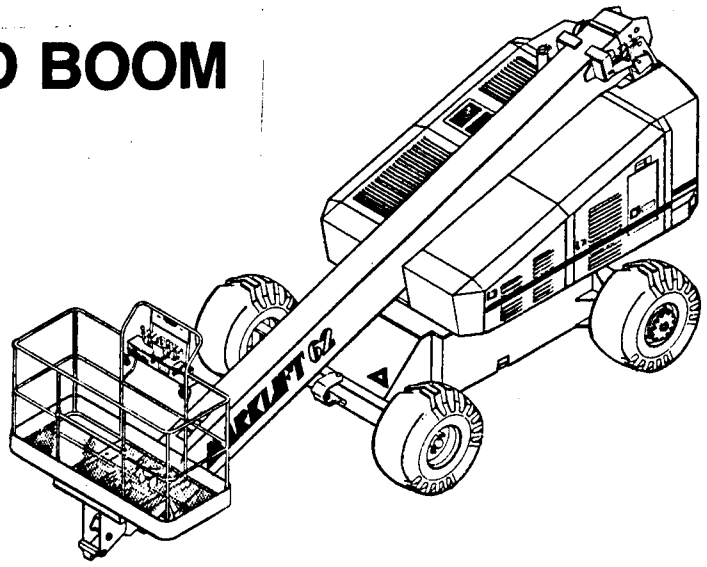
MARKLIFT®

SELF-PROPELLED BOOM (MODEL 62)

OPERATION MAINTENANCE AND PARTS MANUAL



REVISION 4
AUGUST 1984

REVISION 5
AUGUST 1986

REVISION 3
APRIL 1984

REVISION 2
SEPTEMBER 1981

REVISION 1
MAY 1981

INITIAL ISSUE
AUGUST 1980

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17002

This is a reduced copy of the actual report that is sent with each Machine.

NEW EQUIPMENT CONDITION REPORT

(WARRANTY REGISTRATION)

BOOMS	YES	NO
1 CAPACITY DECAL IS _____		
2 ALL APPLICABLE WARNING DECALS ARE INSTALLED		
3 EMERGENCY DESCENT VALVE FUNCTIONS PROPERLY		
4 OPERATORS INSTRUCTIONS ARE PROPERLY INSTALLED		
5 OPERATORS GUIDE RECEIVED		
6 ELECTRIC SCHEMATIC RECEIVED		
7 ALL CONTROLS (UPPER & LOWER) ARE IDENTIFIED & OPERATE PROPERLY		
8 STOP SWITCHES OPERATE PROPERLY (UPPER & LOWER)		
9 CONDITION OF PLATFORM GUARD RAILS		
10 BASKET ACCESS GATE WORKS PROPERLY		
11 HORN/BEACON OPERATE PROPERLY (OPTIONAL)		
12 BRAKES ARE ADJUSTED AND OPERATE PROPERLY		
13 CIRCUIT BREAKERS OPERATE PROPERLY		
14 ENGINE RPM'S ARE _____ RPM'S		
15 ALL HYDRAULIC CYLINDERS ARE FREE OF LEAKS		
16 ALL HYDRAULIC CYLINDER RODS ARE FREE OF PAINT/SCRATCHES		
17 110V GENERATOR OPERATES PROPERLY (OPTIONAL)		
18 HYDRAULIC PUMP IS FREE OF LEAKS		
19 DRIVE MOTORS ARE FREE OF LEAKS		
20 ROTATION GEAR BOX OIL LEVEL IS _____		
21 ROTATION RING GEAR BOLTS (UNDERCARRIAGE) ARE TORQUED AT _____ FT. LBS.		
22 LUG NUTS ON WHEELS ARE TORQUED AT _____ FT. LBS.		
23 BATTERY FLUID LEVEL IS FULL		
24 HYDRAULIC HOSES & FITTINGS ARE TIGHT & FREE OF LEAKS		
25 AIR PRESSURE IN TIRES IS _____ PSI		
26 HYDRAULIC OIL LEVEL IS _____		
27 SYSTEM PRESSURE IS _____ PSIG		
28 PILOT PRESSURE IS _____ PSIG		
29 FUEL TANK AND FITTINGS ARE FREE OF LEAKS		
30 HYDRAULIC TANK AND FITTINGS FREE OF LEAKS		
31 MANUAL OVERRIDES OPERATE PROPERLY		
32 MUFFLER TIGHT AND FREE OF LEAKS		
33 ENGINE OIL LEVEL IS FULL		
34 ENGINE OIL FILTER IS FREE OF LEAKS		
35 ALL ELECTRICAL CONNECTIONS ARE TIGHT		
36 ENGINE ALTERNATOR FUNCTIONING PROPERLY		
37 VALVE MANIFOLD & FITTINGS ARE FREE OF LEAKS		
38 PROPER OIL LEVEL IN DRIVE WHEEL TORQUE HUB		
39 CABLE TENSION _____		

SCISSORS	YES	NO
1 CAPACITY DECAL IS _____		
2 ALL APPLICABLE WARNING DECALS ARE INSTALLED		
3 EMERGENCY DESCENT VALVE FUNCTIONS PROPERLY		
4 OPERATORS INSTRUCTIONS ARE PROPERLY INSTALLED		
5 OPERATORS GUIDE RECEIVED		
6 ELECTRICAL SCHEMATIC RECEIVED		
7 ALL CONTROLS (UPPER & LOWER) ARE IDENTIFIED AND OPERATE PROPERLY		
8 PLATFORM GUARD RAILS IN GOOD CONDITION AND ATTACHMENT BOLTS INCLUDED		
9 PLATFORM ACCESS GATE WORKS PROPERLY		
10 HORN/BEACON OPERATES PROPERLY (OPTIONAL)		
11 BRAKES (IF INSTALLED) OPERATE PROPERLY		
12 CIRCUIT BREAKER OPERATES PROPERLY		
13 ENGINE RPM'S ARE _____ RPM'S		
14 SCISSOR ARM SHAFT COLLARS ARE IN PLACE AND ARE TIGHT		
15 LIFT CYLINDER IS FREE OF LEAKS		
16 110V INVERTER OPERATES PROPERLY (OPTIONAL)		
17 110V GENERATOR OPERATES PROPERLY (OPTIONAL)		
18 HYDRAULIC PUMP IS FREE OF LEAKS		
19 SYSTEM PRESSURE IS SET AT _____ PSIG		
20 DRIVE MOTORS ARE FREE OF LEAKS		
21 DRIVE GEAR BOX OIL LEVEL (SRT MODELS)		
22 ALL NUTS & BOLTS ARE TIGHT		
23 (2) WHEEL NUTS ARE TORQUED AT ____ FT. LBS.		
24 LUG NUTS ON THE WHEELS ARE ___ FT. LBS		
25 BATTERY FLUID LEVEL IS CORRECT		
26 HYDRAULIC HOSES AND FITTINGS ARE FREE OF LEAKS		
27 AIR PRESSURE IN TIRES IS _____ PSI		
28 HYDRAULIC OIL LEVEL _____		
29 FUEL TANK & FITTINGS ARE FREE OF LEAKS		
30 HYDRAULIC OIL TANK & FITTINGS ARE FREE OF LEAKS		
31 STEERING CYLINDER IS FREE OF LEAKS		
32 MANUAL OVERRIDE ON VALVES OPERATE PROPERLY		
33 MUFFLER TIGHT & FREE OF LEAKS		
34 ENGINE OIL LEVEL FULL		
35 ENGINE OIL FILTER FREE OF LEAKS		
36 ALL ELECTRICAL CONNECTIONS ARE TIGHT		
37 ENGINE ALTERNATOR FUNCTIONS PROPERLY		
38 CHARGER FUNCTIONS PROPERLY (ELECT. MACH.)		
39 VALVE MANIFOLD & FITTINGS ARE FREE OF LEAKS		

MODEL NUMBER_____ SERIAL NUMBER_____

OPTIONS_____

INSPECTOR #_____

9. After initial warm-up of gasoline engine, press engine stop button making sure stop circuit is operational. The ignition switch may be left in the "ON" position indefinitely if engine stop button has been pressed, without fear of burning the engine points. However, should the engine stall, the operator must either push the stop button or turn off ignition switch to prevent current path to coil.

10. Position selector switch to ground and operate switches, moving as follows: Boom UP/DOWN, rotation RIGHT/LEFT, and extend OUT/IN. Check for hose leaks.

11. After check-out of ground control functions, position selector switch to AERIAL for operation at work platform. Depress foot switch prior to moving any control function switches. This increases engine RPM (if throttle HI/LO selector is positioned in HI), and electrically completes circuit to controls.

    Your MARKLIFT is equipped with proportional controls. When using any proportional function, press foot switch, raise controller locking device and gradually move controller in direction selected. The controller handle is spring-centered and self-locking to prevent inadvertent operation. Familiarize yourself with the operation of the controller until you are able to start and stop each function, forward and reverse, obtaining a gradual, smooth movement.

MARKLIFT SELF-PROPELLED BOOM
(MODEL 62)

A working knowledge of the hydraulic system facilitates trouble shooting or adjustments by a mechanic. Therefore, the information below, although general, will provide the mechanic with such knowledge.

The MARKLIFT employs the latest components in mobile hydraulic equipment. The hydraulic circuit contains an engine driven variable displacement piston pump combined with proportional control valves.

Both the pump and control valves are pressure compensated and load sensing, resulting in a highly efficient controllable system utilizing less energy to drive, thus reducing fuel consumption.

The compensator has been pre-set at 2500 PSI to "DESTROKE" the pump. The pump compensator also receives a load sensing signal shuttled from each proportional control valve directly connected to cylinder load ports. Consequently the direct Boom loads are transmitted back to the pump so the pump only delivers enough flow and pressure to satisfy the cylinder, depending on command from the control valve orifice.

The load sensing system is automatically removed from the hydraulic circuit during the engine start operations so as not to create excessive starter drag.

The throttle is activated hydraulically directly from the pump high pressure discharge, though a solenoid valve. The throttle solenoid valve is energized through a selector switch in the platform, wired in series with the foot switch.

It is recommended that the MARKLIFT be moved into an area free of any overhead obstructions on a flat, level surface with no hazardous irregularities or accumulation of debris.

The operator should familiarize himself with the drive by raising the Boom approximately 5 feet off the ground prior to driving the unit. He will soon find that gradual starts and stops are relatively easy to perform. Gradually raise the Boom higher, and drive unit again until maximum height is established. Remember, at all times, that the proportional signal from the controller to the valve is controlled by the operator. There is approximtely 3 degrees of "dead" motion each side of the controller NEUTRAL position.

The best operation position can be achieved by placing the thumb over the knob of the controller and wrapping the fingers loosely around the locking stem. Now, rest the heel of the hand on the controller housing and apply a downward motion with the thumb, making the index finger lift the locking stem. Once the controller is disengaged and moved foreward or reverse, the pressure on the thumb may be omitted because the locking stem has engaged the cam and cannot drop into the locking position until the lever or handle is returned to the center position.

After the operator has been instructed by a trained operator and has spent less than 30 minutes practicing, he should be capable of smoothly starting and stopping the machine on all proportional functions.

MARKLIFT SELF-PROPELLED BOOM

(MODEL 62)

ENGINE

1. Will not start or run.

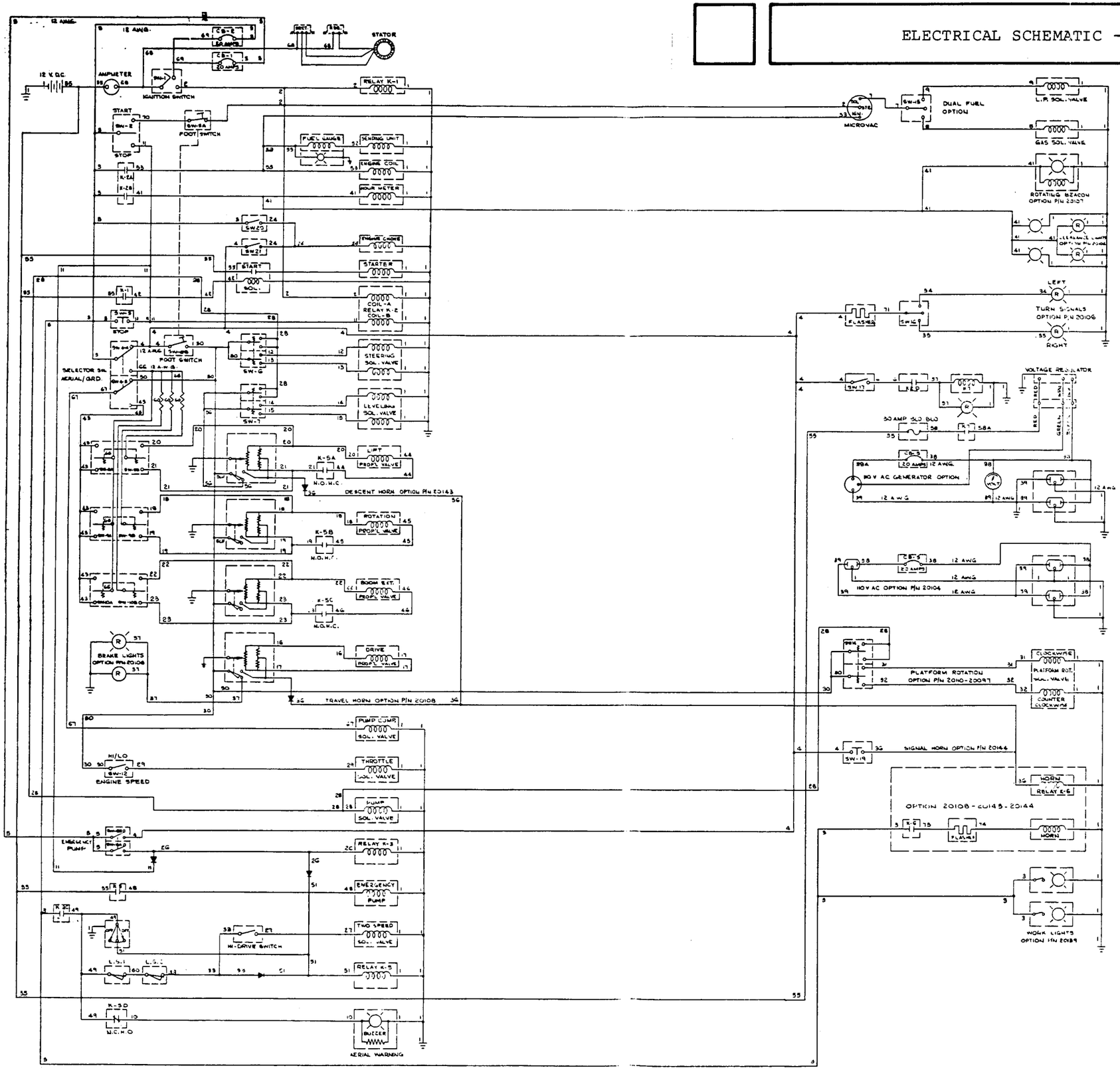
   A. Check ground control box ciruit breaker.
   B. Check for opened fuel shut-off valve.
   C. Check fuel selector to see if it is in L.P. position.
   D. Check for low battery.
   E. Check for fouled spark plugs.
   F. Check for water in gas tank.
   G. Check engine points.
   H. Refer to your local service facility.

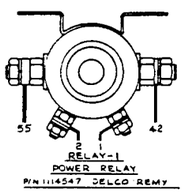
2. No high speed.

   A. Check aerial HI/LO selector switch.
   B. Check throttle solenoid valve.
   C. Refer to your local service facility.

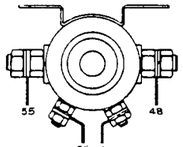
3. No idle.

   A. Check aerial HI/LO selector switch.
   B. Check throttle solenoid valve.
   C. Refer to your local service facility.

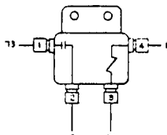




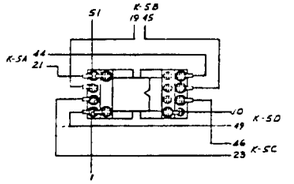
RELAY-L
POWER RELAY
P/N 1114547 DELCO REMY



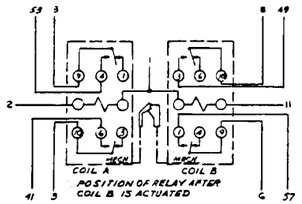
RELAY-3
POWER RELAY
P/N 1114547 DELCO REMY



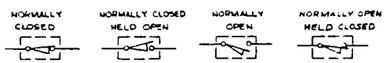
RELAY-6
P/N 1162B2 DELCO REMY D 1768



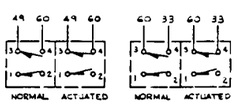
RELAY K-5
BASE RELAY IDEC P/N SY4S-05
RELAY SQUARE "D" P/N BSCI RSD14B



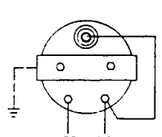
RELAY-2
LATCHING TYPE
P/N KBIIDG POTTER-BRUMFIELD



LEGEND FOR LIMIT SWITCHES



LIMIT SWITCH NO.1 LIMIT SWITCH NO.2



FUEL GAUGE
P/N BE303 STEWART WARNER

ITEM	PART NUMBER	DESCRIPTION	QTY
-61	60702	HEX NUT - 5/16-18UNC	2
-62	63302	SPLIT LOCK WASHER - 5/16	2
-63	63402	FLAT WASHER - 5/16	2
-64	20661	ANSI A92 PLATE	1
-65	20662	PATENT NUMBERS PLATE	1
-66	22385	"CAUTION - ATTACH YOUR SAFETY BELT FIRST" DECAL	1
	20070	ELECTRICAL SCHEMATIC	
	21057	HYDRAULIC SCHEMATIC	
	21938	HYDRAULIC HOSE DIAGRAM	

FIGURE 2.1 - CARRIAGE ASSEMBLY (JANUARY 1982)

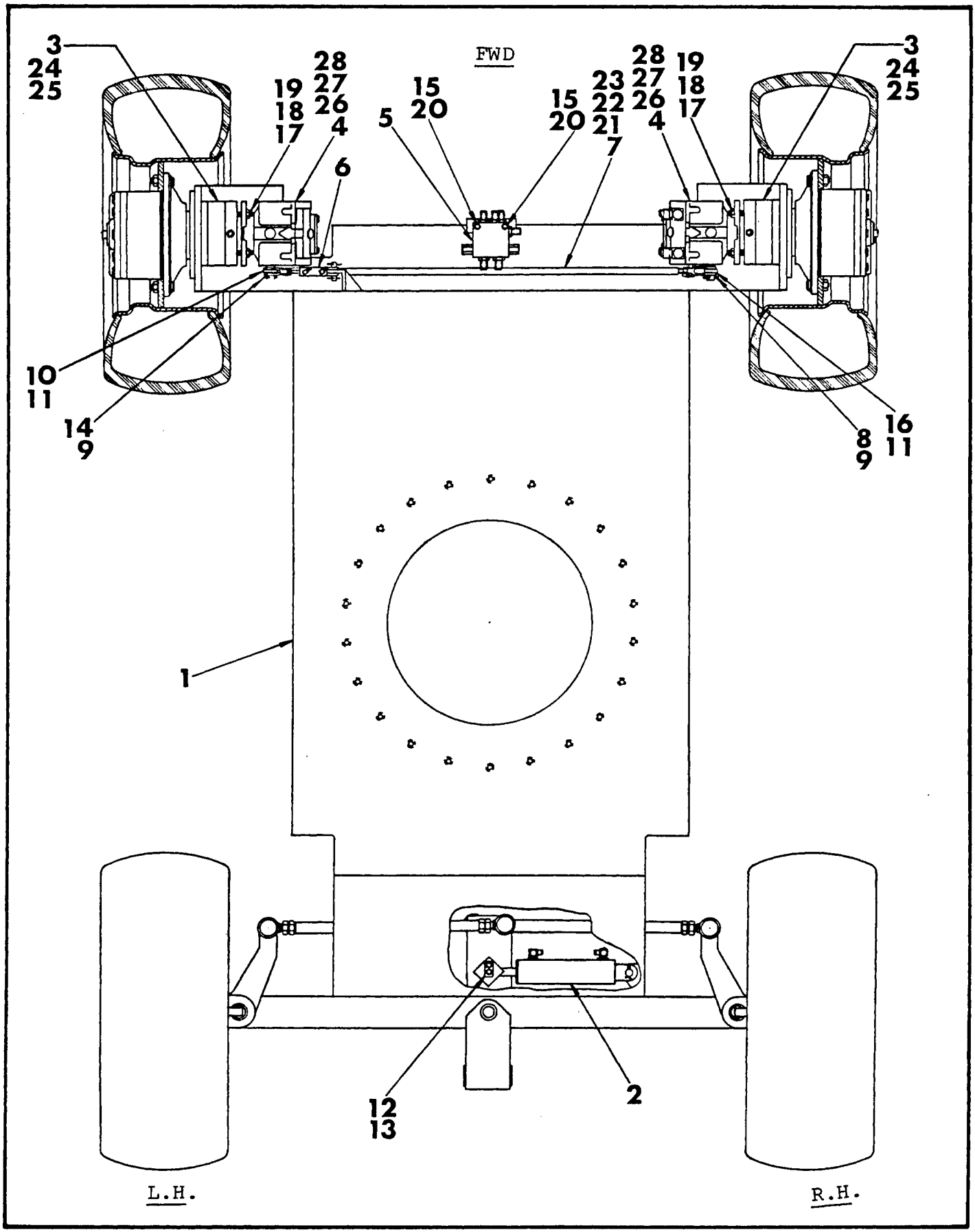
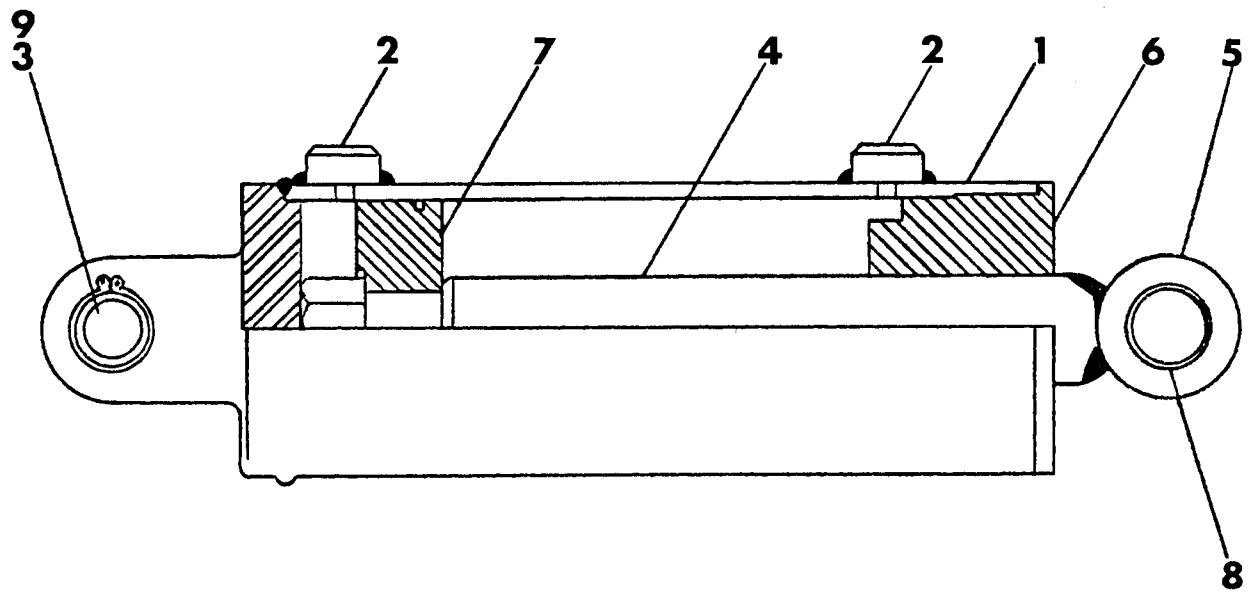


FIGURE 6.1 - STEERING CYLINDER



ITEM	PART NUMBER	DESCRIPTION	QTY
6.1-	21239	STEERING CYLINDER	1
-1		BARREL - SE00239B	1
-2		PORT - 9885	2
-3		BASE CLEVIS ASSEMBLY - 19314	1
-4	66466	ROD - SE00239R	1
-5		ROD PINEYE - 18213	1
-6	66200	"S"T" HEAD - 13128	1
-7	66199	PISTON - 14214	1
-8	66485	16 DU 24 BUSHING - 9506	2
-9		CLEVIS PIN - 9221	1
-10	66041	SEAL KIT - 25421	1

FIGURE 9.1 - TURRET ASSEMBLY - 21940

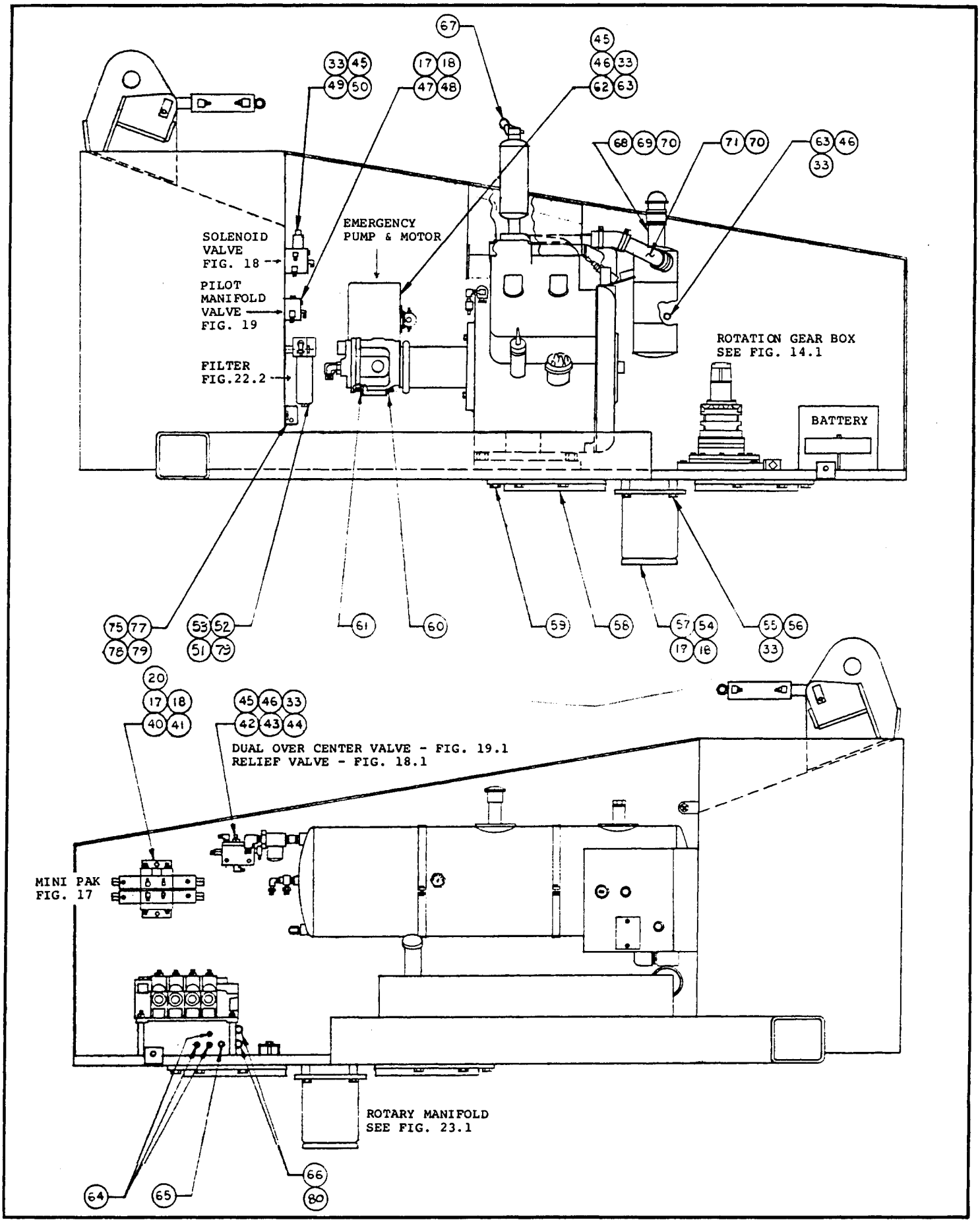
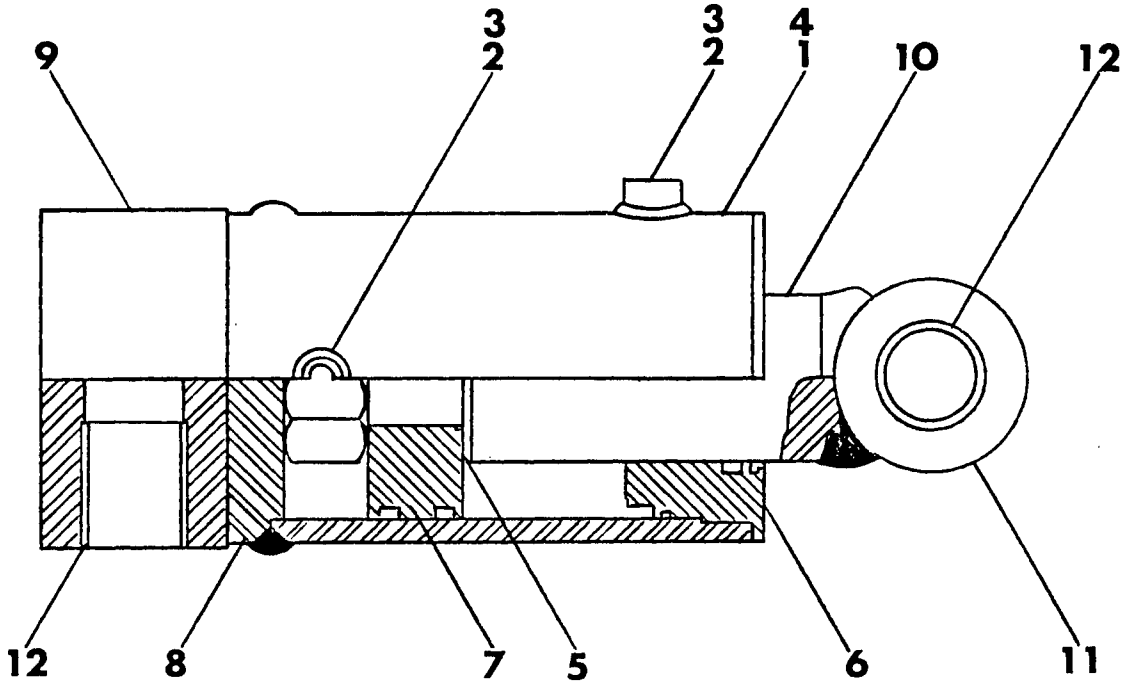


FIGURE 12--LIFT CYLINDER

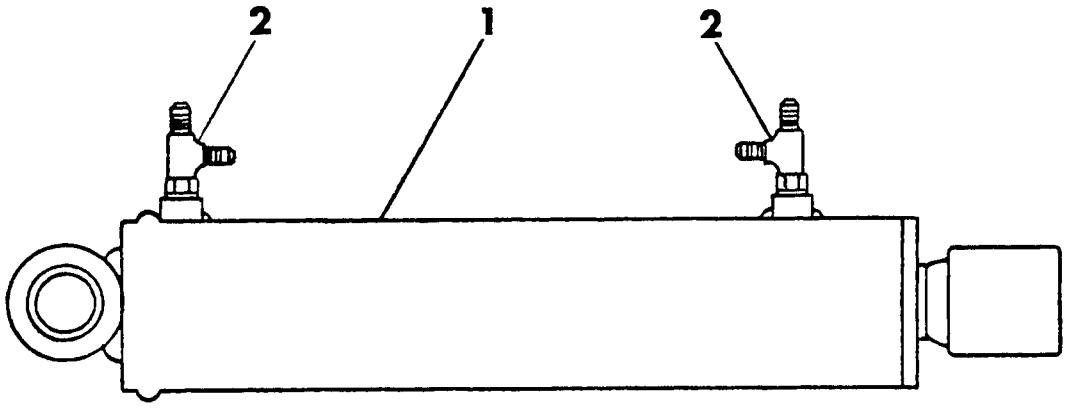


ITEM	PART NUMBER	DESCRIPTION	QTY
12-	21112	LIFT CYLINDER	1
-1		BARREL -SE00212B	1
-2		PORT - 9888	2
-3		CAP PLUG - 9813	3
-4		MARK NAME PLATE - 9303	1
-5		STOP TUBE - 18913	1
-6	66550	TEE HEAD - 13206	1
-7		"U" PISTON - 14136	1
-8		PLAIN BASE - 17021	1
-9		BASE PINEYE - 18458	1
-10		ROD - SE00212R	1
-11		ROD PINEYE - 18459	1
-12		32 DU 32 BEARING - 9507	4
-13	66043	SEAL KIT - 25368	1

FIGURE 16 - PROPORTIONAL VALVE ASSEMBLY

ITEM	PART NUMBER	DESCRIPTION	QTY
16.1-	22519	PROPORTIONAL VALVE ASSEMBLY	1
-1	21776	PROPORTIONAL VALVE	1
-2	80004-09	STRAIGHT THREAD CONNECTOR	1
-3	80028-05	SWIVEL NUT RUN TEE	1
-4	80058-03	FEMALE PIPE ADAPTER	1
-5	80060-05	NUT	1
-6	80056-01	TUBE END REDUCER	1
-7	80008-08	MALE ELBOW	1
-8	80039-04	FEMALE TEE	1
-9	80052-04	PIPE NIPPLE	2
-10	20357	NEEDLE VALVE	1
-11	80001-08	MALE CONNECTOR	1
-12	80063-15	FEMALE PIPE ADAPTER	1
-13	55300	TEE	1
-14	80004-03	STRAIGHT THREAD CONNECTOR	1
-15	80004-24	STRAIGHT THREAD CONNECTOR	1
-16	80004-18	STRAIGHT THREAD CONNECTOR	1
-17	80004-14	STRAIGHT THREAD CONNECTOR	4
-18	80012-18	STRAIGHT THREAD ELBOW	1
-19	54709	HEX REDUCING NIPPLE	1
-20	2527	QUICK DISCONNECT COUPLING	1
-21	845	CAP	1
-22	80059-03	CAP	1
-23	80012-14	STRAIGHT THREAD ELBOW	2

FIGURE 21 - MASTER LEVELING CYLINDER ASSEMBLY



ITEM	PART NUMBER	DESCRIPTION	QTY
21-	21084	MASTER LEVELING CYLINDER ASSEMBLY	1
-1	21111	MASTER LEVELING CYLINDER (SEE FIG. 27)	1
-2	80033-03	STRAIGHT THREAD RUN TEE	2

FIGURE 25 - AERIAL CONTROL CONSOLE ASSEMBLY

ITEM	PART NUMBER	DESCRIPTION	QTY
-32	20597	GASKET	1
-33	20598	GASKET - CENTER COVER	1

FIGURE 26.1 - FINAL BOOM ASSEMBLY
(MARK TRACK)

ITEM	PART NUMBER	DESCRIPTION	QTY
-29	63313	SPLIT LOCK WASHER - NO. 10	2
-30	70148	LEVER ARM	1
-31	60325	HEX HEAD CAP SCREW - 3/8-16UNC X 1 (GR. 5)	16
-32	63303	SPLIT LOCK WASHER - 3/8	16
-33	21321	COVER PLATE	2
-34	62204	SOCKET HEAD SET SCREW - 1/2-13UNC X 1	4
-35	61101	JAM NUT - 1/2-13UNC	4
-36	20453	PAD PRESSURE PLATE	2
-37	21315	WEAR PAD	2
-38	60603	HEX HEAD CAP SCREW - 5/16-18UNC X 3/4 (BOWMALOK 41006)	2
-39	22593	RETAINER	1
-40	2806	STRAIN RELIEF	1
-41	2768-385	ELECTRICAL CABLE - 18-2 AWG X 385	1
-42	70107	LIMIT SWITCH	1
-43	64301	COTTER PIN - 1/8 DIA. X 1	1

FIGURE 28 - INNER BOOM ASSEMBLY

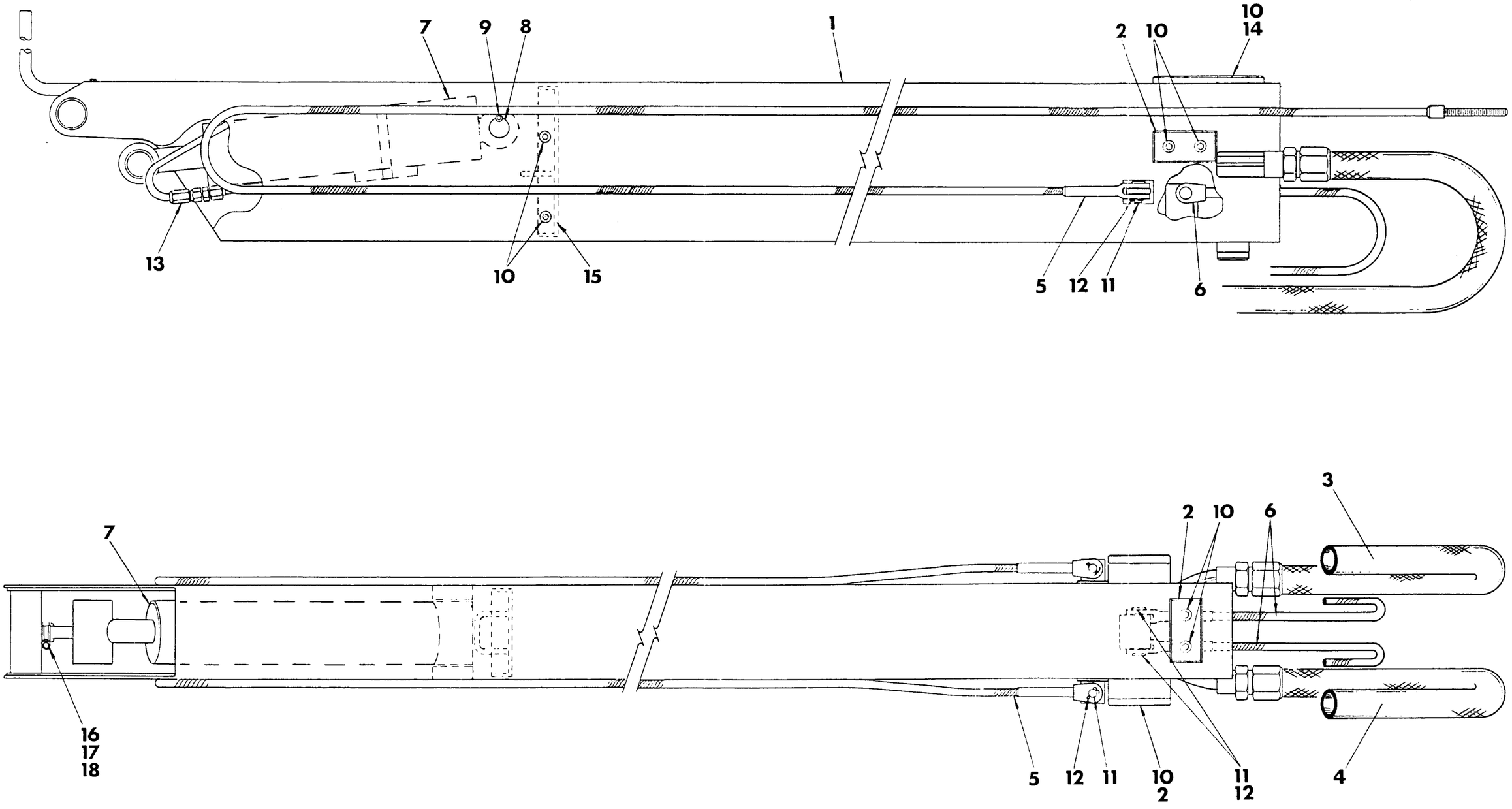
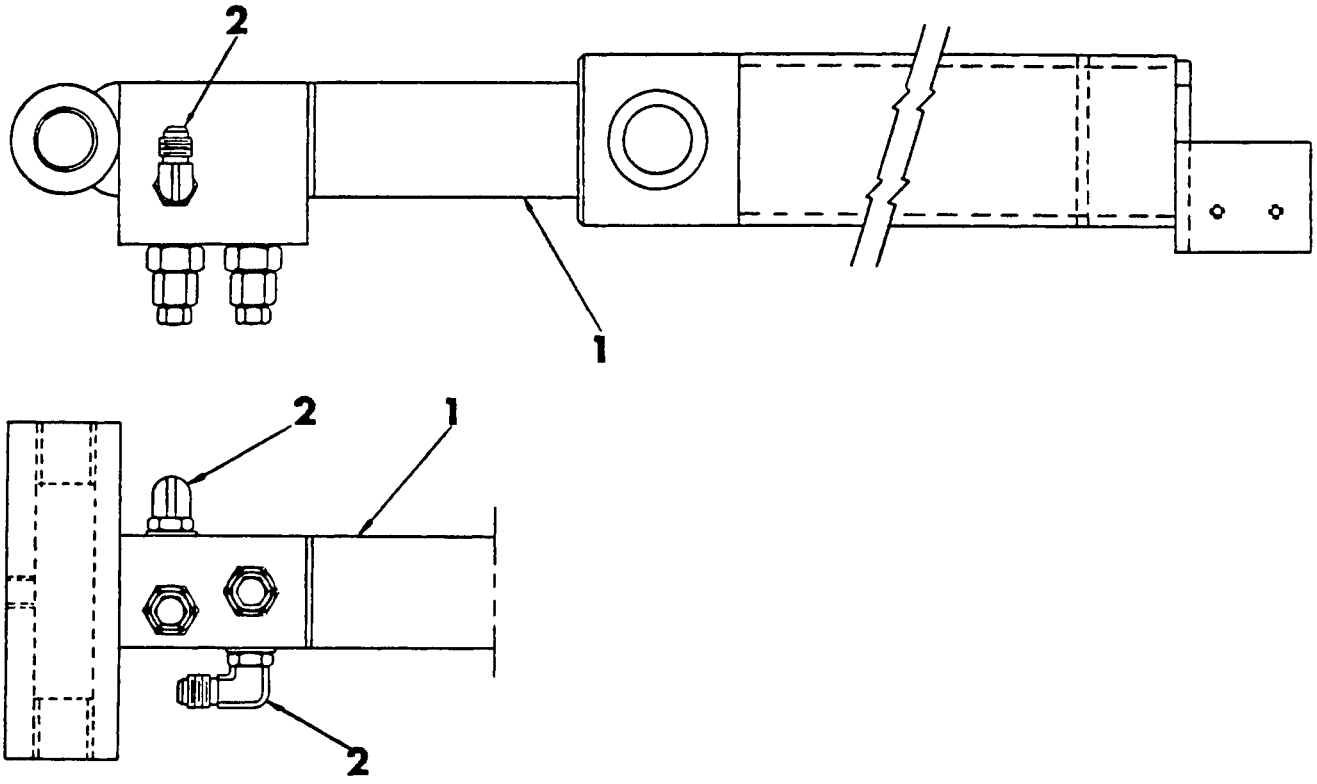
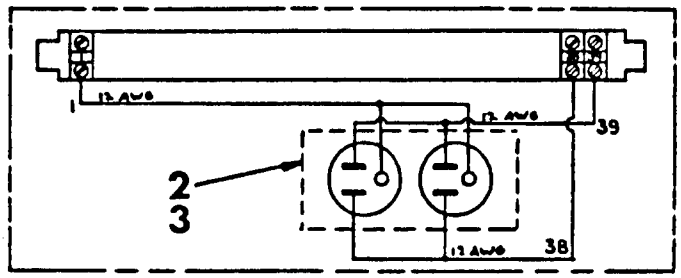


FIGURE 31.1 - BOOM EXTENSION CYLINDER ASSEMBLY (INTERNAL HOLDING VALVE)

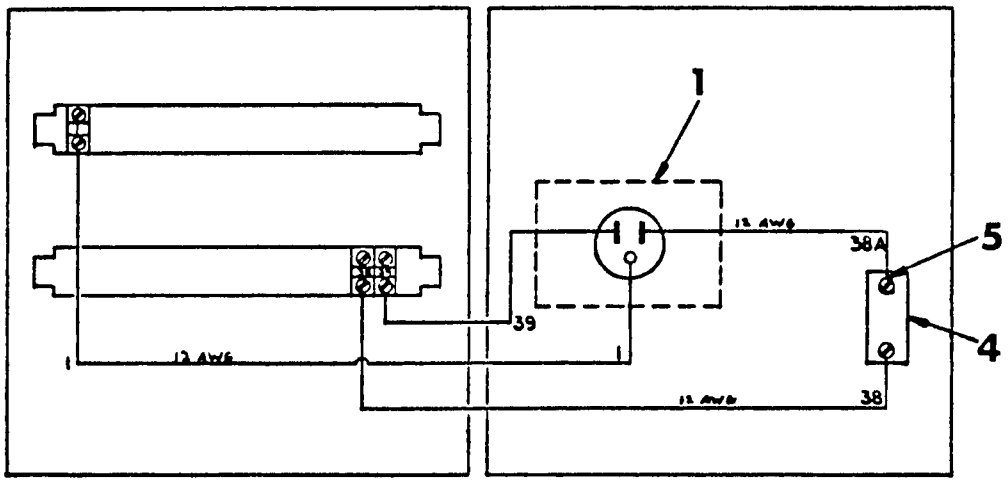


ITEM	PART NUMBER	DESCRIPTION	QTY
31.1-	21893	BOOM EXTENSION CYLINDER ASSEMBLY	1
-1	21261	BOOM EXTENSION CYLINDER SUB-ASSEMBLY (SEE FIG. 37)	1
-2	80012-11	STRAIGHT THREAD ELBOW	2

FIGURE 34 - GROUND & AERIAL 110 VAC RECEPTACLES (OPTION)



AERIAL CONTROL CONSOLE



GROUND CONTROL CONSOLE

ITEM	PART NUMBER	DESCRIPTION	QTY
34-	20104	GROUND & AERIAL 110 VAC RECEPTACLES	1
-1	70119	COVER PLATE - WITH MALE RECEPTACLE	1
-2	288	COVER PLATE	1
-3	70126	RECEPTACLE	1
-4	20562	CIRCUIT BREAKER	1
-5	2832	RING TONGUE CONNECTOR	7

FIGURE 39 - RAISED PLATFORM ROTATION (OPTION)

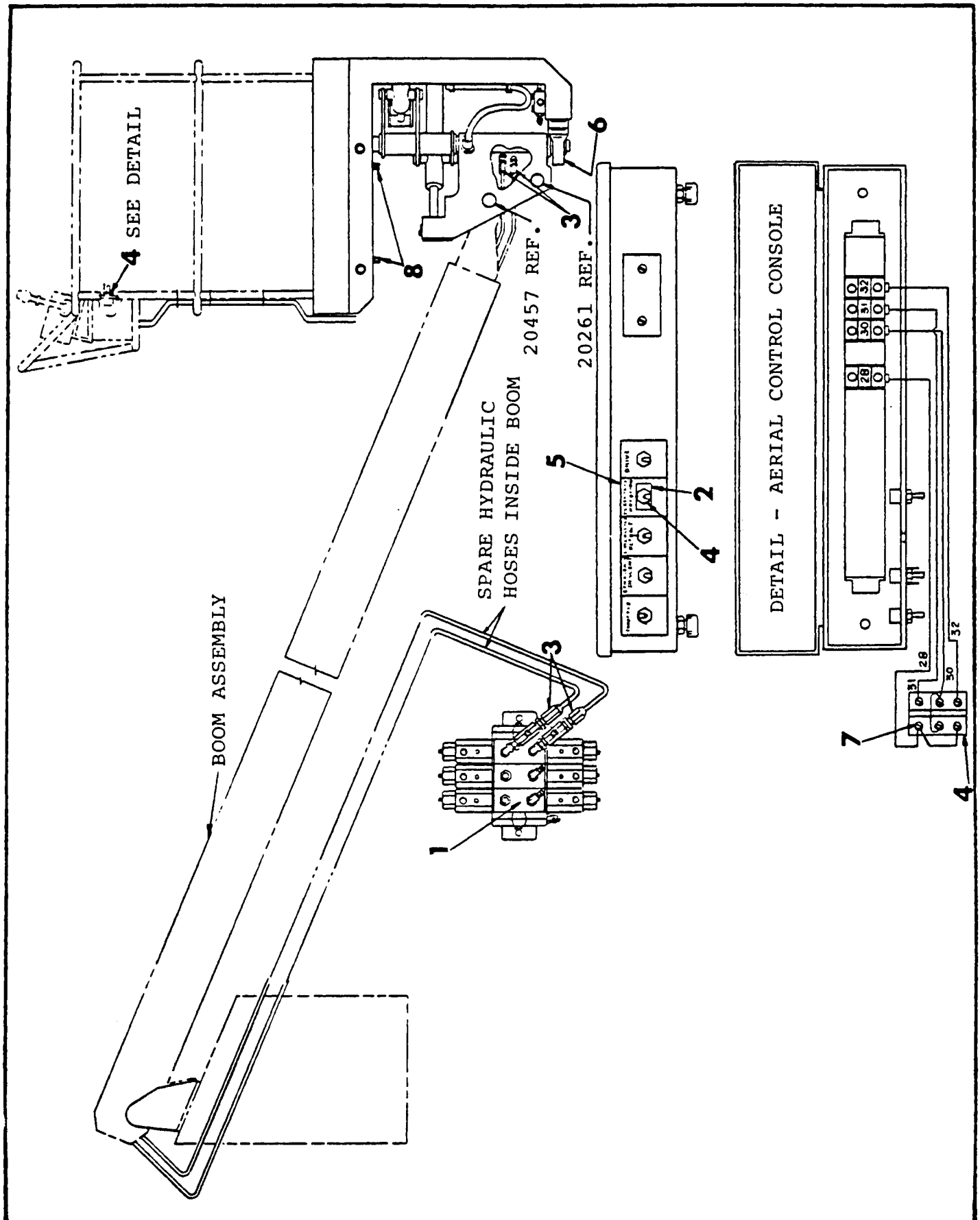
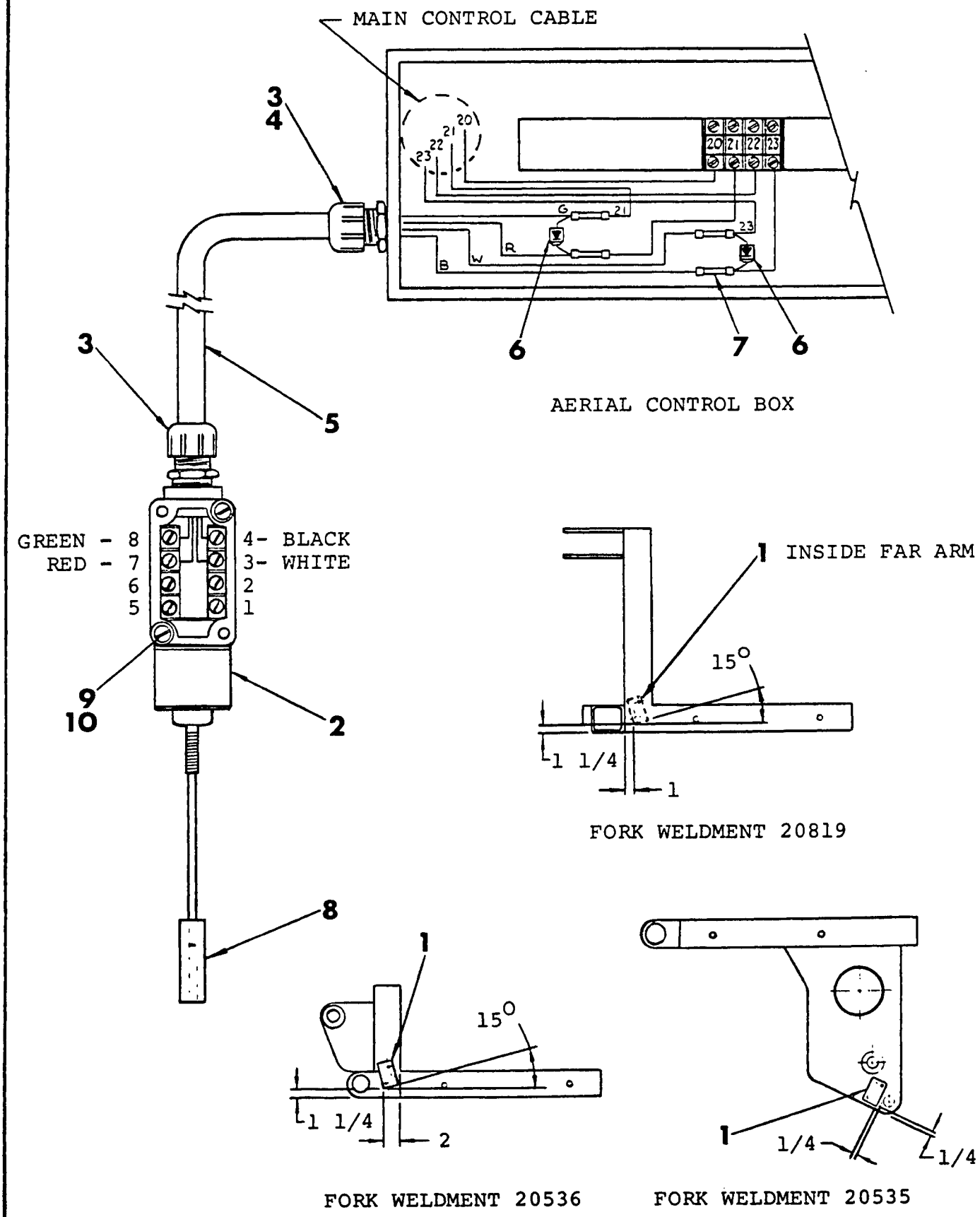


FIGURE 42 - FORK GROUND SENSOR (OPTION)



REPLACEMENT KITS

PART NUMBER	KIT DESCRIPTION	KIT INCLUDES
RK-1 plus your brake model number	Inspection Kit	Face Gaskets Case Gaskets
RK-2 plus your brake model number	Oil Seal & Gasket Replacement Kit	Face Gaskets Case Gaskets Oil Seal
RK-3 plus your brake model number	O-ring & Back-up Ring Replacement Kit	Face Gaskets Case Gaskets Oil Seal O-Rings Back-up Rings Loc-tite
RK-4 plus your brake model number	Lining Replacement Kit	Face Gaskets Case Gaskets Primary Disc Stator Discs Rotor Discs
RK-5 plus your brake model number	Bearing Replacement Kit	Face Gaskets Case Gaskets Bearing Oil Seal
RK-6 plus your brake model number	Spring Replacement Kit	Face Gaskets Case Gaskets Springs
RK-7 plus your brake model number	Pressure Override Seal Replacement Kit	Face Gaskets Case Gaskets Oil Seal

function thru the spool metering notch will be constant regardless of load. This provides constant rate for the function.

E. The remote control system determines the directional valve spool position by varying the pressure in each spool end cap. The two commonly used control systems are:

1) Remote pilot control oil ported to each end cap thru external tubing from a remote pressure reducing valve.

2) Electro-hydraulic pilot valves, manifold to the spool section, and controlled electrically from a remote location. This pilot valve obtains its pilot supply oil from the module and ports it to the spool end cap at various pressure levels proportional to the electrical command.

Figure 1 & 2 shows a typical 4 spool section module of the following configuration in sequence, starting with the dual port inlet:

Dual Port Inlet Manifold Assembly with a by-pass compensator, unloader, system relief valve and an optional pilot control circuit relief valve.

Directional Valve Manifold Assemblies with shuttles and pressure reducers.

Plugs in the pressure compensation control line and main pump line between directional valve manifold #3 and #4.

Directional Valve Manifold with one shuttle and a blank spool in the pressure reducer cavity.

Single Port Inlet Manifold Assembly with a by-pass compensator, unloader, and system relief valve.

This module is supplied by one 20 gpm pump ported into the dual port inlet for directional valves #1, #2, & #3, and one 30 gpm pump ported into the single port inlet for directional valve #4.

The remote control configuration can be electro-hydraulic using the Bertea pilot valve and electrical controllers or it can be the remote pilot oil system using lever operated pressure reducing valves to provide control oil from 0 to 200 psi into either spool end cap.

III OPERATION (Figure #2)

A. LOAD SENSING & PRESSURE COMPENSATING

When the system is not in use and the directional valve spools are in the center position, the pressure compensating (P.C.)

Directional Valve Manifold Assembly Figure #6

Each directional valve assembly consists of the directional valve spool (Item 23); a means to position the spool by either the electro-hydraulic pilot valve (Item 11) or a remote pilot oil system (Item 2 or 4); a shuttle to sense highest working cylinder port pressure (Item 31 or 35); and a shuttle (Item 36) to transmit the highest pressure with in the total module to the inlet compensator.

An optional pressure reducer spool (Item 46) is provided when constant rate for the function is required in multiple spool section stacks. When only single functions are operated at one time, a blank spool is provided in order to simplify the system.

The standard end cap (Item 20) with various length pins (Item 18) determine the maximum spool travel and hence the maximum flow rate for any specific spool. This selction of spool and pins provide field adjustment of desired function speeds.

The optional manual override assembly for a remote controlled spool is shown in Figure #7. This assembly will provide direct manual control of the spool in the event of a failure in the remote controller, the electrical power supply, or a malfunction of the pilot valve.

The hand knob is held in the thread disengaged position by a light spring to prevent inadvertent operation. Press the knob inward while rotating to engage the threads in the cap and the drive screw. Continued rotation clockwise will move the spool from center and will provide flow from the cylinder port adjacent to this end cap. The knob must be rotated outward and disengaged prior to operating the manual override on the opposite end cap.

A plug is provided, as shown, to bleed the air from each end cap after initial assembly and operation. Air trapped in the spool end cap will reduce the response of the valve assembly.

Single Port Inlet Manifold Assembly Figure #8

The single port manifold provides inlet porting for the power system fluid only. The tank return porting has an optional configuration of joining the pilot valve control fluid tank return, to the power fluid return for common porting to tank or separating the two return circuits for independent tank lines.

When the ¼ NPTF pipe plug (Item 29) is installed, it will block the pilot control return fluid from the power system tank line! With this configuration the pilot fluid must be connected to tank from port 28A. Without the ¼ NPTF plug installed, both fluid return circuits are common.

F. Can Not obtain full system pressure.

1) System relief valves adjusted too low.

a. Increase relief valve setting (3) by adjusting the cap clockwise.

2) Inlet control orifice plugged.

a. clean orifice (5).

3) Foreign material on relief valve seat.

a. Remove relief valve cap (3), spring, and poppet. Flush the cavity.

4) Damaged "o" ring on unloader.

a. Remove unloader body (4) and replace "o" ring.

G. By-pass pressure too high.

1) Excessive flow.

a. Reduce pump output.

2) Excessive return pressure.

a. Remove return line restriction.

3) Unloader piston stuck in the "in" position.

a. Remove unloader (4) and clean orifice.

4) Directional valve spool stuck.

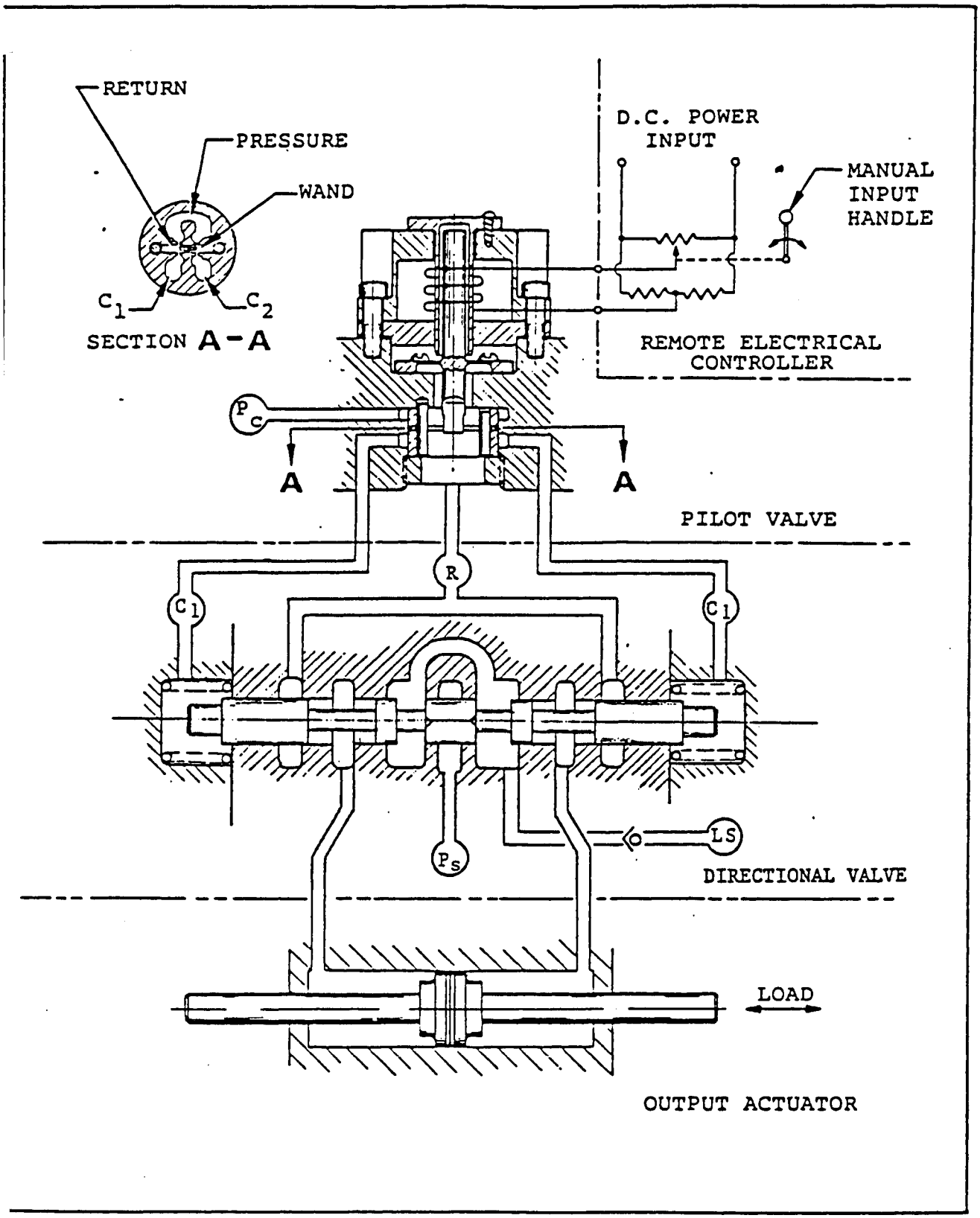
a. Remove spool (9) and check for burrs and/or foreign material.

H. Remote Pilot Oil Applications

Control problems with remote pilot oil systems are usually caused by a mal-function of either the pressure reducer or purge manifold assembly.

Disconnect the control lines at the purge manifold and attach pressure gages to the lines. With the manual lever in the center position the pressure in the lines should be equal. Movement of the lever should increase the pressure proportionally in one line to at least 200 psi greater than the other line pressure. Opposite lever travel should reverse the pressure differential.

Service Manual Series VS30-700250 new



SCHEMATIC
SINGLE FUNCTION LOAD SENSE REMOTE CONTROL VALVE
FIGURE 2

Parker Fluidpower

LOAD SENSE PUMP

A pump that has less than 400 psi standby pressure will require a circuit that permits the pump to unload during standby and also provide pilot circuit pressure (300 psi) prior to movement of the directional valve spool. The use of a pilot circuit pressure sensing line connected thru a shuttle and a 3-way normally closed solenoid valve to the load sense port of the pump will provide this feature.

During standby, the valve is closed, allowing the pump control circuit to bleed down to tank pressure and unload the pump for standby. Moving the lever of a remote electrical controller will close a switch and energize the solenoid valve to the open position. The pump load sense control port is now connected to the pilot circuit pressure requirement (300 psi) and it will provide the flow and pressure to meet this demand.

When a directional valve spool is moved into a fluid metering position, it will connect the pump load sensing line to the cylinder port through the shuttle. The pump control system will now follow this higher pressure demand.

COMPENSATED PUMPS

Since a compensated pump typically holds a high pressure during standby, the pilot circuit always has adequate pressure for operation.

LOAD SENSE VALVE MODULE (VARIABLE PUMPS)

A typical (4) spool valve module is shown in Figure 12 with the inlet and outlet manifolds. Each spool section contains a load sensing circuit with a compensator to hold 100 psi differential across the metering notch of the directional valve spool. The check valve in the load sense line of each section provides control pressure isolation for that section.

An optional feature is available to provide external load pressure limitation for individual spool sections, as shown. For example, if one function requires a maximum continuous limitation of 1000 psi, a small relief valve, set at that pressure, can be installed on the optional external load control line. The maximum pressure of the other functions will be limited by the system relief valve or pump compensator setting.

If a dual pressure limitation is desired, a solenoid valve can be used on the external line as shown. One mode of operation would be limited by the system relief valve and the second mode by the relief valve on the external load control line. Logically, multiple relief valves can be used if required.

I. INSTALLATION OF THE THROTTLE CONTROL

A. Introduction

Refer to sketch shown with parts list, included on page 2.

One Throttle Control can operate an unlimited number of circuits, that are driven by the same pump discharge line in the hydraulic system.

The Throttle Control piston (2) senses the pump discharge line pressure. The pressure increases, and pulls the throttle open, when you operate a circuit to move a load. The pump by-passes, and allows the throttle to close when the valve circuit lever is returned to neutral.

The pressure must increase, above by-passing pressure, at least 15 PSI for each pound of throttle pull, plus the amount your by-passing pressure will vary, due to oil viscosity changes, over your oil operating temperature range.

Highly loaded circuits usually increase the pressure to a level far above the pump by-passing pressure, and produce a motivating force far beyond the minimum required to open the throttle.

Lightly loaded circuits, such as, when the boom is lowering, swing circuits, outriggers lowering, etc., produce the least pressure. The plumbing flow restrictions must be revised in these circuits if the load cannot increase the circuit pressure sufficiently above by-passing pressure to produce the motivating force needed to open the throttle.

The pressure will increase at a greater rate as the engine speed increases because the plumbing relating to the circuits usually contain greater restrictions. A lightly loaded circuit may then become operable at a higher engine speed, if it did not operate at idle.

The motivating force can be increased by revising your plumbing, downstream of the throttle control connection, as follows:

Restrict the plumbing relating to the circuits. (1) Add an orifice. (2) Reduce diameter and/or lengthen line size. (3) Add a two-way check valve with a heavier spring in the direction of flow. This will increase pressure more at idle speed where needed most. It, therefore, is the best type of restriction.

Decrease your by-passing pressure. (1) Remove "bottle necks", and elbows. (2) Increase diameter and/or shorten line size.

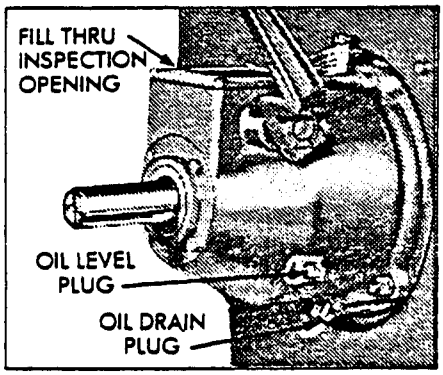


Fig. 2, VH4D
CLUTCH LUBRICATION

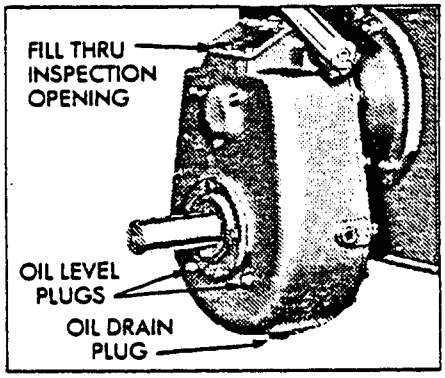


Fig. 3, VH4D
CLUTCH REDUCTION LUBRICATION

Models VG4D and V465, Fig. 4 and Fig. 5:

The clutch in both the power take-off and clutch reduction units is of the dry disc type, therefore NO OIL should be put into the clutch housing. Grease fittings are provided for periodic lubrication of the bearings. The HOUSING BEARING should be greased every 50 hours of operation, and the THROWOUT BEARING every day before starting. use Mobil Gargoyle grease BRB No 3, Sinclair AF-1 grease, or equal.

The PILOT BEARING is sealed and requires no external lubrication.

The SHIFTER SHAFT should be lubricated periodically if external oil fittings are provided.

THE REDUCTION UNIT IS OPERATED IN OIL and the gear case oil level must be maintained to the oil DIPSTICK mark or PLUG opening, which ever is applicable. In ROCKFORD units use No. 30 S.A.E. crankcase oil, for TWIN DISC units use

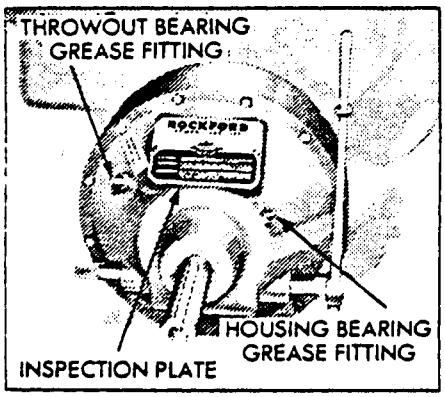


Fig. 4, VG4D, V465D
CLUTCH LUBRICATION

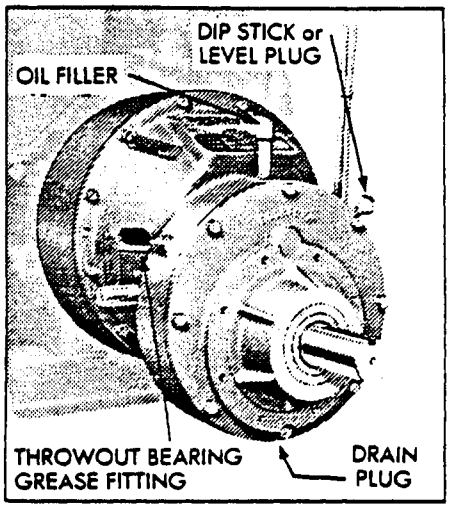


Fig. 5, VG4D, V465D
CLUTCH REDUCTION LUBRICATION

high grade transmission oil, S.A.E. No. 90 to No. 110 viscosity. Change oil every 500 hours of service, while unit is warm.

STARTING

With reference to Fig. 1: Engines enclosed in a sheet metal house are referred to as Power Units, whereas those without a house are called Open Engines.

Power Unit side doors should always be removed when operating.

STARTING PROCEDURE Fig.'s 6,7,8

1. Check crankcase oil level and gasoline supply. Open shut-off valve in fuel strainer.

   OIL BURNING engines must be started on gasoline and run for 2 or 3 minutes before switching to oil. Special instructions are available for starting L.P.G. and NATURAL GAS burning engines.

2. Disengage clutch, if furnished.

3. Prime new engine — if necessary, see Fig. 6. Hand primer lever at fuel pump (available option), should be worked back and forth until strainer bowl is full — then an additional 5 or 10 strokes to fill carburetor bowl. If primer does not function — turn crankshaft one complete revolution.

   Gravity feed (power units), and electric start engines do not require priming.

4. Set throttle about 1/2 open if variable speed governor control is furnished. With a two speed control, start in full load position — idle after engine starts.

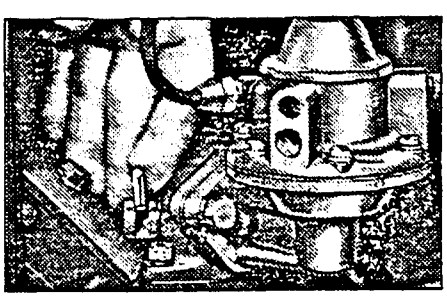


Fig. 6, FUEL PUMP PRIMER

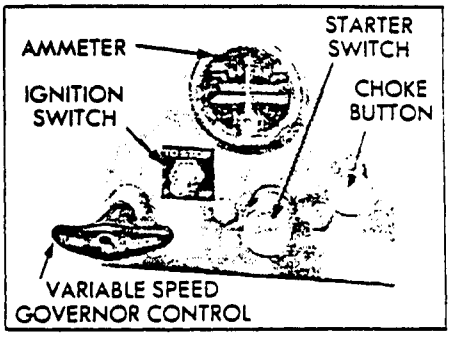


Fig. 7, VH4D, VG4D
CONTROL PANEL

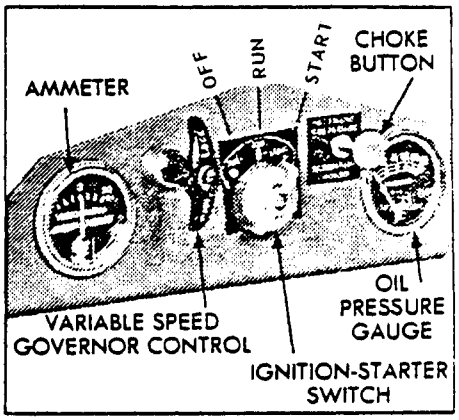


Fig. 8, V465D
CONTROL PANEL

Models VH4D and VG4D only, Fig. 7

5. Pull out ignition switch, if applicable (tag reads "TO STOP PUSH IN").

   Magneto ignition engines (less ignition switch), have a lever type ground switch on side of magneto which is always in the ON or running position, except when depressed for stopping.

5a. Close choke by pulling choke button to extreme out position.

5b. Turn engine over slowly one or two revolutions. CAUTION: Be sure that crank does not bind — apply oil to the crank jaw and crank nut extension for ease of engagement and release.

   Push choke control button in about halfway and then pull up rapidly on the starting crank. Do not attempt to spin the engine with the starting crank. If engine does not start on the first pull up of the crank, re-engage the crank and repeat the operation.

   With electric starting motor; depress starter switch button in place of hand cranking. See Fig. 7.

5c. After engine starts, push choke button in as required for smooth running. Choke should be completely open (button in), when engine is warmed up.

Less choking is necessary in warm weather or when engine is warm, than when cold. Should flooding occur, open choke fully and continue cranking.

Model V465D only, Fig. 8

6. After setting throttle as per paragraph 4.
   Turn IGNITION-STARTING SWITCH to 'Start' position and at the same time pull out choke button only sufficient to start the engine.

MAINTENANCE MANUAL

FOR

"HELAC" PIVOT-TYPE

ROTARY ACTUATORS

TABLE OF CONTENTS

HP - 384