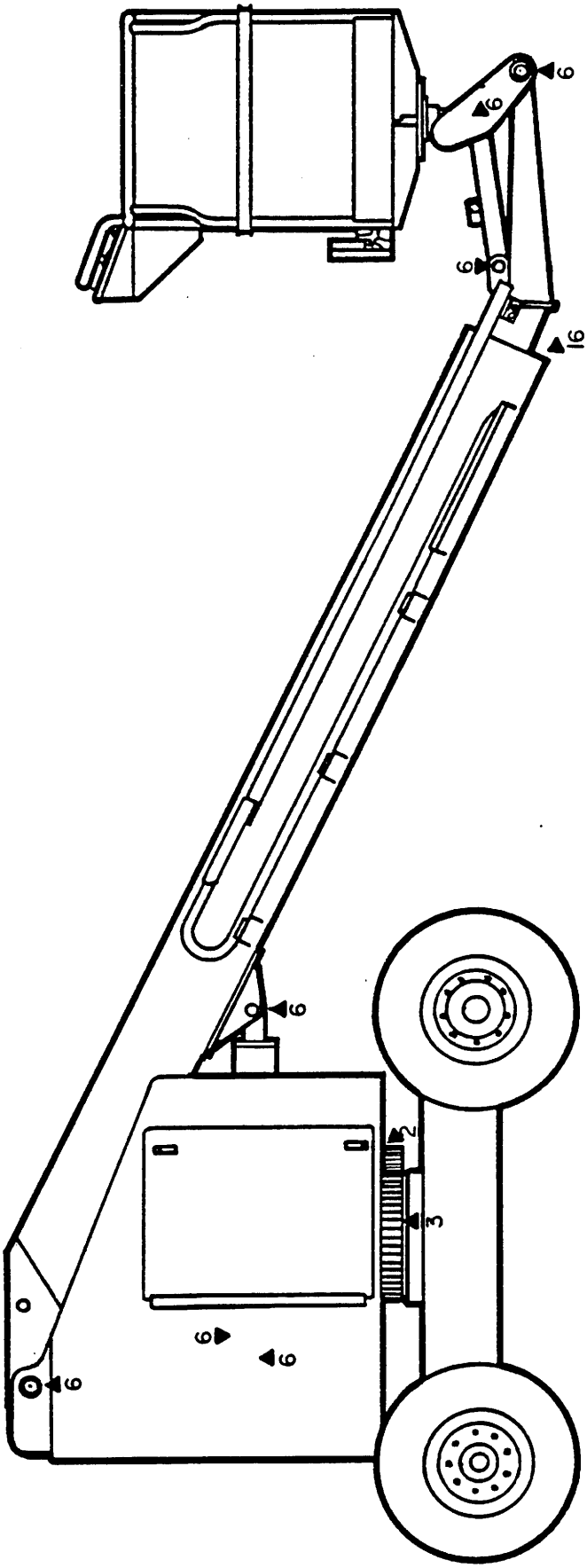
NOMENCLATURE	SPECIFICATION & FILL LEVEL	INTERVAL	
SWING REDUCER (SWING DRIVE)	OIL SAE 85-140 SAE 90W OR GREASE EP N.L.G.I. #1 WINTER EP N.G.L.I. #0	INITIAL 100 HRS. THEN EVERY YEAR OR 2000 HRS. WHICHEVER COMES FIRST	2
BOOM CHAIN SPROCKETS OF SHEAVES	EP N.G.L.I. #2 UNTILL NEW GREASE COMES OUT	MONTHLY OR 100 HRS. WHICHEVER COMES FIRST	5
BOOM CHAIN	WD 40 OR PENETRATING OIL	MONTHLY OR 100 HRS. WHICHEVER COMES FIRST	12
PLATFORM ROTATE MECHANISM	MULTI PURPOSE N.G.L.I. #2 UNTILL NEW GREASE COMES OUT	MONTHLY OR 100 HRS. WHICHEVER COMES FIRST	13
PLATFORM ROTATE TRUNNION (EARLY MODEL MACHINES)	MULTI PURPOSE N.G.L.I. #2 UNTILL NEW GREASE COMES OUT	MONTHLY OR 100 HRS. WHICHEVER COMES FIRST	14
STEERING TIE ROD ENDS	EP N.G.L.I. #2 UNTILL NEW GREASE COMES OUT	MONTHLY OR 100 HRS. WHICHEVER COMES FIRST	15



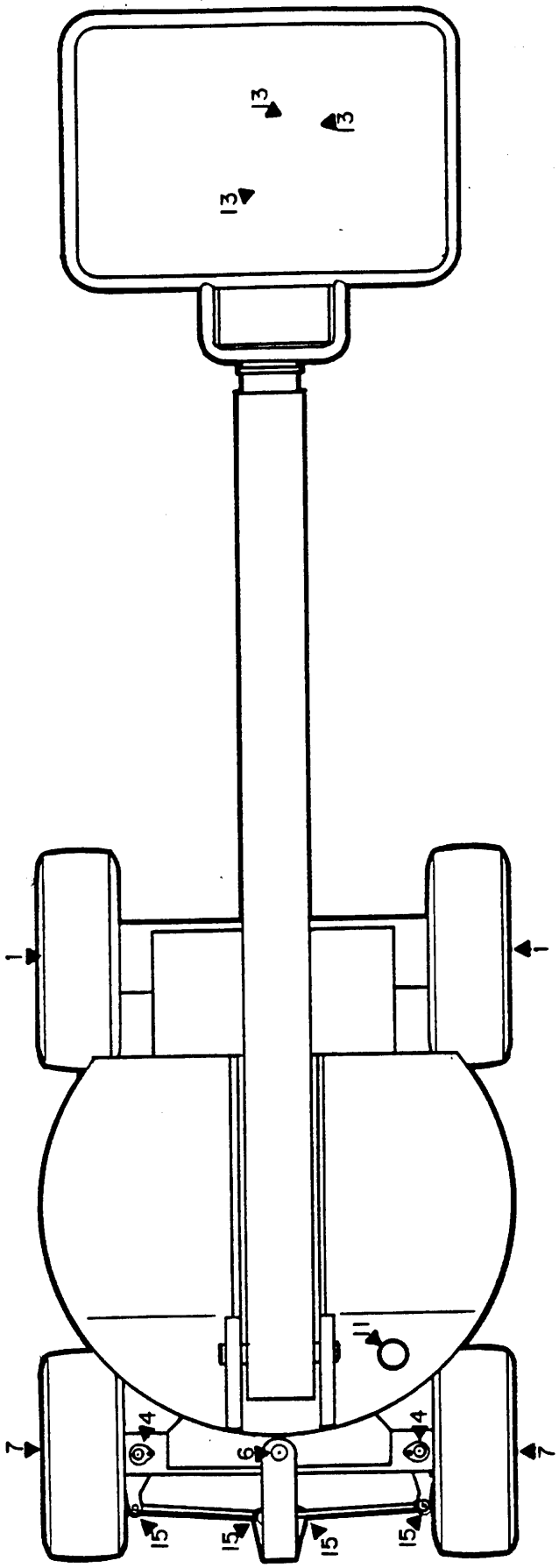
LUBRICATION DIAGRAM



LUBRICATION DIAGRAM



LUBRICATION DIAGRAM



LUBRICATION DIAGRAM

Mobil D.T.E.® 10 Series

PREMIUM HYDRAULIC OILS

The Mobil D.T.E. 10 Series of hydraulic oils was developed specifically to meet the requirements of modern hydraulic systems that must operate at low ambient temperatures or under widely varying ambient temperature conditions. In the marine trade, hydraulically operated deck and cargo handling equipment may be required to operate under tropic conditions at one port and under arctic conditions at the next port within a short period of time. These conditions require that the fluid has sufficiently low viscosity to permit start up of the equipment at the subzero ambient temperatures encountered, yet has sufficiently high viscosity to maintain system efficiency and minimize internal leakage when the system is fully warmed up or high ambient temperatures are encountered. These requirements can be met only by fluids with viscosity indices considerably higher than those of normal petroleum oils, and the fluids must be formulated so that mechanical shearing in the pumps and hydraulic elements does not cause excessive loss of VI and viscosity in service. In addition, these fluids must have the antiwear characteristics required for modern, high pressure hydraulic systems, give long service life, prevent rusting, separate readily from water, and resist foaming in service.

PRODUCT DESCRIPTION

The Mobil D.T.E. 10 Series are very high VI oils with carefully controlled low temperature flow properties. They are manufactured from highly refined base oils combined with selected VI improvers. Antiwear agents, rust and oxidation inhibitors, and a defoamant are also included. All components are selected and balanced to maintain, as nearly as possible, the good air release and water separation properties of the base oils.

In the development of the Mobil D.T.E. 10 Series particular attention was paid to the requirements of systems that must operate under widely varying ambient temperature conditions. A survey was conducted with major builders of marine hydraulic equipment and, based on their requirements, the viscosities of the series were selected. The survey uncovered a requirement for fluids with low, controlled viscosities at subzero temperatures, and viscosities high enough at the maximum anticipated operating temperatures to maintain system efficiency and minimize internal leakage. These desired viscosity-temperature characteristics are obtained in the Mobil D.T.E. 10 Series by selection of base oils with excellent low temperature flow properties and high VI and by the addition of a shearstable VI improver to the base blends. The VI improver used is selected for high resistance to shearing and viscosity loss under the conditions encountered in hydraulic systems. This shear resistance is illustrated by the results of a severe Diesel Injector Shear Test in which no member of the series exceeded 10 to 15 percent loss in viscosity at 100 °F (38 °C) after 10 passes through the injector.

Characteristic	Mobil D.T.E. 11	Mobil D.T.E. 13	Mobil D.T.E. 15	Mobil D.T.E. 16	Mobil D.T.E. 18	Mobil D.T.E. 19
API Gravity	31.9	29.2	28.6	27.8	27.5	27.1
Specific Gravity	0.866	0.881	0.884	0.888	0.890	0.892
Flash Point, °C °F	165 329	165 329	165 329	165 329	165 329	165 329
Pour Point, max, °C °F	-45 -50	-45 -50	-45 -50	-45 -50	-40 -40	-40 -40
Viscosity cSt 40 °C 100 °C	15.0/16.5 4.12	32/34 6.37	46/49 8.28	68/72 10.87	100/104 12.87	145/151 17.23
cSt 100 °F (37.8 °C) 210 °F (98.9 °C)	17.41 4.20	36.05 6.51	52.42 8.56	78.91 11.14	113.02 13.22	165.9 17.78
Viscosity Index, min	145	145	145	135	120	120
Brookfield Viscosity cP @ 0 °F, max @ 0 °F, typ @ -20 °F, max @ -20 °F, typ @ -30 °F, typ @ -40 °F, typ	 500 350 1250 1130 3200 10,500	 1250 940 3650 3300 7680 19,300	 2500 1730 6800 6250 13,500 57,800	 4500 3390 18,000 16,500 43,800 161,000	 9500 7790 67,750 61,600 220,000 —	 20,000 18,770 263,000 239,000 — —
Low-Temperature Pumpability Delivery @ 0 °F (-18 °C), gpm Efficiency @ 0 °F (-18 °C), % Total Acid No., min Zinc, % wt. min	 8.2 99 0.8 0.06	 6.6 88 0.8 0.06	 4.7 83 0.8 0.06	 2.7 36 0.8 0.06	 1.5 20 0.8 0.06	 0.5 7 0.8 0.06
Rust Test, ASTM D665, Synthetic Sea Water	Pass	Pass	Pass	Pass	Pass	Pass
Emulsion Test, ASTM D1401, min to 40-37-3	30	30	30	30	30	30
Foam Test, ASTM D892 Tendency, Stability, ml Seq. I, II, III	20/0	20/0	20/0	20/0	20/0	20/0

HYDRAULIC SYSTEM

Contamination Checks

A. Comply with a contamination analysis using the following as a guide in determining the requirement.

1. Any time the engine driven pump is replaced.
2. Fluid discoloration is evident in the reservoir sight tube.
3. After the first 50 hours of operation the high pressure filter element indicates a plugged condition (Schroeder Filter only).
4. Whenever the high pressure filter shows a high metal content.
5. Valves in the main valve bank have a continuous problem with the spools sticking and trouble shooting indicates the valve stacks are torqued properly (15 foot pounds).
6. Once a year under normal conditions.
7. Once every 6 months under dusty or dirty conditions of use.

B. If the above schedule is followed it will prevent premature system component wear to include cylinder seals, drive motors and early failure of the pump. It will also decrease unit down time.

C. A contamination analysis should be accomplished by a qualified laboratory with the following information to insure a proper analysis and recommendations.

1. Type of oil (the type of oil at initial fill is Mobil DTE-13).
2. Serial number of unit having analysis and type of unit, i.e.: (mobile aerial platform).
3. Purpose of analysis, i.e.: pump failure, discolored, etc.
4. Type of analysis i.e. complete to show additive breakdown, acid buildup, viscosity, type and percent of contaminants. Comparison to new oil and recommendations.

D. If flushing and replacement of fluid is recommended refer to flushing procedures.

HYDRAULIC SYSTEM FLUSHING PROCEDURE

A. Drain, flush and refill the main hydraulic tank.

B. Remove the system return hose from the pump, plug and cap the open hose and pump fitting.

C. Remove the system return hose from the hydraulic tank. Cap the hydraulic tank fitting and put the open system return hose in an empty container to catch the old system fluid.

NOTE: It is recommended to use a filter cart and external pumping in the following procedures. The main engine driven pump may be used but caution should be used to insure that the pump does not cavitate. In either case during flushing the system pressure should be between 600 and 1000 PSI during the flushing except for boom lift which you may have to increase the pressure to move the boom. The engine should be set at 1600 RPM also to reduce the GPM.

D. Remove the hydraport hose at the pump, cap the open fitting and install the hose in an empty container.

E. Remove the brake return hoses at the drive motors and allow 1 quart of fluid to drain from each hose with a fresh supply coming from the reservoir, reinstall brake return hoses.

F. If a pumping unit is being used connect the output to the engine pump pressure hose. Start the pump being used and run until gallons of fluid have drained from the removed hydraport hose. Use caution during this step as the engine driven pump will be putting out full volume and pressure with the hydraport hose disconnected. Reconnect the hydraport hose.

G. Block the foot pedal to deliver 800 PSI and use the limit switch at the ground stroke handle to control the pump destroke solenoid if using the engine driven pump.

NOTE: During the following steps hydraulic fluid will be exiting from the open system return hose, continuous monitoring of the reservoir fluid level or fresh fluid supply must be maintained to prevent pump cavitation. Also when servicing oil from a drum keep the pick up tube 1 inch off of the bottom of the drum to keep from picking up drum contaminants.

All the cylinders should be in their stowed position at the beginning of the following procedures.

H. A) Raise the boom 3 feet then lower it completely two times.

B) Raise the boom to the full up position.

C) Lower the boom 3 feet then raise it back to the full up position twice.

I. A) Extend the boom for 5 seconds then retract it completely two times

B) Extend the boom to the full out position.

C) Retract the boom for 5 seconds then extend it to the full out position twice.

D) Reconnect the system return hose to the pump, retract and lower the boom.

CAUTION: Monitor the reservoir fluid level when lowering and retracting the boom to prevent the reservoir from over filling as more fluid will enter the reservoir than what is leaving it during this step.

E) Disconnect the system return hose as in step C.

F) Extend the boom until high speed drive disengages and raise the drive tires from the ground and operate the drive until 5 gallons of oil have come out of the return hose, then reverse the drive for 5 more gallons. Lower the unit to the ground.

G) Cycle the steering to the full stroke position in both directions twice.

H) Cycle any remaining cylinders twice except cab rotate and cab leveling.

I) Reconnect all removed hoses to their respective positions.

J) Disconnect the return hose at the free flow end of the check valve under the cab control panel and plug the hose. Install another hose on the check valve and put the loose end in an empty container.

K) Cycle cab rotate two full cycles then operate cab leveling with the selector for two full cycles.

L) Disconnect the master leveling cylinder hoses at the master cylinder and operate the manual leveling valve in both directions until at least 1½ gallons have come out of each disconnected hose. Reconnect the rod end hose and bleed air from the hose before tightening the hose fitting.

M) Raise the boom to its full up position catching the fluid coming out the blind end port of the master leveling cylinder.

N) Reconnect the blind end hose to the master leveling cylinder bleeding the air from the hose before tightening the hose fitting.

O) Lower the boom andusing the manual selector operate cab leveling through 2 complete strokes.

P) Restore the unit to its original condition and fill the reservoir to the full mark on the sight gauge.

Q) Operate all functions to their full extreme positions insuring that the cab levels properly when booming up and down.

R) Check to insure reservoir pressurization is operating by pressing on the red button on the hydraulic tank cap, you should hear air escaping. Repair the tank pressurization if it is not working as it may have caused the contamination problem.

S) If all the systems are operating properly check for leaks and repair as needed.

A VARIABLE DISPLACEMENT PRESSURE COMPENSATED RADIAL PISTON PUMP

This pump has 8 inlet and 8 discharge valves, 8 pistons, 8 piston springs, a cam, crankcase control valve, crankcase pressure control orifice and pressure regulator (compensator). It is obvious that as the shaft turns, the pistons move upward and downward.

On the downward piston stroke fluid is drawn into the piston from the reservoir through the inlet valve; on the upstroke the fluid is exausted through the outlet valve and into the system.

On this pump the displacement is varied by reducing the piston travel. How is this accomplished? First let us examine the piston and its spring in relation to the crankcase pressure. Observing that the force applied downward inside the piston (i.e. toward the cam) is the spring force; and also, noting that the force upward (away from the cam) is the pressure force, (crankcase pressure) acting on the piston, it follows then that whenever the pressure force is greater than the spring force, the piston will be suspended some distance away from the cam, of course dependent on the magnitude of the crankcase pressure. Consequently the piston would be in equilibrium. Of course as the crankcase pressure is further increased, the piston stroke will be reduced even more and vice-versa.

The next question that would seem to arise is: How is crankcase pressure increased and decreased to change the piston stroke? This change is accomplished by the pressure compensator and the crankcase orifice. Let's examine the compensator first. On our generalized pump drawing we see a hollow poppet type valve with a spring holding the poppet on the seat. The system pressure is acting on the poppet lip with a force equal to the spring force on the poppet. If the poppet were preloaded against the seat by the spring then the poppet would not move away from the seat untill the pressure force acting on the poppet were greater than the spring force. Of course as the poppet moves away from the seat, a flow path is open to the crankcase from the discharge side of the pump (system pressure). Observe that the exit from the crankcase is restricted by the crankcase orifice, resulting in as increase in crankcase pressure as the fluid passes from the crankcase orifice and back to the pump inlet. As stated earlier, the increase in crankcase pressure reduces the piston stroke.

The compensator poppet has a hollow center. It is through this passage that we maintain throttle control of the pump by changing the flow rate to the pump crankcase, via the foot pedal or ground handle. This procedure is effective until system pressure reaches compensator poppet cracking pressure at this point, (200-250 PSI below system pressure setting). The pump will be able to deliver its peak or maximum volume dependent only upon system demand for this volume. As system pressure increases past this point, the pressure acts on the compensator poppet gradually allowing the poppet to open, in turn adding fluid to the crankcase overcoming the capacity of the 60 thous-

sanths orifice and building up crankcase pressure until the pump pistons are suspended far enough from the cam to allow only the fluid needed to keep the pump in a static state (1GPM).

As system pressure is lowered from compensator cracking pressure, volume and pressure capabilities of the pump are reduced until only the pressure required to keep the pistons off the cam and allowing 1 GPM volume flow are met. This is where the hydraport system controls the pump.

We control the flow and pressure two ways on our machines: 1) the deadman solenoid, when open,(energized on older mach's. w/N.C. valve, de-energized on late model mach's. w/N.O. valve) bypasses the pressure compensator allowing fluid to go directly to the crankcase from the pistons. The pressure will only go as high as necessary to overcome piston spring force to collapse the pistons. When the deadman solenoid is closed, (de-energized on older mach's. w/N.C. valve, energized on late model mach's w/N.O. valve) maximum system pressure is controlled by the spring loaded adjustable compensator. When the system pressure becomes high enough to overcome the spring tension, the poppet in the compensator opens, allowing enough fluid to the crankcase to stop the pressure from rising by lifting the pump pistons off the cam.

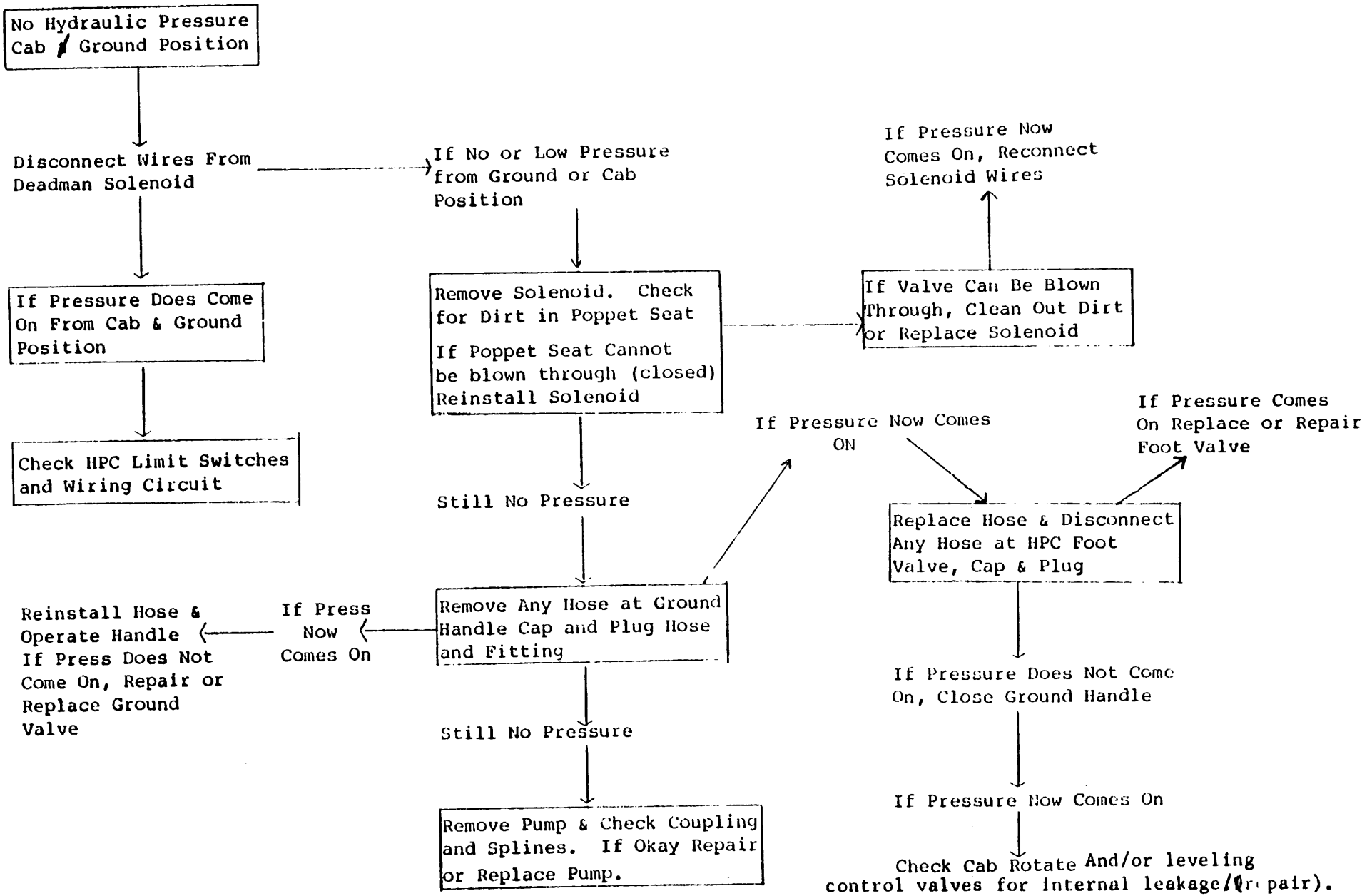
The foot pedal and ground handle have limit switches to control the deadman valve (open/close). The foot valve and ground valve are series connected. The fluid source starts at the pump side of the check valve in the valve bank manifold. From this point, it goes up the boom and tee's off just below the cab rotate and leveling valve. It then goes to the piston side of the foot valve. When the foot valve is not compressed, the fluid flows through the large part of the slotted orifice. It then goes out the other port of the foot valve and tee's into the line just below the check valve under the control console. From this tee the fluid is hosed to the ground control valve (normally open), and then connects to the pump at the port opposite the compensator adjustment. This port houses the center of the hollow poppet of the pressure compensator. So as the foot pedal is depressed, the slotted orifice in the foot valve gets smaller, thus allowing less fluid to go back to the pump crankcase. As the crankcase pressure drops, the pump pistons stroke longer allowing more fluid and pressure into the main system. As system pressure increases, the fluid flow through the slotted orifice increases to the point of balancing the crankcase pressure to the system pressure and volume demand. In other words lets say the foot pedal is depressed half way to control pressure to 1500 PSI: as volume is used in the main system a corresponding pressure drop will occur depending on how much volume is used. As orifices are sensitive to pressure changes, a volume drop will occur on the far side of the orifice reducing the pressure in the crankcase section of the pump, allowing the pistons to stroke longer until the system demand for pressure and volume decreases. System pressure will then increase untill a balanced flow is met across the slotted

orifice allowing the pump to destroke approximately 1 GPM (the fow required across the orifice to keep the pump destroked). The pump, also, has a 60 thousanths crankcase bleed orifice that assists with this balance. Since this orifice is a fixed orifice and the maximum pressure change within the crankcase is only 25 PSI, the flow stays fairly constant across this orifice (if internal leakage of the pump becomes too much for this orifice, the pump volume will decrease as the internal leakage increases).

On older machines there is a needle valve going back to the hydraulic tank from the compensator port which should always be kept closed to allow the pump to throttle. The more it is opened, the faster the crankcase pressure is dumped, thus reducing the intended throttling characteristics. Opening the needle valve over balances the pump control to the point of the pump calling for immediate pressure when the deadman solenoid is closed. All machines equipped with the snap tite valve in the ground position have little throttling as the snap tite valve was not designed to throttle. Also, on the early models the pump deadman valve is deenergized and the minimum pressure on these systems is 200 PSI from the ground position as no limit switches were used.

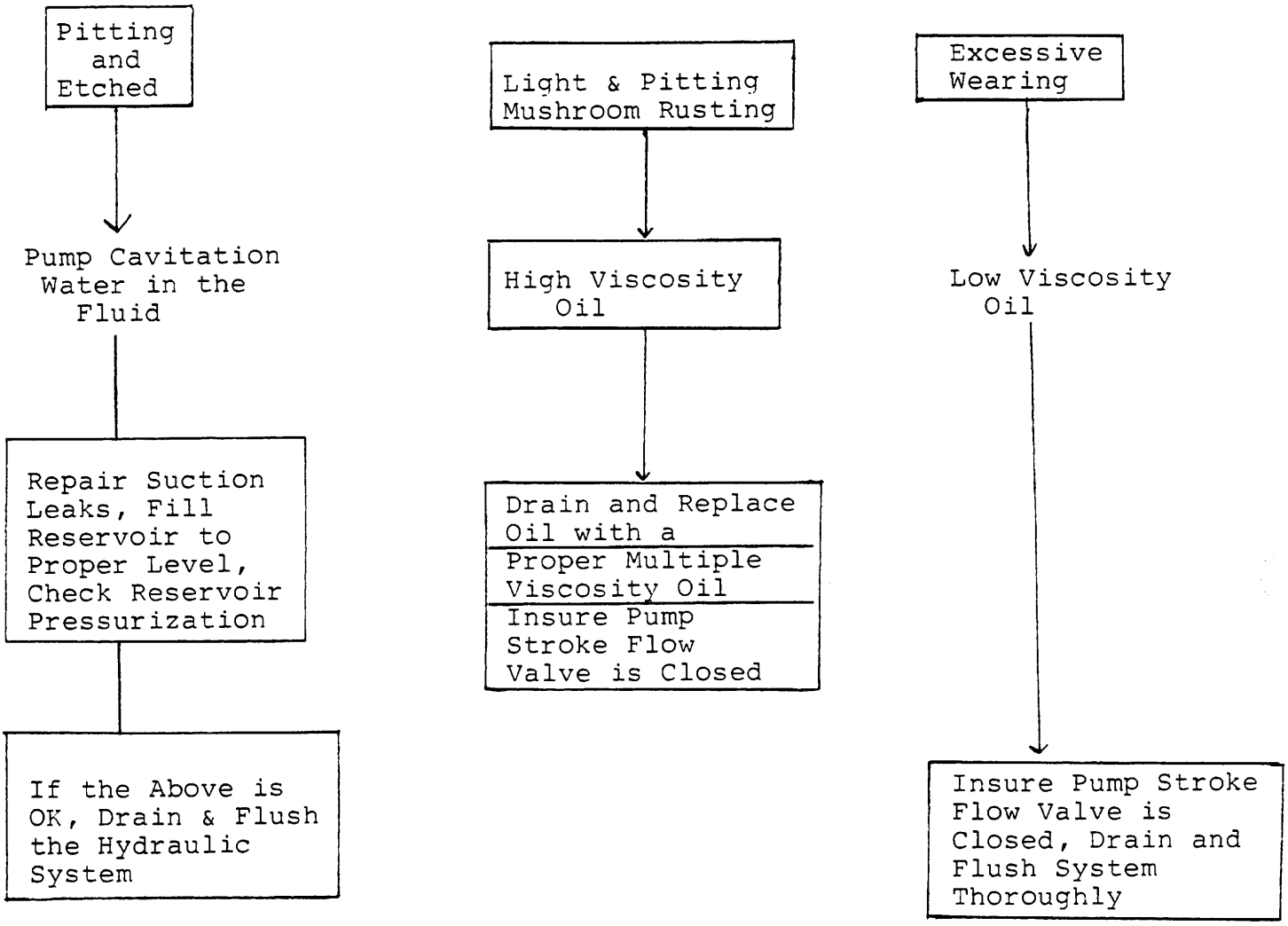
HPC

HYDRAPORT CONTROL

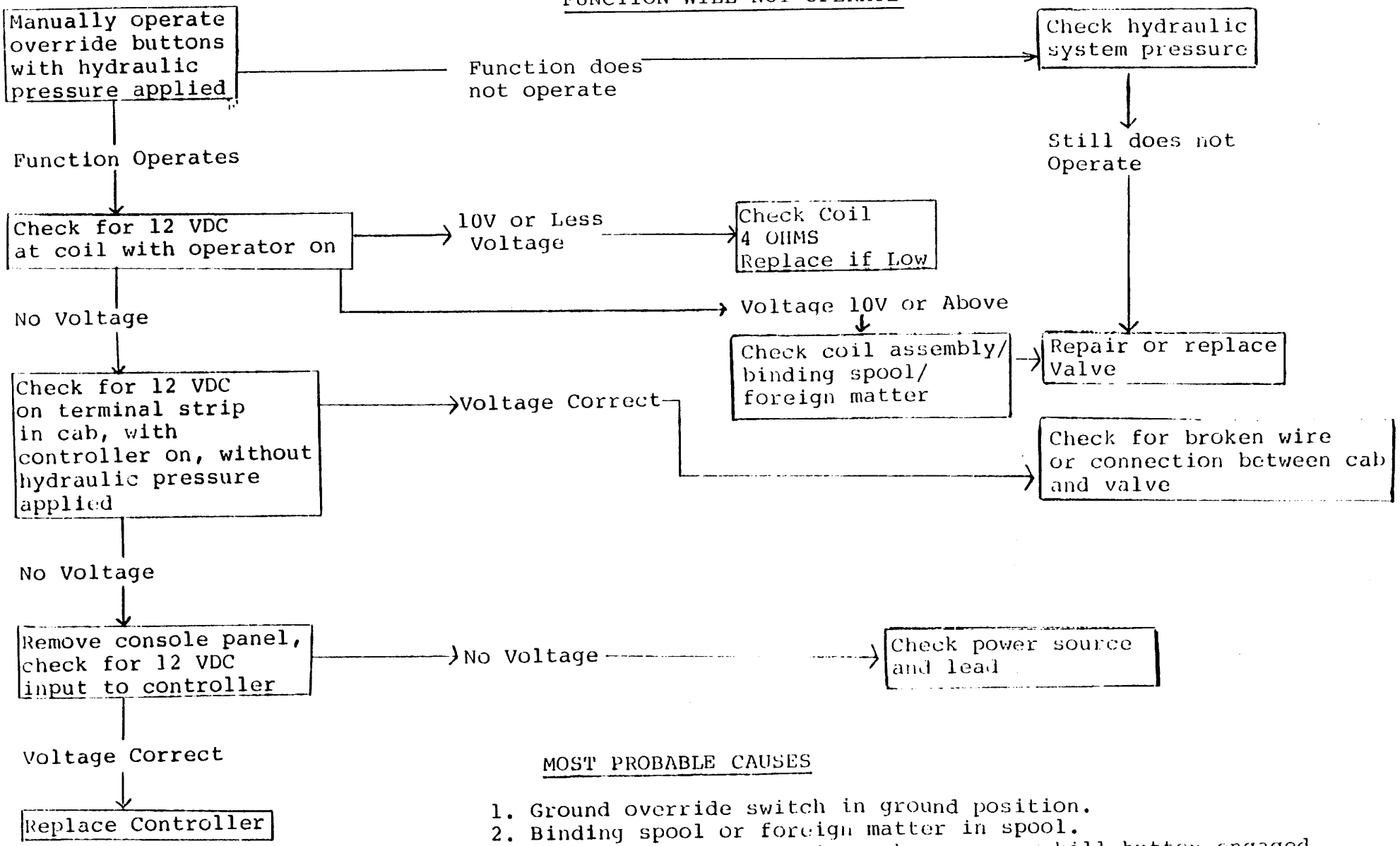


EXCESSIVE PUMP WEAR

PUMP PISTON AND CAM



FUNCTION WILL NOT OPERATE

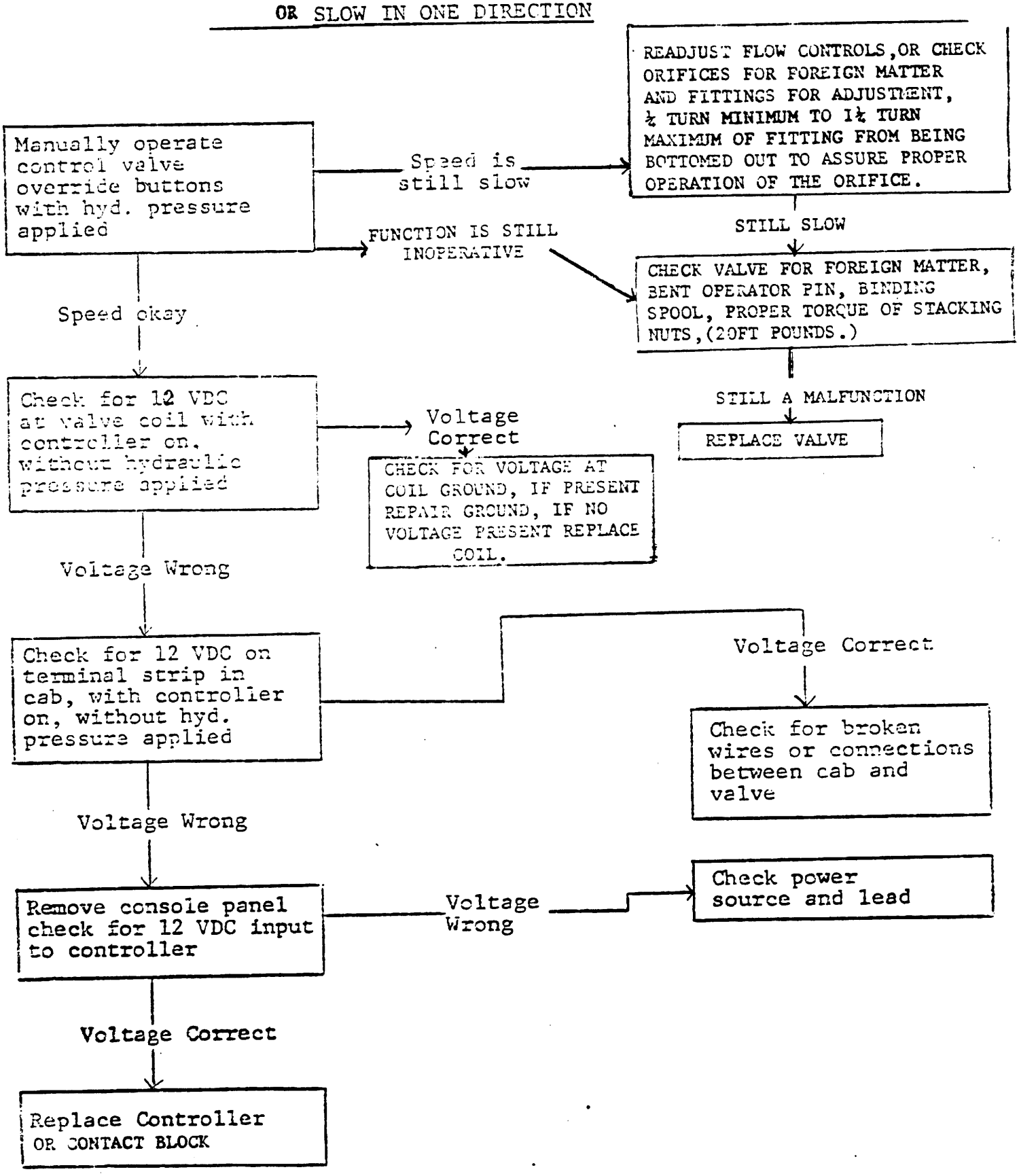


MOST PROBABLE CAUSES

1. Ground override switch in ground position.
2. Binding spool or foreign matter in spool.
3. Emergency pump operation, cab emergency kill button engaged
4. 24 conductor cable malfunction.

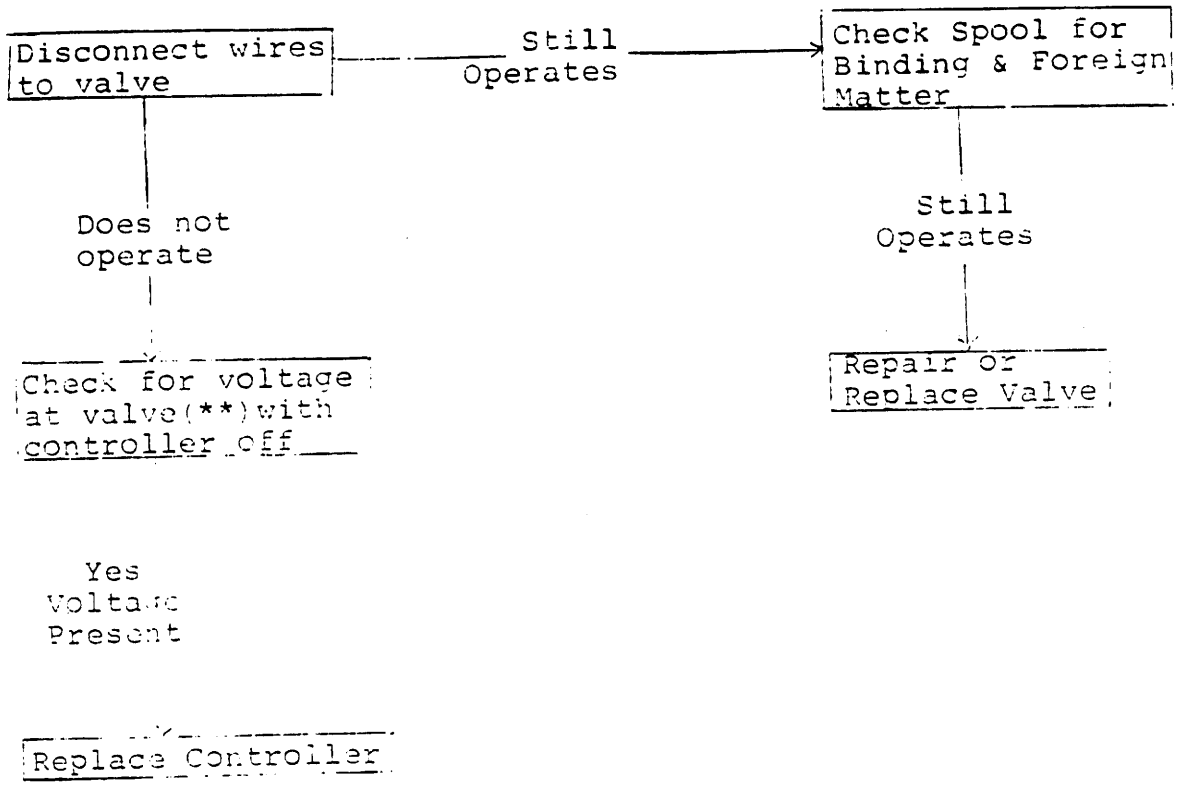
FUNCTION SPEED IS INOPERATIVE

OR SLOW IN ONE DIRECTION



FUNCTION OPERATES

BY FOOT VALVE ONLY

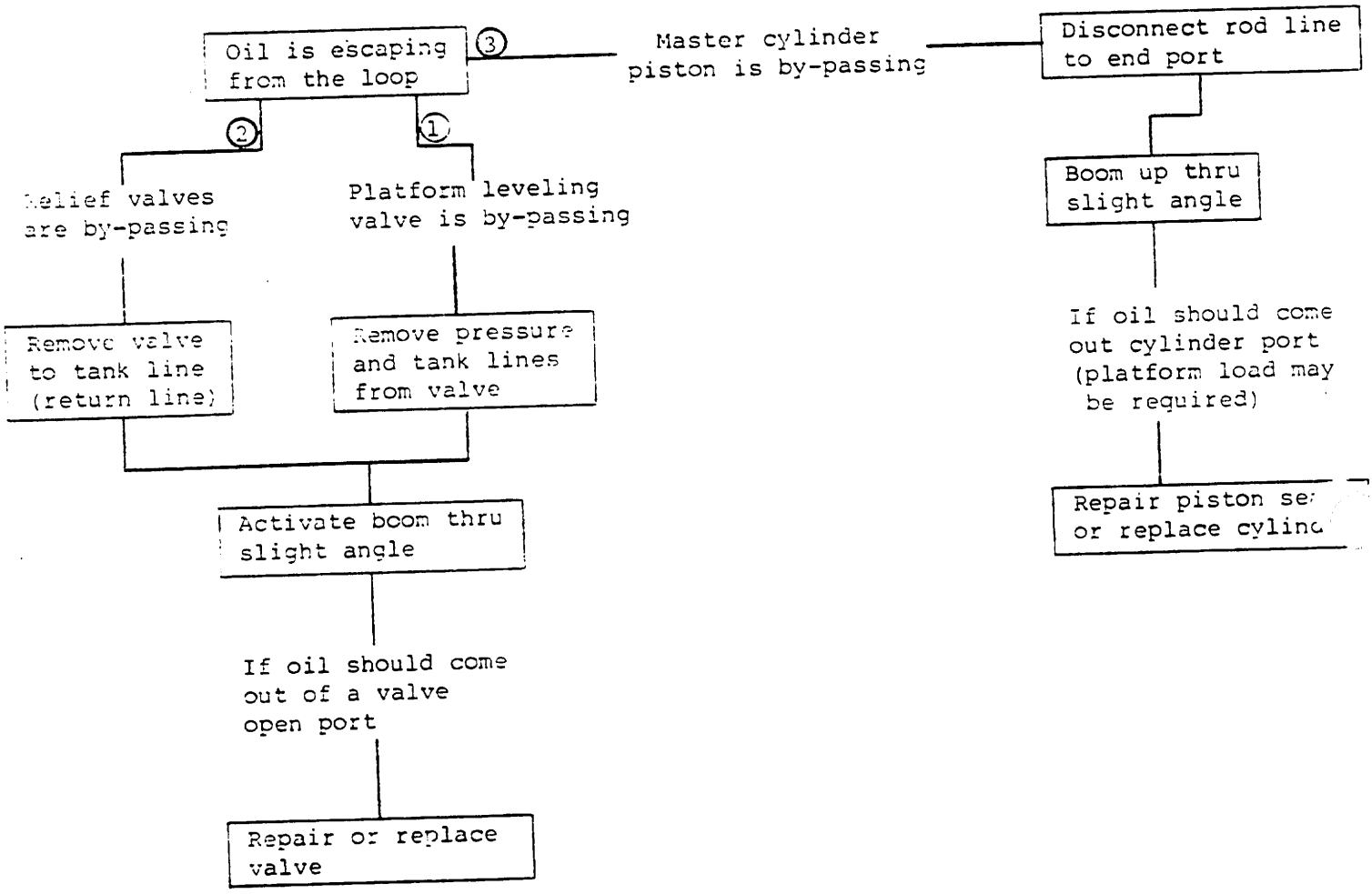


** Reconnect wires to valve

PLATFORM RATCHETS OR DOES NOT LEVEL

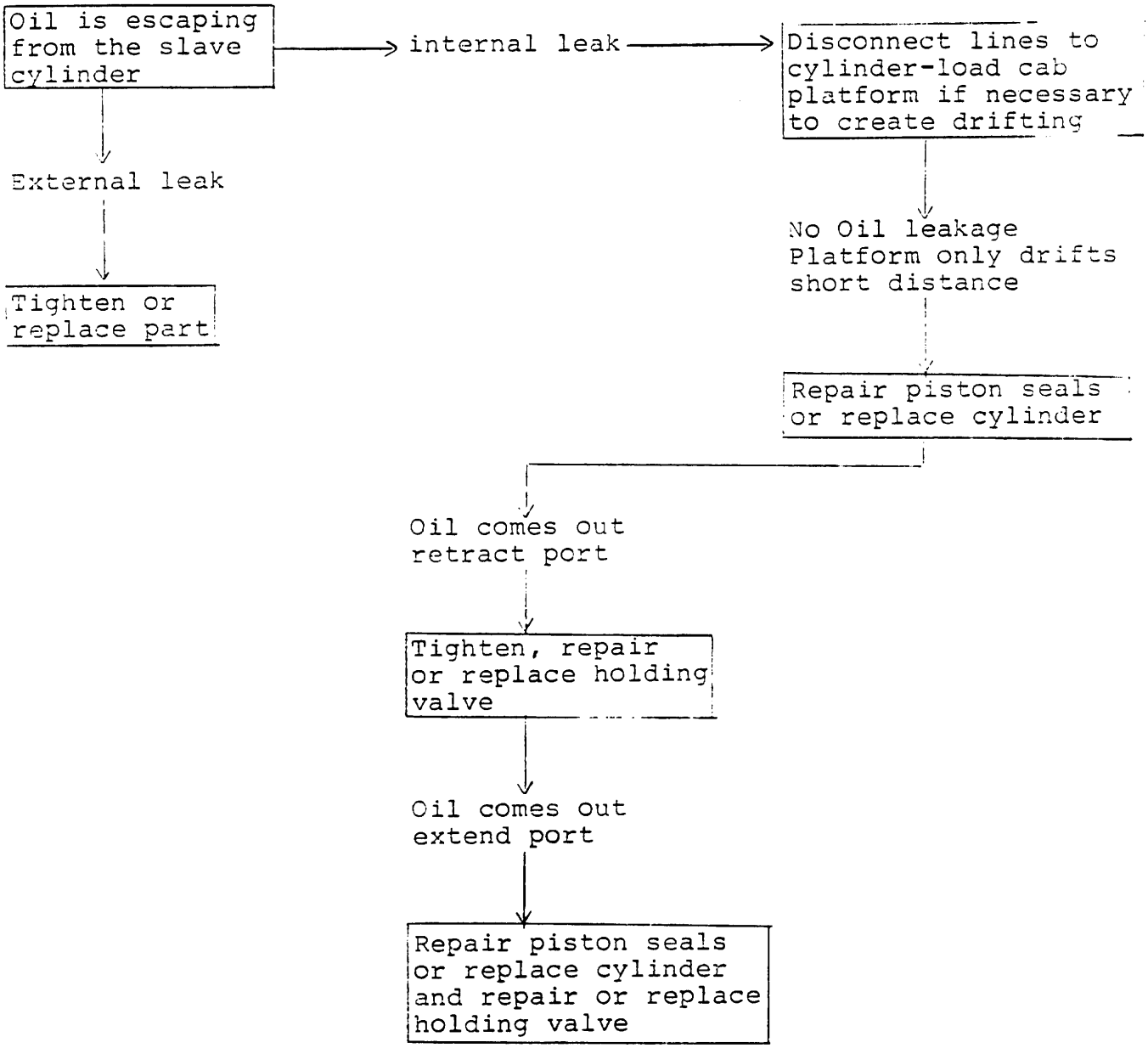
Platform does not stay level while booming up or down.

1. Check for platform drifting
2. Check for damaged parts such as bent pins or elongated pin holes



PLATFORM DRIFTING

With engine off, platform does not stay level.



TROUBLE SHOOTING

PROBLEM:

1. Boom trac cross braces breaking.
   A. Check for hose skiving in the boom trac. If skiving is noted, proceed to step B.
   B. If system pressure is too high, it will cause the boom hoses to shrink more than normal. If pressure is normal, proceed to step C.
   C. If the hydraulic system pressure is normal, the hoses are run too tight in the trac. To achieve proper hose tension, it may be necessary to adjust the hoses 3 or 4 times, (hoses too loose may get pinched under the trac).

2. Boom trac sagging.
   A. The lowest portion of a sagging trac has the pin holes stretched usually caused by a damaged 'I' beam support (high spots and twisting). If the unit is equipped with an overhead guard, the trac could also get caught on a damaged guard which could also tear off the moving anchor.
   B. Lack of lubrication and cleaning.

3. Boom extend and retract is rough (3 piece boom only).
   A. Check boom chain tension, extend the boom fully, then retract approx. 12 to 18 inches. Check the lowest point of the chain from the mid boom. The chain should be 1 inch for every 10 foot of unit model, i.e. MP-80 and 8 inch sag. If too loose, the chain sprockets may be destroyed.
   B. Excessive sand or grit inside the boom.
   C. Grease on boom collecting grit. The booms are dry running and should require no greasing. Use bonded silicone spray only.
   D. The inside chain anchor block is worn and has sharp edges grabbing the lower base boom when retracting.
   E. The lower extend holding valve is out of adjusment or other internal hydraulic adjustment, i.e. the flow valves on the extend control valve.
   F. The inner or outer chain has frozen or has stiff links. Clean and lubricate with a penetrating oil, it may be necessary to soak the chain overnight to remove the kinks and stiff links.

4. Cabs equipped with a center rotate trunnion loose.
   A. Loose trunnion bolts.
   B. Worn trunnion bushings, trunnion should be greased at the zerk provided on newer units.

5. Little or no hydraulic throttling
   (No pressure to full pressure)
   A. Insure the pump stroke valve leading to the hydraulic tank is closed.
   B. Insure the limit switch under the foot pedal engages before the foot valve piston can move over 1/8 inch.

C. Insure that the foot valve piston groove (or slotted side) faces towards the valve ports.

D. Insure that the pressure hose (common to the cab rotate and leveling flow control valve) is connected to the port closest to the foot valve piston rod.

6. Boom will only raise if the cab rotate, leveling flow valve is closed.

   A. The cab rotate or leveling valve is leaking internally causing system pressure to be reduced by fluid bypassing the foot pedal.

7. Boom will not retract from the fully extended position only.

   A. Hydraulic system pressure filter dirty, Schroeder filter only.

   B. Hydraulic system pressure low.

   C. Grit on boom sections, it may be necessary to lubricate the bottom of the mid and tip boom with a dry-type silicone lubricant.

8. Unit will not go into high speed drive with boom retracted and lowered.

   A. Filter dirty (Schroeder filter only, see filter element in specifications).

   B. On units equipped with only one high speed drive valve, and the low speed drive valve is inoperative. The low speed will bypass drive fluid slowing down drive speed somewhat (see item 9).

9. Unit will not drive with the emergency pump.

   The low speed drive valve is inoperative.

10. Snap-Tite selector valves cracking the body or blowing the body seal.

    A. Caused by back pressure on the return port. Insure that the pressure and return hoses are connected properly.

    B. Check for blocked or partially blocked return hoses.

    C. For the cab rotate and leveling vlaves, insure that the check valve is installed with the arrow pointing down (away from the selector valves). Check for internal leakage of the check valve.

11. Valves sticking in valve bank.

    A. Too much valve body bolt torque and/or uneven torque. The nuts should be torqued to 15 foot pounds.

    B. Valve body facing not milled square causing uneven valve stack and resulting in a distorted valve body.

    C. Improper hydraulic oil in the unit. Many fluids will not mix properly causing different additives to break down and disturbing varnishes on moving and unmoving surfaces resulting in eventual failure of a component.

    D. Contaminated hydraulic fluid, or old fluid. A sample should be examined and measured against original specifications of the fluid used. All fluids will get tired with age and abuse.

    E. On older units, the spring in the low speed drive needle flow valve may have gotten into a drive valve jamming the spool.

12. Low speed drive valve inoperative in low speed drive mode only.

    A. Spool sticking.

    B. A low resistance in one of the high speed drive valve coils. Each coil should have 4 ohms resistance, if a high speed drive valve has less than 4 ohms resistance, excessive voltage will feed across the coil to the opposite coil of the low speed valve trying to be operated. Thus both coils are trying to actuate.

13. One tire leaves the ground when the boom is extended over a corner of the unit.

    A. The unit is not on level ground.

    B. The unit capacity has been exceeded.

    C. Tires are under-serviced with calcium chloride solution. This condition could also rust out the rims, as the normal liquid level is over the top of the rim to reduce oxygen concentration.

14. CONTROLLER SWITCH FAILURE

Indications: Lever doesn't return to center position.

Cause: Operator rod bent, excessive force due to; jerking machine and using levers as handles, results in neutral position of switch not in relation to the handle center position causing vertical travel control to be off center, shorter operator rod travel in the direction handle rod is bent, possibly not engaging switch. Over travel in the opposite direction which could cause the operator rod to leave its seat and, also, allow the switch pin to come up too far resulting in a jammed switch or broken switch pin.

Contamination: Moisture can freeze switch in cold weather. Dust and dirt can get under the switch pin not allowing it to travel or breaking the pin by trying to force the pin travel, the operator rod could, also, get bent if too much force is used, (controller boot damage is the main factor contributing to contamination).

WHEEL DRIVE MOTOR FAILURE

15. CAUSE OF FAILURE

A) Contamination - If one motor failed, the internal loose pieces will eventually flow into the opposite motor causing that motor to fail.

B) Improper installation of needle bearings.

C) Excessive bearing loads caused by high speed braking with brakes set for full application.

D) Useful bearing life exceeded caused by braking loads.

E) System not flushed or protected properly after components failure within the drive circuit.

F) Use of poor quality oils or worn-out oil will decrease the life of any component.

G) Towing machine with hubs engaged.

H) Cavitation - Motor running faster than input is available causing ratcheting.

I) Motor stopping unit, i.e. brake adjustment closed too far, low speed flow valve has a malfunctioning check valve.

SWING GEAR PINION SHAFT, TOOTH AND/OR RING BEARING FAILURE

16. CAUSE OF FAILURE

Shock = excessive side loading of boom. Unit throttling not being used, causing instant on and off of the swing motion i.e. foot pedal being blocked to the on position, the foot pedal being operated before the controller or the hydra-port control not being maintained for throttle control. Lack of gear lube causing gears to bind. Pinion gear too tight (no backlash to ring gear). Gear box loose causing the load to be at the ends of the gears instead of being evenly distributed over the teeth of the pinion which will also cause ring gear teeth wear due to slippage. Foreign objects caught between the teeth forcing the pinion away from the ring gear.

17. HYDRAULIC PUMP COUPLING FAILURE

A. Hayes Coupling: Splined coupling not locked to splined shaft, causing coupling to move away from insert resulting in insert destruction and ensuing coupling failure.

B. Browning Coupling: The splined half will move on the spline, eventually working into the back of the pump and destroying the spline. A stop should be welded into the coupling to prevent it from moving into the pump.

EXCESSIVE HEAT Excessive heat will cause excessive wear on seals and metal parts due to lowered viscosity.

Symptoms = Pump case turns brown, darkens or hydraulic oil darkens. Premature pump failure.

Causes:
1. Excessive water content in the oil.
2. Improper oil viscosity.
3. Pump cam bearing failure.
4. Lack of lubrication, worn out oil, improper oil.
5. Stroke flow valve opened.
6. Foot pedal blocked closed.

Corrective Action:
1. Drain and flush system, rebuild pump as required.
2. Close pump stroke valve.

WATER IN FLUID

Symptoms = Pitting and etching of pump pistons with eventual pump piston cam wear causing heat build up and premature pump failure.

Corrective Action: Drain and flush system. Replace worn pump components. Check reservoir pressurization.

THE MOST COMMON CAUSES OF HYDRAULIC SYSTEM MALFUNCTIONS IN ORDER

1. Incompatible hydraulic oils mixed, destroying the additives and causing varnish build up resulting in the valves to stick.

2. Water in the oil due to a damp climate and reservoir pressurization inoperative.

3. Improper oil used; viscosity too high cold climates, viscosity too low warm climates. Note: Mobil DTE-13 is a multiple viscosity oil that is light enough for cold climates and resists thinning in warm climates.

4. Fuel in the oil, lowers the viscosity and lubricity of the oil.

VARNISH Varnish is the dark brownish residue left from oxidation of hydraulic fluids.

Symptoms = This residue will cause pistons and spools to stick and will hang up moving parts with close tolerances.

Causes:
1. Mixing incompatible oils or use of poor quality oils.
2. Excessive heating of the oil.

Corrective Action: Drain and flush system.

CAVITATION Cavitation is a gaseous condition within the fluid stream where the pressure is reduced to the vapor pressure of the fluid. The higher the system pressure the more violent the reaction will be.

Symptoms = Pitting and etching of pump pistons.

Causes:
1. Low reservoir fluid level.
2. Air leaks in suction line.
3. Oil viscosity too high, improper oil used.
4. Cold hydraulic fluid.
5. Pump speed too high.
6. Vaporization of water.

Corrective Action:
1. Warm up system before using full system pressure or adjust system as required.
2. Have fluid analyzed regularly and use proper hydraulic fluid.
3. Repair any suction hose leaks.
4. Insure reservoir pressurization is operating properly.

POOR LUBRICATION Parts break through lubricant causing metal to metal contact.

Symptoms = Heads of pump pistons worn to shape of cam. Excessive heat build up.

Causes:
1. Fluid viscosity too low.
2. Lack of anti wear additives in the oil.
3. Fluid contaminated with water or other low viscosity liquid.
4. Improper or poor grade oil used.

Corrective Action: Drain and flush system, install recommended hydraulic oil.

DEUTZ ENGINE

1. Starter stays engaged
   A. Start button sticking
   B. Relay sticking
2. Engine quits after 30 seconds.
   A. Oil pressure switch stuck closed or no oil pressure.
   B. Wire # 20 is grounded energizing the 30 second safety relay.
   C. Start button or plug-in relay sticking closed.
3. The rack (fuel shut off) will not shut the engine off.
   A. Injector fuel shut off shaft is clogged with dirt.
   B. Fuel shut off arm spring broken.
   C. The bolt holding the rack solenoid bell crank is too tight and/or needs cleaning.
   D. The rack solenoid is adjusted improperly, causing the shaft to bind, or adjusted to not allow the linkage to go to the off position.
4. Rack solenoid failure.
   A. See items A - C and D above.
   B. If the solenoid is not adjusted to be bottomed out with the rack linkage in the full open position, the holding coil will not engange and the pulling coil will not disengage (The pulling coil will not take a continuous amp load without destruction of the coil very quickly). Also, if you allow the linkage to bottom out completely, when engaged, destruction of the linkage could occur.
5. Excessive engine vibration at idle.
   A. All Deutz engines have a high quivering (vibration) point, that usually occurs between 700 rpm and 1300 rpm. By setting the idle rpm above this point, excessive destructive vibration will be eliminated.

V 465 WISCONSIN ENGINE

1. Engine floods when starting unit.
   A. Choke operator piston sticking.
   B. Choke set too rich.
   C. Starting engine on high throttle, (engine should be started on low rpm or vacuum loss will not allow choke piston to operate).
   D. Throttle linkage binding or out of adjustment not allowing carburator to go into idle, or idle rpm set too high causing an intake vaccum loss.
   E. An electric solenoid operated choke is available to eliminate this condition.

HYDRA-PORT CIRCUIT

Electrical: The ground override switch selects power to either the ground or platform ignition switch. At the platform the power is then sent thru a switch under the foot pedal, which then sends power to the pump solenoid. When the solenoid is energized the pump destroke valve, opens. When the foot pedal is depressed to the point of the valve spool just starting to move, switch will operate opening the circuit to the pump solenoid which de-energizes closing the destroke valve which now puts the pump into a pumping mode. This same process occurs from the ground position. Also on some models a Hi-Low pressure system may be used from the ground position. In this case a button will be used to control the pump solenoid. The stroke valve will be energized by the ignition switch. The Hi-Low switch in the Hi mode will energize stroke valve, which will put the pump in a full stroke mode when the pump solenoid is de-energized. The flow valve controls what the pressure will be when switch is in the Low mode.

Hydraulic: When the pump destroke valve is closed fluid flows to the filter, then thru the valve bank manifold, up the boom and thru the foot valve, then back down the boom to the ground handle (not shown) or thru the Hi-Low pressure valves, and back into the center of the pump holding the pistons away from the operator cam only allowing enough fluid pumping to maintain the pistons in this mode. As the foot valve is depressed an orifice within the valve gets smaller allowing less fluid to return back to the pump which allows the pistons to move closer to the operator cam. The pistons then start pumping harder, if the fluid is not used pressure builds up at the inlet of the foot valve which increases the flow across the foot valve as the flow increases in the center of the pump, pressure builds up and again holds the pistons away from the operator cam only allowing enough pumping to maintain this condition. When the foot valve is completely depressed no fluid returns to the pump. In this case the pistons will pump fully until an internal pressure control within the pump opens up sending fluid into the center of the pump only allowing the pistons to pump enough fluid to maintain this condition. If fluid is used to operate a function a pressure drop will occur closing the internal pressure control and the pump will now be on full pumping capability again. This same condition will occur when using the ground handle. If the Hi-Low circuit is being used valve will be closed only letting what flow valve will let thru it until valve is closed which again will put the pump on a full pumping mode capability.

The Hydra-port circuit is further explained on page M-13.

HYDRAPORT

REF.#

① Hydraulic Pump

Radial piston, engine driven cam, crankcase pressure controlled, (as crankcase pressure increases pump output decreases). Delivers fluid pressure to all the hydraulic systems.

② Destroke Valve

Normally closed 2 port valve, when the valve is opened it dumps pump output pressure into the pump crankcase section of the pump and when closed allows the hydraport circuit to control pump output.

③ Filter

Filters pump output fluid. Note: Resistance of element to fluid flow will cause system pressure to increase when the destroke valve is closed.

④ Distribution Manifold

This is where the hydraport circuit begins, it allows fluid to go up the boom to the foot stroke valve. Note: All Systems on the unit are closed center with the exception of the hydraport circuit which is an open center loop.

⑤ Foot Stroke Valve

A normally open 2 port manually controlled valve designed to open and close gradually controlling the volume of fluid going back to the pump crankcase causing pump output control.

⑥ Ground Stroke Valve

Same as the foot stroke valve with the exception that platform leveling and rotate manual selectors become inoperative due to the return being blocked by the ground stroke valve.

ITEM	TROUBLE SHOOTING	ADJUSTMENTS	REPAIRS	MISC.	PARTS
1 Pump	M5.1,.2	M1.1 (Fig.6) M1.2 (Fig.10)	D8	M4	D8
2 Destroke Valve	M5.1				
3 Filter	M6.2 (Fig.7) M6.2 (Fig.8)		D11	M3	D11
4 Manifold					C2
5 Foot Stroke Valve	M5.1 M6.2 (Fig.5) M6.2 (Fig.6)			M4	D5
6 Ground Stroke Valve	M5.1			M4	D5

UNITS EQUIPPED WITH GROUND PENDANT
CONTROL THIS SYSTEM REPLACES
GROUND STROKE VALVE

A. Ground Stroke Solenoid

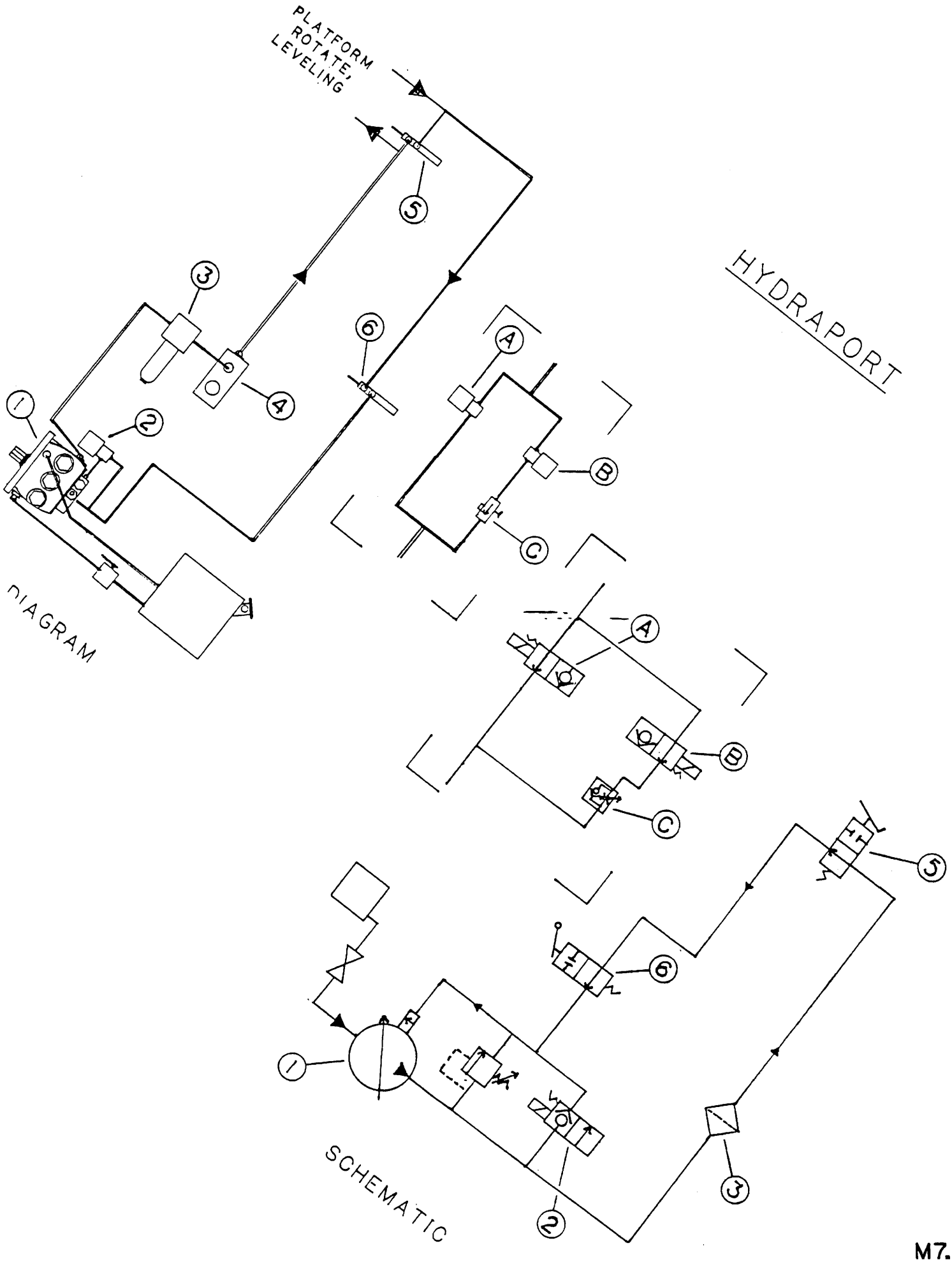
Normal open 2 port valve when energized shuts off fluid free flow to pump crankcase and forces all crankcase flow thru high pressure valve.

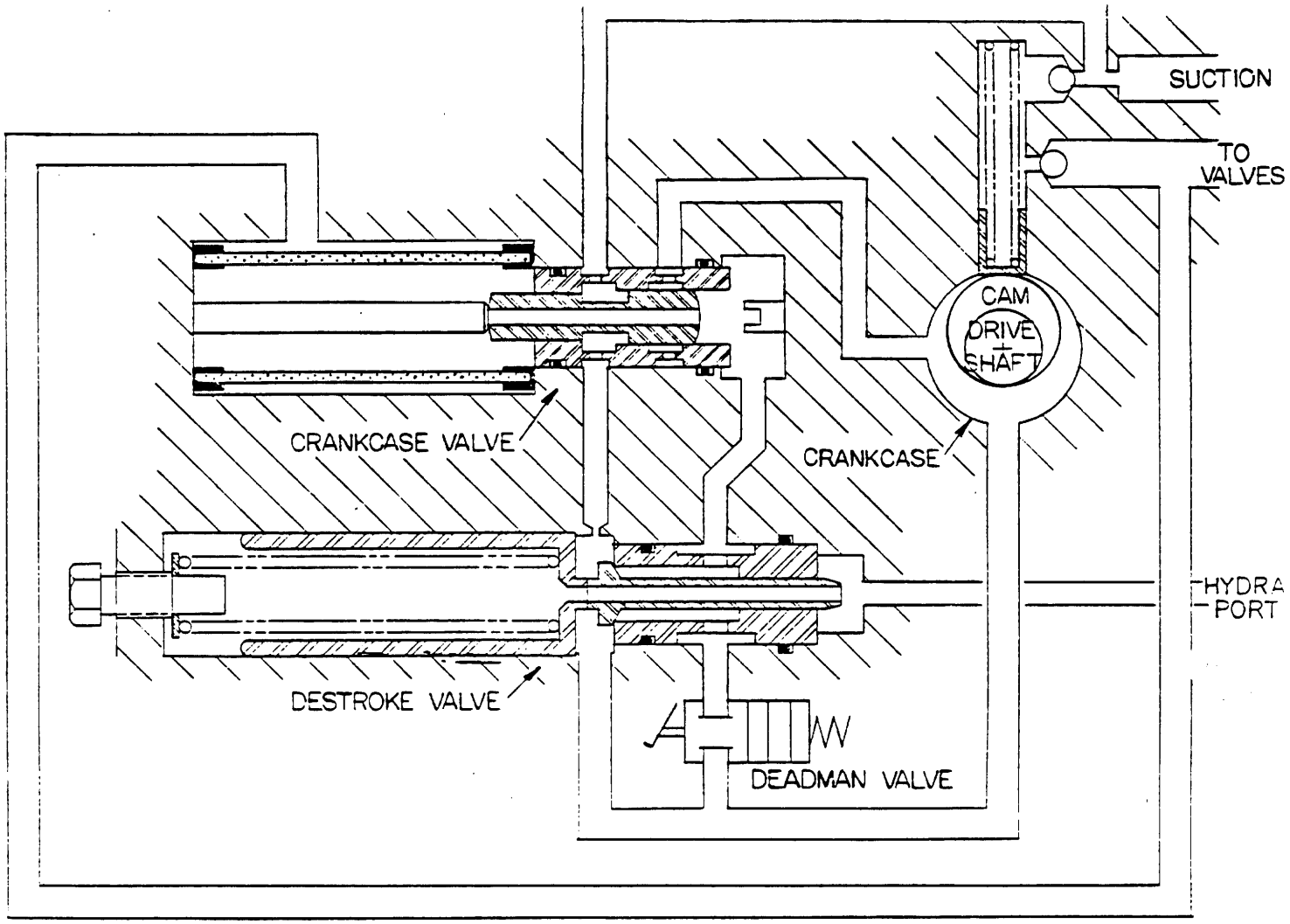
B. Ground High Pressure Valve

Normal open 2 port valve when energized shuts off all fluid flow to the pump crankcase forcing the pump into full stroke.

C. Low Pressure Valve

Adjustable flow controlling amount of fluid flow to the pump crankcase when the ground stroke solenoid is closed thus controlling the ground low pressure.


PLATFORM ROTATE, LEVELING
HYDRAPORT
DIAGRAM
SCHEMATIC
1
2
3
4
5
6
A
B
C



STROKE CONTROL VALVE

PR-24,30,40 & 60 SERIES PUMPS

BOOM LIFT

REF.#

(1) SELECTOR VALVE

Solenoid operated 3 position 4 port normally closed with manual override buttons. Selects fluid pressure to the boom lift circuit.

(2) HOLDING VALVE

Prevents unintentional boom down movement. It allows free fluid flow into the blind end of the lift cylinder, it will not let the fluid out of the blind end of the cylinder until the pressure in the rod end overcomes pilot spring force opening a pilot spool thus letting the cylinder retract and lower the boom.

(3) LIFT CYLINDER

Double acting powers boom up and down movements and support the boom.

(4) FLOW CONTROL VALVE

Controls boom down speed and prevents the holding valve from bouncing and squeeling.

(5) ORIFICE

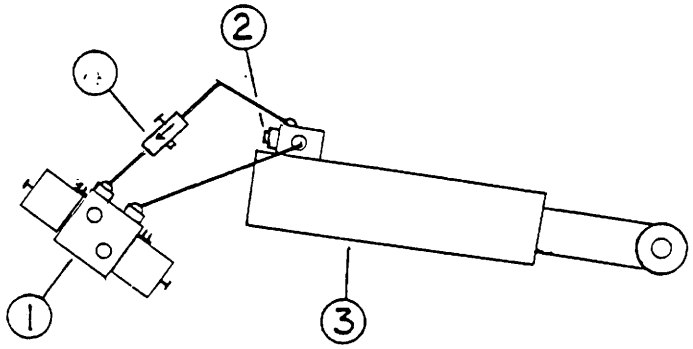
Controls boom up speeds.

NOTE: Units that do not have a flow control valve will have 2 orifices controlling boom up speed and maximum boom down speed. For exact boom down speed control adjusting the orifice control within the holding valve will be required.

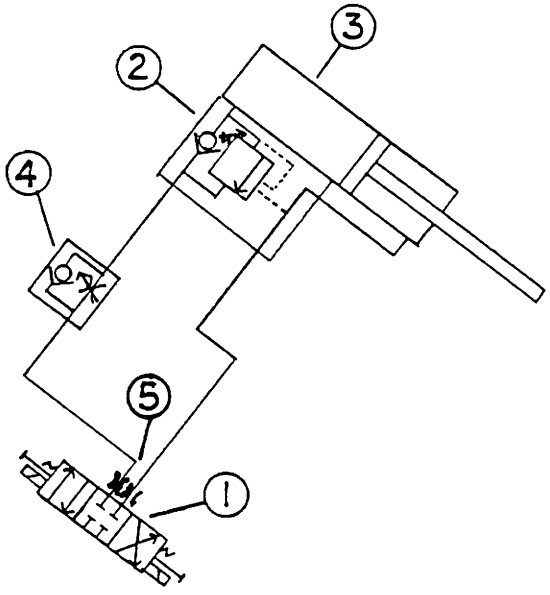
Caution must be observed when maintenance of the holding valve is required. The boom must be fully down and pressure relieved from the cylinder.

ITEM	TROUBLE SHOOTING	ADJUSTMENTS	REPAIR	MISC.	PARTS
1 Selector Valve	M6.2 (Fig.6) M6.2 (Fig.11) M5				D13
2 Holding Valve		M1.3 (Fig.15)			D9
3 Lift Cylinder					D9
4 Flow Control Valve		M1.3 (Fig.14)			D9
5 Orifices	M5.4				C2

BOOM LIFT



DIAGRAM



SCHEMATIC

BOOM EXTEND

The boom extend selector valve is 3 position 4 port normally closed valve (all ports blocked in the neutral position). Note: Earlier units may use a motoring valve (both cylinder ports vented to return in the neutral position). This is because double lock valves were used .

Two load holding valves are now being used that do not require a motoring valve selector .

Three piece booms also use return flow control valves to prevent holding valve oscillation which will be noted as a jerky boom. If the selector valve is positioned to extend the boom fluid will go out port B, free flow thru the flow valves , free flow thru a check valve within the holding valve and go into the case end of the extend cylinder , as pressure builds up a sensing port to the bottom of the cylinder will open the holding poppet allowing the rod end fluid to leave the cylinder. To retract the boom the same procedure applies only the fluid will enter the rod end and port B will be returned.

Mechanical: On three piece booms the third section will be chain driven, the second and third boom sections slide on nylons pads.

The second boom section will be cylinder driven as the cylinder is connected between the first and second boom sections.

The chain will be in 2 sections. Both sections will connect together and run a continuous loop around the second boom section. The chains will be anchored where they connect at point (D) on the tip boom and point (C) on the base boom. As point (C) is fixed, whenever the second boom section is moved point (D) will move. When extending the second boom the boom chain (A) will pull on point (D) extending the third boom. When retracting the second boom the boom chain (B) will pull on point (D) retracting the boom.

ITEM	TROUBLE SHOOTING	ADJUSTMENTS	REPAIR	MISC.	PARTS
1 Selector Valve	M5 M6.2 (Fig.11)				D13
2 Flow Control Valves	M5.4 M6.1 (Fig.3)	M1.3 (Fig.15)			C2
3 Holding Valves	M6.1 (Fig.3)				B3
4 Extend Cylinder					D19
5 Orifices	M5.4				C2
6 A/B Chains	M6.1 (Fig.3)				

BOOM EXTEND

REF.#

(1) SELECTOR VALVE

Solenoid operated 3 position 4 port normally closed with manual override buttons. Selects either boom extend or retract pressure to the boom extend cylinder. NOTE: Earlier units use a motoring spool (cylinder ports vented to return), due to double lock valves being used.

(2) FLOW CONTROL VALVES

Used on 3 & 4 piece booms, controls boom operating speed and prevents holding valve oscillation by controlling cylinder return fluid flow and allowing free fluid flow to the cylinder.

(3) HOLDING VALVES

Prevents unintended boom movements by not allowing cylinder return fluid flow until inlet pressure pilots the return holding valve to open. Holding valves are installed on the extend and retract ports of the extend cylinder.

(4) EXTEND CYLINDER

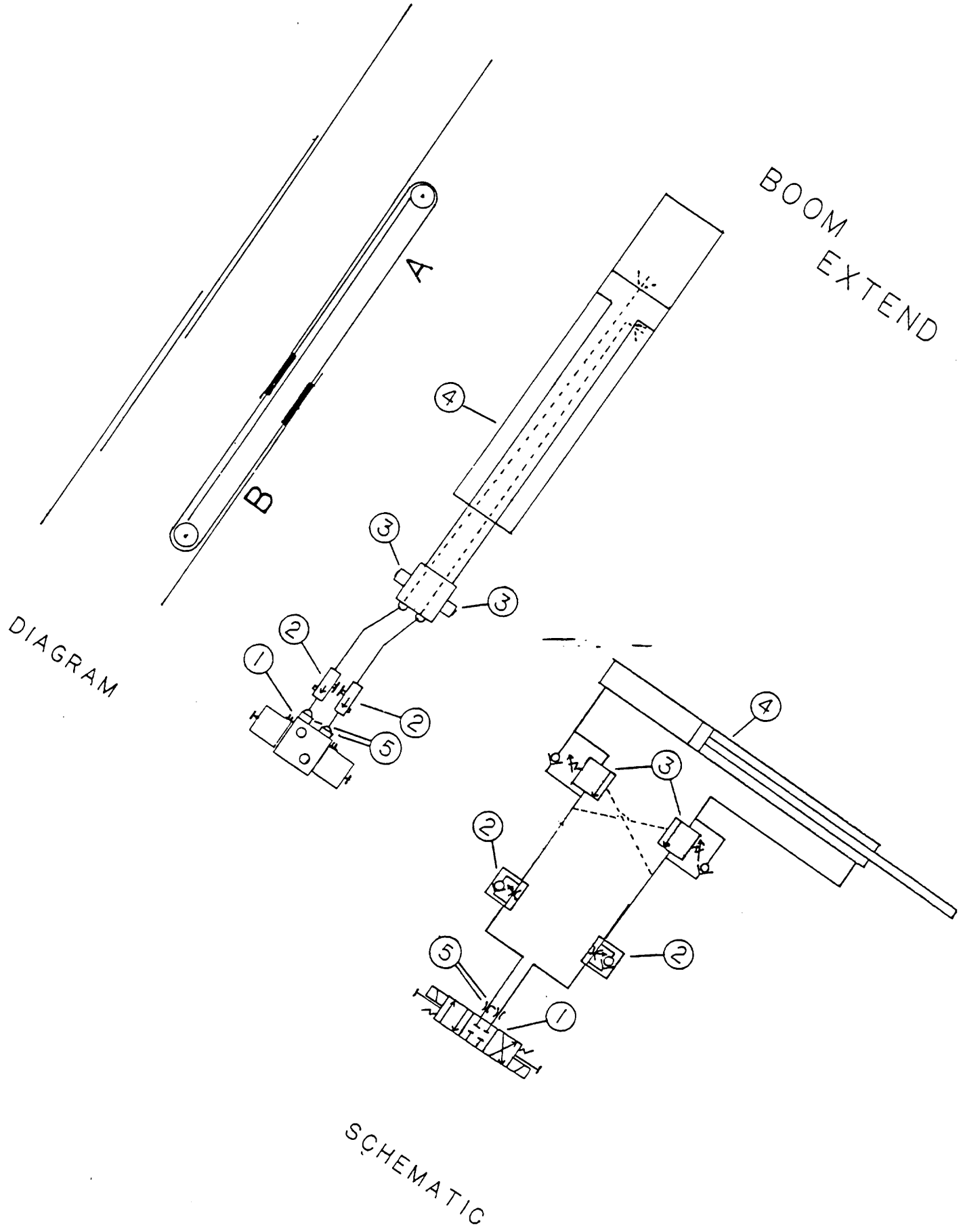
Double acting, ported internally thru the center of the piston rod as shown by the dotted lines. It powers the second boom section movements.

(5) ORIFICES

Used on 2 piece booms in place of the flow control valves. They control fluid volume flow to the extend cylinder and allows free fluid return flow from the cylinder.

(A/B) BOOM CHAINS

On 3 and 4 piece boom sections the third and fourth sections will be chain driven. On 3 piece booms there will be 2 chains, the outer chain (A) pulls out the third boom and prevents it from retracting. The inner chain (B) pulls the third section in and prevents the boom from extending. Both chains are anchored to the front of the base boom and the rear of the tip boom and run a loop around the second boom section. As the second boom section moves, the chain walks around the second boom section carrying the third boom section with it. On 4 piece booms the same chain set up is installed on the third boom and anchored to the second and fourth boom sections causing the same operation to be repeated.


BOOM EXTEND
A
B
4
3
3
2
1
2
5
DIAGRAM
4
3
2
5
2
1
SCHEMATIC

SWING

REF.#

① Selector Valve

Solenoid operated with a manual override, 3 position 4 port valve with a motoring spool. Selects fluid pressure to the swing circuit for clockwise or counterclockwise upper frame rotation. The motoring spool allows a return to relieve brake pressure in the swing circuit.

② Orifices

Controls maximum rotation speed by limiting the amount of fluid into the swing circuit.

③ Flow Valve

Adjustable, used on large units.

To prevent the boom from moving faster than the motor directs it to on down hill swings, it also controls boom tendancies to stop and go.

④ Shuttle Valve

Selects either clockwise or counterclockwise pressure into the gear box brake to release the brake.

⑤ Swing Motor

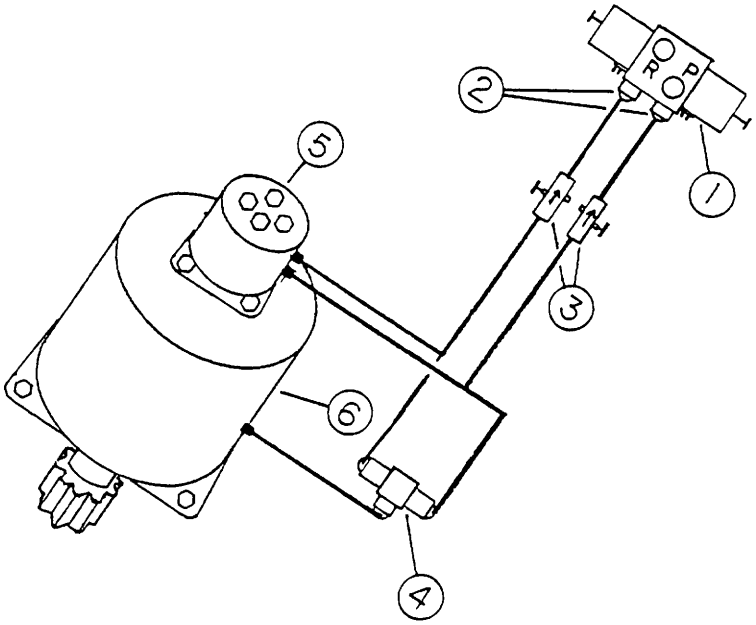
Rotor driven keyed to a shaft which in turn powers the gear reducer, (or worm reducer lower view) for swing.

⑥ Swing Brake

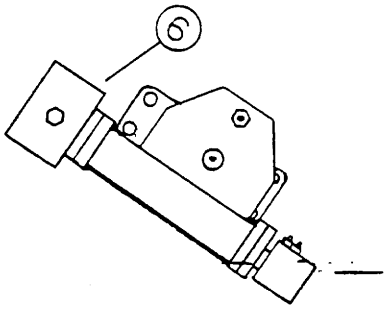
Multiple disc type, part of the gear box. Prevents the pinion shaft from taking the full load during quick stops by allowing the pinion to slip during overloads.

ITEM	TROUBLE SHOOTING	ADJUSTMENTS	REPAIR	MISC.	PARTS
1 Selector Valve	M5				D13
2 Orifices	M5.4				C2
3 Flow Valve	M5.4				B2
4 Shuttle Valve					B2
5 Swing Motor			D6		D6
6 Swing Brake	M6.4 (Fig.16)	M1.2 (Fig.9)			F2

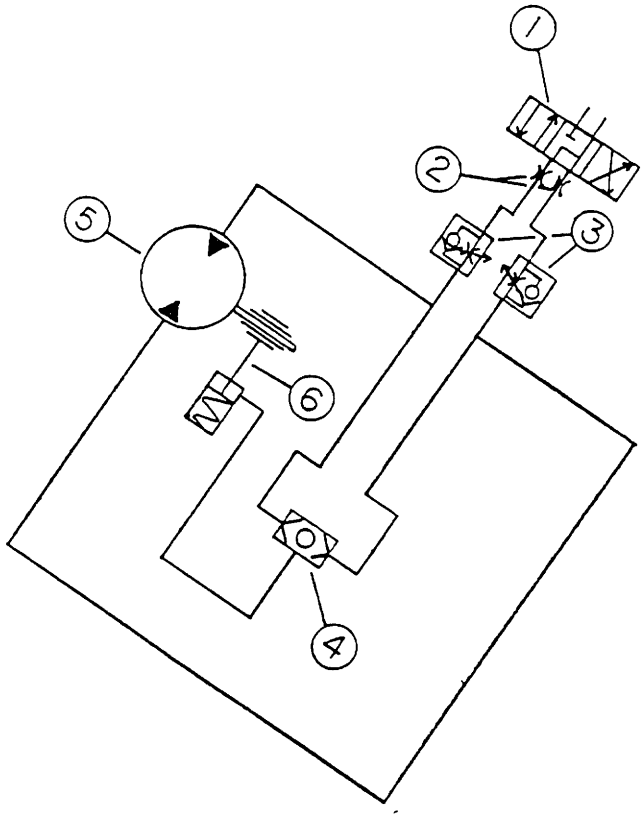
SWING



DIAGRAM



SCHEMATIC



DRIVE

REF. #

(1) SELECTOR VALVE LOW SPEED

Solenoid operated with manual override motoring spool 3 position 4 port valve. Selects forward or reverse drive during low speed operation. The motoring spool allows brake pressure to leave the brakes when the valve is in the neutral position.

(2) FLOW VALVES

Adjustable, controls the amount of fluid going to the drive circuit during low speed drive and allows free flow of brake pressure to return when the selector valves are in the neutral position. This valve operates whenever the unit is selected to drive.

(3) HI SPEED SELECTOR VALVE

Solenoid operated closed center 3 position 4 port valve. (Some units require 2 valves due to the fluid volume required during drive.) This valve does not operate during low speed drive. (When the boom is raised above 0° or when the boom is extended past the drive cut out switch.) This valve is selected with the low speed drive valve and controls the forward or reverse drive motion of the drive motors.

(4) SWIVEL

Allows continuous 360° rotation of the upper frame while porting fluid flow to the lower frame.

(5) SHUTTLE VALVE

Selects either forward or reverse drive pressure into the brake system to release the brakes when the unit is being driven.

(6) BRAKE FLOW VALVE

Adjustable, controls the volume of fluid leaving the brake circuit, thus controlling how fast the brakes are applied.

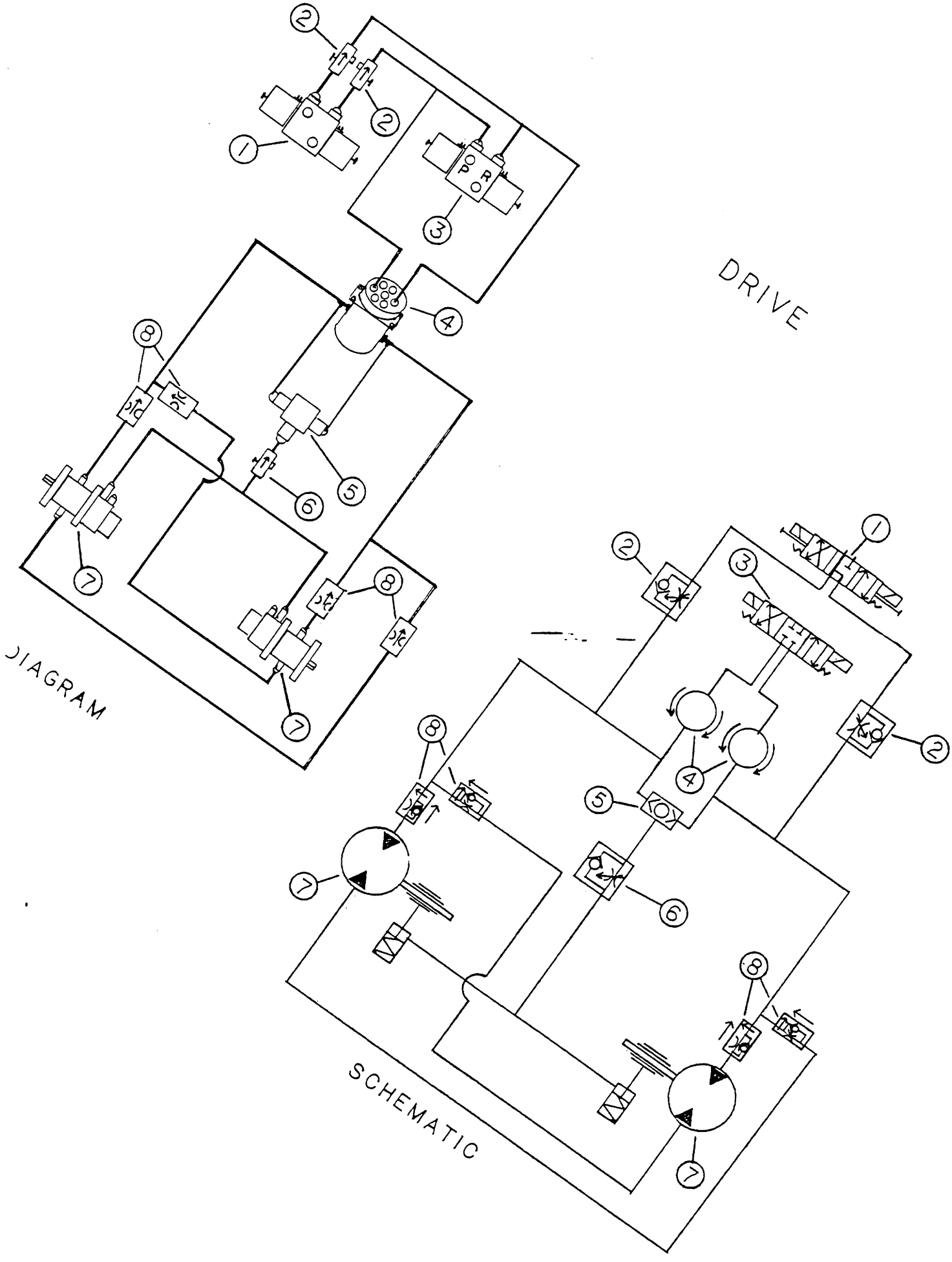
(7) BRAKE MOTOR

Is a roll seal, abutment style with a wetted multiple disc brake. The motor rotor is keyed to a shaft which is splined on both ends, on one end is the brake stators the other end is inserted into a gear reducer which turns the wheels. Motor internal leakage is passed thru the brake discs and back to the reservoir thereby cooling the brake and preventing excessive disc wear.

⑧ DRIVE FLOW VALVES

Pressure compensated, controls the volume of fluid going thru a motor with a pressure differential shutoff which insures that the opposite motor will have half of the volume of fluid available at near system pressure capabilities even though one wheel spins out and tries to take the full volume.

ITEM	TROUBLE SHOOTING	ADJUSTMENTS	REPAIR	MISC.	PARTS
1 Selector Valve	M5 M6.2 (Fig.8-Fig.11)				D13
2 Flow Valves		M1.1 (Fig.2)			C2
3 Selector Valve	M5 M6.2(Fig.11) M6.3(Fig.12)				D13
4 Swivel	—				D2
5 Shuttle Valve					B1
6 Brake Flow Valve		M1.1 (Fig.3)			B1
7 Brake Motor	M6.2(Fig.15)		D3		D3
8 Drive Flow Valve				M6.2(Fig 11-E)	B1


DRIVE
JIAGRAM
SCHEMATIC

REF.#

① SELECTOR VALVE

Solenoid operated 3 position 4 port normally closed with manual override buttons. Selects fluid pressure to the steering circuit.

② SWIVEL

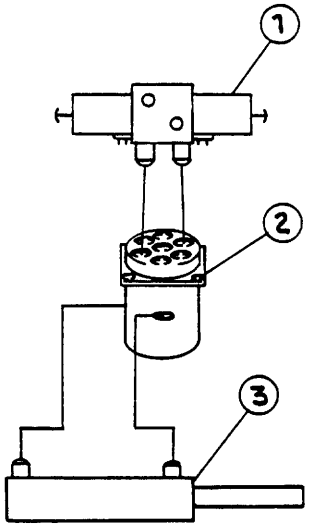
Allows the passage of pressure and return fluid between the upper and lower frame even during continuous 360° upper frame rotation.

③ STEER CYLINDER

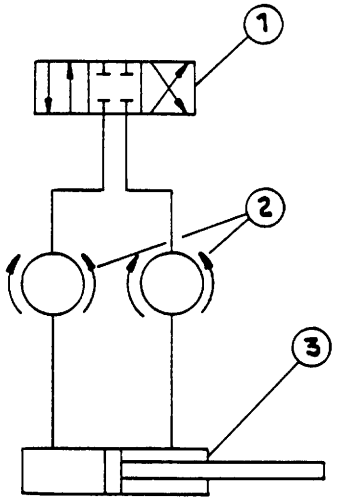
Double acting, connected to the steering linkage and powers all steering movements.

ITEM	TROUBLE SHOOTING	ADJUSTMENTS	REPAIR	MISC.	PARTS
1 Selector Valve	M5 M6.2 (Fig. 11)				D-13
2 Swivel					D-2
3 Steer Cylinder					D-1

STEERING



DIAGRAM



SCHEMATIC

REF. #

(1) Hydrapc

Control

(2) Check V

Prevent
rotate
the hyc

(3) Flow Va

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and pre
of retu

(4) Select

Manual
fluid
platfo

(5) Slave

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Contro

(6) Holdin

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(7) Master

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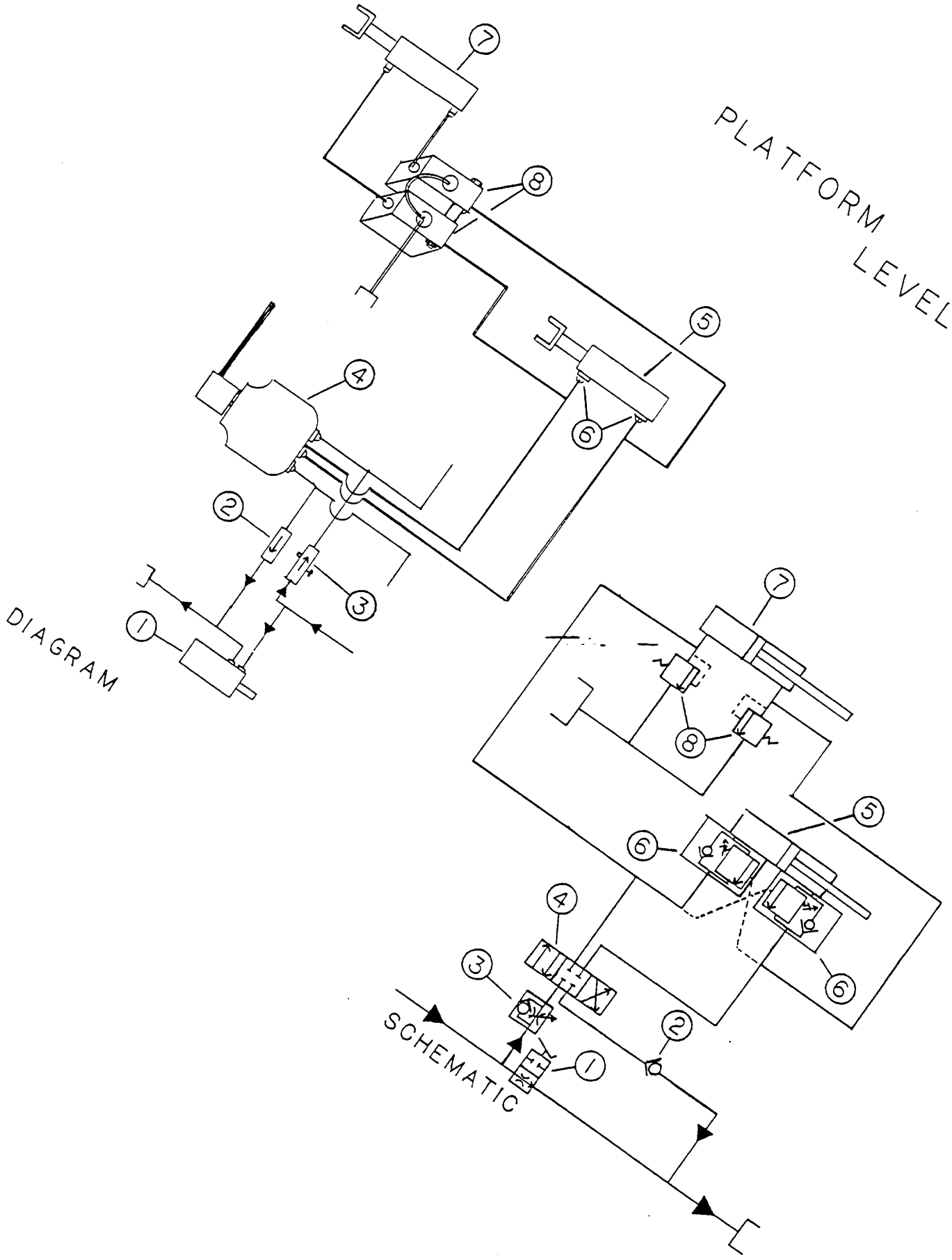
(8) Relief

Adjust
result
cylind
levele
cylind

PLATFORM LEVELING

ITEM	TROUBLE SHOOTING	ADJUSTMENTS	REPAIR	MISC.	PARTS
1 Foot Valve	M5.1	M1.3 (Fig.18) M6.1 (Fig.5)			D5
2 Check Valve				M6.2 (Fig. 10)	B4
3 Flow Valve		M1.1 (Fig.4)		M6.2 (Fig. 6)	B4
4 Selector Valve	M5.6 M6.2 (Fig.6) M6.2 (Fig.10)				D14
5 Slave Cylinder	M5.6, .7				D21
6 Holding Valves	M5.6, .7				D21
7 Master Cylinder	M5.6, .7				D10
8 Relief Valves	M5.6, .7	M1.1 (Fig.7)			

PLATFORM LEVELING



PLATFORM ROTATE

EF.#

(1) Hydraport Foot Valve

Controls main hydraulic pump output flow and pressure.

(2) Check Valve

Prevents pressure from entering the return system for platform rotate and leveling while the ground position is pressurizing the hydraport circuit.

(3) Flow Valve

Adjustable controls the volume of fluid entering the platform rotate and leveling systems. Prevents rotate linkage destruction and prevents main hydraulic pump cycling due to excessive amounts of return fluid entering the hydraport circuit.

(4) Selector Valve

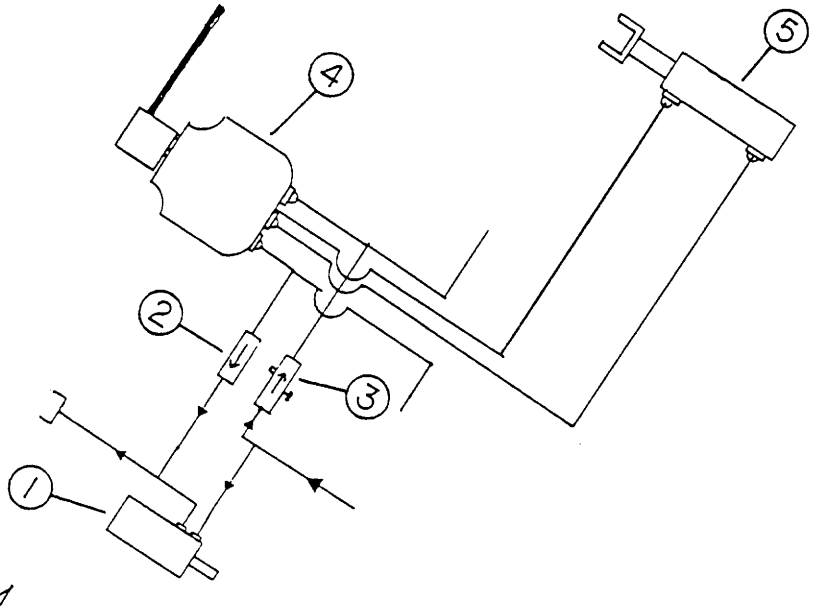
Manually operated 3 position 4 port normally closed valve. Selects fluid flow to the rotate cylinder.

(5) Rotate Cylinder

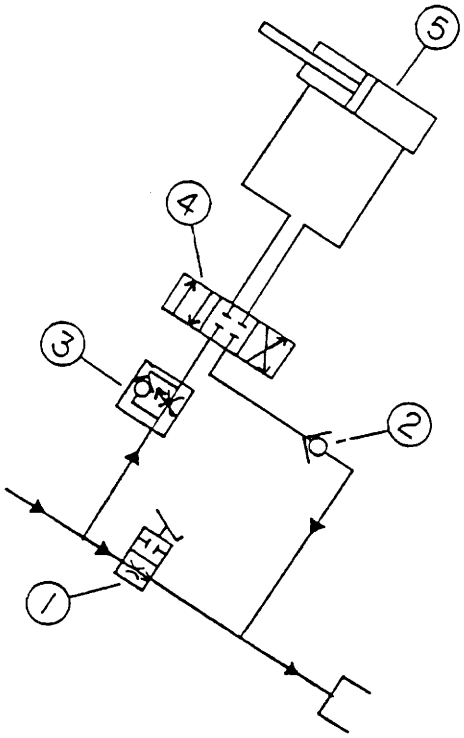
This is a rotary actuator that powers platform rotation. (On older units this was a double acting cylinder that powers linkage to rotate the platform.) The rotary actuator is the center pivot trunnion on present units.

ITEM	TROUBLE SHOOTING	ADJUSTMENTS	REPAIR	MISC.	PARTS
1 Foot Valve	M5.1	M1.3 (Fig.18) M6.1 (Fig.5)			D5
2 Check Valve				M6.2 (Fig. 10)	B4
3 Flow Valve		M1.1 (Fig.4)		M6.2 (Fig. 6)	B4
4 Selector Valve	M5.6 M6.2 (Fig.6) M6.2 (Fig.10)				D14
5 Rotate Cylinder					D24

PLATFORM ROTATE



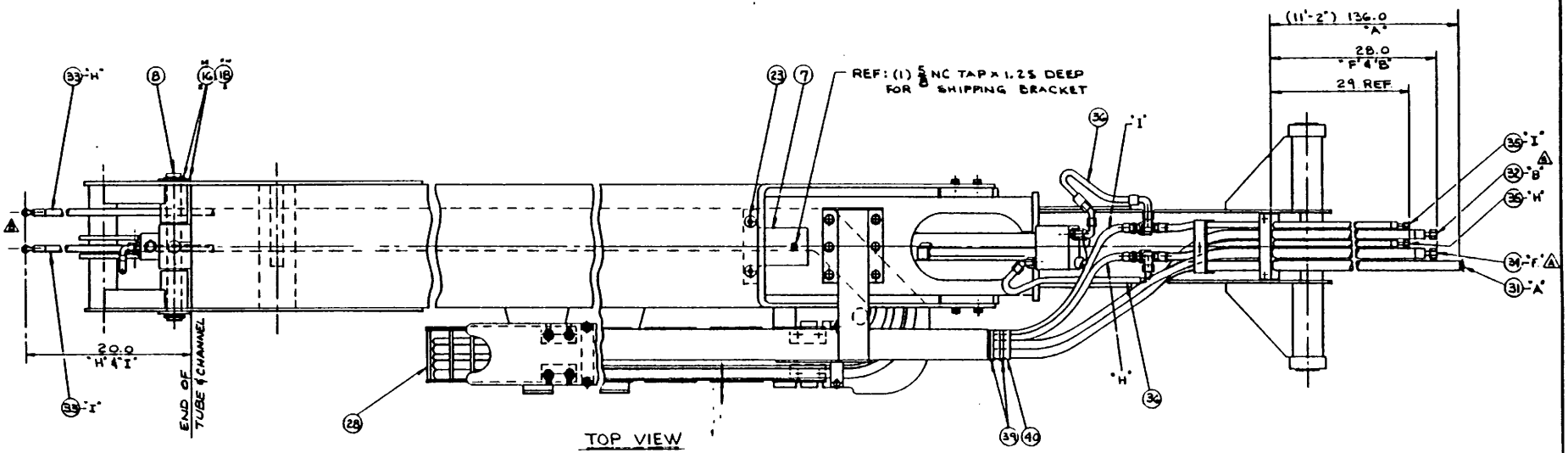
DIAGRAM



SCHEMATIC

BILL OF MATERIAL

ITEM	QTY	PART NO.	DESCRIPTION	MATL.	WEIGHT
			REFER TO SH. 1		



BOOM 2 SECTION
MAJOR ASSY.

SH 2 OF 2

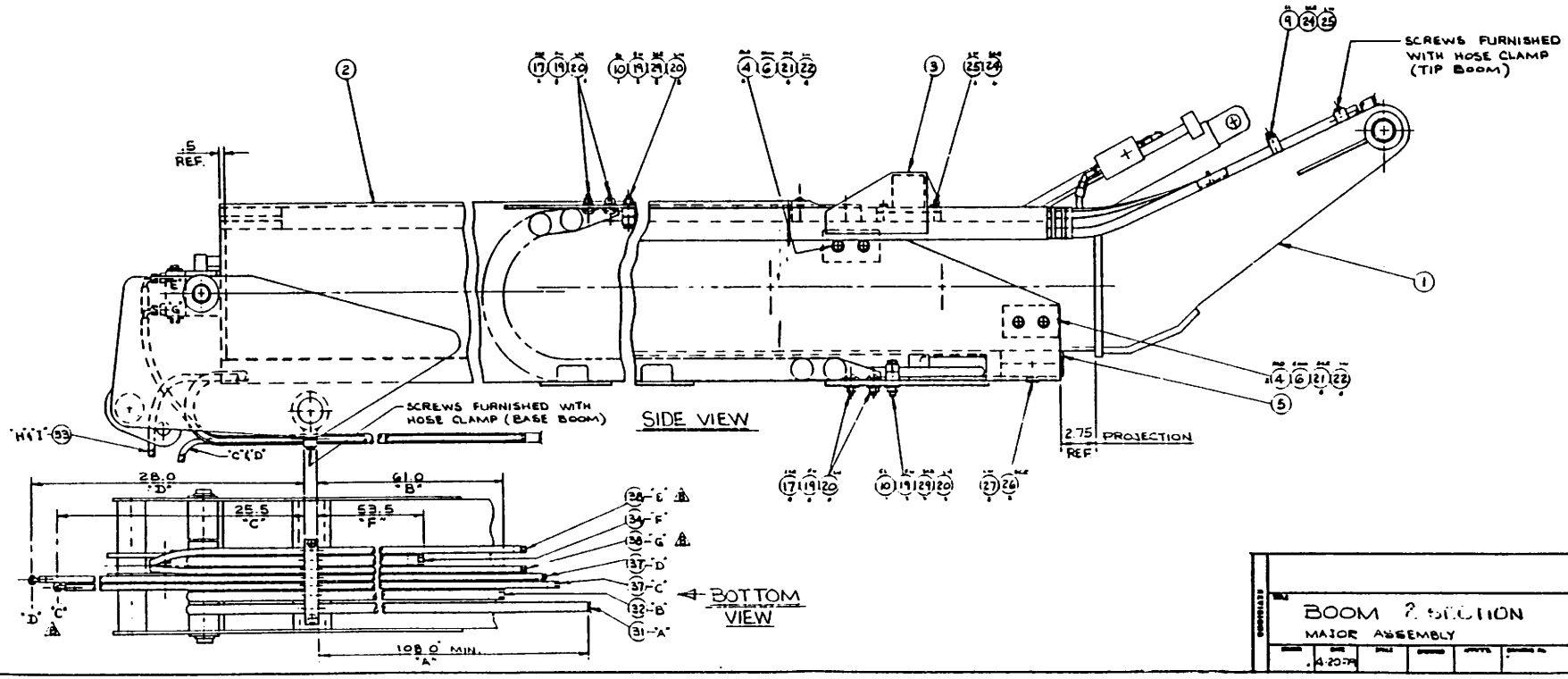
4-20-79

ITEM	QTY	PART NO	DESCRIPTION	MATL	WT.
31	1	B670-911	CABLE 24C 712"	"A"	
32	1	05-34100	HOSE ASSY 3/8 I.D. x 574.5	"B"	
33	2	05-22800	HOSE ASSY 1/4 I.D. x 474	"H & I"	
34	1	05-34200	HOSE ASSY 3/8 I.D. x 561.	"F"	
35	2	05-23800	HOSE ASSY 1/4 I.D. x 40.	-	
36	2	05-22100	HOSE ASSY 1/4 I.D. x 29.5	-	
37	2	05-21700	HOSE ASSY 1/4 I.D. x 109."	"C & D"	
38	2	05-21800	HOSE ASSY 1/4 I.D. x 96"	"E & G"	
39	AR	03-64000	TIE WRAPS		
40	1	A-440-906	RUBBER PAD		
41					
42					
43					
44					
45					

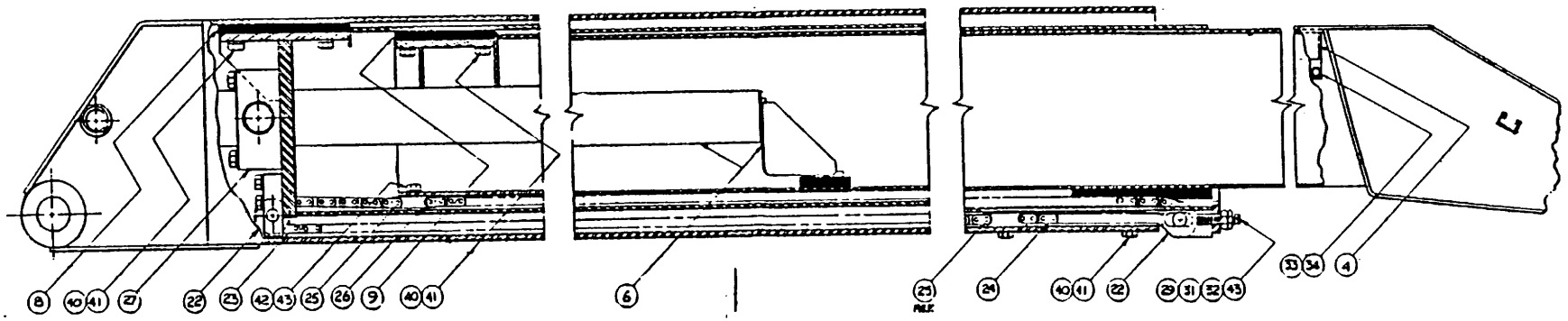
ITEM	QTY	PART NO	DESCRIPTION	MATL	WT
16	2	08-46700	SNAP RING 1 1/4		30.
17	8	07-17005	SCR, BUT HD 1/4 NC x 1 GR 5		
18	2	07-62035	FLATWASHER 1 1/4 (HVY)		
19	20	07-62014	FLATWASHER 1/4 (HVY)		
20	12	07-50014	LOCKNUT 1/4 NC		
21	8	07-03084	SCR, HHCS 1/2 NC x 3 1/2 GR 5		
22	8	07-65018	LOCKWASHER 1/2		
23	2	07-17085	SCR, BUT HD 1/2 NC x 1 GR 5		
24	7	07-03045	SCR, HHCS 3/8 NC x 1 GR 5		
25	7	07-65016	LOCKWASHER 3/8		
26	2	07-03128	SCR, HHCS 5/8 NC x 1 3/4 GR 5		
27	2	07-65021	LOCKWASHER 5/8		
28	1	08-00720	HOSE TRACK		
29	4	07-03010	SCR, HHCS 1/4 NC x 2 1/2 GR 5		
30					

BILL OF MATERIAL

ITEM	QTY	PART NO	DESCRIPTION	MATL	WEIGHT
1	1	D440-307	POINT BOOM SUB-ASSY		
2	1	C440-205	BASE BOOM - WELDED		1,077.
3	1	D440-201	TUBE - WELDED		37.
4	4	B440-301	SLIDER PAD		1.6
5	1	B440-302	SLIDER PAD		1.5
6	AS REQ	B440-901	SHIM - SLIDE PAD		.17
7	1	B440-910	SPACER		6.9
8	1	B440-904	PIN - TELESCOPE CYL		4.1
9	1	B450-924	CLAMP - BOOM POINT		.2
10	2	B440-210	CLAMP - HOSE TRACK		3.
11					
12					
13					
14					
15					



BOOM ? SECTION
MAJOR ASSEMBLY
SH 1 OF 2
4-20-79

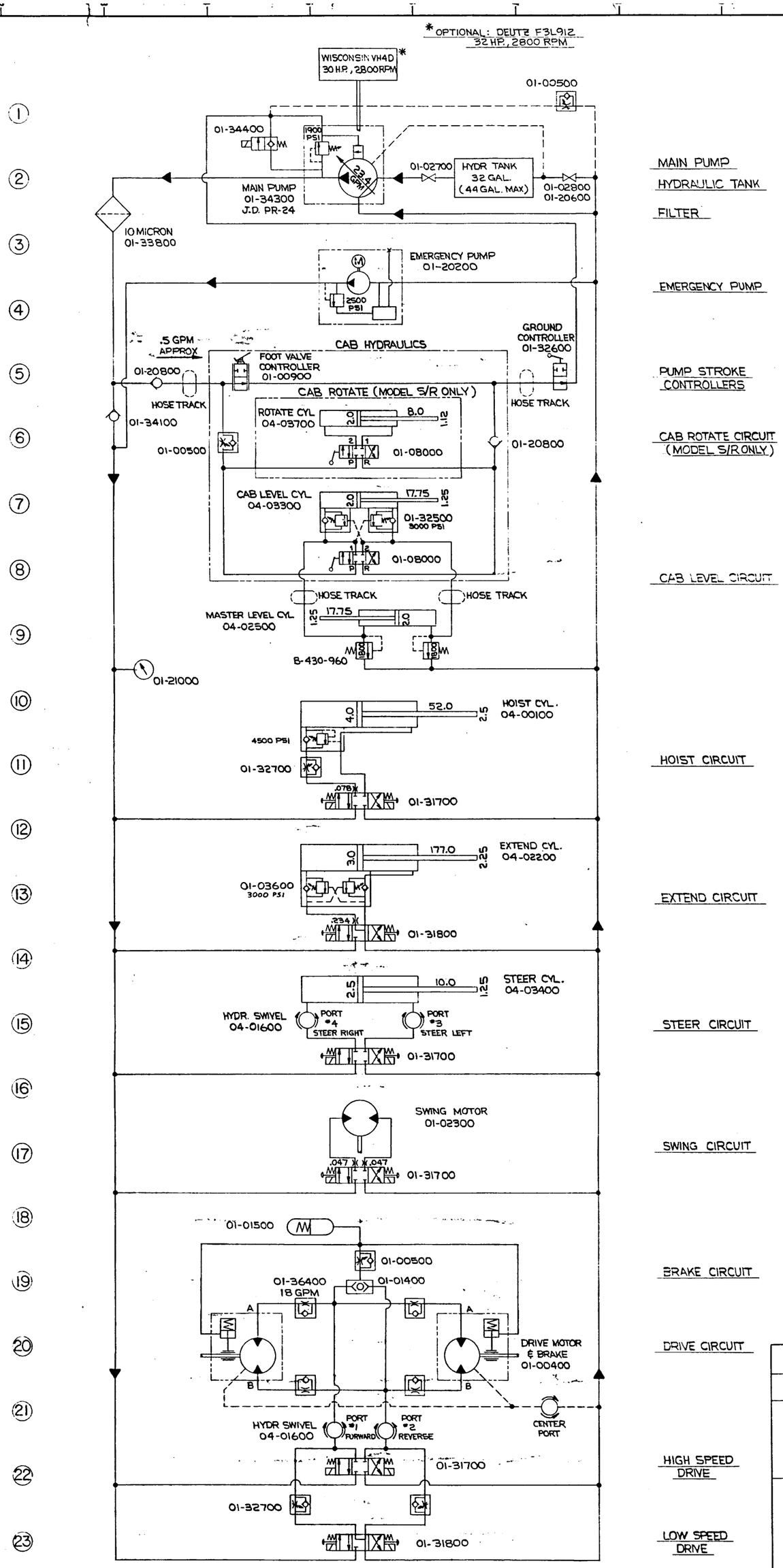


SIMON

MAJOR BOOM ASSEMBLY
- SECTION

ENGINEERING DRAWING SEQUENCE:
Early MP Hydraport Service Manual

1.	SDS-202410-7	Hydraulic Schematic, MP 40	11" x 17"
2.	SDS-204428-6	Hydraulic Schematic, MP 50 and MP 60	11" x 17"
3.	SDS-202412-1	Electrical Schematic, MP 40	11' x 17"
4.	SDS-204431-2	Electrical Schematic, MP 40, MP 50, and MP 60	11" x 17"
5.	SDS-204429-3	Electrical Schematic, MP 50 and MP 60	11" x 17"



REVISIONS	E.R.L. NO.
ERL #1304 6-26-86	
REDRAWN ERL #12523 10-90	

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IMPLIED TOLERANCE

DECIMAL PLACES	ANGULAR UNITS
X.XX	.06
X.XXX	.015
X.XXXX	.0050

TITLE: HYDRAULIC SCHEMATIC FOR MODELS 1MP-40 S/S S/R

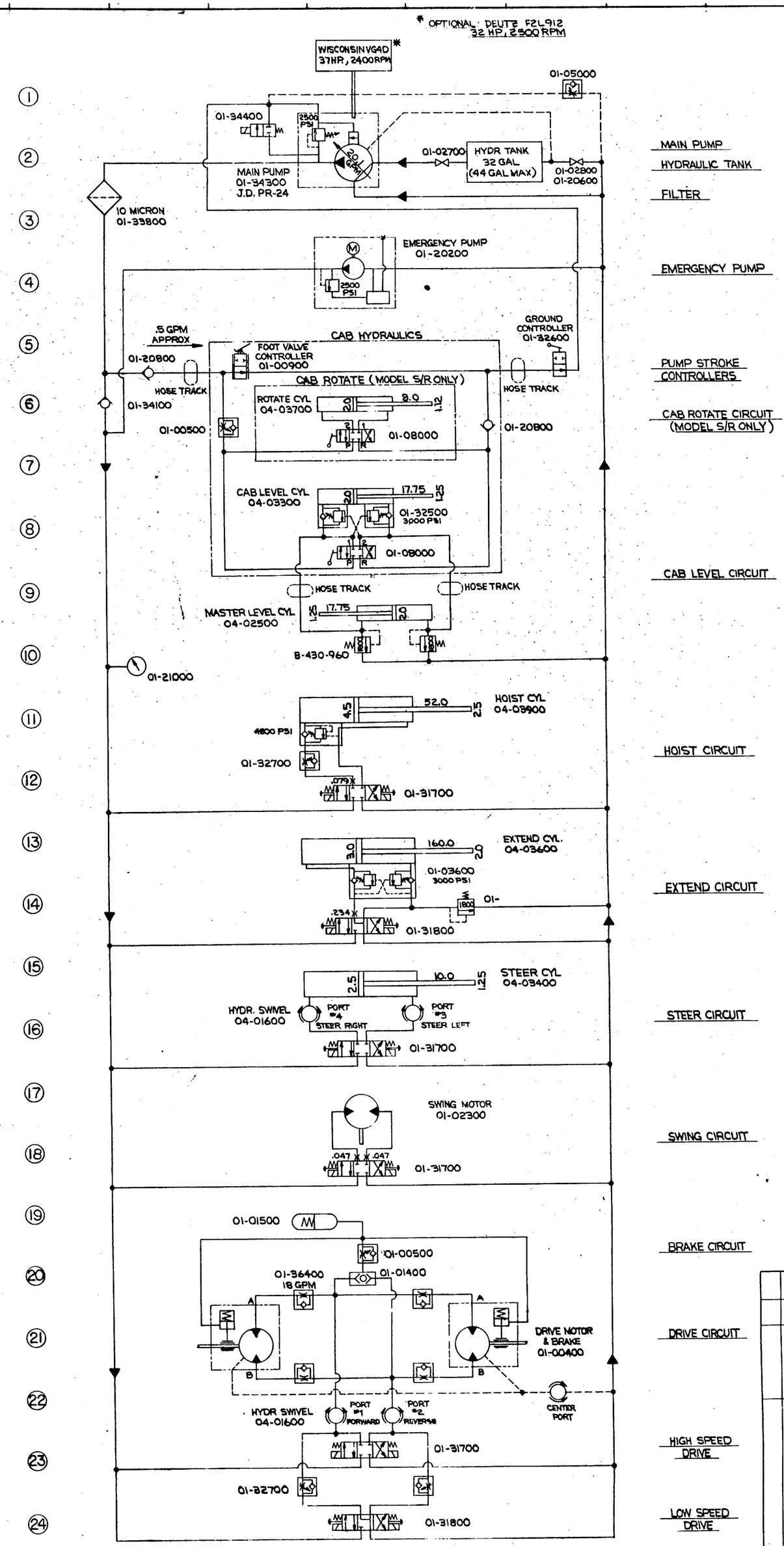
DRAWN	DATE	SCALE	CHECKED	APPR'VD
PJP	3-10-86	~		

DRAWING NO: SDS-22410-7

SHEET

ITEM	QTY.	PART NO.	DESCRIPTION	MAT'L.	WT.
			BILL OF MATERIAL		

D-400-602



CHGD EXTEND CYL. HOLDING VALVE FROM 01-03500. TO 01-03600.

REVISIONS

NO.	P.C.L.	DRAWN	DATE	SCALE	CHECKED	APPR'D
		PJP	3-1-86	~		

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IMPLIED TOLERANCE

X.XX	1
X.XXX	06
X.XXXX	015
X.XXXXX	0030

TITLE

HYDRAULIC SCHEMATIC

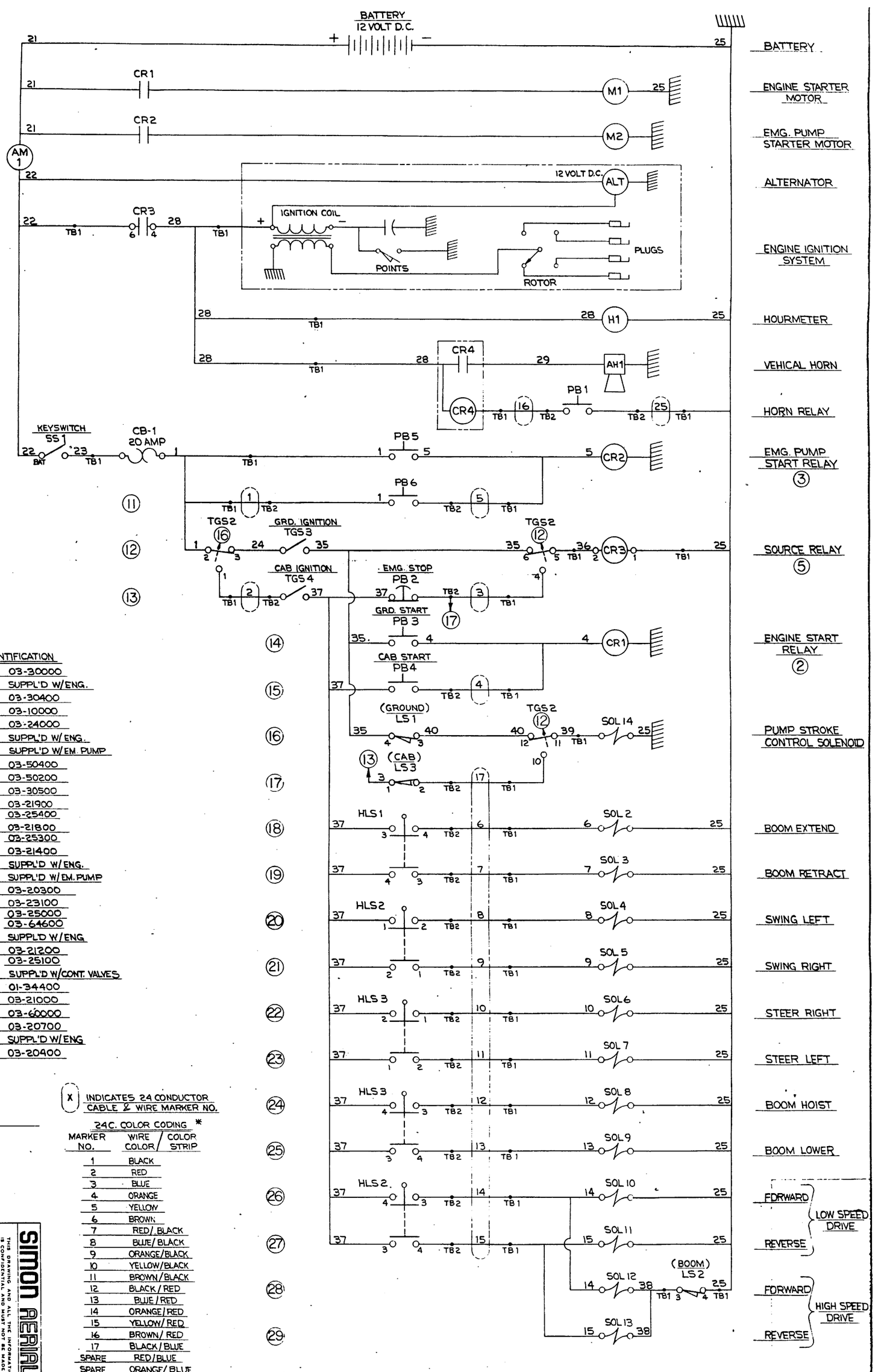
FOR MODELS: MP60-S & S/R

SHEET

DRAWING NO SDS-20442-6

ITEM	QTY.	PART NO.	DESCRIPTION	MAT'L	WT.

BILL OF MATERIAL



DEVICE IDENTIFICATION

AH1	03-30000
ALT	SUPPL'D W/ENG.
AM	03-30400
BATT	03-10000
CB1	03-24000
CR1	SUPPL'D W/ENG.
CR2	SUPPL'D W/EM. PUMP
CR3	03-50400
CR4	03-50200
H1	03-30500
HLS1	03-21900 03-25400
HLS2&3	03-21800 03-25300
LS1,2&3	03-21400
M1	SUPPL'D W/ENG.
M2	SUPPL'D W/EM. PUMP
PB1,4&6	03-20300
PB2	03-23100 03-25000 03-64600
PB3	SUPPL'D W/ENG
PB5	03-21200 03-25100
SOL 2 TO 13	SUPPL'D W/CONT. VALVES
SOL 14	01-34400
SS1	03-21000
TB1&2	03-60000
TGS2	03-20700
TGS3	SUPPL'D W/ENG
TGS4	03-20400

(X) INDICATES 24 CONDUCTOR CABLE & WIRE MARKER NO.

24C. COLOR CODING *

MARKER NO.	WIRE COLOR / COLOR STRIP
1	BLACK
2	RED
3	BLUE
4	ORANGE
5	YELLOW
6	BROWN
7	RED/BLACK
8	BLUE/BLACK
9	ORANGE/BLACK
10	YELLOW/BLACK
11	BROWN/BLACK
12	BLACK/RED
13	BLUE/RED
14	ORANGE/RED
15	YELLOW/RED
16	BROWN/RED
17	BLACK/BLUE
SPARE	RED/BLUE
SPARE	ORANGE/BLUE
25	YELLOW/BLUE
SPARE	BROWN/BLUE
SPARE	BLACK/BROWN
SPARE	RED/ORANGE
SPARE	BLUE/BROWN

* FOR: "REX BRAND 24C."

REVISIONS

E.R.L. NO	
	A WIRE #37 WAS #2
	B REDRAWN 11-9-78
	C REDRAWN ERL#12533 3-21-80

DRAWN DJP | DATE 3-21-80 | SCALE ~ | CHECKED | APPR'D | DRAWING NO SDS-20412-1 | SHEET

TITLE ELECTRICAL SCHEMATIC FOR MODEL HP405 & S/R, GAS HYDRAPORT

SIMON AERIALS INC. MILWAUKEE, WI 53224

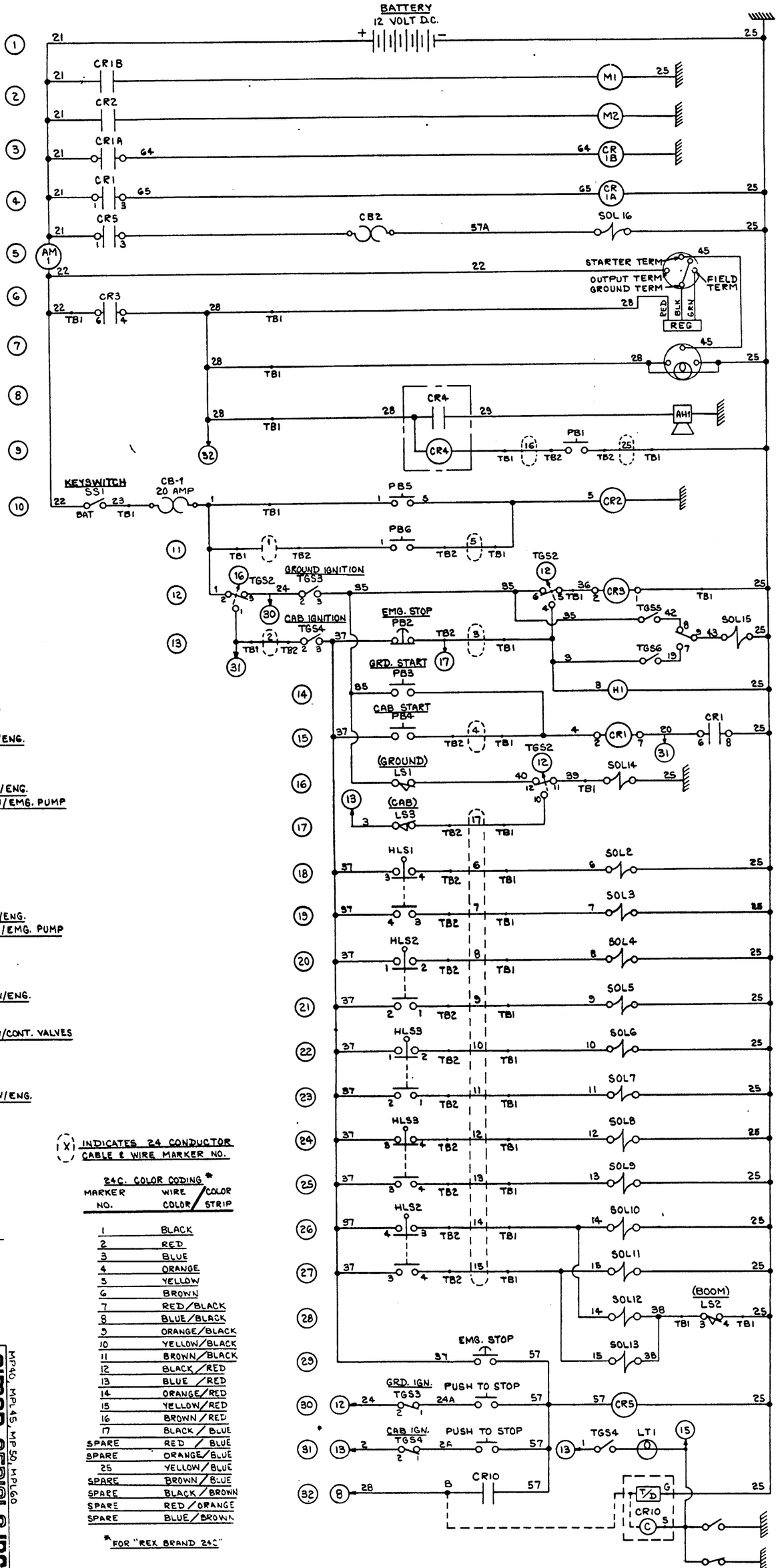
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IMPLIED TOLERANCE

X ± .XX	
X ± .XXX	.06
X ± .XXXX	.015
ANGULAR	.030

D-400-803



DEVICE IDENTIFICATION

AH1	03-30000
ALT	SUPPL'D W/ENG.
AM	03-30400
BATT	03-10000
CB1	03-24000
CR1	SUPPL'D W/ENG.
CR2	SUPPL'D W/EMG. PUMP
CR3	03-50400
CR4	03-50200
H1	03-30500
HLS1	03-21900
	03-25400
HLS2 & 3	03-21800
	03-25300
LS1,2 & 3	03-21400
M1	SUPPL'D W/ENG.
M2	SUPPL'D W/EMG. PUMP
PB1,4 & 6	03-20300
PB2	03-23100
	03-25000
	03-64000
PB3	SUPPL'D W/ENG.
PB5	03-21200
	03-25100
SOL2 - 15	SUPPL'D W/CONT. VALVES
SOL 14	01-34400
SS1	03-21000
TB1 & 2	03-60000
TGS2	03-20700
TGS3	SUPPL'D W/ENG.
TGS4	03-20400

(X) INDICATES 24 CONDUCTOR CABLE & WIRE MARKER NO.

24C. COLOR CODING *

MARKER NO.	WIRE COLOR / COLOR STRIP
1	BLACK
2	RED
3	BLUE
4	ORANGE
5	YELLOW
6	BROWN
7	RED/BLACK
8	BLUE/BLACK
9	ORANGE/BLACK
10	YELLOW/BLACK
11	BROWN/BLACK
12	BLACK/RED
13	BLUE/RED
14	ORANGE/RED
15	YELLOW/RED
16	BROWN/RED
17	BLACK/BLUE
SPARE	RED/BLUE
SPARE	ORANGE/BLUE
25	YELLOW/BLUE
SPARE	BROWN/BLUE
SPARE	BLACK/BROWN
SPARE	RED/ORANGE
SPARE	BLUE/BROWN

* FOR "REX BRAND 24C"

REVISIONS

E.R.L. NO.	
A	WIRE #37 WAS #2 — RED/BRN 11-3-78
B	RED/BRN 9-12-80 — RED/BRN 12-1-81 ERL-W 1343
C	ERL-W 1658

MP40, MPL45, MP50, MPL60

SIMON AERIALS INC. MANITOWOC, WI 54220

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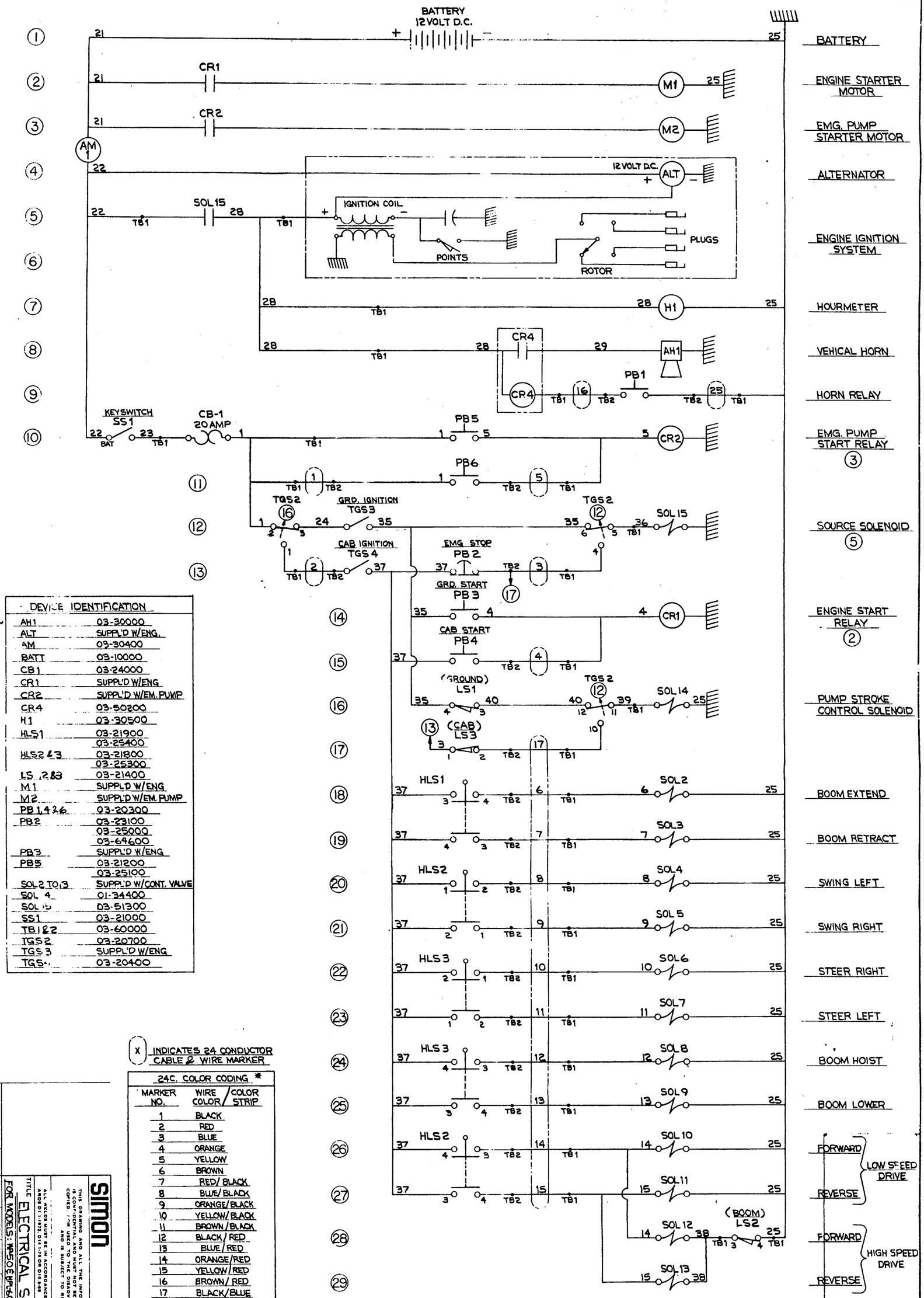
ALL WELDS MUST BE IN ACCORDANCE WITH A.W.S. STAND ARDS D1.1-1972, D1.1-76 OR D19.8-69

DRAWN	DT	DATE	12-1-81
SCALE	~	CHECKED	
APPVD		DRAWING NO.	SDS-20493/-2

TITLE ELECTRICAL SCHEMATIC FOR MODEL: HMOG & S/R, DIESEL AMP-60 MPL-60

SHEET

IMPLIED TOLERANCE	PLACE DECIMAL
X.XXXX	0050
X.XXX	015
X.XX	04
X.X	1



DEVICE IDENTIFICATION	
AH1	03-30000
ALT	SUPPL'D W/ENG.
AM	03-30400
BATT	03-10000
CB1	03-24000
CR1	SUPPL'D W/ENG
CR2	SUPPL'D W/EM. PUMP
CR4	03-50200
H1	03-30500
HLS1	03-21900 03-25400
HLS2 & 3	03-21800 03-25300
LS 1 & 3	03-21400
M1	SUPPL'D W/ENG
M2	SUPPL'D W/EM. PUMP
PB1, 4 & 6	03-20300
PB2	03-23100 03-25000 03-69600
PB3	SUPPL'D W/ENG.
PB5	03-21200 03-25100
SOL 2 TO 13	SUPPL'D W/CONT. VALVE
SOL 14	01-34400
SOL 15	03-51300
SS1	03-21000
TB1 & 2	03-60000
TGS 2	03-20700
TGS 3	SUPPL'D W/ENG
TGS 4	03-20400

(X) INDICATES 24 CONDUCTOR CABLE & WIRE MARKER

24C. COLOR CODING *	
MARKER NO.	WIRE COLOR / COLOR STRIP
1	BLACK
2	RED
3	BLUE
4	ORANGE
5	YELLOW
6	BROWN
7	RED/BLACK
8	BLUE/BLACK
9	ORANGE/BLACK
10	YELLOW/BLACK
11	BROWN/BLACK
12	BLACK/RED
13	BLUE/RED
14	ORANGE/RED
15	YELLOW/RED
16	BROWN/RED
17	BLACK/BLUE
SPARE	RED/BLUE
SPARE	ORANGE/BLUE
25	YELLOW/BLUE
SPARE	BROWN/BLUE
SPARE	BLACK/BROWN
SPARE	RED/ORANGE
SPARE	BLUE/BROWN

* FOR: "REX BRAND 24C"

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TITLE: ELECTRICAL SCHEMATIC
FOR MODELS: MP50 & MP60 S & SR

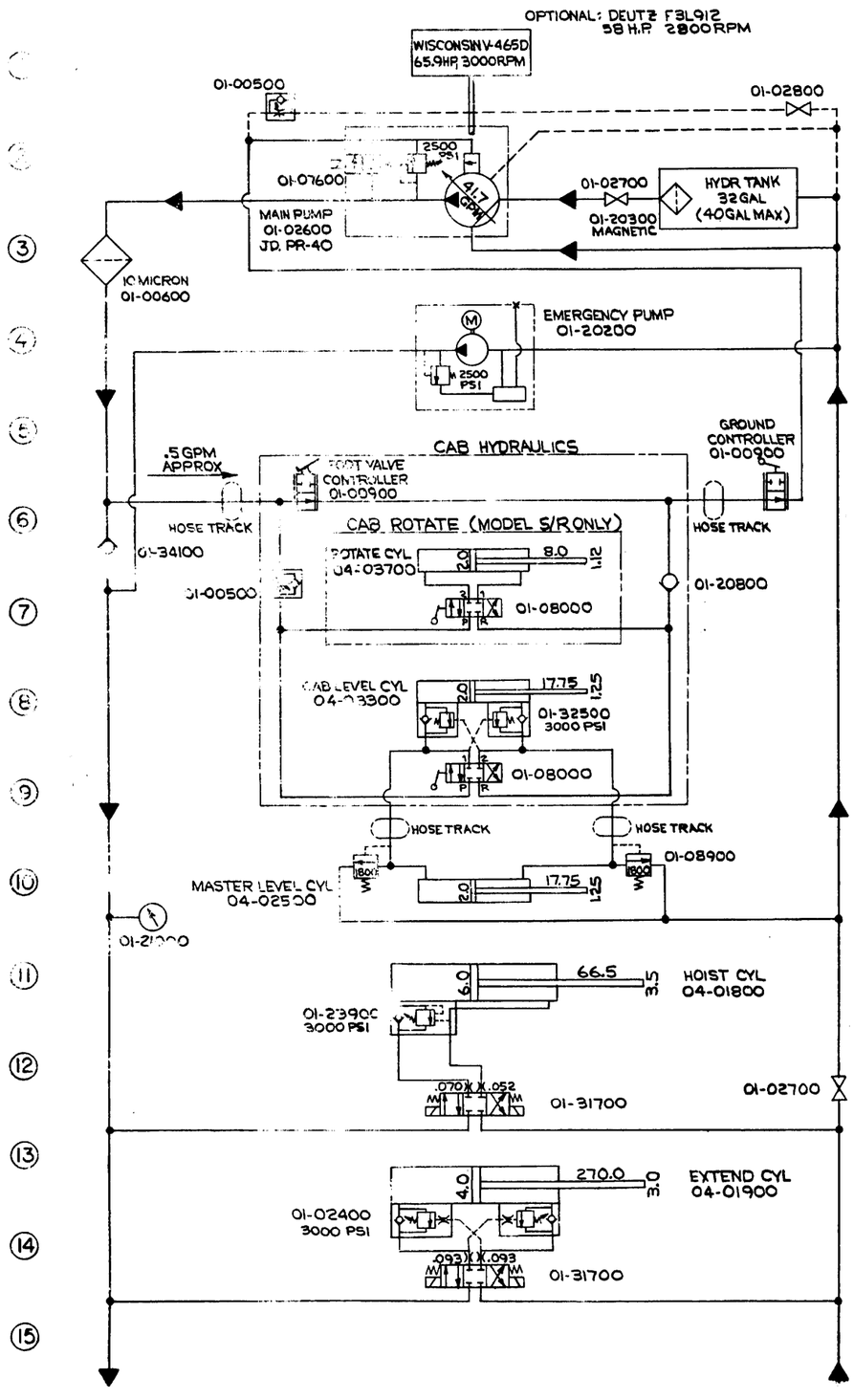
DRAWN: HP 3-28-80
DRAWING NO.: SDS-200424-3

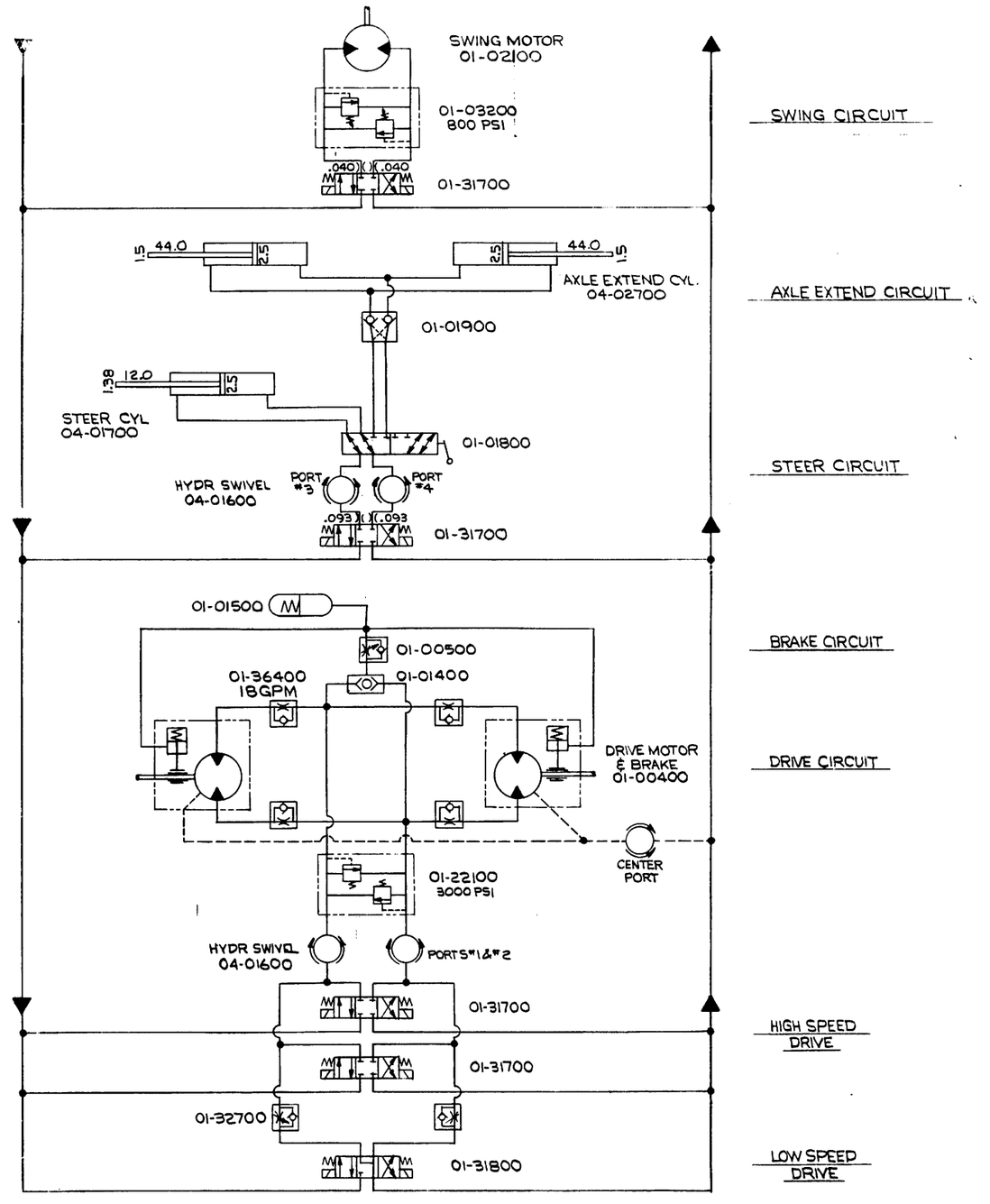
IMPLIED TOLERANCE
X.XXXX
X.XXX
X.XX
X.X

REVISIONS
E.R.L. NO.

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IMPLIED TOLERANCE

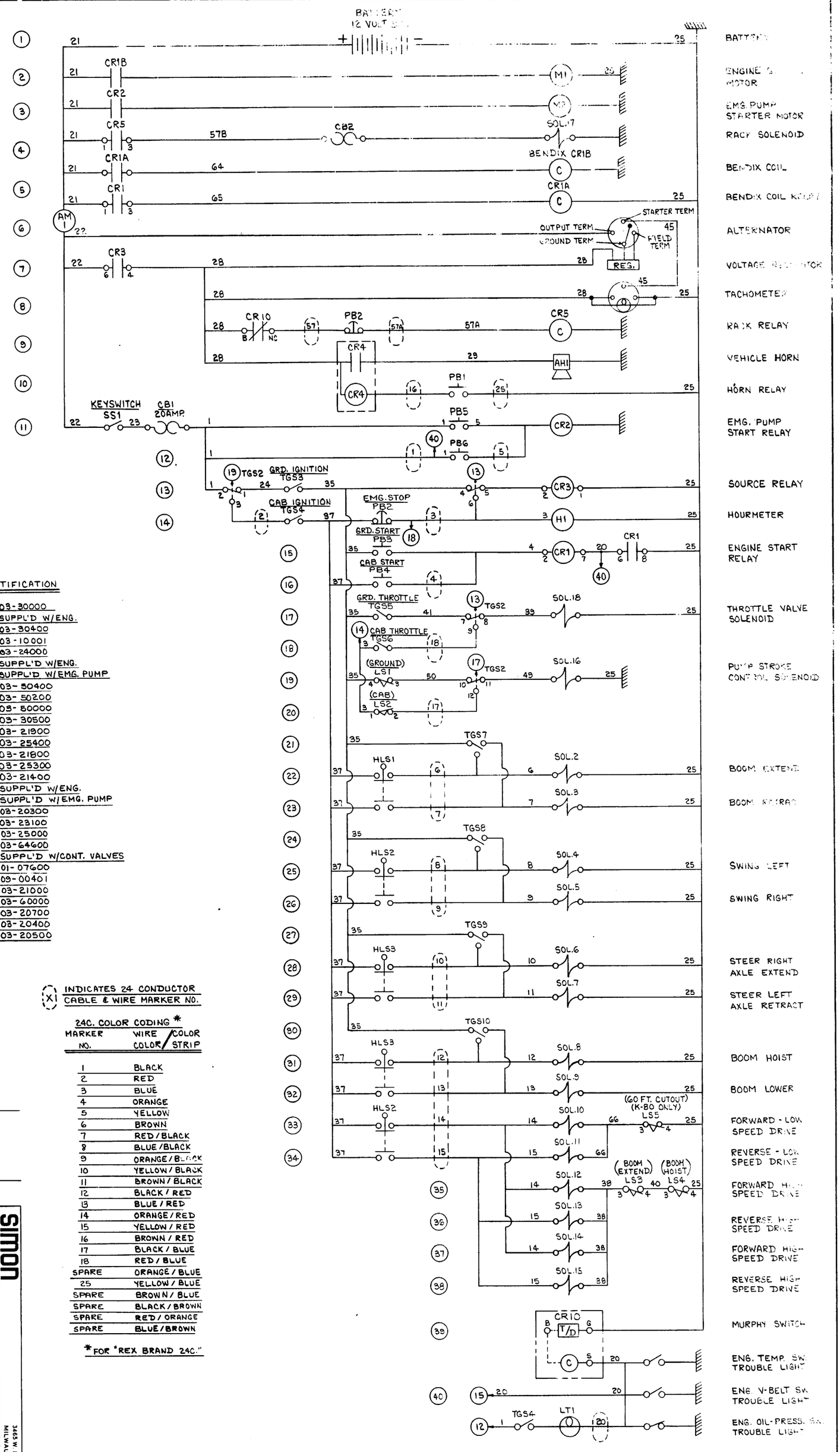
DECIMAL PLACES	PLUS OR MINUS
X.X	1
X.XX	.06
X.XXX	.015
X.XXXX	.0050

A ERL #1290, 6-9-81
SWING MOTOR CHG'D FROM 01-04100 TO 01-02100

TITLE: HYDRAULIC SCHEMATIC, HYDRA-PORT
FOR MODEL: K-80S & SR
SHEET

REVISIONS	E.R.L. NO	DRAWN	DATE	SCALE	CHECKED	APPR'V'D	DRAWING NO.
		PJP	1-21-81	~			SDS-204435-2

D-800-602



DEVICE IDENTIFICATION

AH1	03-30000
ALT	SUPPL'D W/ENG.
AM	03-30400
BATT	03-10001
CB1	03-24000
CR1	SUPPL'D W/ENG.
CR2	SUPPL'D W/EMG. PUMP
CR3	03-50400
CR4	03-50200
CR5	03-50000
H1	03-30500
HLS1	03-21900
	03-25400
HLS2 & 3	03-21800
	03-25300
LS1,2,3&4	03-21400
M1	SUPPL'D W/ENG.
M2	SUPPL'D W/EMG. PUMP
PB1,3,4,5&6	03-20300
PB2	03-23100
	03-25000
	03-64600
SOL. 2 TO 15	SUPPL'D W/CONT. VALVES
SOL. 16	01-07600
SOL. 17	09-00401
SS1	03-21000
TB1,2&3	03-60000
TGS2	03-20700
TGS3,4,5&6	03-20400
TGS7,8,9&10	03-20500

(X1) INDICATES 24 CONDUCTOR CABLE & WIRE MARKER NO.

24C. COLOR CODING *

MARKER NO.	WIRE COLOR / COLOR STRIP
1	BLACK
2	RED
3	BLUE
4	ORANGE
5	YELLOW
6	BROWN
7	RED / BLACK
8	BLUE / BLACK
9	ORANGE / BLACK
10	YELLOW / BLACK
11	BROWN / BLACK
12	BLACK / RED
13	BLUE / RED
14	ORANGE / RED
15	YELLOW / RED
16	BROWN / RED
17	BLACK / BLUE
18	RED / BLUE
SPARE	ORANGE / BLUE
25	YELLOW / BLUE
SPARE	BROWN / BLUE
SPARE	BLACK / BROWN
SPARE	RED / ORANGE
SPARE	BLUE / BROWN

* FOR "REX BRAND 24C."

REVISIONS: 12-2-81 ST

E.R.L. NO. 1345

DRAWN DT | DATE 12-2-81 | SCALE ~ | CHECKED | APPR'D | DRAWING NO SDS-204932-9 | SHEET

TITLE ELECTRICAL SCHEMATIC, HYDRO-PORT FOR MODELS: K-80, K-60, K-45 DIESEL

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IMPLIED TOLERANCE

X.X	±.1
X.XX	±.06
X.XXX	±.015
X.XXXX	±.0050

ANGULAR ±1°

D-600-812