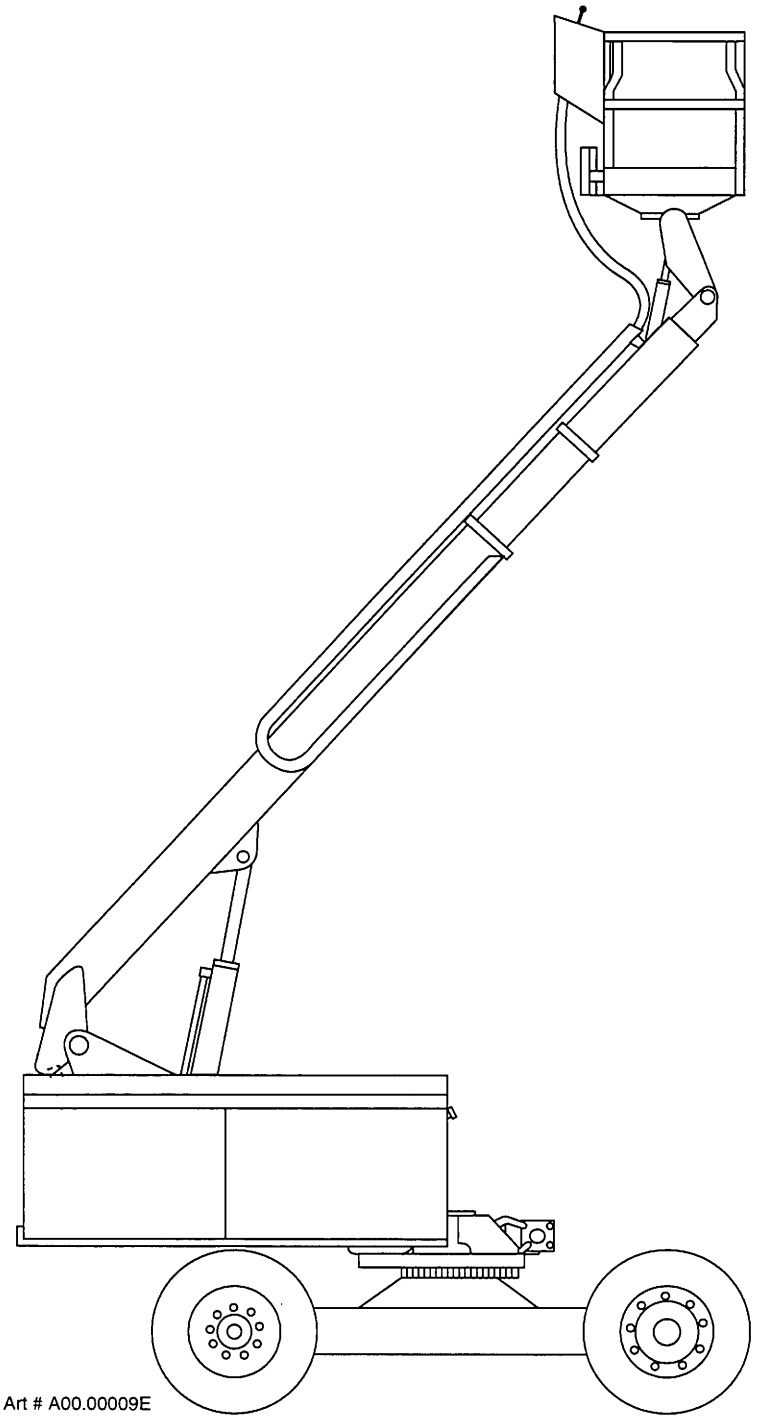
SIMON AERIALS INC.
10600 W. Brown Deer Road
Milwaukee, Wisconsin 53224
Phone (414) 355-0802
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Cable: SIMON MIL

SIMON

SERVICE MANUAL

MODEL
MP

HYDRAPORT
prior to 1 Jan. 1994



Art # A00.00009E

PART NO. 89-100207

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THIS MANUAL CONTAINS INSTRUCTIONS FOR THE SERVICE, ADJUSTMENTS AND MAINTENANCE OF THE MP SERIES SIMON AERIAL BOOM LIFT.

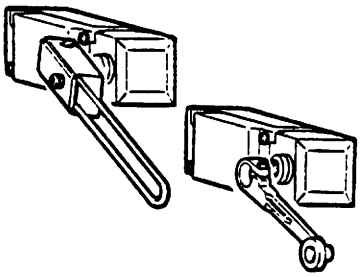
IT IS INTENDED TO BE USED IN CONJUNCTION WITH AND AS A SUPPLEMENT TO THE OPERATORS, PARTS AND COMPONENT REPAIR MANUALS WHICH ARE PROVIDED SEPARETELY.

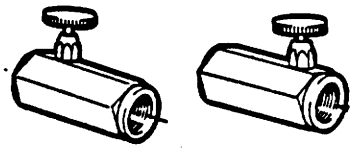
THE MP SERIES MOBILE PLATFORM HAS BEEN DESIGNED AND BUILT TO PROVIDE THE CUSTOMER WITH MANY YEARS OF DEPENDABLE SERVICE. THE FULL BENEFITS PROVIDED BY THIS MACHINE CAN BE DERIVED ONLY BY FOLLOWING THE PROPER OPERATING AND MAINTENANCE PROCEDURES. ONLY TRAINED AND AUTHORIZED PERSONNEL SHOULD OPERATE AND SERVICE THIS EQUIPMENT. OPERATORS AND SERVICE PERSONNEL SHOULD STUDY THESE MANUALS TO ASSURE THAT THEY HAVE A THOROUGH UNDERSTANDING OF THE CONTENTS WHICH PERTAIN TO THEIR PARTICULAR RESPONSIBILITIES.

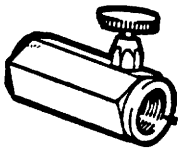
OPERATORS MUST ALSO UNDERSTAND ALL WARNINGS AND INSTRUCTIONS ON THE BODY OF THE MACHINE AND CONTROL CONSOLES.

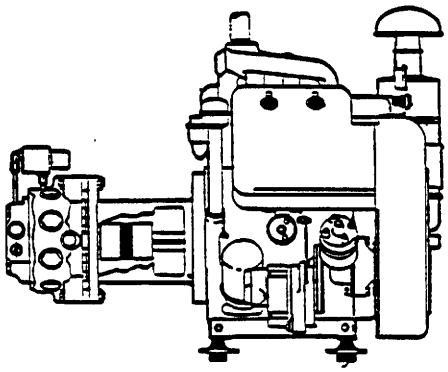
MODIFICATIONS FROM THE ORIGINAL DESIGN OF THIS EQUIPMENT ARE STRICTLY FORBIDDEN WITHOUT WRITTEN PERMISSION FROM SIMON AERIALS, INC.

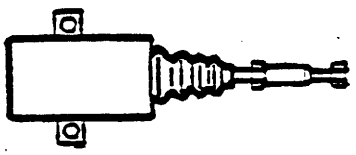
SIMON AERIALS, INC. RESERVES THE RIGHT TO IMPROVE AND EXPAND PRODUCT FEATURES ON ITS EQUIPMENT. THEREFORE, SPECIFICATIONS AND/OR EQUIPMENT IS SUBJECT TO CHANGE WITHOUT PRIOR NOTICE. THESE MANUALS ARE PERIODICALLY UPDATED TO REFLECT ANY CHANGES THAT OCCURED BETWEEN PRINTINGS. IT IS THEREFORE RECOMMENDED THAT USERS CONTACT SIMON AERIALS, INC. FOR LATEST INFORMATION REGARDING THIS EQUIPMENT.











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.

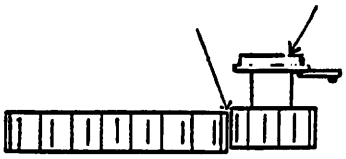
4) CAB ROTATE is controled by a variable flow check valve located under the basket control panel. This valve controls the leveling speed of the basket as well. The valve should be set for basket rotate speed, which should be approximately 20 seconds from one extreme position to the other.

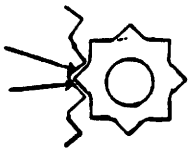
5) ENGINE RPM'S:

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

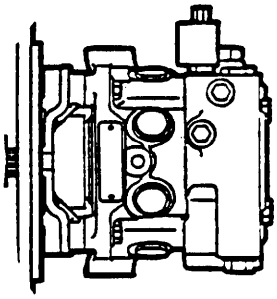
Duetz Diesel -------- Idle Speed 1800
High Speed 2500

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.

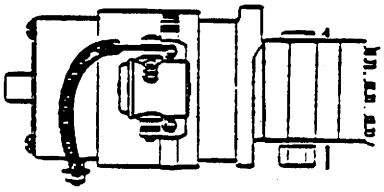




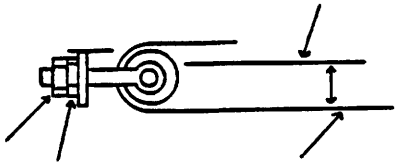
7) SWING GEAR & PINION BACKLASH should be set with zero backlash. Also, no preload of the pinion to the swing gear is allowed. To adjust, loosen the gear box side lock bolts and adjust the front lock bolts until the proper backlash is attained. Retighten the side lock bolts and retorque the foot mount 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.



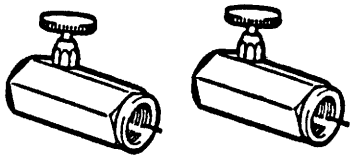
8) MAIN HYDRAULIC PUMP - JOHN DEERE : To adjust the pressure, locate the adjusting screw on the side of the adapter plate. Loosen the lock nut and turn screw in to increase system pressure or out to decrease system pressure. System pressure should be set at a pre - descibed setting depending on model.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



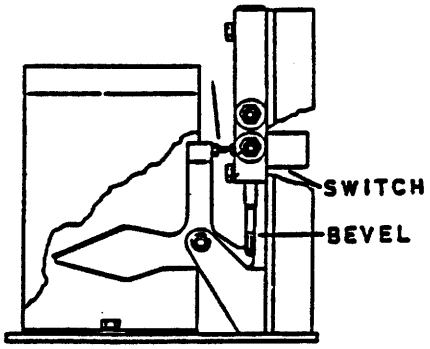
9) EMERGENCY PUMP pressure setting is located on the side of the adapter plate. To adjust the pressure on the pump, remove the cap and turn the adjusting screw in to increase pressure.To decrease pressure, turn adjusting screw out. Consult unit specification chart for proper settings.



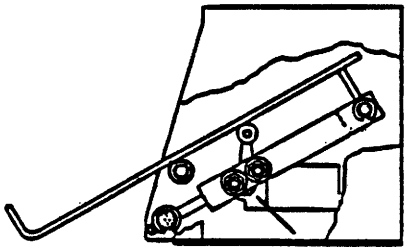
10) BOOM EXTEND CHAIN ADJUSTMENT: Adjustment should be as follows- 1" of droop for each 10 feet of unit model. Example: MP50 = 5" MP80 = 8". Adjustment is accomplished by tightening or loosening the chain adjusting screw on the mid-boom section. Maintain equal tension on both chains when adjusting.



11) BOOM DOWN SPEED ADJUSTMENT is located at the valve bank at the rear of the lift valve. This valve controls the boom down function speed and gives smooth operation to the down function as well. If boom bounces while descending, adjust the valve clockwise until the bounce disappears.



FOOT PEDAL ASS'Y. - LATE MODEL



FOOT PEDAL ASS'Y. - EARLY MODEL

12) FOOT VALVE located in the basket, controls the hydraulic pump pressure and flow which in turn controls function speed. For proper adjustment the metering slot MUST be facing the pressure and return ports. This can be checked by insuring that the beveled 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 nearest the exposed piston rod. This is the pressure port. When connecting the operator pedal, insure that the pedal does not compress the piston rod in the unactuated position.

Adjust the pump stroke switch to activate just as the piston rod starts to move. With the pedal in the unactuated position, the switch should NOT be sending voltage to the pump destroke valve. NOTE: On the OLD STYLE foot valve, voltage is sent to the destroke valve in the unactuated position.

Model	Upper Bearing & Lower Bearing
MPN 30	9/16-12 Grade 8 bolt w/hardened flatwasher torque to 120 ft/lbs.
MPN 40 MP 40 MP 50 MPN 55	5/8-11 Grade 8 bolts w/hardened flatwasher torque to 170 ft/lbs
MP 60 MPH 60 MP 70 MP 80 MP 80N	3/4-16 Grade 8 bolts w/hardened flatwasher torque to 340 ft/lbs

Wheel Torque

Model	Front Wheel	Rear Wheel
MPN 30	9/16-18 Grade 5 stud w/lug nut and flatwasher. Torque to 95 ft/lbs	1/2-13 Grade 8 bolt w/ lockwasher,torque to 85 ft/lbs.
MPN 40 MP 40 MP 50	9/16-18 Grade 5 stud w/ lug nut & flatwasher Torque to 95 ft/lbs	1/2-20 Grade 5 stud w/ lug nut and flatwasher Torque to 70 ft/lbs
MPN 55 MP 60 MPL 60 MP 70 MP 80	3/4-16 Grade 5 stud w/ lug nut. Torque to 200 ft/lbs.	3/4-16 Grade 5 stud w/ lug nut. Torque to 200 ft/lbs

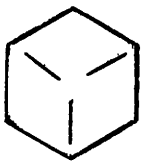
NOTE: ALL BOLT TORQUES ARE CALCULATED USING A LUBRICATED TORQUE SPEC. LUBRICATE ALL BOLTS BEFORE INSTALLATION.

Model	Drive Hub Torque
MPN 30	5/8-11 Grade 5 bolts w/lockwasher torque to 120 ft/lbs
MPN 40 MP 40 MP 50	1/2-13 Grade 8 bolts w/lockwasher torque to 85 ft/lbs
MPN 55 MP 60 MPL 60 MP 70 MP 80 MP 80N	5/8-11 Grade 5 bolts w/lockwasher torque to 120 ft/lbs

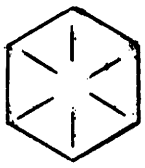
TORQUE IN (LBS.—FT.)

BOLTS, CAPSCREWS, STUDS AND NUTS

Grade 5 Identification, 3 Radial Dashes 120° Apart on Head of Bolt



Grade 8 Identification, 6 Radial Dashes 60° Apart on Head of Bolt



COARSE THREADS	Grade 5 Dry	Grade 5 Lubricated or Plated	Grade 8 Dry	Grade 8 Lubricated or Plated
3/8 — 16	31 — 34	23 — 25	44 — 48	33 — 36
7/16 — 14	49 — 54	37 — 41	70 — 77	52 — 57
1/2 — 13	75 — 83	57 — 63	106 — 117	80 — 88
9/16 — 12	109 — 120	82 — 90	153 — 168	115 — 127
5/8 — 11	150 — 165	113 — 124	212 — 233	159 — 175
3/4 — 10	266 — 293	200 — 220	376 — 414	282 — 310
7/8 — 9	394 — 433	296 — 326	606 — 667	455 — 501
1 — 8	591 — 649	443 — 489	909 — 1000	682 — 750
1 1/8 — 7	794 — 873	596 — 656	1288 — 1417	966 — 1063
1 1/4 — 7	1120 — 1232	840 — 924	1817 — 1999	1360 — 1496

FINE THREADS	Dry	Lubricated or Plated	Dry	Lubricated or Plated
3/8 — 24	35 — 39	26 — 29	49 — 54	37 — 41
7/16 — 20	55 — 61	41 — 45	78 — 86	58 — 64
1/2 — 20	85 — 94	64 — 70	120 — 132	90 — 99
9/16 — 18	121 — 133	91 — 100	171 — 188	128 — 141
5/8 — 18	170 — 187	128 — 141	240 — 264	180 — 198
3/4 — 16	297 — 327	223 — 245	420 — 462	315 — 347
7/8 — 14	434 — 477	326 — 359	668 — 735	501 — 550
1 — 12	646 — 711	485 — 534	995 — 1096	746 — 821
1 1/8 — 12	891 — 980	668 — 735	1445 — 1590	1083 — 1191
1 1/4 — 12	1240 — 1364	931 — 1024	2012 — 2213	1509 - 1660

APPROVED BY AXLE ENGINEERING

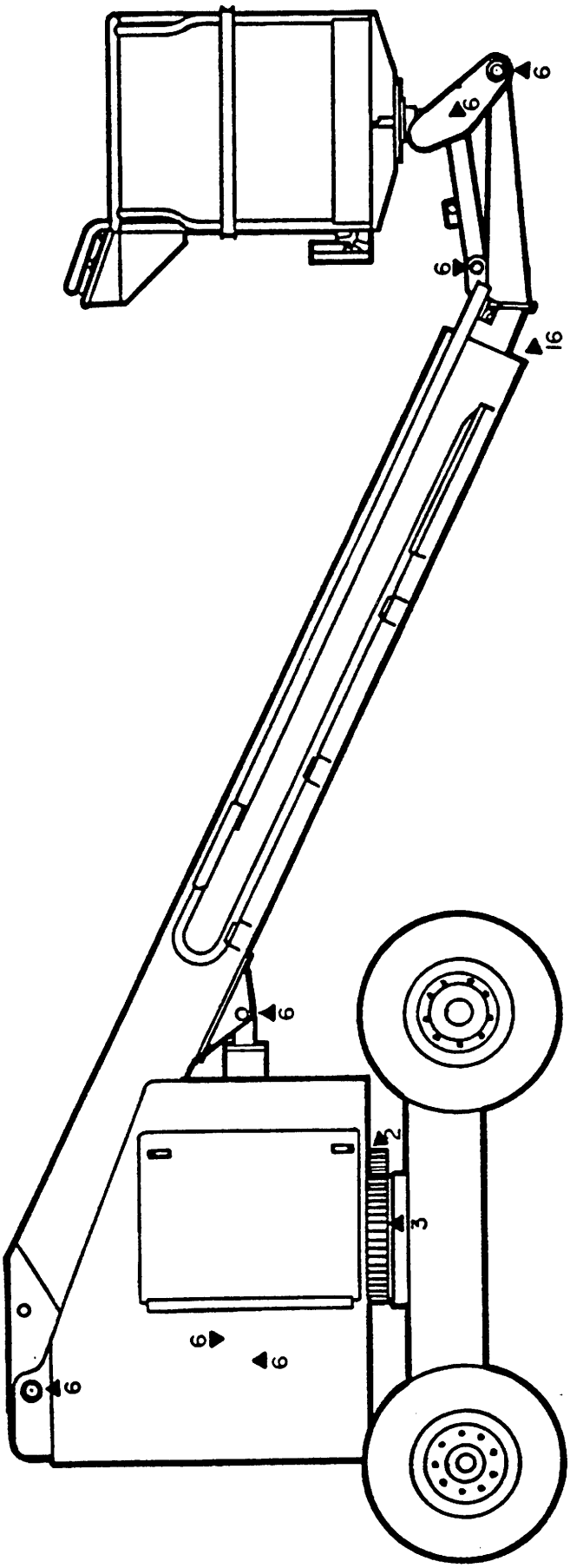
REVISED JANUARY 8th, 1962

FUNCTION	MP40	MPN40	MP60	MPL60	MP80
High speed Drive- 5 Revolutions	10-13	10-13	12-15	18-21	12-15
Low speed Drive- 5 Revolutions	60-75	60-75	75-100	90-110	75-100
Boom Up Function	36-40	36-40	75-80	65-70	90-95
Boom Down Function	47-53	47-53	82-89	72-82	105-110
Boom Extend	32-35	32-35	45-50	38-47	60-65
Boom Retract	53-57	53-57	45-50	56-72	60-65
Swing - 90 Degrees Right & Left Within 6%	30-33	30-33	40-45	40-45	60-65

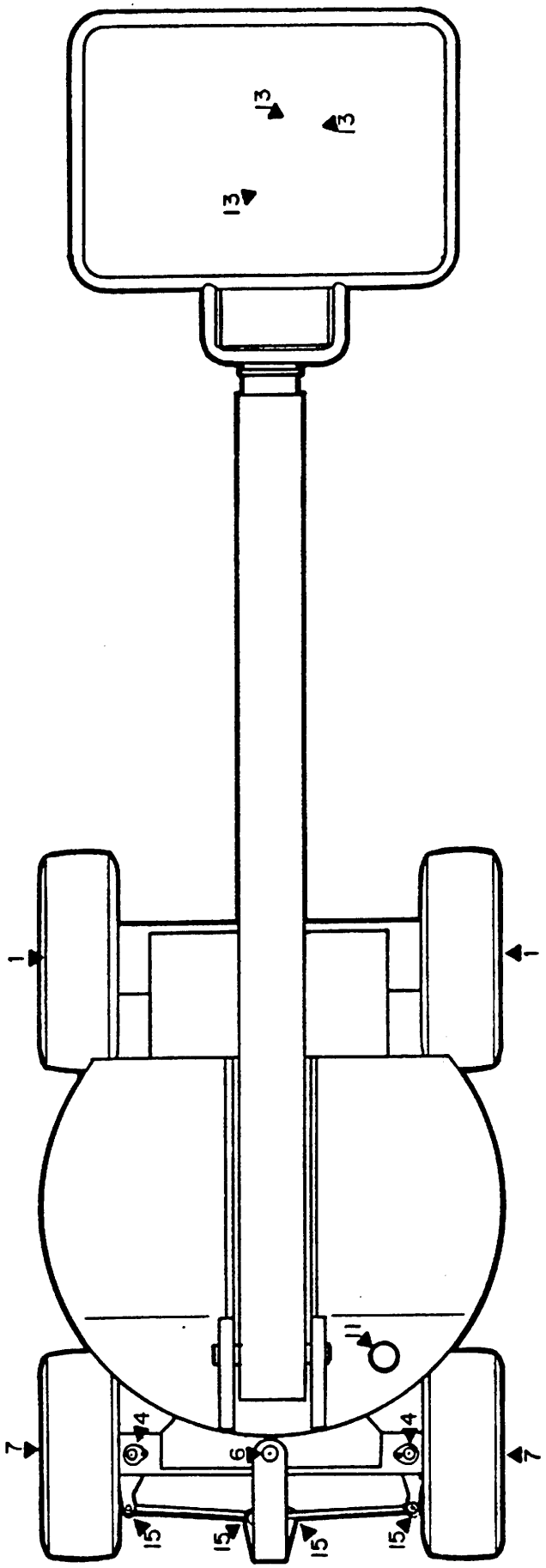
Note: These speeds may vary per unit due to special construction applications. The speeds listed above are for current standard production models manufactured from current Simon specification data sheets.

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

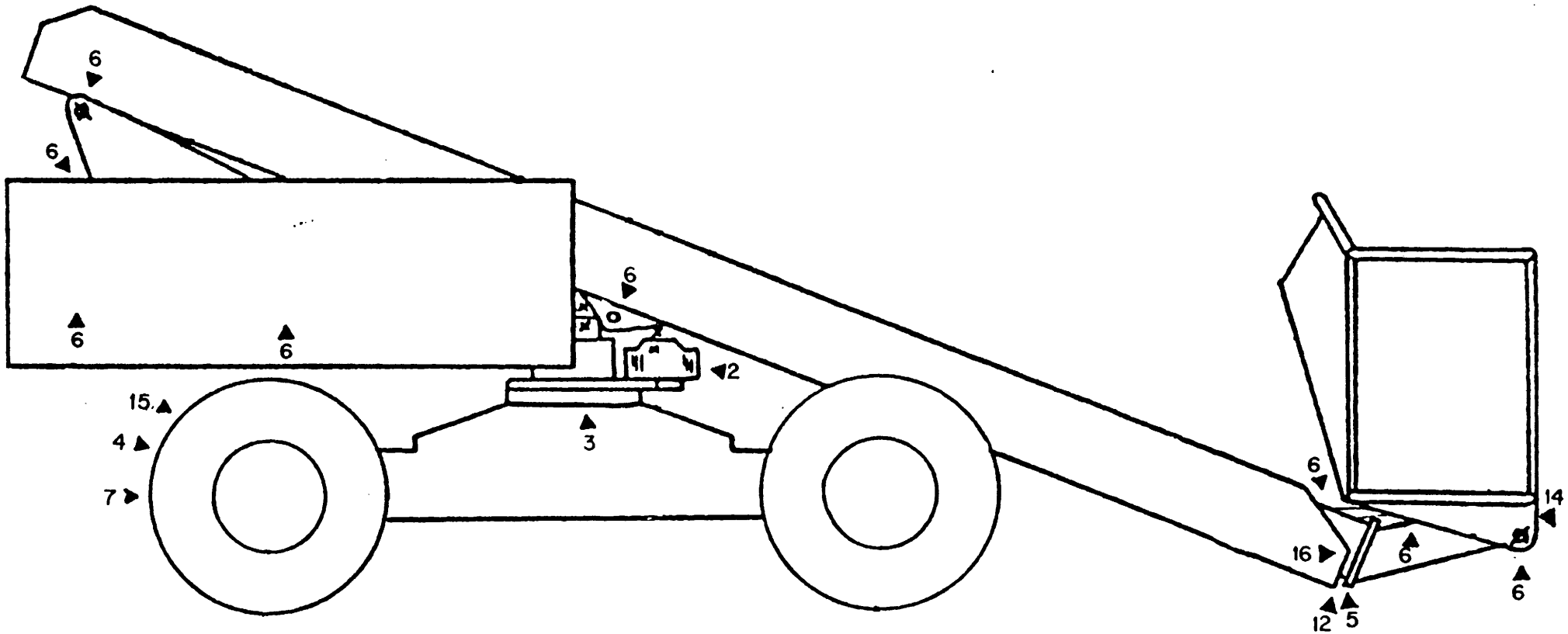
NOMENCLATURE	SPECIFICATION & FILL LEVEL	INTERVAL	
SWING REDUCER (SWING DRIVE)	OIL SAE 85-140 SAE 90W OR GREASE EP N.L.G.I. #1 WINTER EP N.G.L.I. #0	INITIAL 100 HRS. THEN EVERY YEAR OR 2000 HRS. WHICHEVER COMES FIRST	2
BOOM CHAIN SPROCKETS OF SHEAVES	EP N.G.L.I. #2 UNTILL NEW GREASE COMES OUT	MONTHLY 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

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	165	165	165	165	165	165
°F	329	329	329	329	329	329
Pour Point, max, °C	-45	-45	-45	-45	-40	-40
°F	-50	-50	-50	-50	-40	-40
Viscosity						
cSt 40°C	15.0/16.5	32/34	46/49	68/72	100/104	145/151
100°C	4.12	6.37	8.36	10.87	12.87	17.23
cSt 100°F (37.8°C)	17.41	36.05	52.42	76.91	113.02	165.9
210°F(98.9°C)	4.20	6.51	8.56	11.14	13.22	17.78
Viscosity Index, min	145	145	145	135	120	120
Brookfield Viscosity						
cP @ 0°F, max	500	1250	2500	4500	9500	20,000
@ 0°F, typ	350	940	1730	3390	7790	18,770
@ -20°F, max	1250	3650	6900	18,000	67,750	263,000
@ -20°F, typ	1130	3300	6250	16,500	61,600	239,000
@ -30°F, typ	3200	7680	13,500	43,800	220,000	—
@ -40°F, typ	10,500	19,300	57,800	161,000	—	—
Low-Temperature Pumpability						
Delivery @ 0°F(-18°C), gpm	8.2	6.8	4.7	2.7	1.5	0.5
Efficiency @ 0°F(-18°C), %	99	88	63	36	20	7
Total Acid No., min	0.8	0.8	0.8	0.8	0.8	0.8
Zinc, % wt. min	0.06	0.06	0.06	0.06	0.06	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

Contamination Checks:

A. Comply with a contamination analysis using the following as a guide in determining the requirement. By utilizing a hydraulic system check, the life of the Simon Aerial's lift will be enhanced.

1. Change the hydraulic fluid any time the engine driven pump is changed.

2. If fluid discoloration is evident in the reservoir sight glass, change hydraulic fluid and flush complete hydraulic system.

3. After the first 50 hours of operation the high pressure filter element indicates a plugged condition (Schroeder filter only). Remove and replace the element to again filter full fluid flow.

4. Change the hydraulic oil whenever the high pressure filter indicates a high metal content.

5. Change hydraulic oil if the valves in the main valve bank assembly have a continuous problem with the spools sticking.
   Note: Valve stack hold down bolts should be torqued to 15 ft/lbs.

6. Hydraulic fluid should be changed once a year under normal conditions.

7. Hydraulic fluid should be changed every 6 months under dirty or dusty conditions.

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 anaysis 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 the unit having the analysis and the type of unit, ie: mobile aerial platform.
3. Purpose of the analysis, ie: pump failure, discolored oil, etc
4. Type of analysis, ie: complete to show additive breakdown, acid build-up, viscosity, type and percent of contaminants, etc. There should also be a comparison to new oil data specs plus analysis recommendations.

D. If flushing and replacement of hydraulic 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).

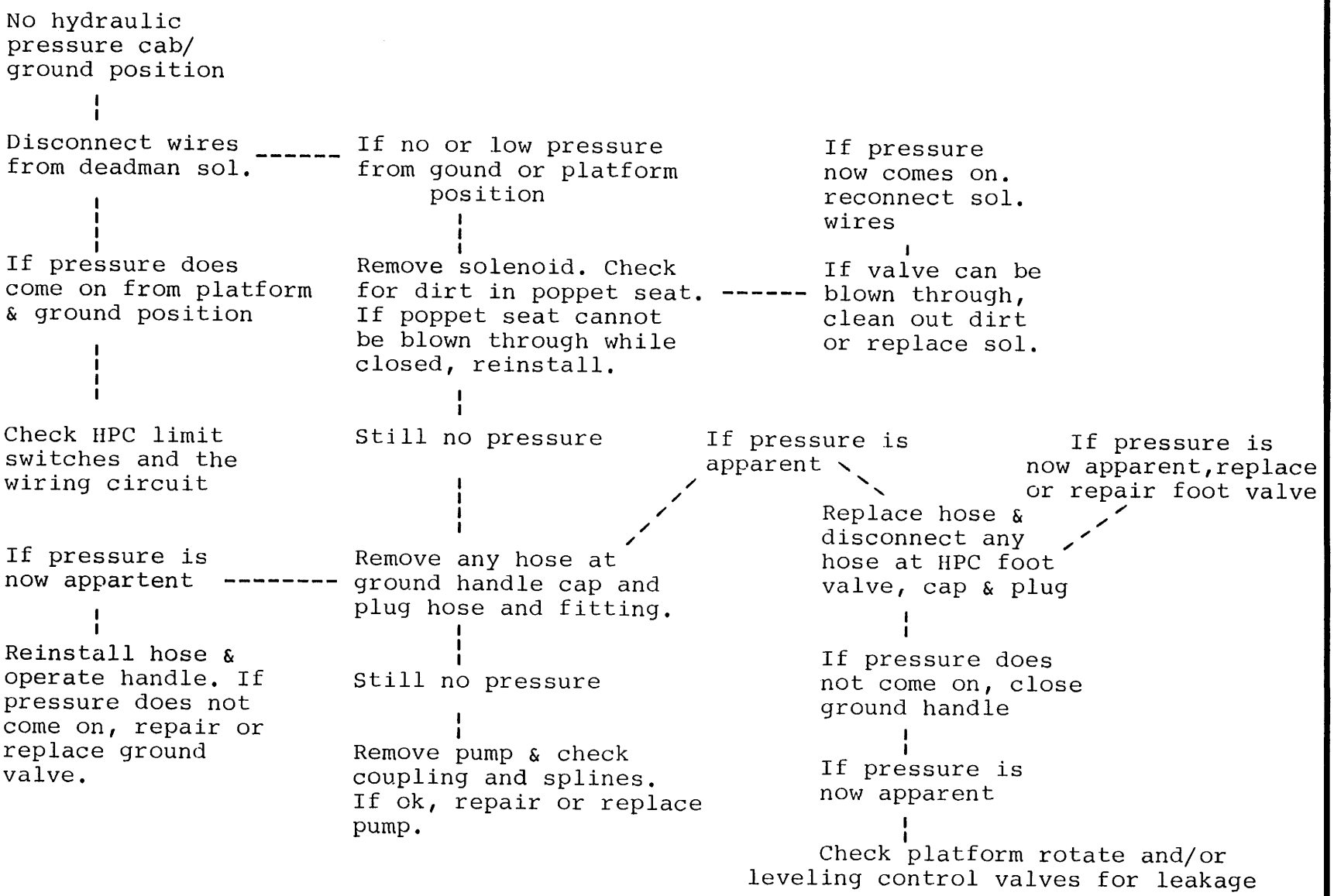
As system pressure is lowered from compensator cracking pressure, volume and pressure capabilities of the pump are reduced until only the pressure required to keep the pistons off the cam and allowing 1 GPM volume flow are met. This is where the hydraport system controls the pump.

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.


No hydraulic pressure cab/ ground position
Disconnect wires from deadman sol.
If pressure does come on from platform & ground position
Check HPC limit switches and the wiring circuit
If pressure is now appartent
Reinstall hose & operate handle. If pressure does not come on, repair or replace ground valve.
If no or low pressure from gound or platform position
Remove solenoid. Check for dirt in poppet seat. If poppet seat cannot be blown through while closed, reinstall.
Still no pressure
Remove any hose at ground handle cap and plug hose and fitting.
Still no pressure
Remove pump & check coupling and splines. If ok, repair or replace pump.
If pressure comes on. reconnect sol. wires
If valve can be blown through, clean out dirt or replace sol.
If pressure is apparent
Replace hose & disconnect any hose at HPC foot valve, cap & plug
If pressure is now apparent,replace or repair foot valve
If pressure does not come on, close ground handle
If pressure is now apparent
Check platform rotate and/or leveling control valves for leakage

Excessive Pump Wear -

Pump Piston and Cam

Pitting and etching	Pump cavitation or water in fluid	Repair suction leaks. Fill reservoir to the proper level. Check reservoir pressurization. If the above is OK, drain & flush the hydraulic system.
Light & pitting mushroom rusting	High viscosity oil	Drain and replace oil with a multiple viscosity oil. Insure pump stroke flow valve is closed.
Excessive wearing	Low viscosity oil	Insure pump stroke flow valve is closed. Drain & flush system thoroughly.

Manually operate override button with hydraulic pressure applied

Function operates with button depressed

Check for 12 VDC at coil with control handle activated

Low voltage at coil (10VDC or less) — Check coil resistance- (4ohms) — Replace if low

No voltage. Check for for 12 VDC on terminal strip in platform control box.

If DC voltage is present on terminal strip, check for 12 VDC at controller — Repair controller if voltage is not apparent after the controller

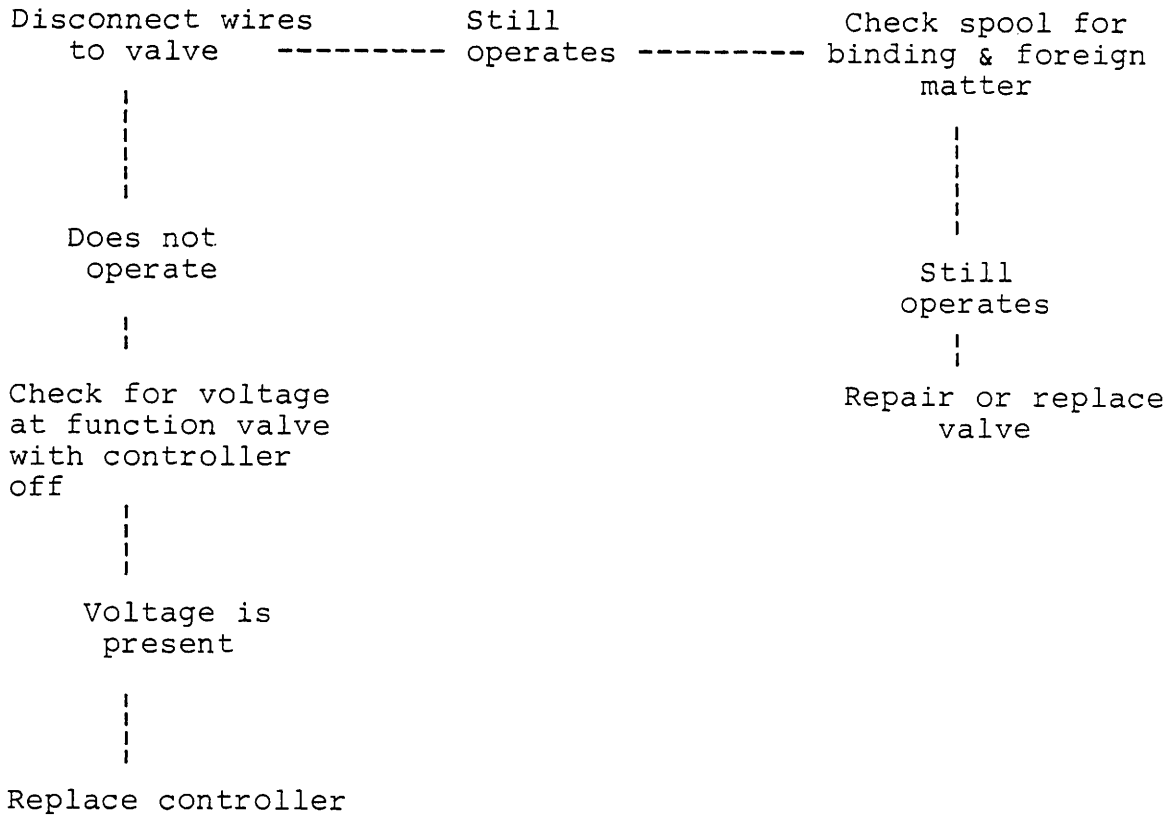
If voltage is apparent after the controller but still no function operates.

Check for broken wire or connection between platform console and ground terminal box. — Repair wiring as necessary

MOST PROBABLE CAUSES:

1. Ground/platform switch in incorrect mode
2. 24 conductor cable malfunction

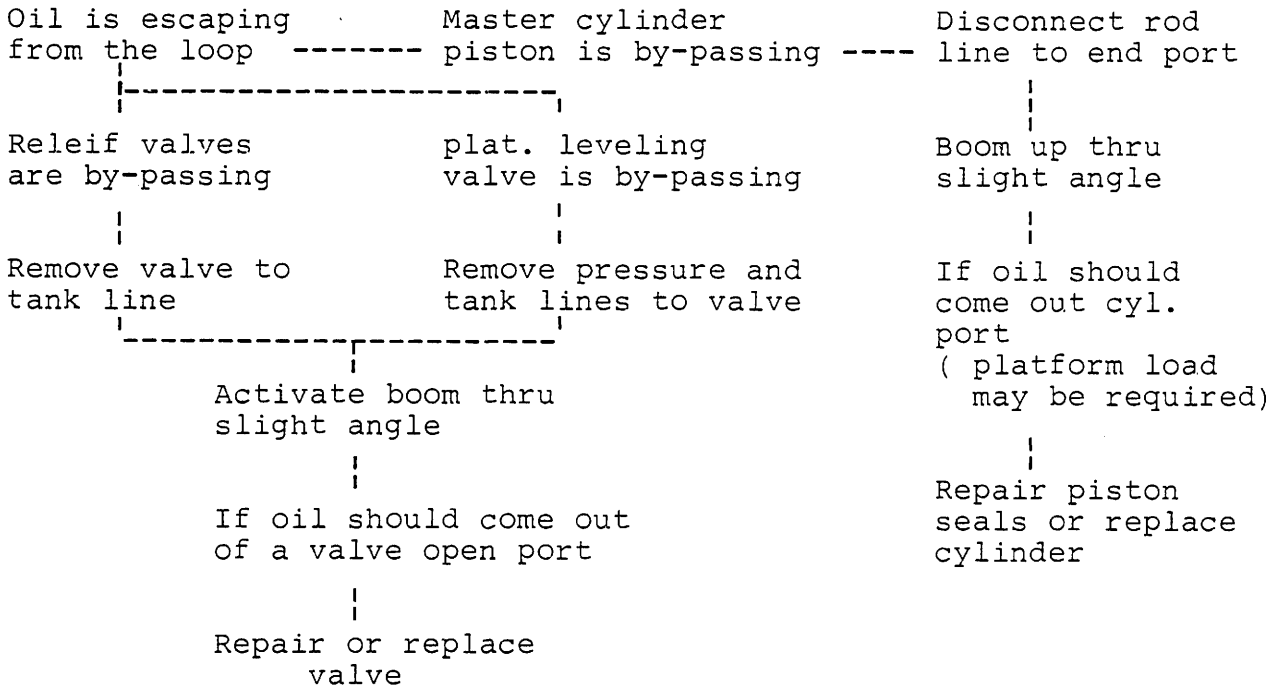
Function Operates By Foot Valve Only



Platform Ratchets or Does Not Level Properly

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

Oil is escaping from the slave cylinder ---- Internal leak ---- Disconnect lines to cylinder (place load in platform if needed to create drifting)

External Leak

Tighten or replace part

No oil leakage. Platform only drifts a short distance.

Repair piston seals or replace cylinder

Oil comes out retract port

Tighten, repair or replace holding valve.

Oil comes out extend port

Repair piston seals or replace cylinder. Also, repair and/or replace holding valve.

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.

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.

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).

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.

REF #

1. Hydraulic Pump -

   Radial piston pump, 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. When closed, it allows the hydra-port circuit to control pump output.

3. Filter -

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

4. Distribution Manifold -

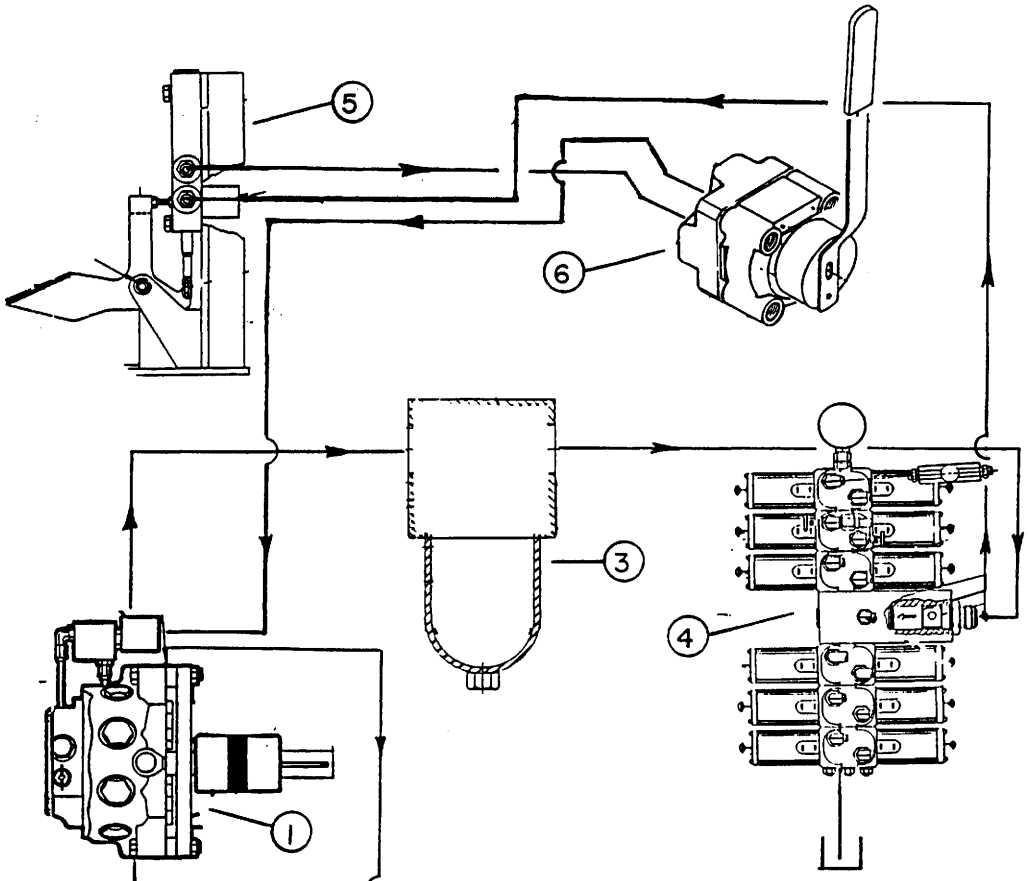
   This is where the hydra-port circuit begins. It allows fluid to go up the boom to the foot stroke valve. NOTE: all systems on the unit are closed center with the exception of the hydra-port circuit which is open center loop.

5. Foot Stroke Valve -

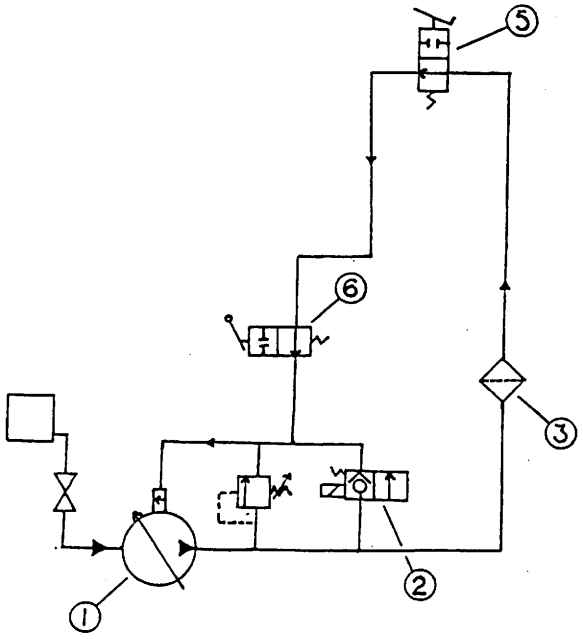
   A normally open,2 port, manually controlled valve designed to open and close gradually controlling the volume of fluid going back to the pump crankcase causing pump output control.

6. Ground Stroke Valve -

   This valve is an open center four-way valve which allows fluid to flow freely from the platform foot valve through to the pump crankcase. When the snap-tight valve is closed, fluid flow is stopped causing the pump to come on stroke.



Diagram



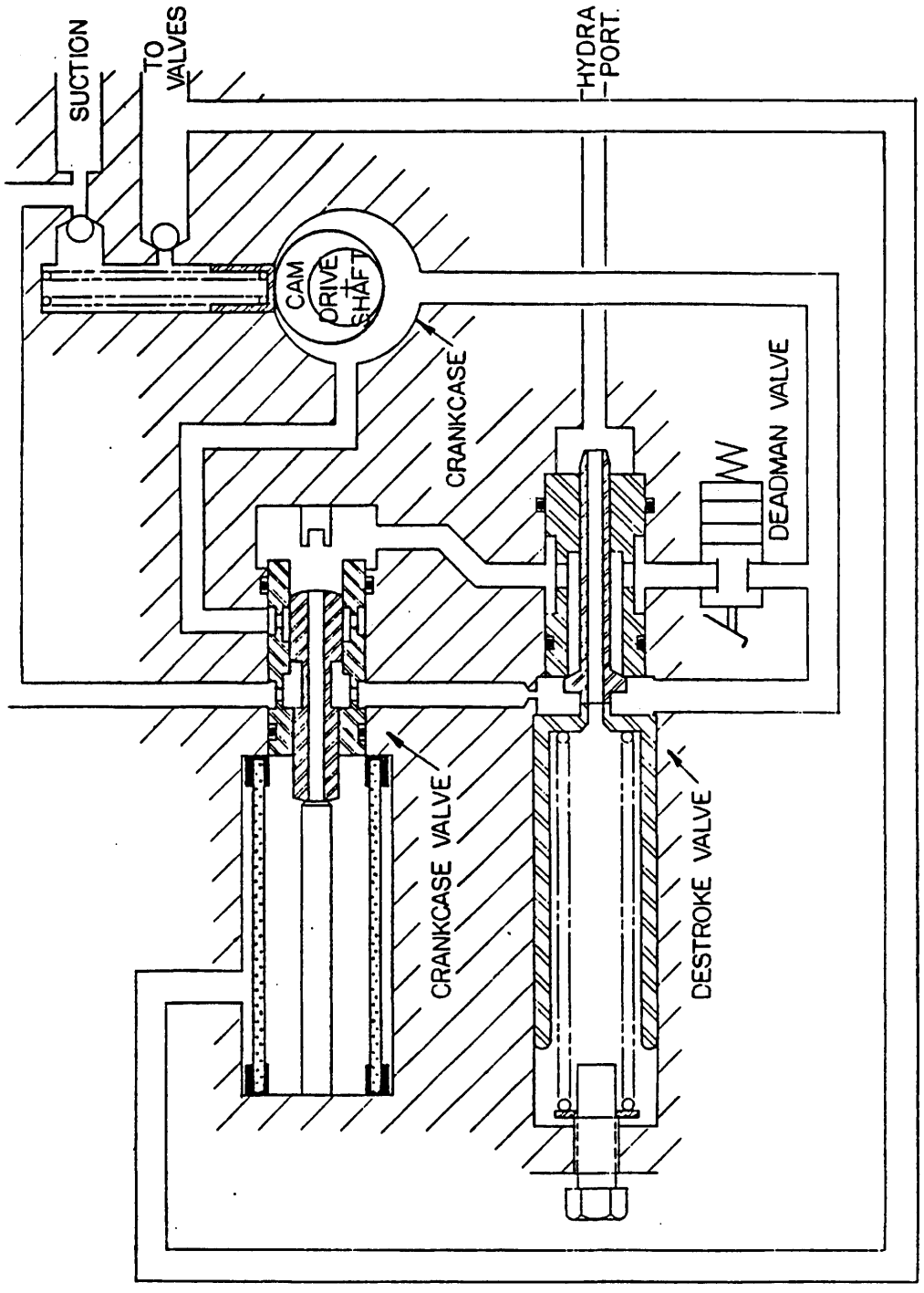
Schematic

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

Electrical: The ground override switch selects power to either the ground or the platform ignition switch. At the platform, the power is sent thru a micro-switch on the foot pedal (5), which then sends power to the destroke solenoid (2). When the solenoid is energized, the pump destroke valve closes. This puts the pump on stroke which allows the Hydra-Port circuit to be activated.

This same process occurs from the ground controls. When the ground override switch is placed in the ground position, there is power to the micro-switch located next to the snap-tight valve at the hydraulic valve bank. When the snap-tight valve handle is pulled, the micro-switch is activated allowing power to activate the pump destroke solenoid valve.

Hydraulic: When the pump destroke valve (2) is closed, fluid flows to the hydraulic pressure filter (3), then to the valve bank manifold (4). The fluid is then tee'd off the manifold assembly and goes up the boom and is routed thru the foot valve (5). The fluid then goes back down the boom to the ground control handle which is located at the main hydraulic valve bank (6). After the oil leaves the ground control handle, it is routed to the center of the pump,holding the pistons away from the imput shaft and cam assembly. This pressure is only great enough to allow the fluid pumping to maintain the pistons within the pump in a null state. As the foot pedal is depressed, the orfice within the valve becomes smaller allowing less fluid to return back to the pump which allows the pistons to move closer to the cam. The pump then comes on stroke causing more oil to be pumped. If this fluid is not used, pressure builds at the inlet port of the foot valve which increases the flow to the pump which in turn holds the pistons away from the cam. When the foot valve or the ground control handle are closed completely, no fluid returns to the center of the pump. This condition brings the pump on full stroke allowing for maximum unit speed.



STROKE CONTROL VALVE
PR-24,30,40 & 60 SERIES PUMPS

REF #

1. Selector Valve -

Solenoid operated 3 position, 4 port normaly 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 a pilot spring force opening a pilot spool thus letting the cylinder retract and lower the boom.

3. Lift Cylinder -

A double acting cylinder powers the boom up and down movements and support of the boom.

4. Flow Control Valve -

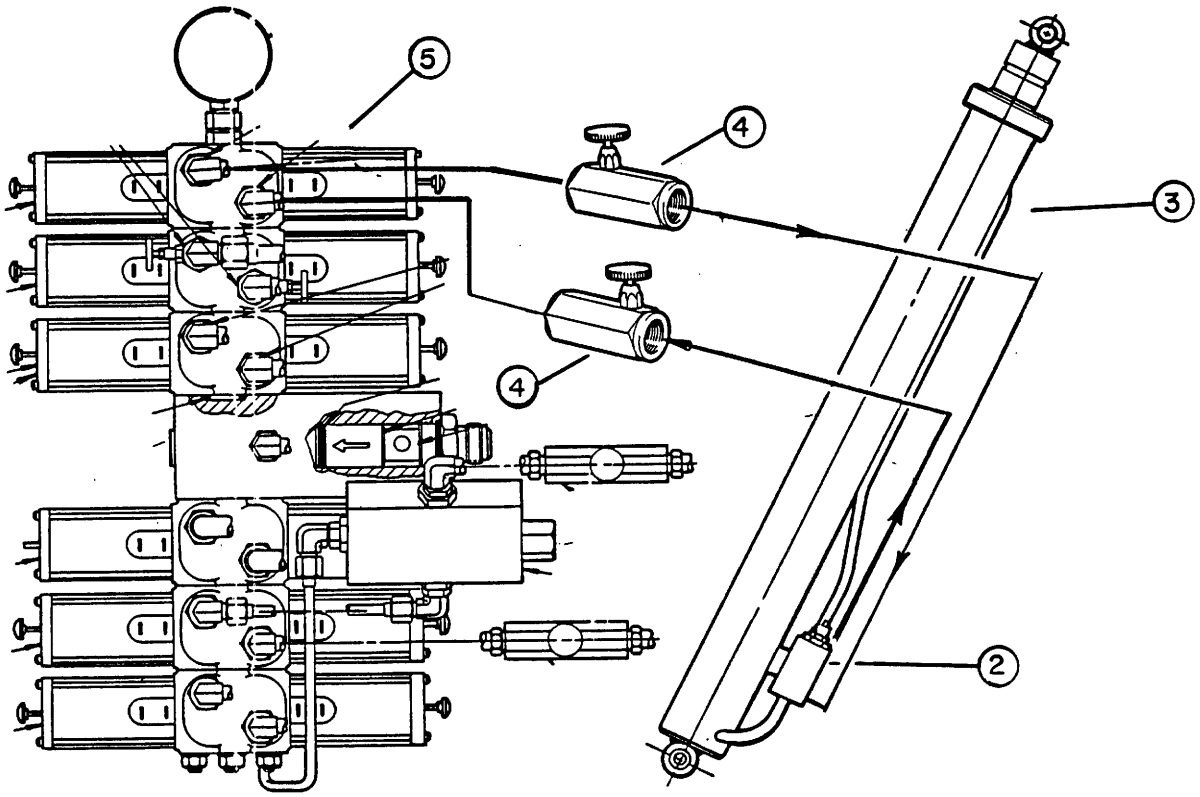
This valve controls boom down speed and prevents the holding valve from bouncing and squeeling.

5. Orfices - (OLD STYLE UNITS)

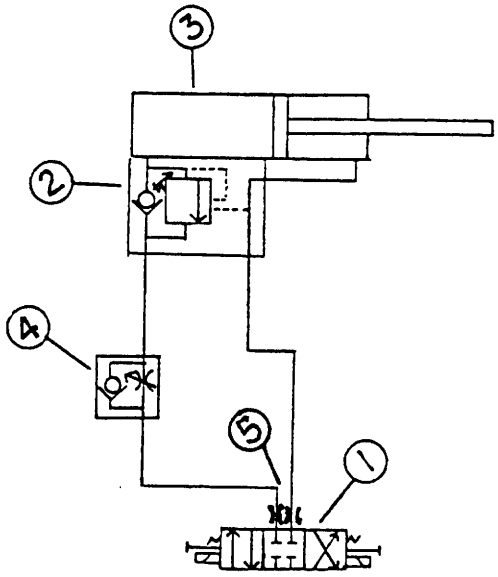
This controls boom up speeds.

NOTE: Units that do not have a flow control valve will have 2 orfices controlling boom up speed and maximum boom down speed.

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



DIAGRAM



SCHEMATIC

REF #

1. Selector Valve -

This valve is a 3 position 4 port normally closed valve.

NOTE: Earlier models may use a motoring valve spool where both work ports are vented to return in the neutral position. In conjunction with this type valve, a double lock valve was used.

2. Flow Control Valves -

These valves allow free flow in one direction while checking the return flow through a metered port.

3. Holding Valves -

Two load holding valves are utilized in the extend / retract circuits. This is done to prevent unintentional boom movement.

4. Extend Cylinder -

A double acting cylinder powers the boom through the telescope cylinder function. Oil is passed through the telescope cylinder rod which is through drilled. This type of cylinder has NO external transfer tube for oil to pass through.

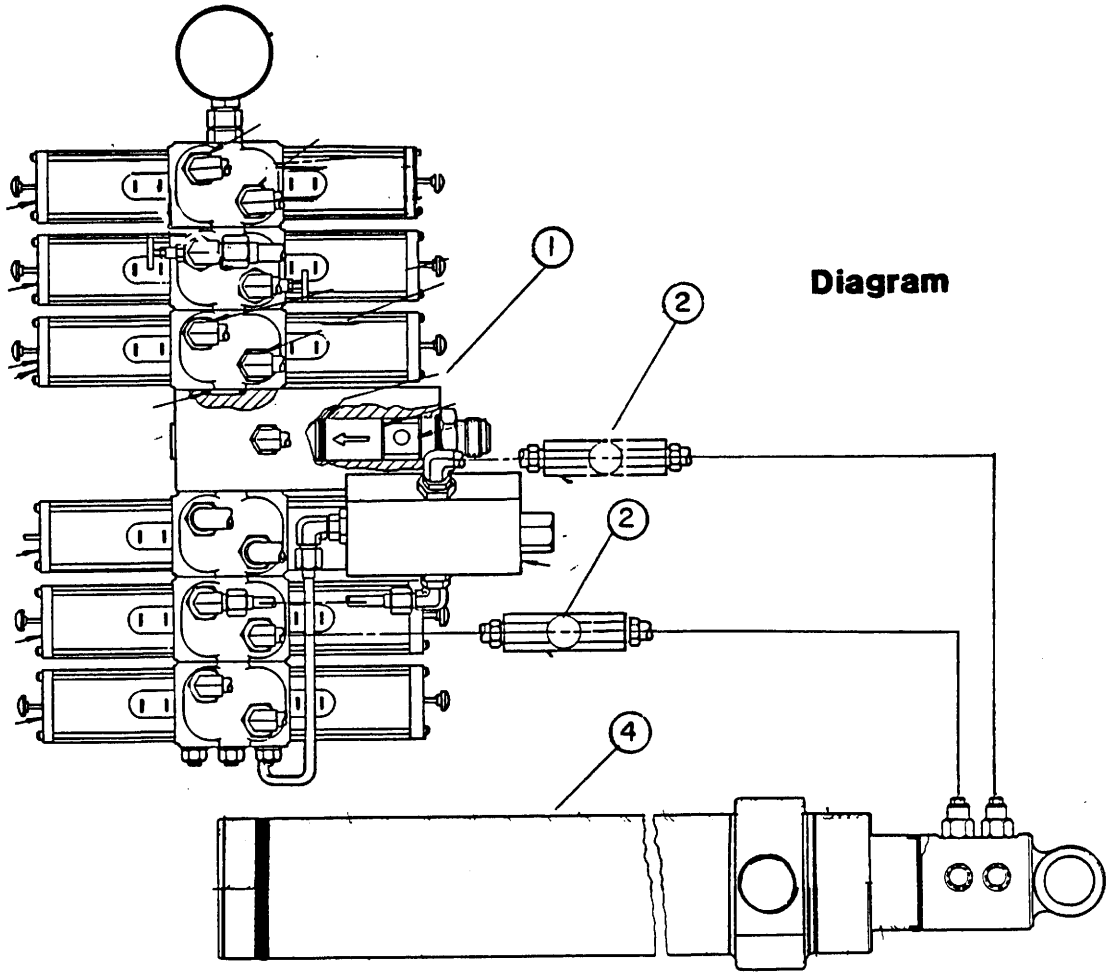
Mechanical Extend Function -

On three piece booms, the third section is chain or cable driven depending on the model.

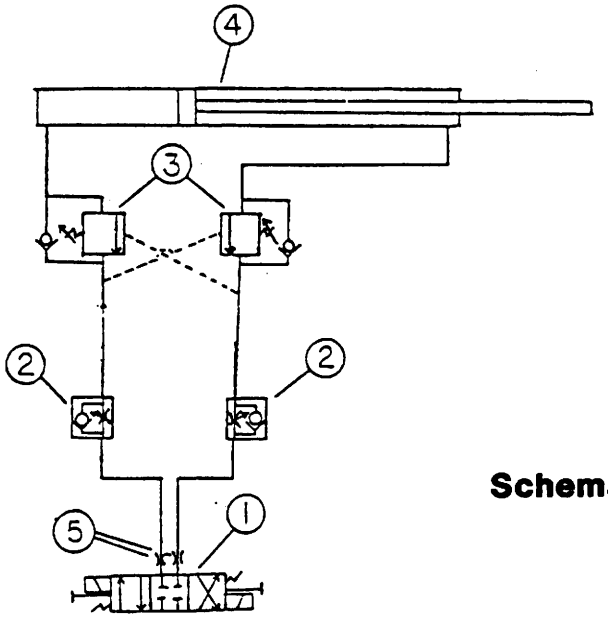
The second section of the boom is cylinder driven as the cylinder is connected between the first and second boom sections. This is called a trunion mounted cylinder application.

The first boom section is the base boom. This section holds the second and third sections and allows them to extend and retract.

NOTE: ALL BOOM TUBE SECTIONS SLIDE ON NYLON PADS.



Diagram



Schematic

Mechanical Extend Function - (Cont.)

The chains are in two sections. Both sections connect together at the anchor blocks allowing a continuous loop around the second section of boom tube. The chains are anchored first at the inside end of the tip section and secondly at the end of the base boom near the anchor adjustment bolts.

On all Simon Aerial three section booms, there are two (2) extend chains or cables while there is only one (1) retract chain. All the weight placed in the basket is suspedended by the two (2) extend chains or cables.

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)				

Ref #

5 Wire Rope Replacement (for MPH-80, MP-95, or MP-110 with Three-Piece or Four-Piece CABLE Operated Boom)

Disassembly Procedure

NOTE: BOOM SECTIONS MUST BE FULLY RETRACTED BEFORE PERFORMING THE FOLLOWING PROCEDURE.

Remove mid and tip booms (as one unit) from the base boom assembly. This will require disconnecting:

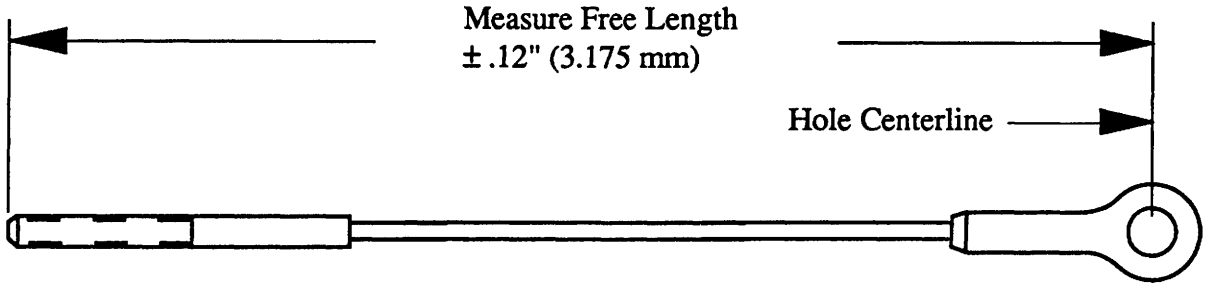
- the hoses to the rod end of the telescope (extend) cylinder,
- the telescope cylinder rod end pin,
- the EXTEND ropes to the front (lower) end of the BASE BOOM section,
- the bottom boom slide (wear) pad and tapped block from the front (lower) end of the MID BOOM section (or sections, for models with 4-piece boom),
- all wear pads from the upper (rear) end of the BASE BOOM section, and
- the bolted block anchoring the RETRACT ropes to the top of the BASE BOOM section upper (rear) end.

Remove the bolted bracket anchoring the ends of the retract and extend ropes on the lower (front) end of the TIP BOOM section. Remove the split half trunnion brackets which attach the telescope cylinder housing (case) to the MID BOOM section (LOWER MID BOOM section on models with 4-piece booms). Lift and slide the telescope cylinder out the lower end of the MID BOOM section.

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

Disassembly Procedure (Continued)

Stretch out the new replacement ropes, and measure the free length of each rope (see chart and illustration below).



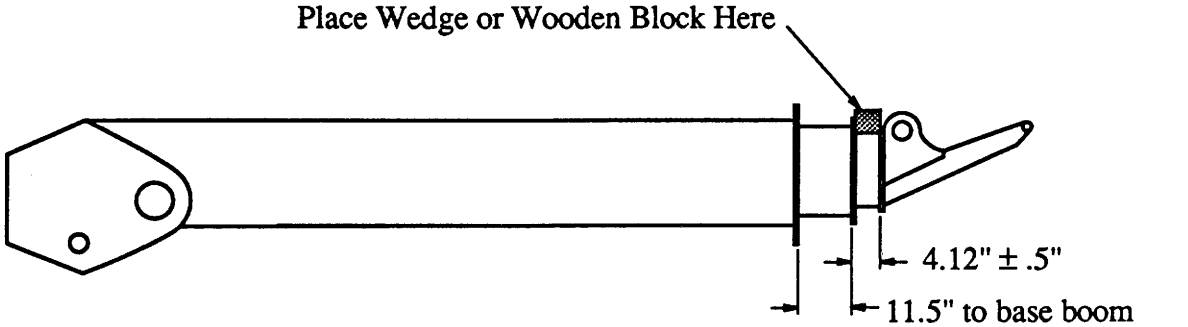
MODEL	EXTEND ROPE		RETRACT ROPE	
	DIA.	LENGTH	DIA.	LENGTH
MPH-80 (MP80-1)	5/8" (16mm)	585.00" (14.859 M)	3/8" (10mm)	343.00" (8.712 M)
MP-95	5/8" (16mm)	705.00" (17.907 M)	3/8" (10mm)	411.00" (10.439 M)
MP-110 Tip Boom	1/2" (12.7mm)	385.63" (9.795 M)	3/8" (10mm)	391.38" (9.941 M)
Upper (Rear) Mid Boom	1/2" (12.7mm)	378.63" (9.617 M)	3/8" (10mm)	378.63" (9.617 M)

Re-assembly Procedure

Re-assemble the boom by reversing the procedures outlined in the previous steps. TAKE CARE TO PREVENT CROSSING THE WIRE ROPES AS THEY ARE RE-INSTALLED IN THE BOOM.

Wire Rope Adjustment

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



Note: Boom shown with telescope cylinder fully retracted.

The position of the tip boom section RELATIVE TO THE MID BOOM is dependent on the adustment of the extend and retract ropes. To extend the tip boom, tighten the extend ropes. To retract the tip boom, tighten the retract ropes.

NOTE: DO NOT ALLOW THE ENDS OF THE WIRE ROPES TO TWIST WHILE MAKING THESE INITIAL ADJUSTMENTS.

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

With the tip boom section still blocked, try to retract the boom. This will cause increased slack in the extend ropes. Re-tighten the extend ropes EQUALLY to remove any slack in the ropes.

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

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

REF #

1. Directional Control Valve -

   This valve is a 3 position, 4 port valve equipped with a motoring spool. This valve also utilizes a manual override for manual operation. This directional control valve selects fluid pressure to the swing circuit for clockwise or counter-clockwise superstructure movement.

   NOTE: Units equipped with an intregal brake have a motoring spool that allows hydraulic fluid to relief to tank thus releasing pressure in the brake chamber.

2. Orifices - (old style units)

   These controlled the boom swing speeds.

   NOTE: Units that do not have a flow contol valve located at the rear of the directional control valve have (2) orifices installed in-line at the directional control valve to control boom speeds.

3. Flow Control Valves - (new style)

   These are located at the rear of the directional control valve and are utilized to control boom speeds. These valves are adjusted by turning the knurled knobs.

4. Shuttle Valve - (used with brake equipped units only)

   This valve selects either clockwise or counter-clockwise pressure to be routed to the intregal brake assembly.

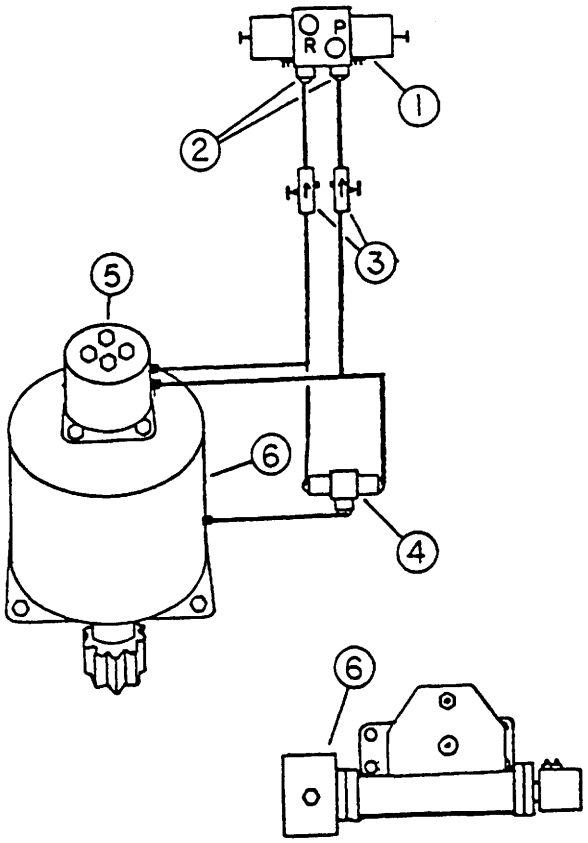
5. Swing Motor -

   This motor is rotor driven which is key to a shaft. This in turn powers the gear reducer assembly.

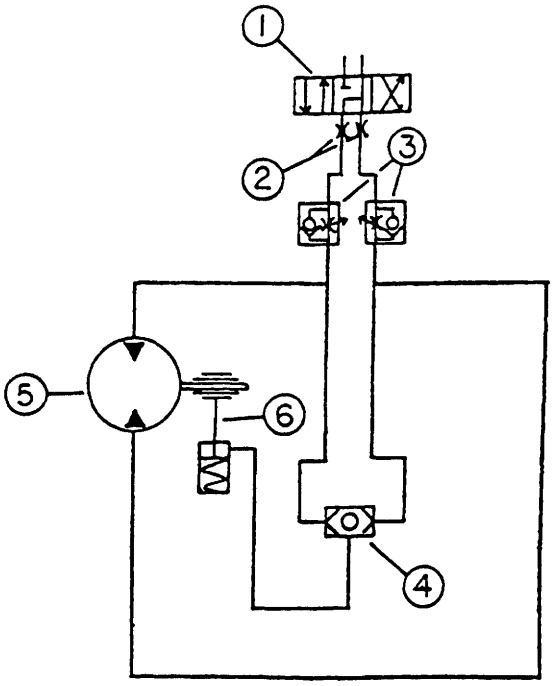
6. Swing Brake -

   The brake is a multiple disc type which is part of the gear box. This brake 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



DIAGRAM



SCHEMATIC

Ref #

1 Motion Control Valve -

The motion control valve found in the drive system has a two fold purpose. It shuttles hydraulic oil flow to the intregal brake assemblies plus it produces a back pressure in the drive system so that unit run a way is impossible. This is accomplished by two (2) counter balance valves located in the motion control valve. Proper brake valve adjustment - open 1½ turn

2 Flow Divider Combiner -

The flow divider combiner provides a differential action for the drive motors. In a turning situation, hydraulic fluid will force the internal spools to channel fluid to the driving wheel. It also has a great impact on driving characteristics when one wheel becomes lite.

3 Globe Valve -

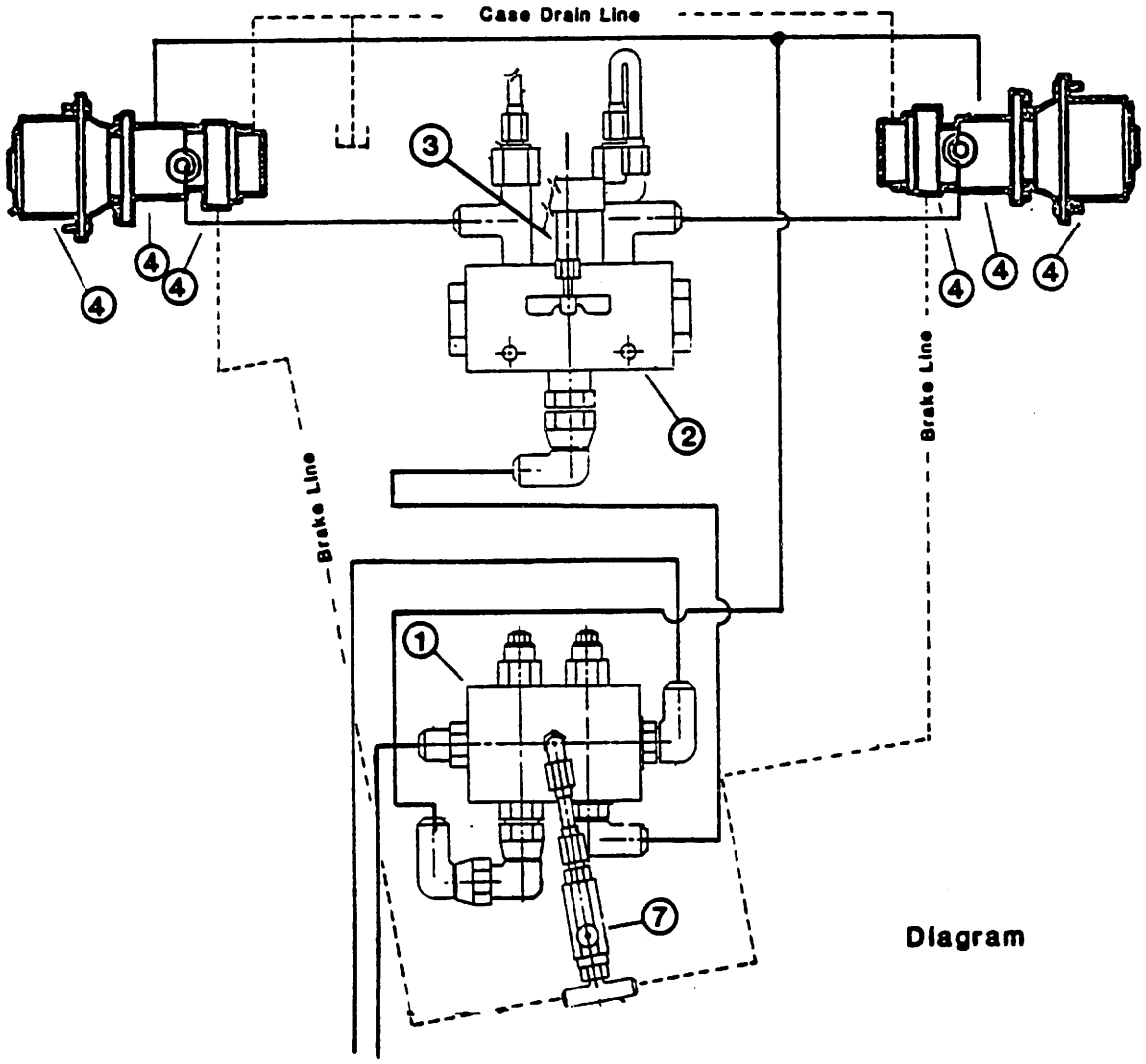
The Globe valve has one function. It allows hydraulic fluid to pass from one drive wheel to the other when unit is in a turn situation. It can be adjusted as to the amount of oil requested to pass but the correct setting should be approximately one and one half turn open from the closed position. In this position, the engine will load slightly and allow a metered amount of hydraulic fluid to pass to the driving wheel.

4 Drive Motors and Brake Assembly -

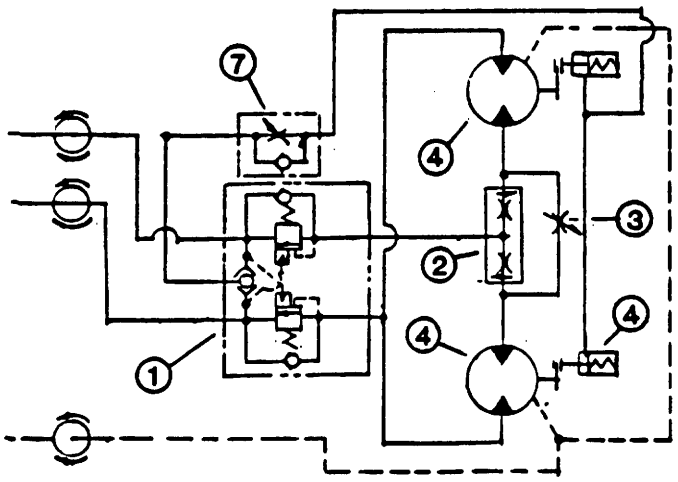
The brake assembly used on the Simon boom lift is a rool seal type brake. It is a wetted disc which is spring applied with hydraulic release. The drive motor rotor is keyed to a shaft which in turn is splined on both ends. One end of the splined shaft is used for the roll seal brake while the other is inserted into the gear reducer assembly.

Note: Motor internal leakage passed through the brake disc's and back to the main hydraulic reservoir thereby cooling the brake and preventing excessive brake disc wear.

There is also two (2) case drain lines which return directly to the main hydraulic reservoir to reduce motor back pressure.



Diagram



Schematic

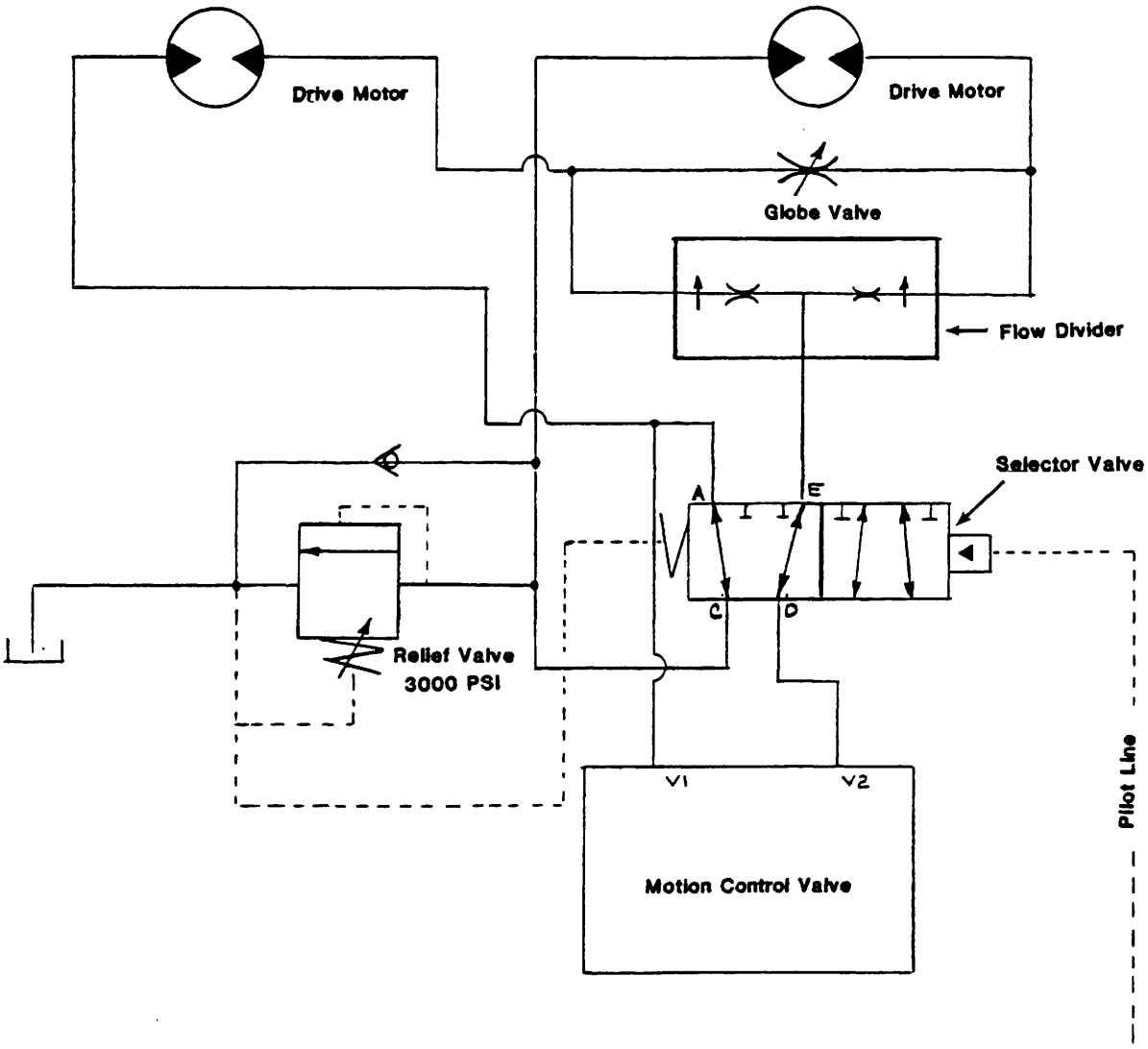
Ref #

5 Selector Valve - (Series / Parallel)

The selector valve used in the Simon drive system allows for a pilot pressure to shift the directional control spool changing the drive system flow from series flow to parallel flow.

6 Relief Valve -

The relief valve utilized in this drive system is set at 3,000 P.S.I. and adds assurance that the drive system will see only this pressure during the drive mode.



Ref #

1. Directional Control Valve -

   This valve is a 3 position, 4 port valve. It is normally closed and equipped with a manual override for manual operation. This valve selects hydraulic fluid pressure to the steering circuit.

2. Hydraulic Swivel -

   The swivel allows passage of pressure and return fluid between the upper and lower assemblies of the unit. This also allows for 360 degrees of continous rotation.

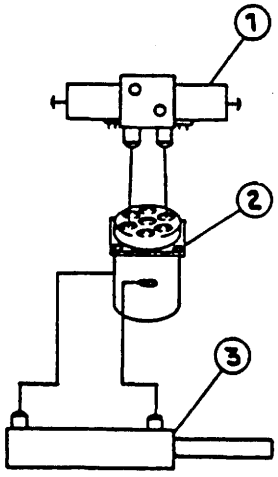
3. Steer Cylinder -

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

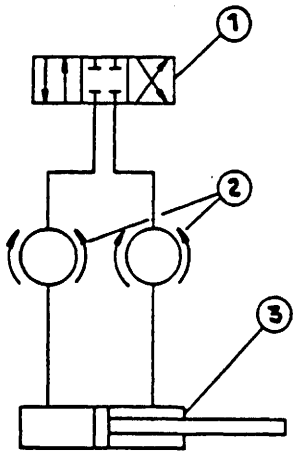
ITEM	TROUBLE SHOOTING	ADJUSTMENTS	REPAIR	MISC.	PARTS
1 Selector Valve	M5 M6.2.(Fig. 11)				D-13
2 Swivel					D-2
3 Steer Cylinder					D-1

STEERING

Diagram



Schematic



Ref #

1 Hydraport Foot Valve -

This valve controls the main hydraulic pump's output flow.

2 Check Valve -

The check valve prevents pressure from entering the return system for platform rotate and platform level when the ground control valve is pressurizing the hydraport circuit.

3 Flow Valve -

This adjustable control valve varies the volume of hydraulic fluid entering the platform rotate and platform leveling circuits. By decreasing the flow to these circuits, this prevents the destruction of the rotating hardware. This valve also prevents the hydraulic pump from cycling due to excessive return flow entering the hydraport circuit.

4 Leveling Selector Valve -

This is a manualy operated, 3 position 4 port, normally closed valve. It selects fluid flow to the leveling circuit for servicing and controlling the platform level position.

5 Slave Leveling Cylinder -

The cylinder is a 2 port double acting cylinder connected between the tip boom and the platform. This cylinder controls the position of the platform in relative to the tip boom.

6 Leveling System Holding Valves -

These are pilot adjustable and prevent platform movement. In the case of hose failure, the holding valve does not allow fluid to leave the slave cylinder unless imput pressure allows the pilot to open .

7 Master Leveling Cylinder -

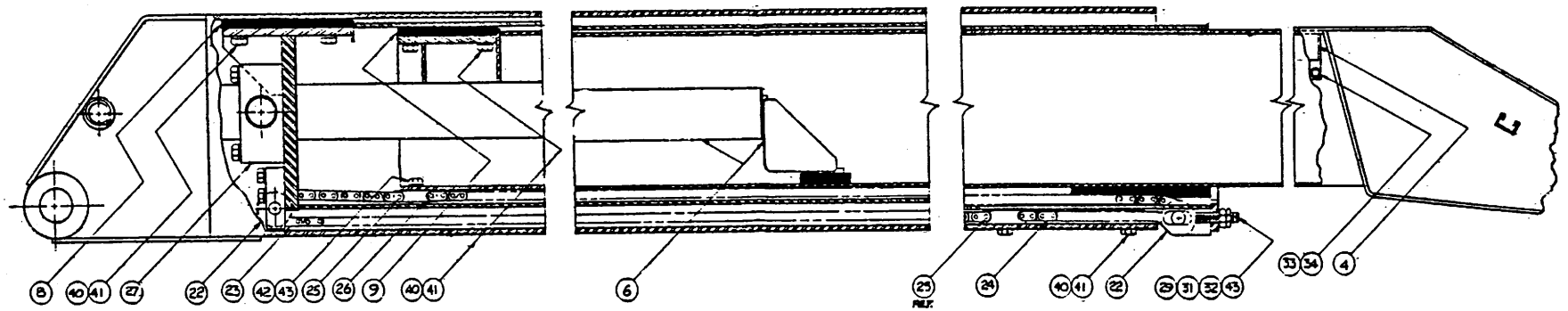
This cylinder is also a 2 port double acting cylinder with the same displacement as the slave cylinder. This cylinder is located between the upper frame and the boom or boom lift cylinder. Whenever the boom is raised or lowered, the master cylinder is forced to move. The fluid displacement from the master cylinder is in turn sent to the slave cylinder. This forces the slave cylinder to move the same distance as the master cylinder.

Ref #

8 Relief Valve -

This valve is adjustable and prevents high pressure spikes in the leveling circuit that could result in component damage. The pressure spikes occur when the slave cylinder is serviced manually by the selector valve and is not leveled which will cause the cylinder to bottom out before the master cylinder stops moving as the boom is lowered.

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)			



SIMON

3465 W. MILL R
MILWAUKEE

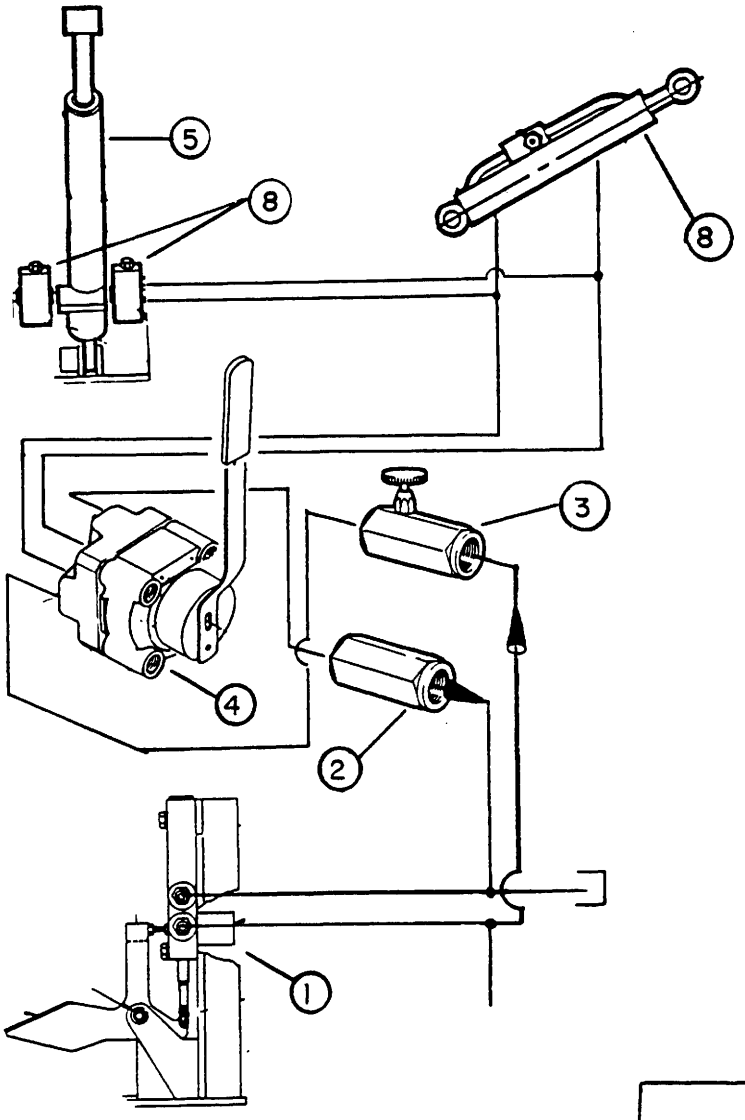
THIS DRAWING AND ALL THE INFORMATION THEREON IS CONFIDENTIAL AND MUST NOT BE MADE PUBLIC, NOR COPIED, NOR USED TO THE DISADVANTAGE OF SIMON AND IS SUBJECT TO RETURN ON DEMAND.

IMPLIED TOLERANCE	
DECIMAL PLACES	FRACTIONS
XX	1
XXX	.05
XXXX	.015
XXXXX	.0050

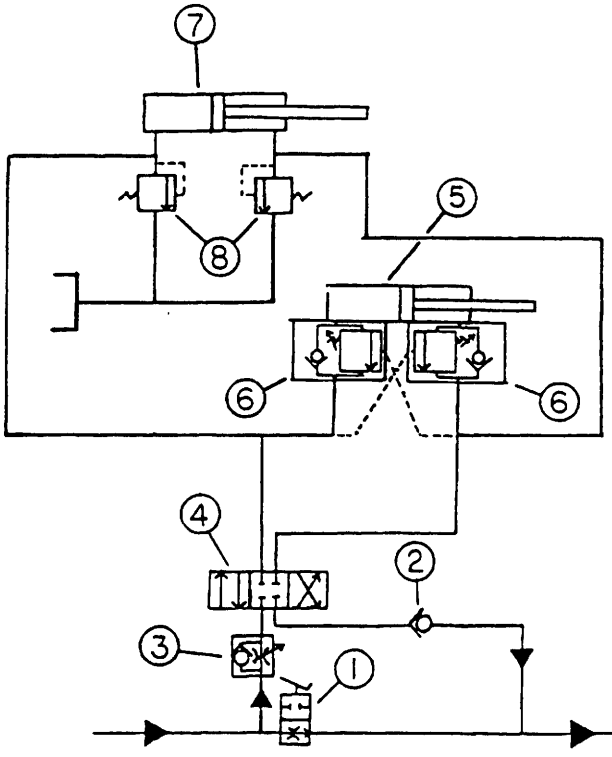
ALL WELDS MUST BE IN ACCORDANCE WITH A.W.S. STANDARDS AS PER SPEC. 010-1-70 OR 010-040

TITLE: MAJOR BOOM ASSEMBLY
SECTION

SHEET



Diagram



Schematic

Ref #

1. Hydraport Foot Valve -

   This valve controls the main hydraulic pump's output flow.

2. Check Valve -

   The check valve prevents pressure from entering the return system for platform rotate and platform level when the ground control valve is pressurizing the hydraport circuit.

3. Flow Valve -

   This adjustable control valve varies the volume of hydraulic fluid entering the platform rotate and leveling circuits. By decreasing the flow to these circuits, this prevents the destruction of the rotating hardware. This valve also prevents the hydraulic pump from cycling due to excessive return flow entering the hydraport circuit.

4. Rotating Selector Valve -

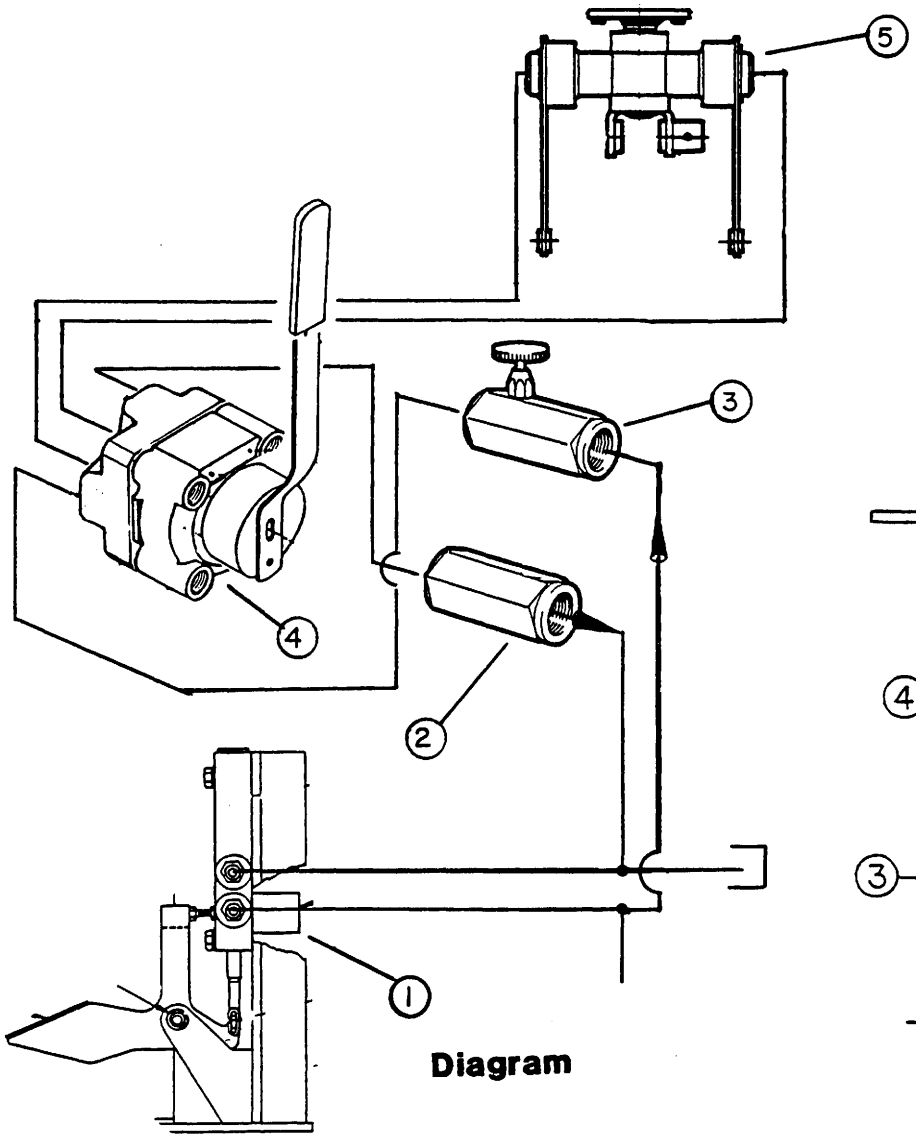
   This is a manually operated, 3 position 4 port, normally closed valve. It selects fluid flow to the rotate circuit for servicing and controlling the platform rotate function.

5. Rotary Actuator -

   The rotary actuator utilized on the Simon boom lift is of a rack and pinion type. Hydraulic fluid enters the actuator from either side, depending on desired rotation, and powers the rack in the opposite direction causing the pinion shaft to rotate.

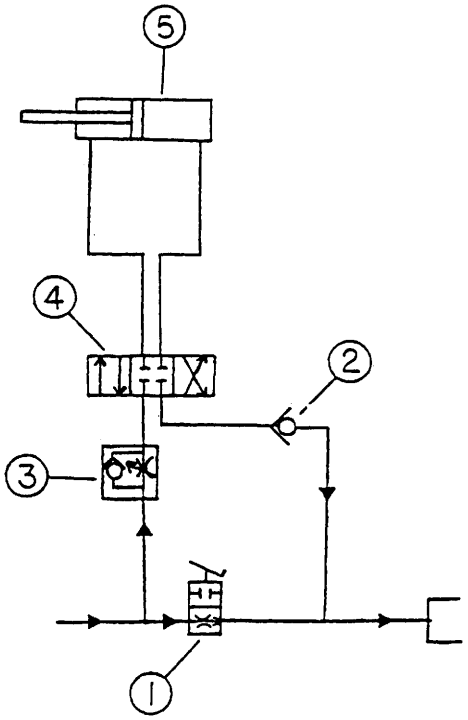
   Note: Older units utilized a double acting cylinder to achieve rotation.

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



Diagram

Schematic



Ref #

1 Main Hydraulic Pump -

The main pump is engine driven and is of a radial piston type. This pump delivers hydraulic fluid, under pressure, through the high pressure filter to the main hydraulic distribution manifold. This manifold is located in the center of the main valve bank.

2 High Pressure Filter -

The high pressure filter, filters the hydraulic fluid before it reaches the main hydraulic distribution manifold. The high pressure filter utilized on current production models is a non by-passing type. The filter element used is rated at 10 microns. This type of hydraulic filter does incorporate a differential pressure shut off valve that will stop fluid flow when the filter becomes dirty. However; this valve allows enough fluid to pass as not to crush the element from back pressure.

Note: Older type Simon booms utilized a high pressure filter with a by-pass circuit. This type of filter is identified by a metal 2 micron filter element located internally in the filter body. This filter housing also has a red indicator pin which, when the element is dirty, pops out of the filter head indicating a by-passing situation.

3 Emergency Pump -

The emergency pump is driven by an electric DC motor. This pump delivers hydraulic fluid, under pressure, to the main hydraulic distribution manifold. This pump should only be used in emergency situations! The electric motor is of a non-continuous type and will fail if used excessively.

4 Check Valve -

The check valve allows the main hydraulic pump free hydraulic fluid distribution to all the hydraulic systems. However; it prevents the emergency pump from bleeding off pressurized flow through the hydraport circuit when activated. This then allows full pressure to selected functions without the use the hydraport control valves.

Ref #

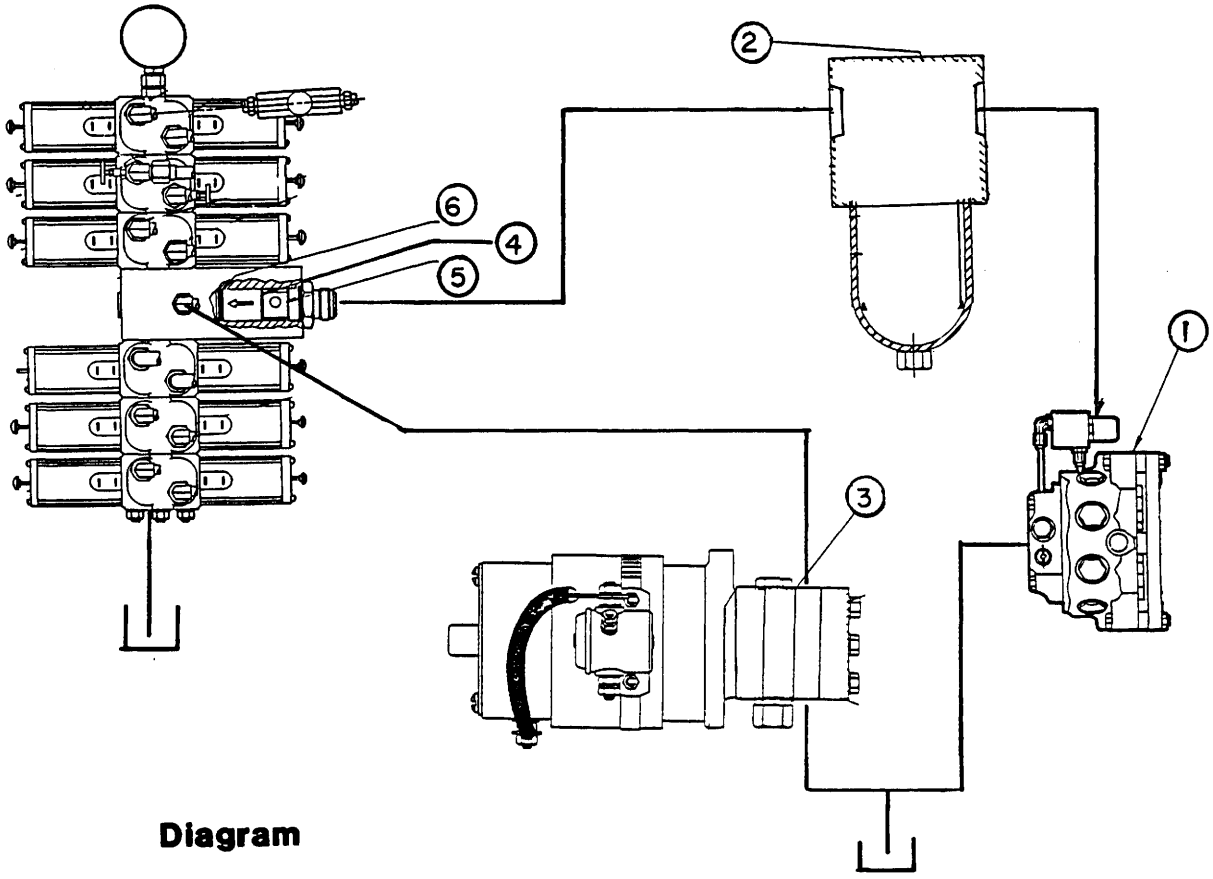
5 Spacer -

The spacer prevents the check valve from backing up and plugging the hydraport control circuit.

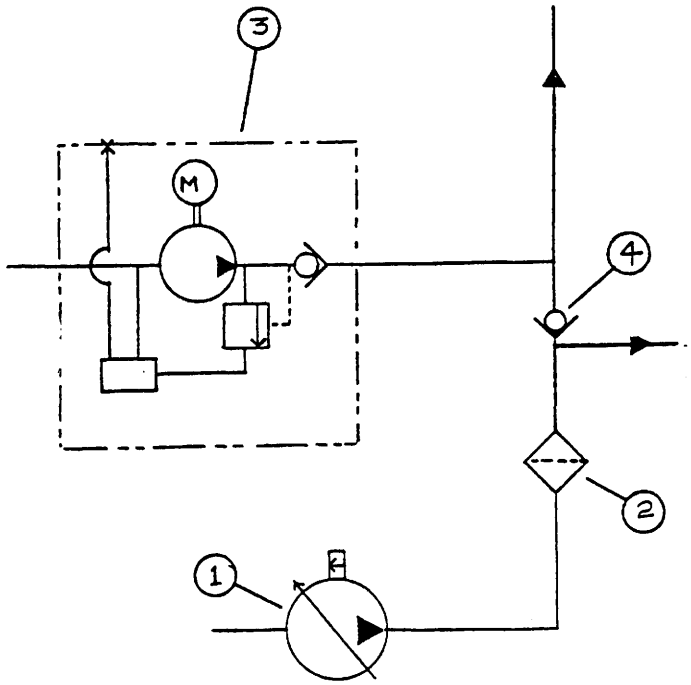
6 Main Hydraulic Distribution Manifold -

The main hydraulic distribution manifold is located in the center of the main valve stack. This manifold allows hydraulic fluid to pass through, from either the main hydraulic pump or the emergency pump, to the directional control valves. This manifold is the control center which determines from which hydraulic source hydraulic flow is directed.

ITEM	TROUBLE SHOOTING	ADJUSTMENTS	REPAIR	MISC.	PARTS
1 Main Hydraulic Pump	M5.1, .2	M1.2 (Fig.10)	D8	M4 M6.5, .6	D8
2 Filter	M6.5, .6		D11	M3	D11
3 Emergency Pump	M6.2 (Fig.9)	M1.2 (Fig.11)	D7		D7
4 Check Valve					C2
5 Spacer					C2
6 Manifold					C2



Diagram



Schematic

The emergency descent package incorporates three (3) manually operated control valves.

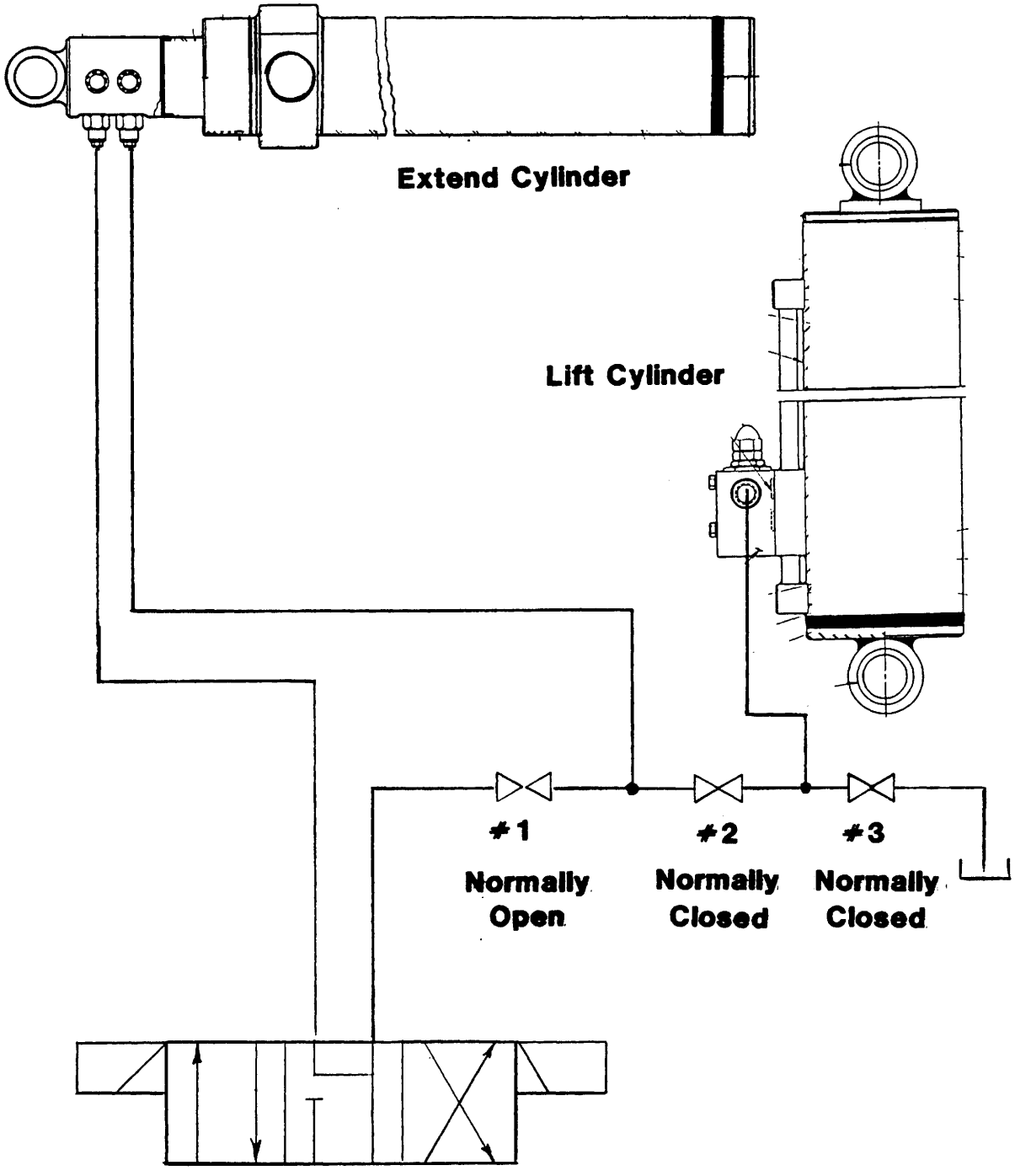
During normal operation, these valves allow hydraulic fluid to pass to various function cylinders as directed. In normal operation, the #1 control valve is in the " OPEN " mode while #2 and #3 control valves are to be in the " Closed " mode. This will allow hydraulic fluid to pass through the #1 control valve to the extend cylinder while hydraulic flow is stopped from entering the lift cylinder and the main hydraulic reservoir through the #2 and #3 control valves.

However; if the main hydraulic power source becomes inoperative and/or the auxilary power source also fails, the emergency descent package can be used. This can be accomplished by " CLOSING " the #1 control valve while " OPENING " the #2 control valve. This will allow hydraulic fluid, under pressure from the raised boom, to flow freely thru the #2 control valve to the extend cylinder causing the extend cylinder to retract.

After the boom has stopped lowering and retracting under its own weight, to continue to lower the boom " OPEN " #3 control valve. This will allow excess hydraulic fluid to pass freely to the main hydraulic reservoir.

NOTE: #3 control valve should only be " OPENED " AFTER the extend cylinder has fully retracted or the boom no longer descends under its own weight.

The emergency retract application for the extend cylinder will only operate when the boom is above horizontal.



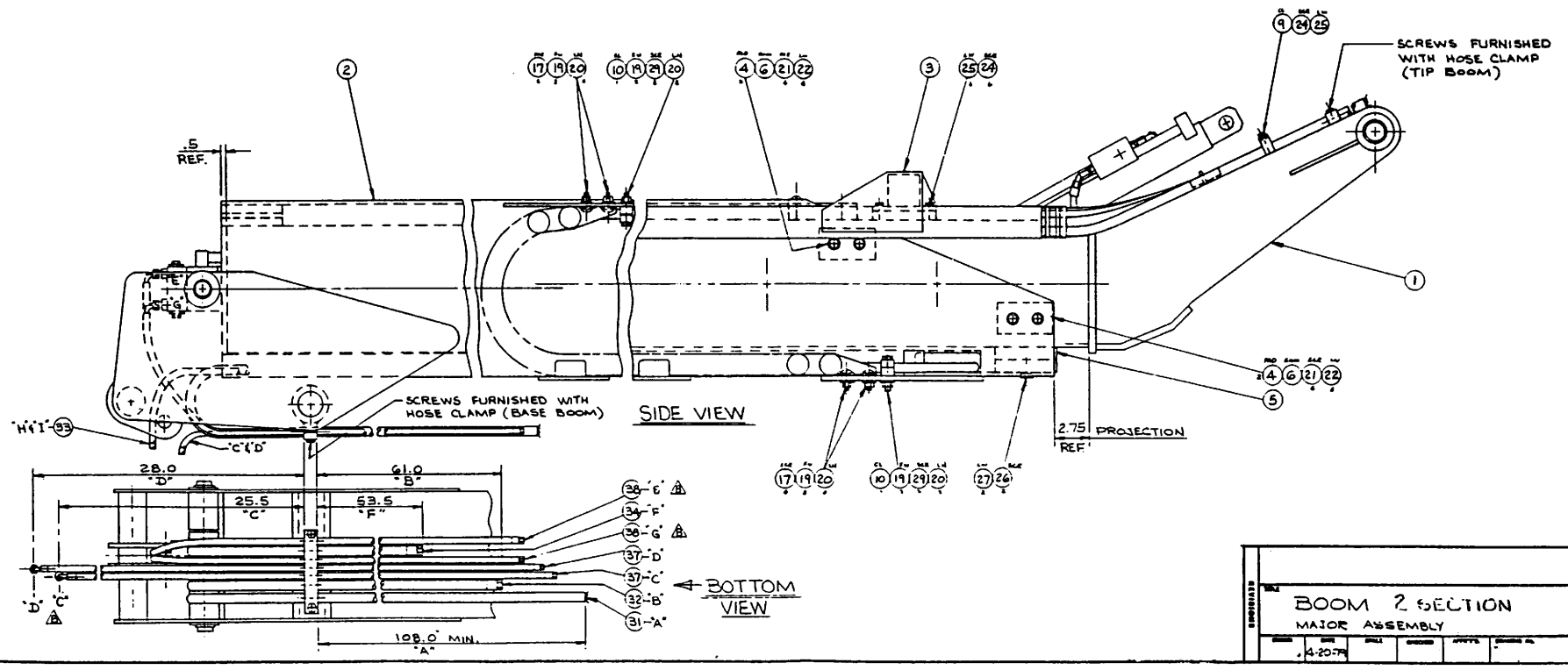
Emergency (Manual) Descent Package

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 514.5	"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	08-40700	SNAP RING 1 1/4		30.
17	8	07-17005	SCR, BUT. HD. 1/4 NC x 1 GR 5		
18	2	07-62025	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, H.H.C.S. 1/2 NC x 3/4 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, H.H.C.S. 3/8 NC x 1 GR 5		
25	7	07-65016	LOCKWASHER 3/8		
26	2	07-03128	SCR, H.H.C.S. 5/8 NC x 1 3/4 GR 5		
27	2	07-65021	LOCKWASHER 5/8		
28	1	08-00700	HOSE TRACK		
29	4	07-03010	SCR, H.H.C.S. 1/4 NC x 2 1/4 GR 5		
30					

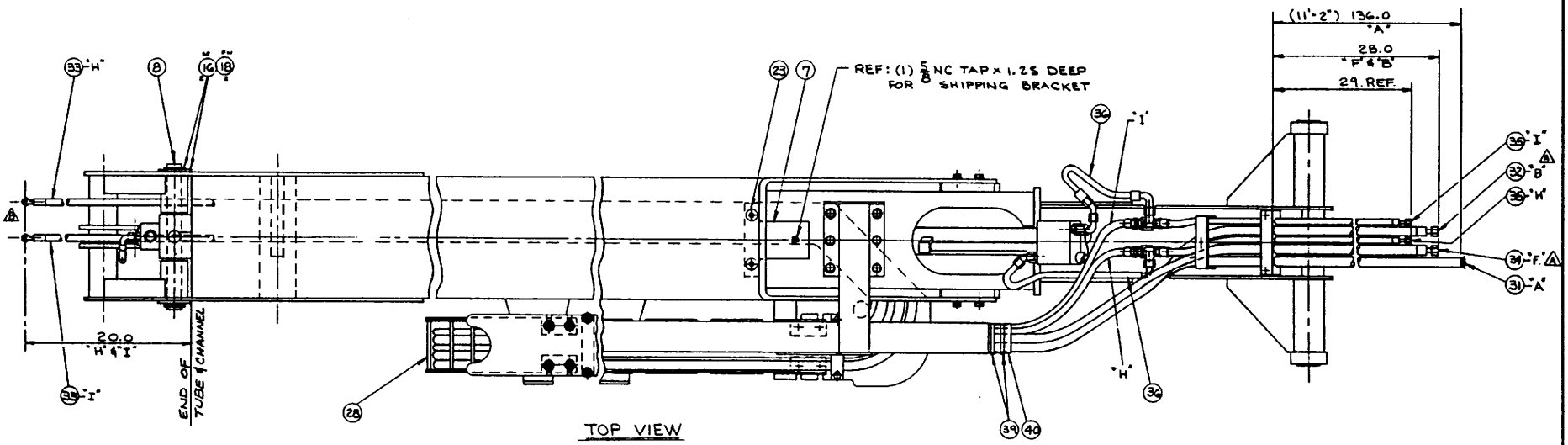
BILL OF MATERIAL

ITEM	QTY.	PART NO.	DESCRIPTION	MATL	WEIGHT
1	1	D440-307	POINT BOOM SUB-ASSY		
2	1	D440-205	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 2 SECTION
MAJOR ASSEMBLY
SH 1 OF 2
4-20-79

BILL OF MATERIAL					
ITEM	QTY.	PART No.	DESCRIPTION	MATL.	WEIGHT
			REFER TO SH. 1		



TOP VIEW

BOOM 2 SECTION
MAJOR ASSY.

SH. 2 OF 2

4-20-79

ENGINEERING DRAWING SEQUENCE:
MP Hydraport Service Manual

1.	SDS-212461-0	Hydraulic Schematic, MP	11" x 17"
2.	SCS-212470-0	Electrical Schematic, MP	8-1/2" x 11"
3.	SDS-212419-0, Pg 1	Electrical Schematic, MP 35 H.P. Gas	11" x 17"
4.	SDS-212419-0, Pg 2	Electrical Schematic, MP 35 H.P. Gas	11" x 17"
5.	SDS-210070-1	Electrical Schematic, MP 110	11" x 17"
6.	SDS-212465-0	Hydraulic Schematic, MPN	11" x 17"
7.	SDS-212474-0	Electrical Schematic, MPN	11" x 17"
8.	SCS-212458-0	Hydraulic Schematic, 2 Wheel Drive	8-1/2" x 11"
9.	SCS-213752-0	Hydraulic Schematic, 2 Wheel Drive (Shift on the go)	8-1/2" x 11"
10.	SCS-212460-0	Hydraulic Schematic, 2 WD to 4WD (Shift on the go)	8-1/2" x 11"
11.	SCS-212457-0	Hydraulic Schematic, Series/ Parallel Drive	8-1/2" x 11"
12.	SCS-212427-0	Electrical Schematic, Deutz 2 Cyl. Diesel	8-1/2" x 11"
13.	SCS-212426-0	Electrical Schematic, Deutz 3 & 4 Cyl. Diesel	8-1/2" x 11"
14.	SCS-212445-0	Electrical Schematic, Ford 2.3 L Gas	8-1/2" x 11"
15.	SCS-212444-0	Electrical Schematic, Ford 2.3 L Dual Fuel	8-1/2" x 11"
16.	SDS-211192-0	Electrical Schematic, Ford 300 c.i. Gas	11" x 17"
17.	SCS-212432-0	Electrical Schematic, Murphy 3 Cyl. Diesel	8-1/2" x 11"
18.	SCS-212443-0	Electrical Schematic, Perkins Diesel	8-1/2" x 11"
19.	SCS-231330-0	Electrical Schematic, 35 H.P. Gas	11" x 17"
20.	SCS-212420-0	Electrical Schematic, 35 H.P. Propane	8-1/2" x 11"
21.	SCS-212421-0	Electrical Schematic, 35 H.P. Dual Fuel	8-1/2" x 11"
22.	SCS-212430-0	Electrical Schematic, 65 H.P. Gas	8-1/2" x 11"
23.	SCS-212429-0	Electrical Schematic, 65 H.P. Propane	8-1/2" x 11"
24.	SCS-212428-0	Electrical Schematic, 65 H.P. Dual Fuel	8-1/2" x 11"

MAIN PUMP
HYDRAULIC TANK
HYDRAULIC FILTER

AUXILIARY PUMP

PUMP STROKE CONTROLLERS

CAB LEVEL CIRCUIT

HOIST CIRCUIT

EXTEND CIRCUIT

STEER CIRCUIT

SWING CIRCUIT

GROUND CONTROL

HOSE TRACK

HYDRALIC TANK

HOSE TRACK

CAB HYDRAULICS

MASTER LEVEL CYLINDER

HOIST CYLINDER

EXTEND CYLINDER

STEER CYLINDER

CAB LEVEL CYLINDER

2500 PSI

CAB ROTATE

FOOT VALVE CONTROL

2500 PSI

HOSE TRACK

HOSE TRACK

SWING MOTOR

10 MICRON

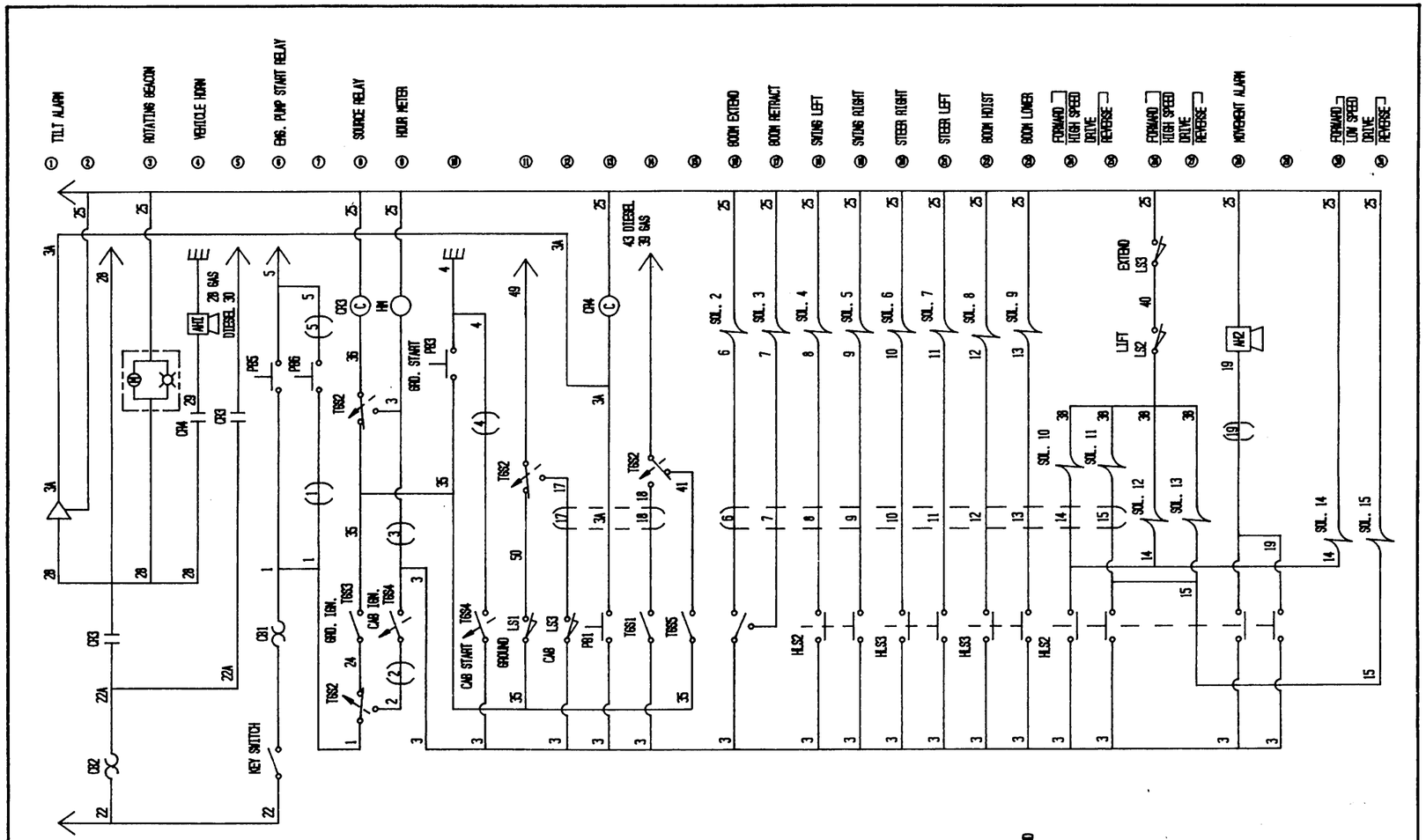
NOTE:
INDICATES PORT NUMBER FOR HYDRAULIC SWIVEL

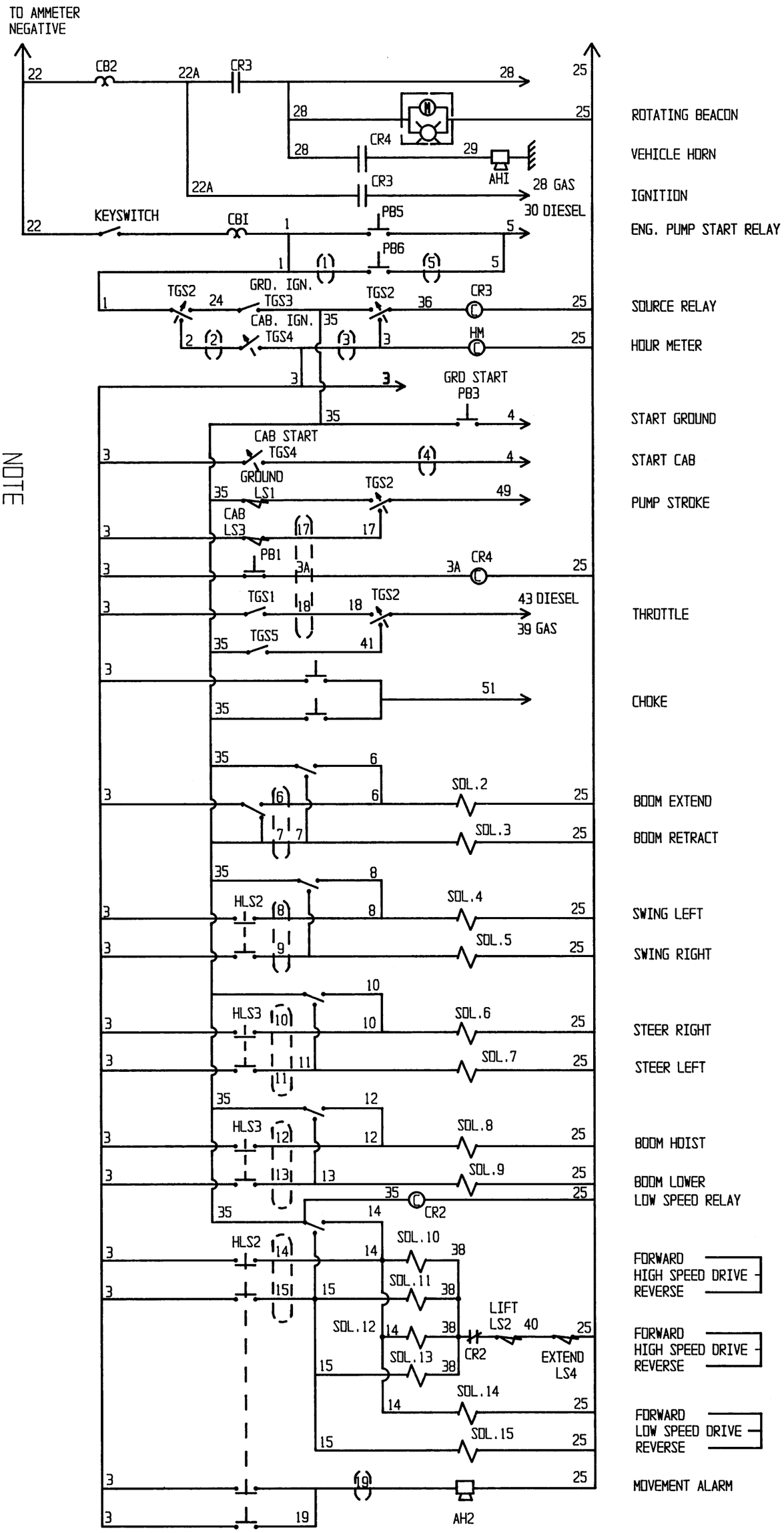
simon-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE
HYDRAULIC SCHEMATIC
HYDRAPORT CONTROLS MP'S

REVISION

DRWG. NO.
SDS-212461-0


① TILT ALARM
② ROTATING BEACON
③ VEHICLE HORN
④ ENG. PUMP START RELAY
⑤ SOURCE RELAY
⑥ HOUR METER
⑦ BOOM EXTEND
⑧ BOOM RETRACT
⑨ SWING LEFT
⑩ SWING RIGHT
⑪ STEER RIGHT
⑫ STEER LEFT
⑬ BOOM HOIST
⑭ BOOM LOWER
⑮ FORWARD HIGH SPEED DRIVE REVERSE
⑯ FORWARD HIGH SPEED DRIVE REVERSE
⑰ MOVEMENT ALARM
⑱
⑲ FORWARD LOW SPEED DRIVE REVERSE
43 DIESEL 39 GAS
28 GAS 30 DIESEL
SOL. 2
SOL. 3
SOL. 4
SOL. 5
SOL. 6
SOL. 7
SOL. 8
SOL. 9
SOL. 10
SOL. 11
SOL. 12
SOL. 13
SOL. 14
SOL. 15
EXTEND
LIFT
LS3
LS2
40
AM1
AM2
HM
HORN
GRD. START
CAB START
GROUND
CAB
GRD. IGN.
CAB IGN.
KEY SWITCH
TGS1
TGS2
TGS3
TGS4
TGS5
TGS6
PB1
PB3
PB5
PB6
LS1
CR1
CR2
CR3
CR4
CR5
CR6
HLS1
HLS2
HLS3
HLS4
HLS5
HLS6
NOTE: SOLENOIDS 10 & 11 OPTIONAL
(X) DENOTES CONDUCTORS THROUGH CABLE IN BOOM
TGS2 SHOWN IN GROUND CONTROLS POSITION
CR1 CIRCUIT BREAKER
CR2 CIRCUIT BREAKER
CR3 SOURCE RELAY
CR4 HORN RELAY
PB1 HORN PUSH BUTTON
PB3 GND START BUTTON
PB5 ENG PUMP GND
PB6 ENG PUMP CAB
TGS1 THROTTLE CAB
TGS2 GND-CAB SWITCH
TGS3 GND IGN SWITCH
TGS4 CAB IGN-START SWITCH
TGS5 GND THROTTLE
TGS6 CAB EXTEND-RETRACT
LS1 GND PUMP STROKE
LS2 CAB PUMP STROKE
LS3 LIMIT SWITCH BOOM LIFT
LS4 LIMIT SWITCH BOOM EXTEND
HLS2 CAB SWING-DRIVE
HLS3 CAB STEER-HOIST
SIMON-AERIALS INC.
MILWAUKEE, WI. 53224
TITLE
ELECTRICAL SCHEMATIC
HYDRAPORT CONTROL SYSTEM
MP SERIES
REVISION
DRWG. NO. SCS-212470-0



NOTE

(X) DENOTES CONDUCTORS THROUGH CABLE IN BOOM

TGS 2 SHOWN IN GROUND CONTROLS POSITION SOLENOIDS 10 & 11 OPTIONAL

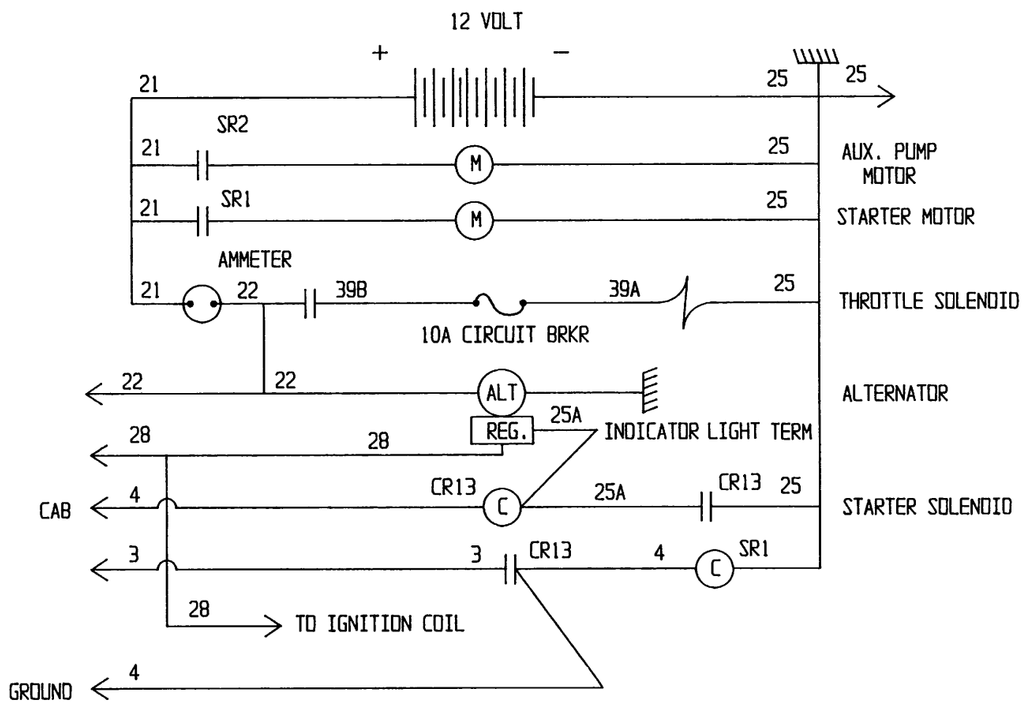
SHEET 1 OF 2

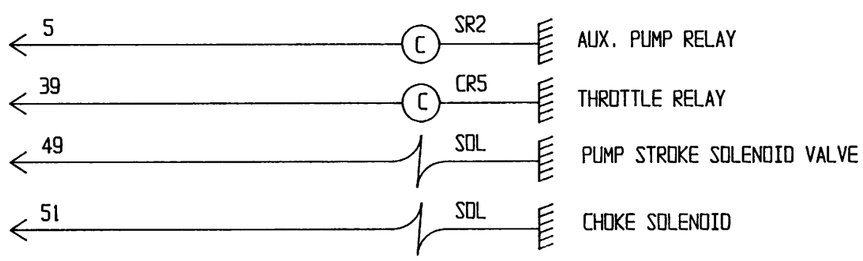
SIMON-AERIALS INC.

TITLE: ELECTRICAL SCHEMATIC HYDRAPORT CONTROL SYSTEM 35 H.P. GASOLINE

REVISION: A / 9-28-88

DWG. NO.: SDS-212419-0





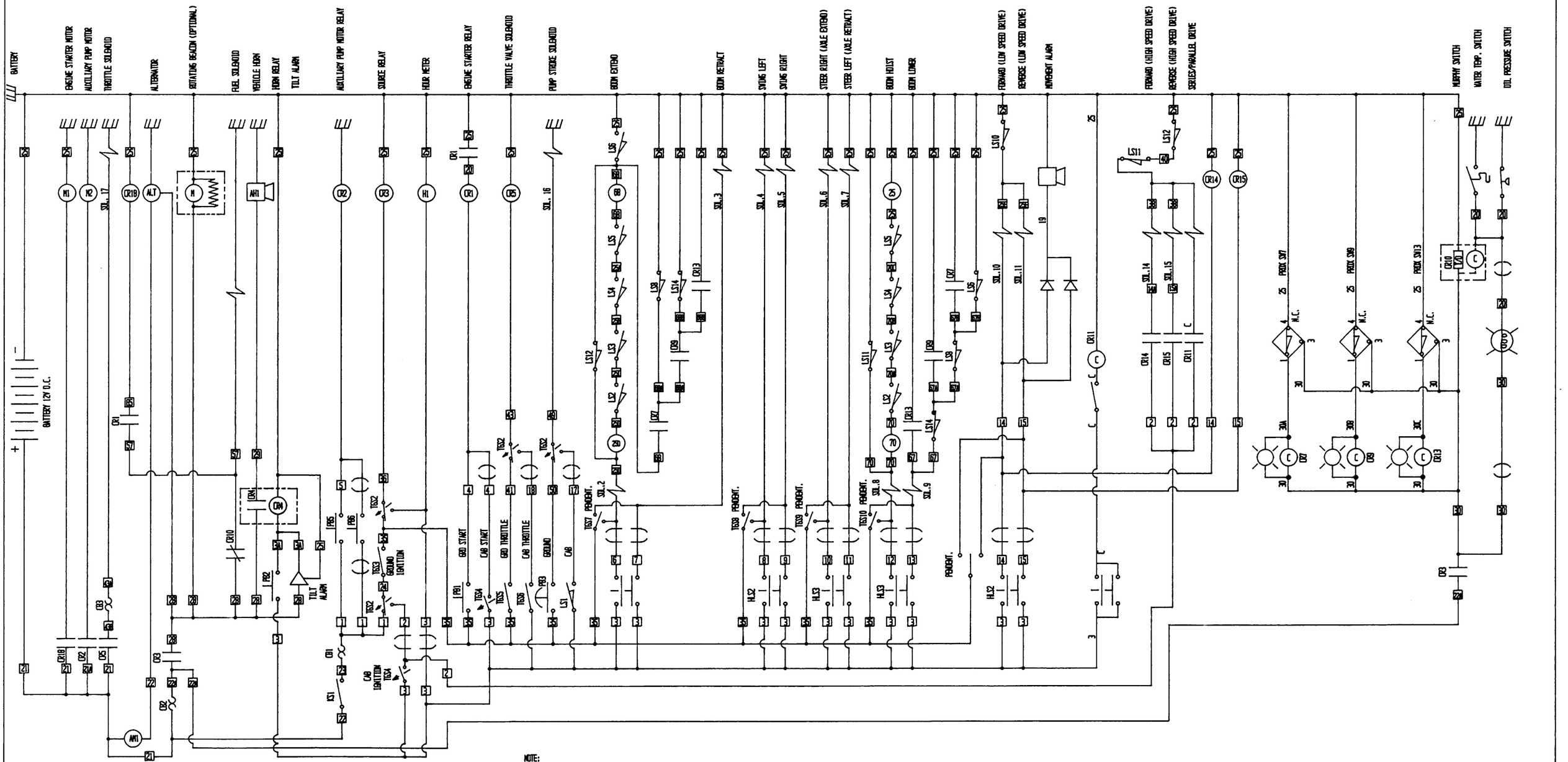
SHEET 2 OF 2

SIMON-AERIALS INC
MILWAUKEE, WI. 53224

TITLE: ELECTRICAL SCHEMATIC
HYDRAPORT CONTROL SYSTEM
35 H.P. GASOLINE

REVISION: A / 9-28-88

DWG. NO.: SDS-212419-0



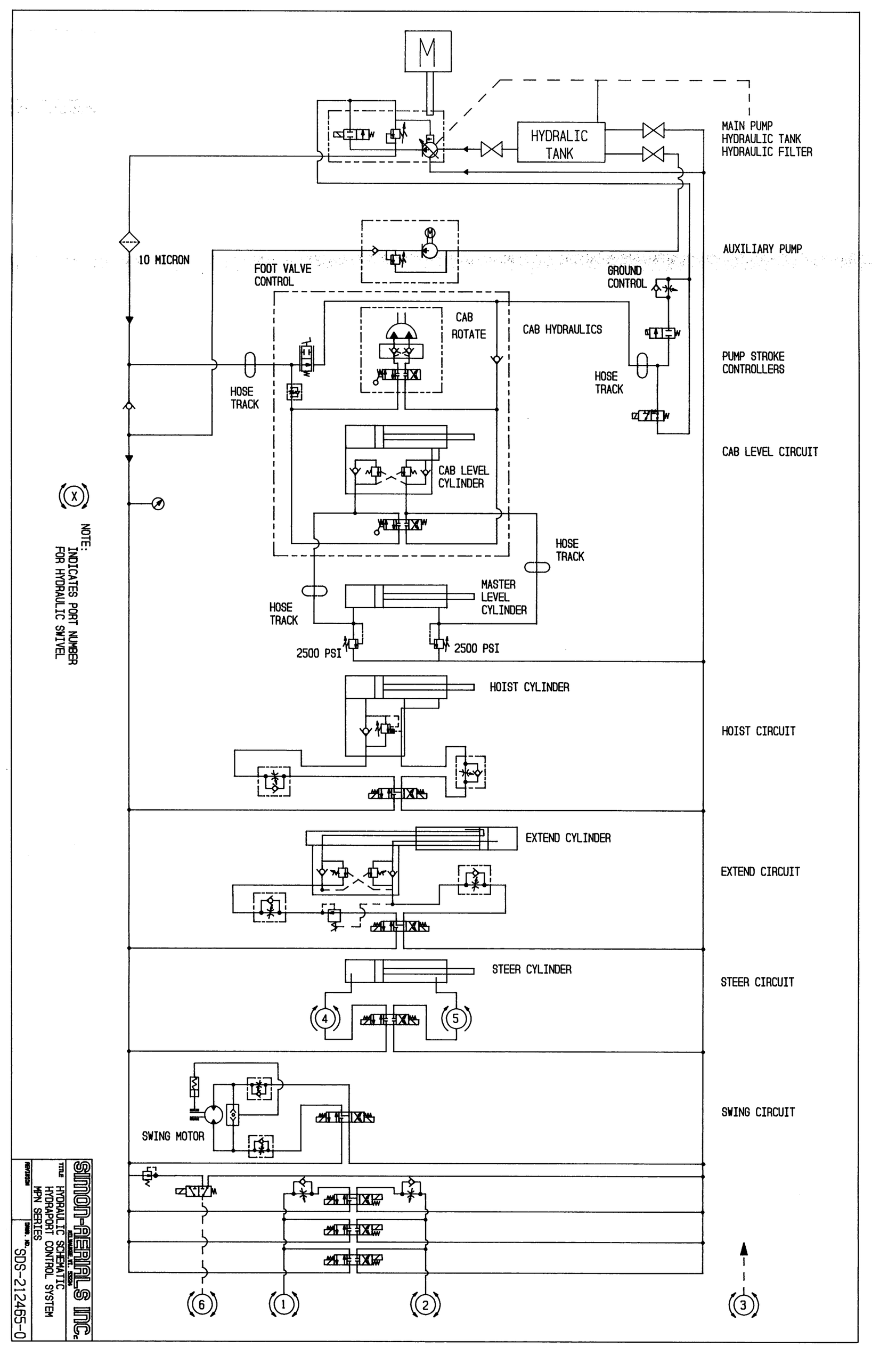
NOTE:
1. ALL LIMIT SWITCHES DRAWN WITH BOOMS IN STOWED POSITION.
2. TOGGLE SWITCHES "2" DRAWN IN GROUND CONTROLS POSITION.
3. ( ) INDICATES 24 CONDUCTOR CABLE.

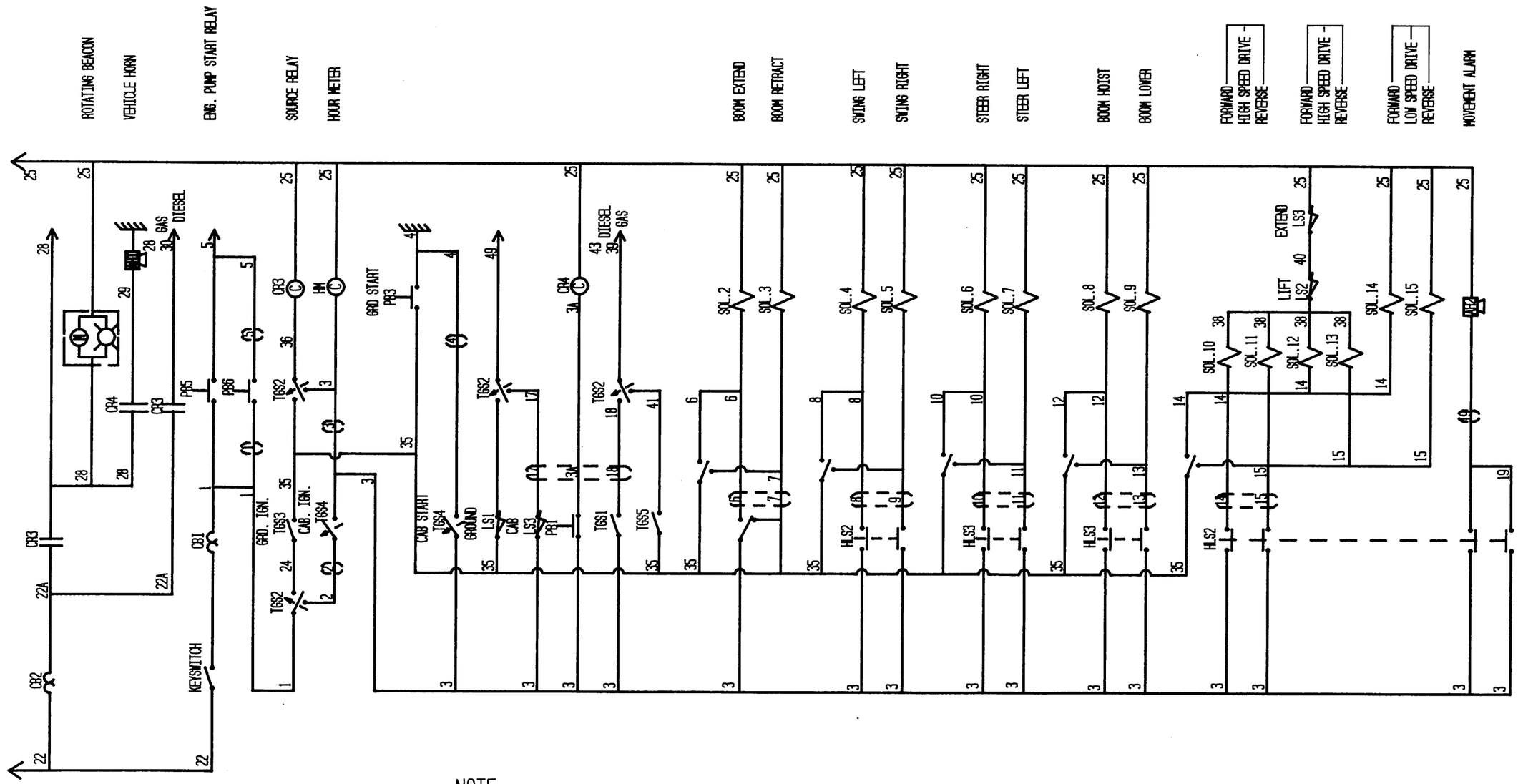
SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE
ELECTRICAL SCHEMATIC
MP-110 HYDRAPORT

REVISION

DRWG. NO.
SDS-210070-1


M
HYDRALIC TANK
MAIN PUMP
HYDRAULIC TANK
HYDRAULIC FILTER
AUXILIARY PUMP
10 MICRON
FOOT VALVE CONTROL
GROUND CONTROL
CAB ROTATE
CAB HYDRAULICS
PUMP STROKE CONTROLLERS
HOSE TRACK
HOSE TRACK
HOSE TRACK
CAB LEVEL CIRCUIT
CAB LEVEL CYLINDER
HOSE TRACK
MASTER LEVEL CYLINDER
HOSE TRACK
2500 PSI
2500 PSI
HOIST CYLINDER
HOIST CIRCUIT
EXTEND CYLINDER
EXTEND CIRCUIT
STEER CYLINDER
STEER CIRCUIT
SWING MOTOR
SWING CIRCUIT
NOTE:
INDICATES PORT NUMBER FOR HYDRAULIC SWIVEL
SIMON-AERIALS INC
TITLE
HYDRAULIC SCHEMATIC
HYDRAPORT CONTROL SYSTEM
MPN SERIES
REVISION
DWG. NO.
SDS-212465-0



NOTE

(8) DENOTES CONDUCTORS THROUGH CABLE IN BOOM

TGS 2 SHOWN IN GROUND CONTROLS POSITION

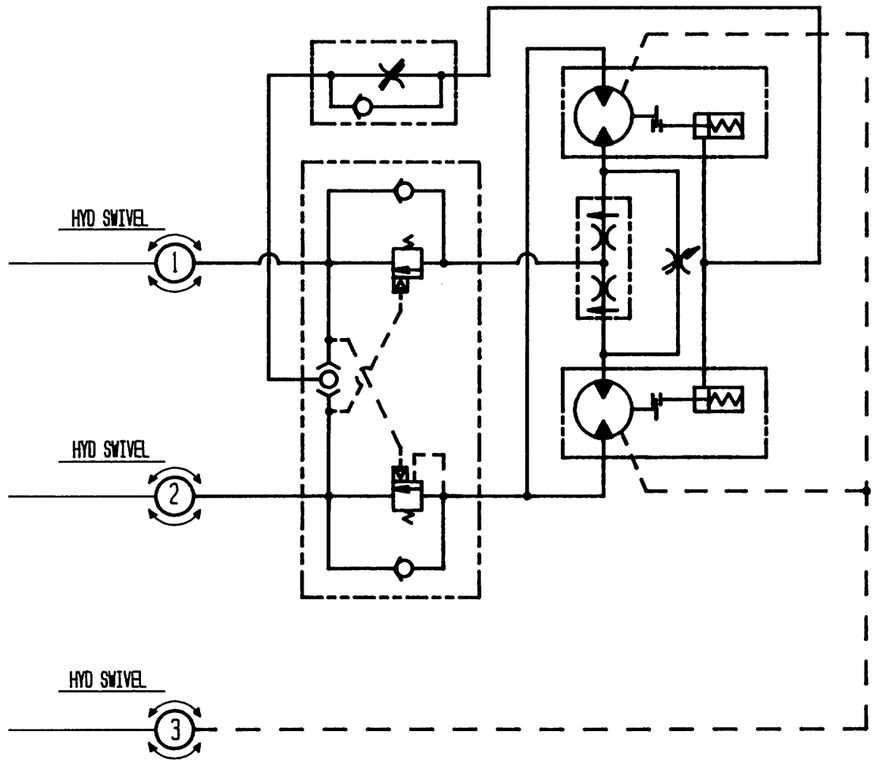
SOLENOIDS 10 & 11 OPTIONAL

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE ELECTRICAL SCHEMATIC
HYDRAPORT CONTROL SYSTEM
MPN SERIES

REVISION

DRWG. NO. SDS-212474-0



NOTE:

(X) INDICATES PORT NUMBER ON HYDRAULIC SWIVEL

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: HYDRAULIC SCHEMATIC
2 WHEEL DRIVE

REVISION:

DRWG. NO. SCS-212458-0

L.H. DRIVE MOTOR
PORT "B" BOTTOM-REVERSE
PORT "A" TOP-FORWARD

LEFT SIDE

STEER CYLINDER

HYDRAULIC SWIVEL
PORT #1-FORWARD
PORT #2-REVERSE
PORT #4-STEER RIGHT
PORT #5-STEER LEFT

REAR

FLOW DIVIDER/
COMBINER

NEEDLE
VALVE

MOTION
CONTROL
VALVE

3-WAY
VALVE

FRONT

R.H. DRIVE MOTOR
PORT "A" BOTTOM-REVERSE
PORT "B" TOP-FORWARD

HI/LOW SPEED
SELECTOR VALVE

RIGHT SIDE

VIEWED FROM BOTTOM OF UNDERCARRIAGE

REV	BY	DATE	DESCRIPTION
			DO NOT SCALE PRINT

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

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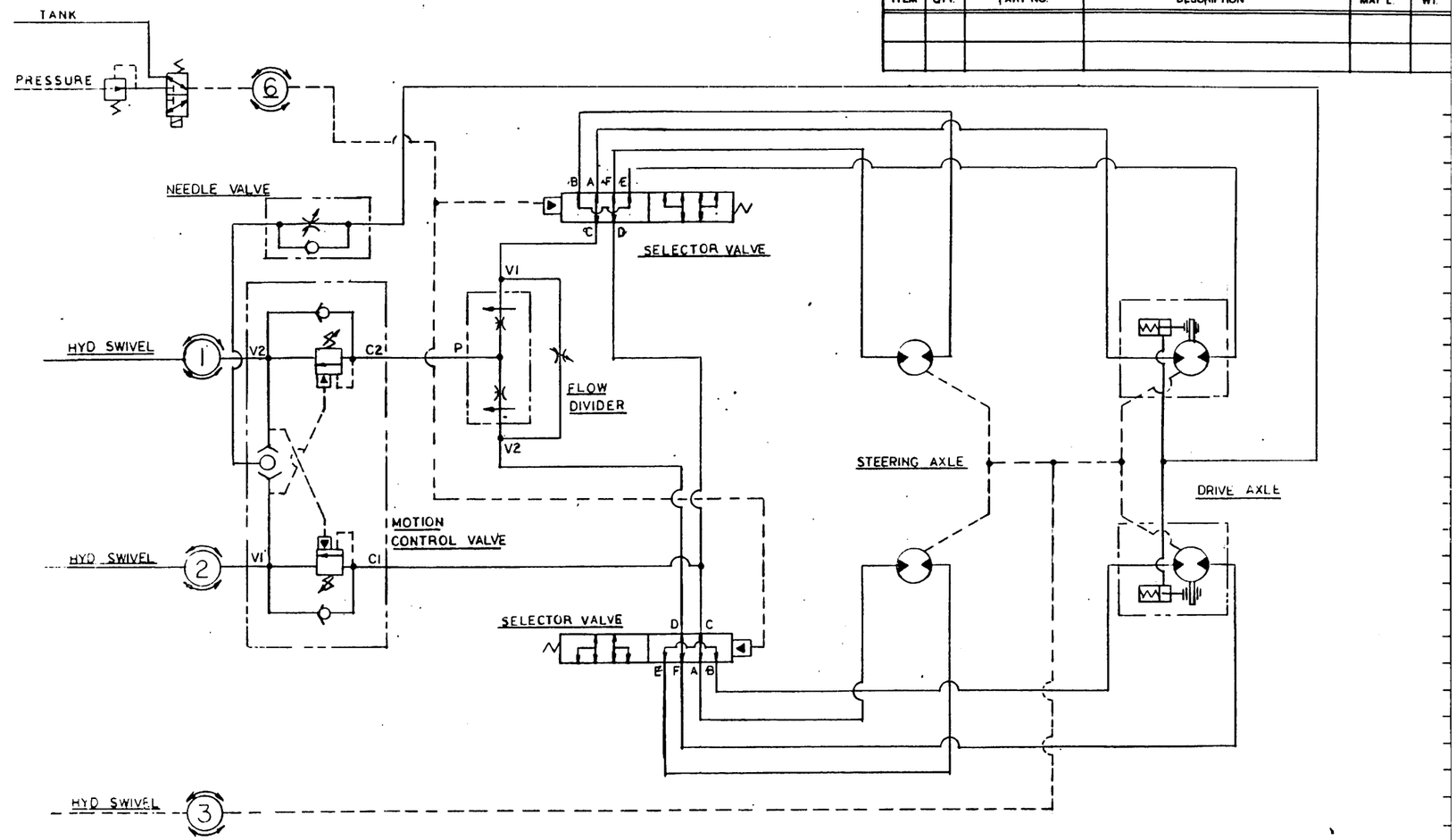
SIMON-AERIALS INC.
KILMAUREE, WI. 53224

TITLE: HYDRAULIC DIAGRAM
2-WHEELDRIVE (SHIFT-ON-THE-GO)
CADKEY DRAWING DO NOT REVISE MANUALLY

SCALE	DRAWN	DATE	CHECKED	APPROVED	DRAWING NO.
N/A	DLB	2-5-88			2137520

IMPLIED TOLERANCE	
X.X	± .1
X.XX	± .08
X.XXX	± .015
FRACTIONAL	± 1/8
ANGULAR	± 0.5 deg.

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



NOTE

(X) INDICATES PORT NUMBER FOR HYDRAULIC SWIVEL

SIMON-AERIALS INC. MILWAUKEE, WI 53224

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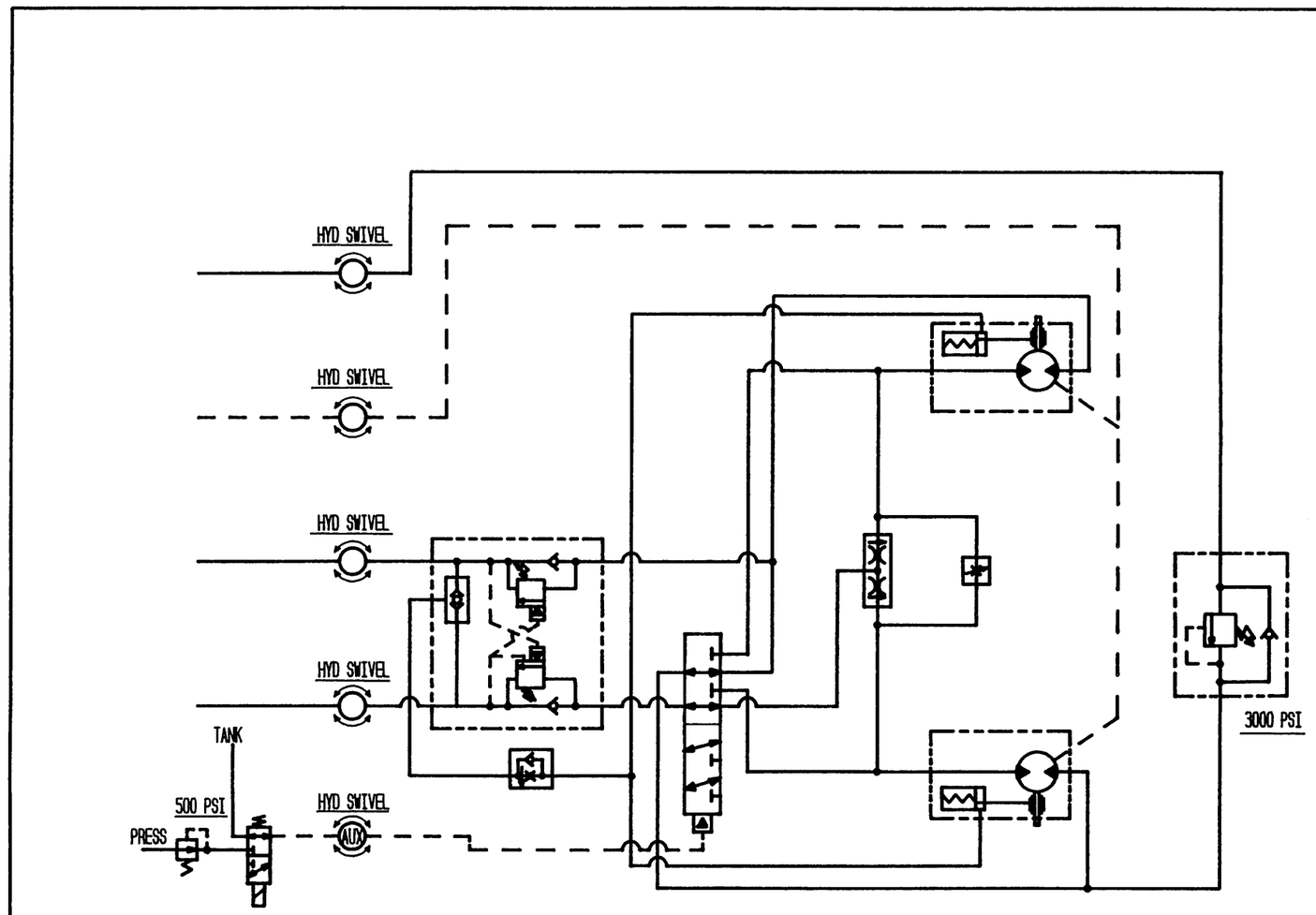
ALL WELDS MUST BE IN ACCORDANCE WITH AWS STANDARDS D1.1-1972 DW1.1D OR D10.9-68

IMPLIED TOLERANCE	
XX	± 1
XXX	± 06
XXXX	± 015
FRACTIONAL	± 1/8
ANGULAR	± 05°
SCALE	DO NOT SCALE PRINT

TITLE HYDRAULIC SCHEMATIC
2WD TO 4WD SHIFT ON THE GO

REVISION	BY	DATE	DESCRIPTION

DRAWN	DATE	CHECKED	APPROVED	DRAWING NO
GJF	4-8-87	MJC	MJC	SCS 212460-0



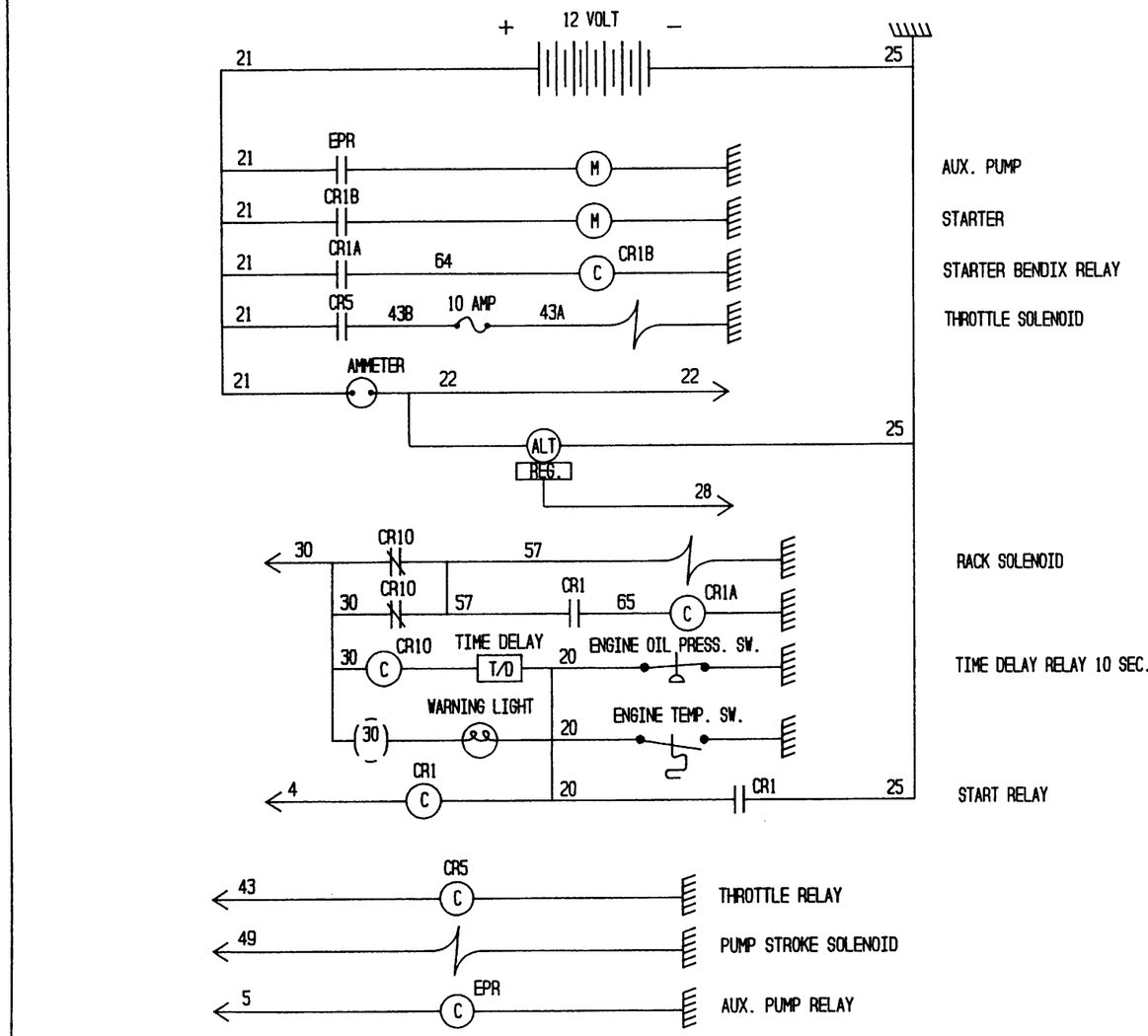
NOTE:

(X) INDICATES PORT NUMBER ON HYDRAULIC SWIVEL

SIMON-AERIALS INC.

TITLE: HYDRAULIC SCHEMATIC SERIES/PARALLEL DRIVE

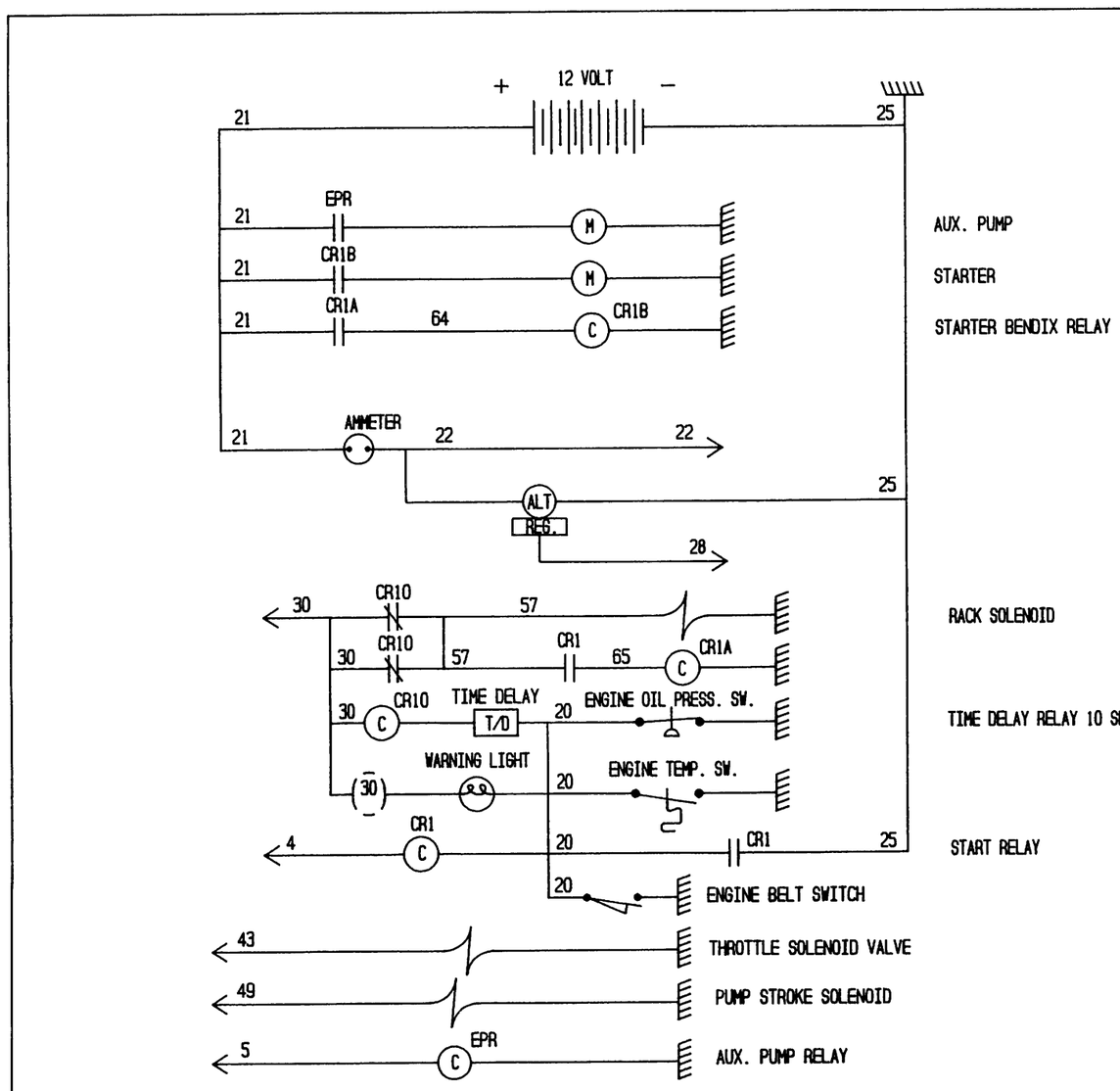
DWG. NO. SCS-212457-0



ENGINE RPM IDLE 1200--1500
HIGH 2500

SIMON-AERIALS INC.
MILWAUKEE,WI. 53224

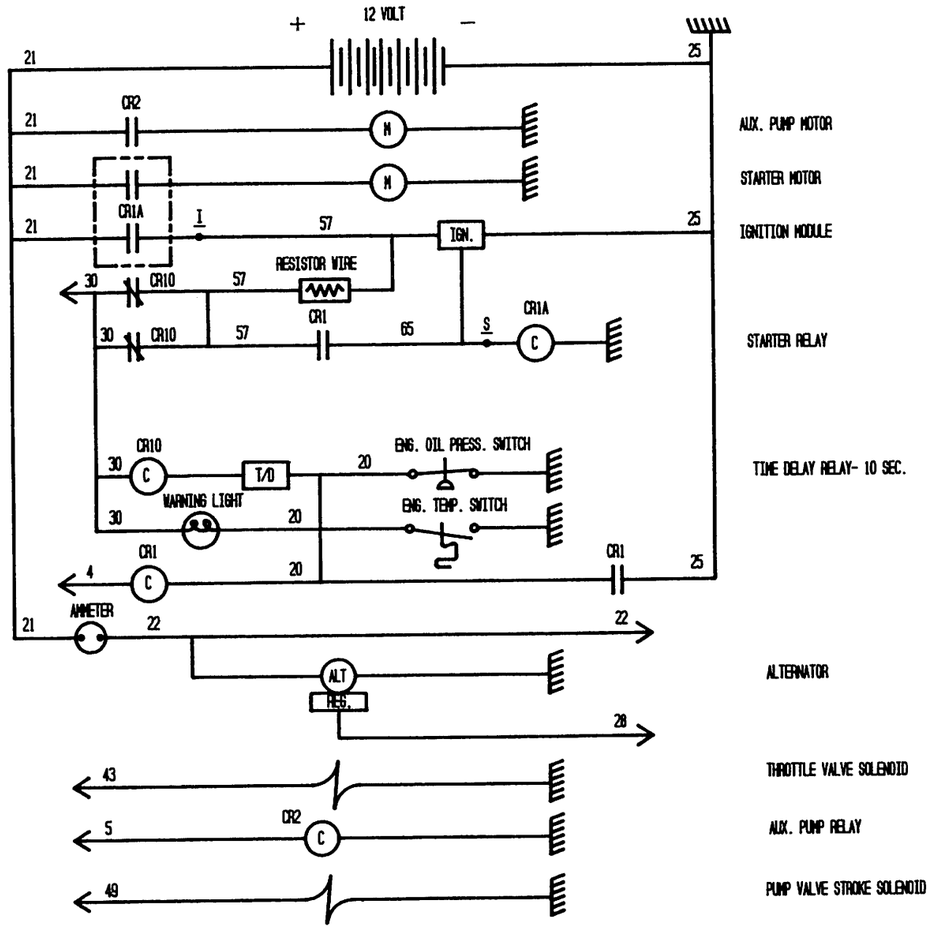
TITLE	ELECTRICAL SCHEMATIC DEUTZ DIESEL 2 CYL.
REVISION	DRWG. NO. SCS-212427-0



ENGINE RPM IDLE 1200—1500
HIGH 2500

SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE	ELECTRICAL SCHEMATIC DEUTZ DIESEL 3 & 4 CYL.
REVISION	DRWG. NO. SCS-212426-0

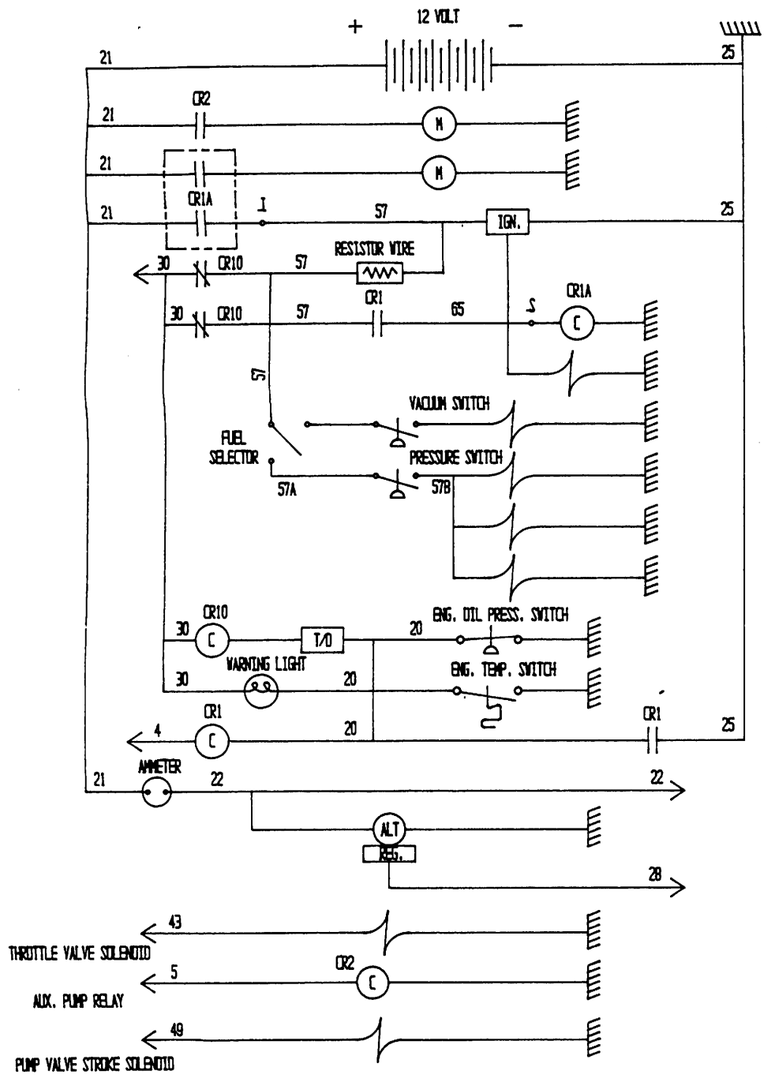


SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: ELECTRICAL SCHEMATIC
FORD 2.3L GASOLINE

REVISION

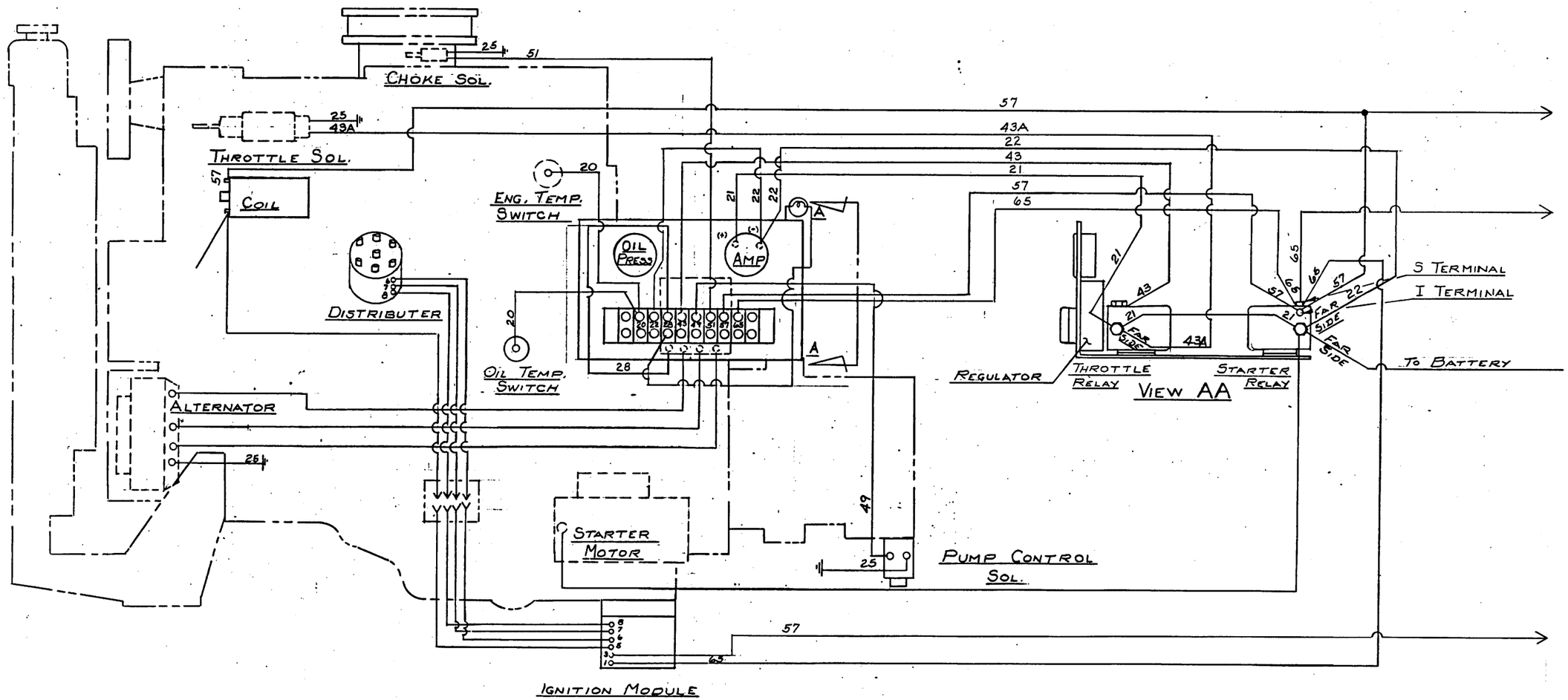
DRWG. NO. SCS-212445-0



SIMON AERIALS INC.
MILWAUKEE, WI. 53224

TITLE	ELECTRICAL SCHEMATIC FORD 2.3L DUAL FUEL
REVISION	A
DRWG. NO.	SCS-2124440

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



VIEWED FROM RIGHT SIDE OF SUPERSTRUCTURE

SIMON-AERIALS INC. MILWAUKEE, WI 53224

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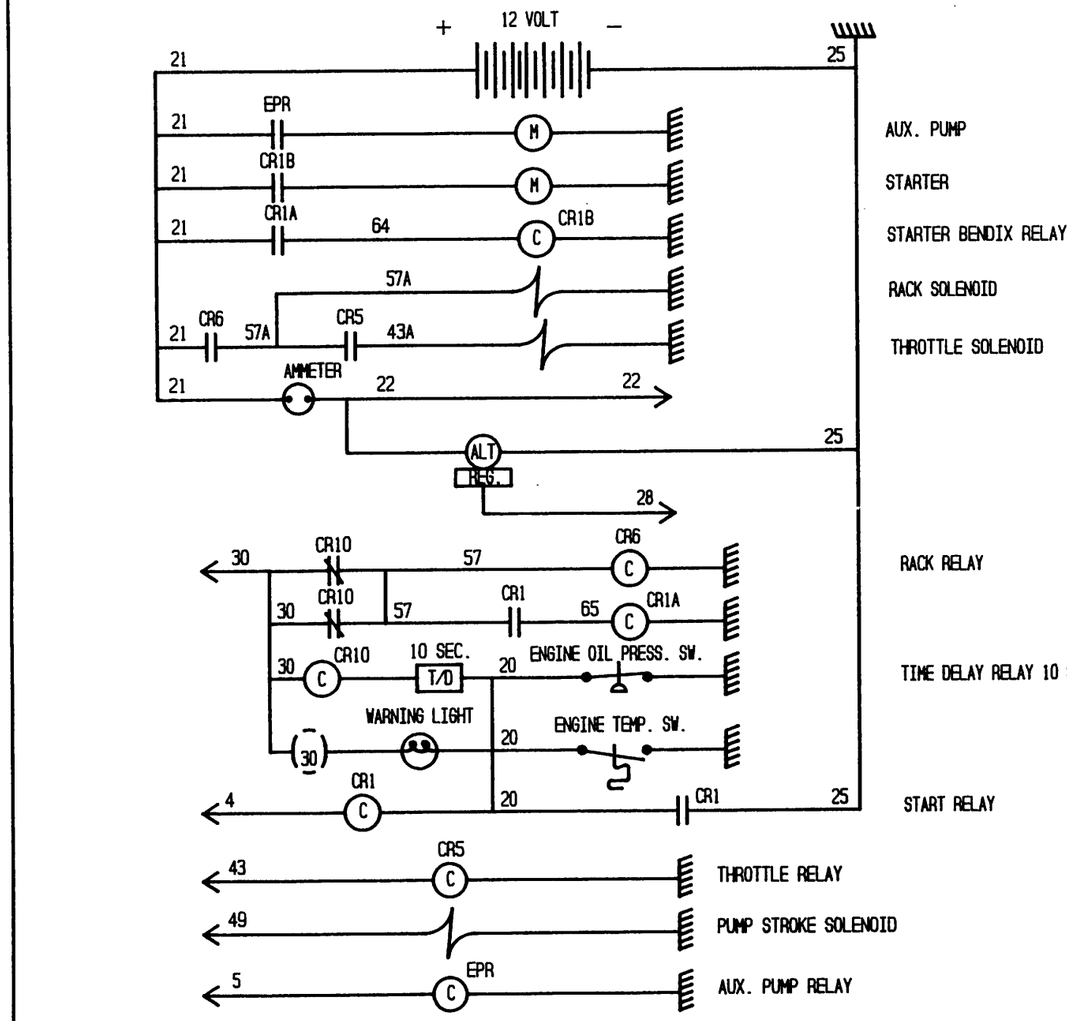
ALL WELDS MUST BE IN ACCORDANCE WITH A.W.S. STANDARDS D1.1-1972, D41.1-72 OR D10.0-69

IMPLIED TOLERANCE	
X.X	±.1
X.XX	±.06
X.XXX	±.015
FRACTIONAL	±1/8
ANGULAR	±0.5°
SCALE ~	DO NOT SCALE PRINT

TITLE: ELECTRICAL DIAGRAM FORD 300 IN³ GAS

REVISION	BY	DATE	DESCRIPTION

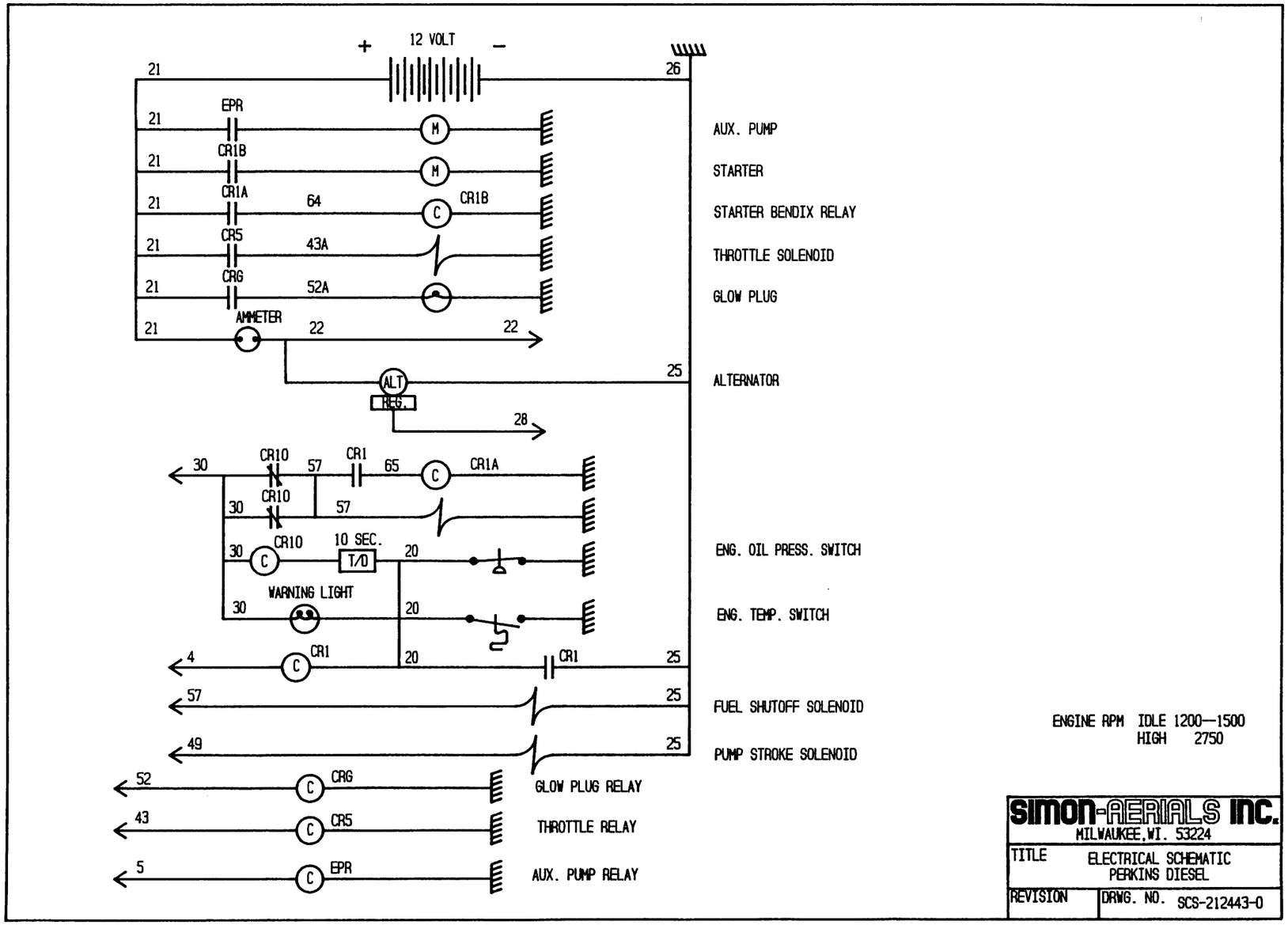
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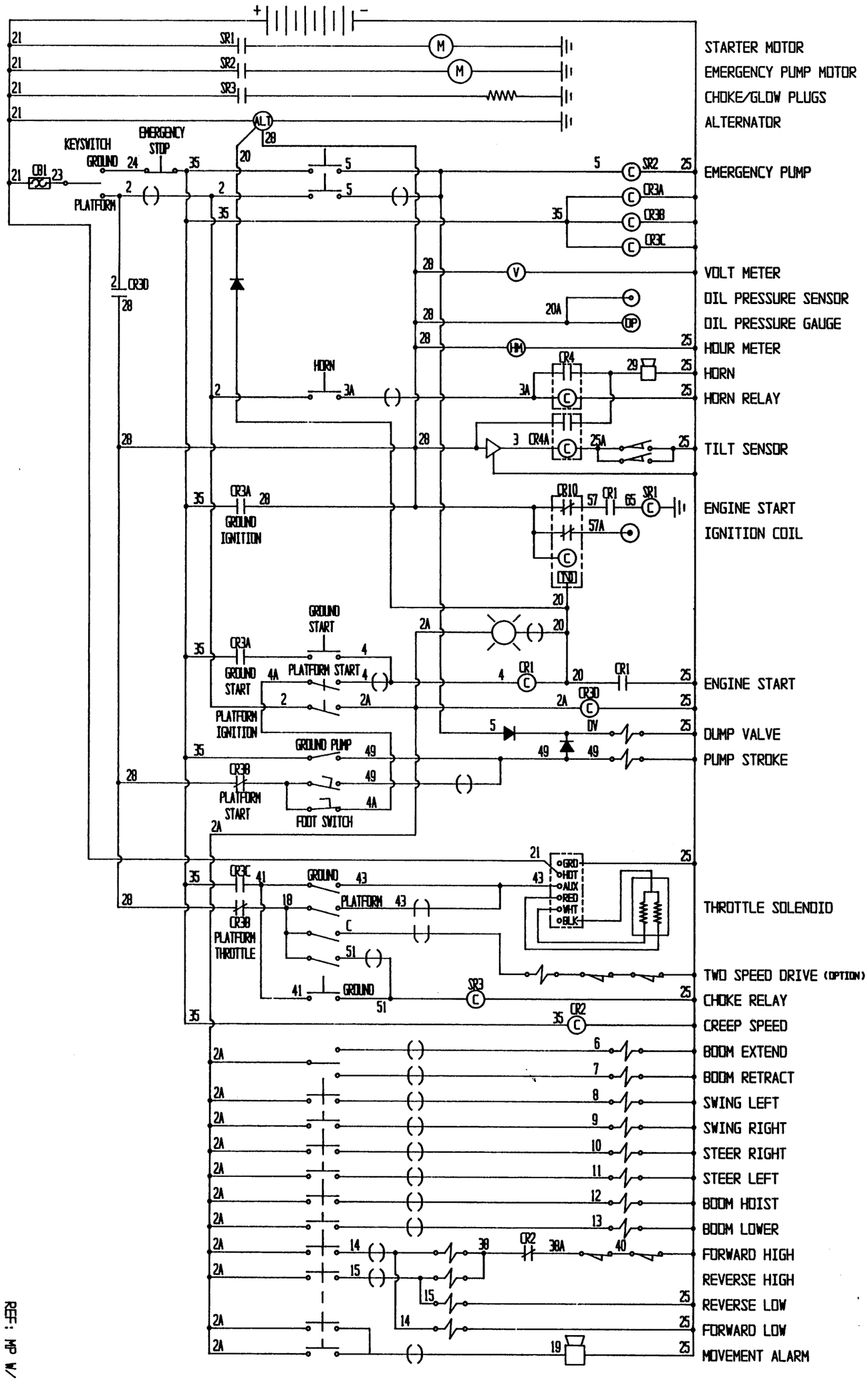


ENGINE RPM IDLE 1200—1500
HIGH 2650

simon-AERIALS INC.
MILWAUKEE,WI. 53224

TITLE	ELECTRICAL SCHEMATIC MURPHY DIESEL 3 CYL.
REVISION	DRWG. NO. SCS-212432-0


+
12 VOLT
−
21
26
EPR
CR1B
CR1A
CR5
CRG
AMMETER
64
43A
52A
22
22
CR1B
M
M
C
25
ALT
REG.
28
AUX. PUMP
STARTER
STARTER BENDIX RELAY
THROTTLE SOLENOID
GLOW PLUG
ALTERNATOR
30
CR10
57
CR1
65
CR1A
C
30
CR10
57
30
CR10
10 SEC.
T/D
20
C
WARNING LIGHT
30
20
ENG. OIL PRESS. SWITCH
ENG. TEMP. SWITCH
4
CR1
20
CR1
25
C
57
25
FUEL SHUTOFF SOLENOID
49
25
PUMP STROKE SOLENOID
52
CRG
C
GLOW PLUG RELAY
43
CR5
C
THROTTLE RELAY
5
EPR
C
AUX. PUMP RELAY
ENGINE RPM IDLE 1200—1500
HIGH 2750
simon-AERIALS INC.
MILWAUKEE, WI. 53224
TITLE
ELECTRICAL SCHEMATIC
PERKINS DIESEL
REVISION
DRWG. NO. SCS-212443-0

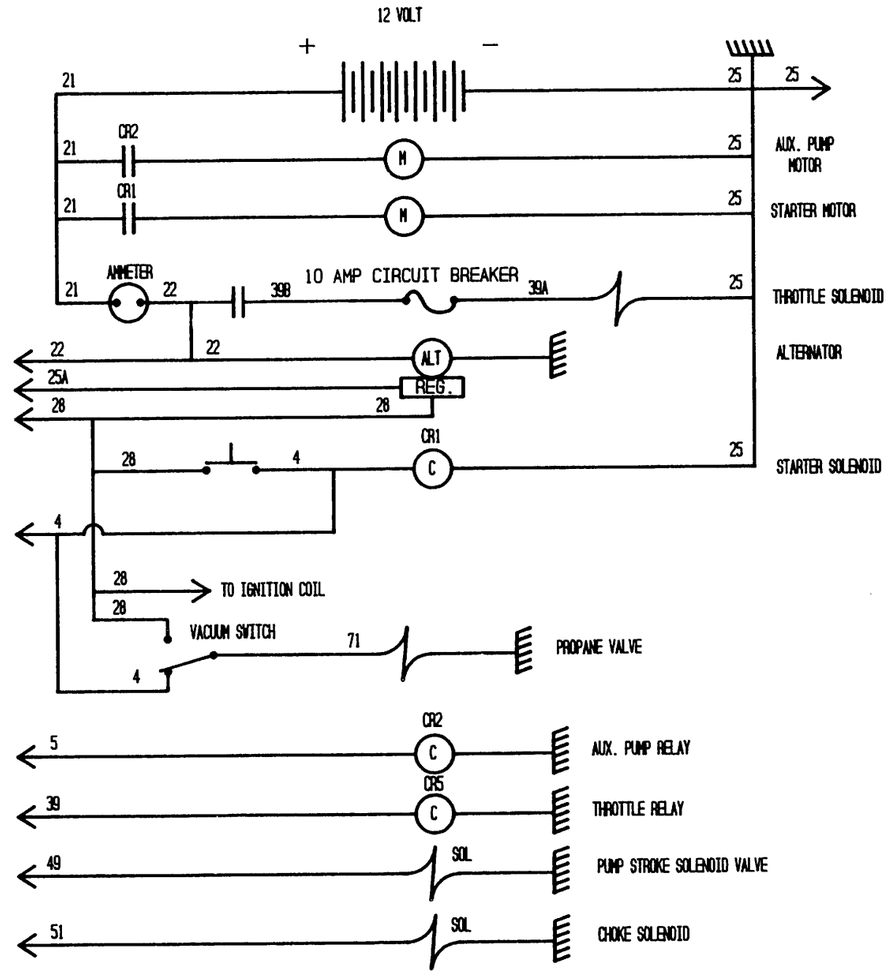


REF: MP W/ WISC. 35 HP ENG

SIMON-AERIALS INC.

TITLE: ELETRICAL SCHEMATIC

DRWG. NO. SCS-2313300

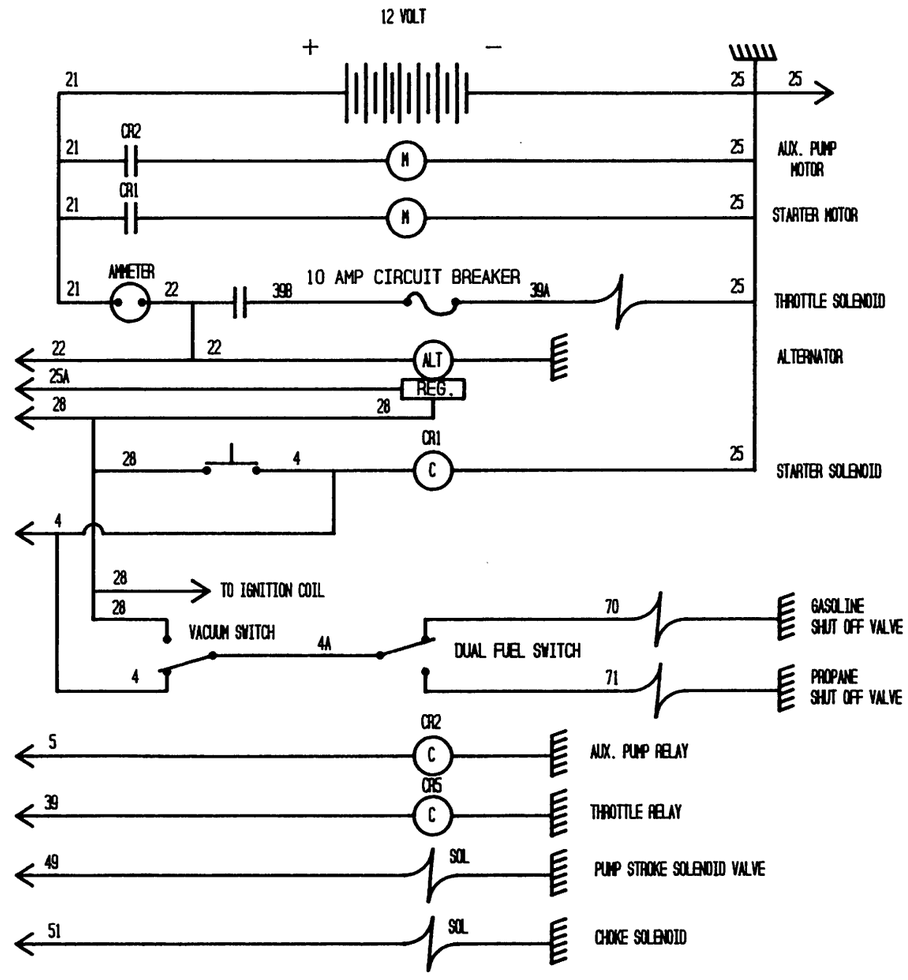


SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: ELECTRICAL SCHEMATIC
35 H.P. PROPANE

REVISION

DRWG. NO. SCS-212420-0

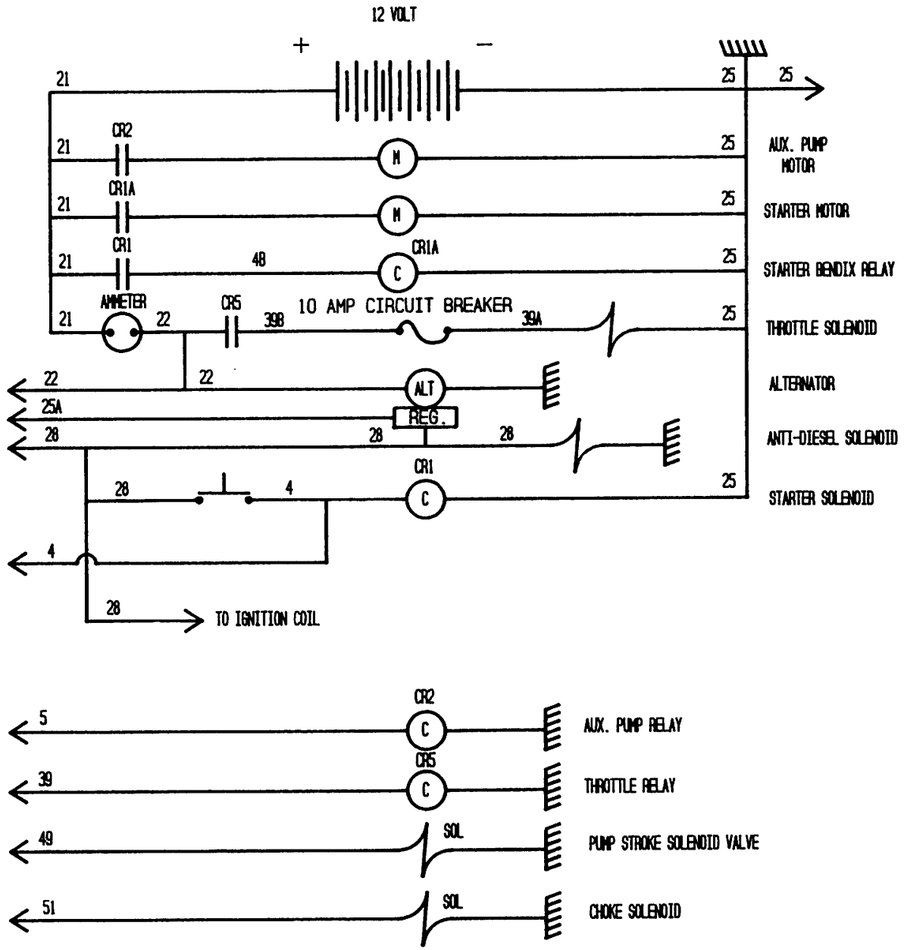


SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: ELECTRICAL SCHEMATIC
35 H.P. DUAL FUEL

REVISION

DRWG. NO. SCS-212421-0

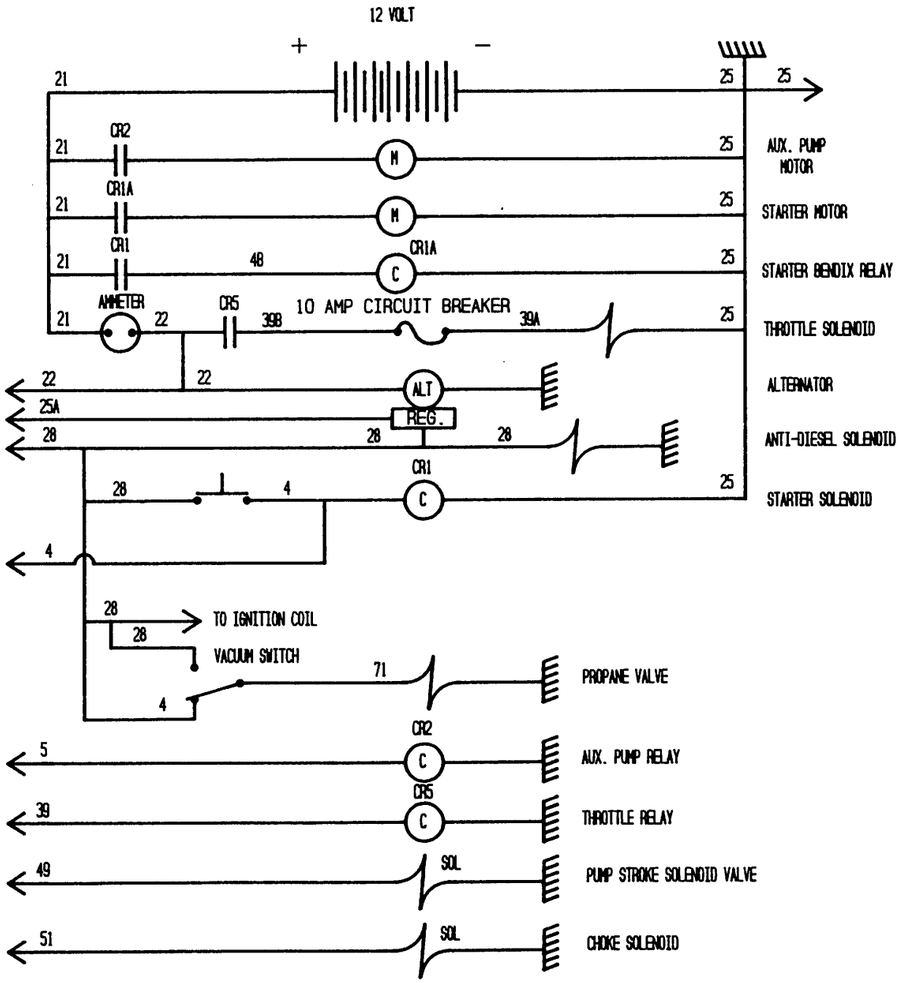


SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: ELECTRICAL SCHEMATIC
65 H.P. GASOLINE

REVISION

DRWG. NO. SCS-212430-0

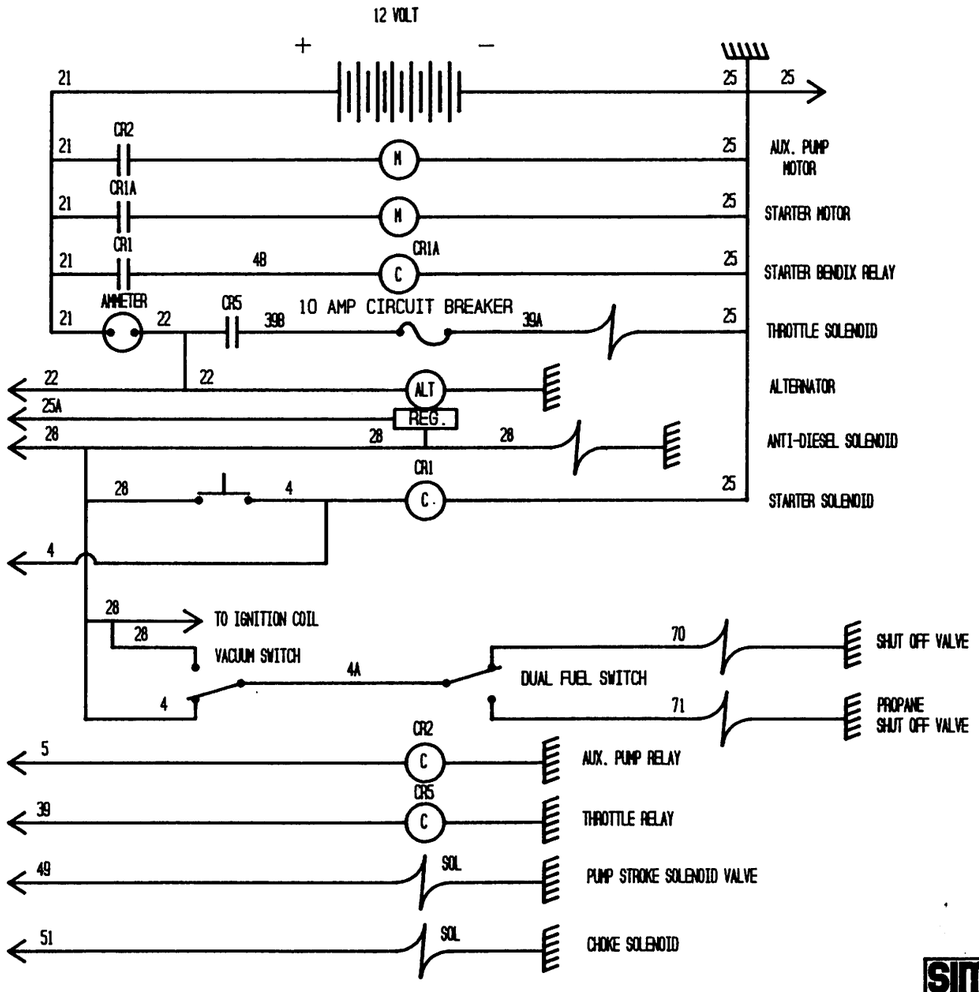


SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: ELECTRICAL SCHEMATIC
65 H.P. PROPANE

REVISION

DRWG. NO. SCS-212429-0



SIMON-AERIALS INC.
MILWAUKEE, WI. 53224

TITLE: ELECTRICAL SCHEMATIC
65 H.P. DUAL FUEL

REVISION

DRWG. NO. SCS-212428-0