SECTION 3
HYDRAULIC FUNCTIONS
PAGE 1

3.1
HYDRAULIC SYSTEMS

Hydraulics can be defined as the transmission of power by means of a confined fluid in order to accomplish work . The work is done by means of hydraulic jacks and motors which are controlled by valves. Hydraulics power all of the machine functions of the Fletcher roof bolter, with the exception of the dust collection and the lighting systems.

Knowing the roof bolter's hydraulic system is the greatest aid in correct preventive maintenance and efficient trouble shooting. Learning the system can be done in three steps; knowing basic hydraulics, learning your machine's hydraulic system, and understanding how each component functions.

This section deals with the basic hydraulic and hydraulic system, and how components are connected to produce and control work. The next section describes particular component functions and how to check them.

GENERAL HYDRAULICS

Hydraulic work is accomplished by the combination of fluid flow and pressures. Pumps create fluid flow and can only withstand pressure. Pressure is created by resistance to flow made by the pump. For instance, a deadheaded cylinder blocks flow and creates enough pressure to open the relief valve. Valves control the direction of fluid flow, the amount of flow, and the maximum pressure supplied to hydraulic actuators. Actuators convert hydraulic work into mechanical work. (Actuators used on the Fletcher roof bolter include motors and jacks.) Mechanical speed is proportional to the hydraulic flow (gpm) and mechanical force or torque is proportional to the hydraulic pressure (p.s.i.).

The hydraulic system schematic is a diagram that enables a person to see the hydraulic system with all it's circuits and components. Following schematics and understanding them is a must for knowing how your machine works and being able to effectively trouble shoot it. Every Fletcher roof bolter is unique and the system schematic diagram provided in this manual is an accurate representation of the corresponding roof bolter only. This schematic may be used to effectively learn and trouble shoot your machine. The relief valve pressure settings are indicated by each relief valve and hose sizes are indicated in eighths of an inch, i.e. a 6x48 hose is 6/8" or 3/4" diameter hose 48" long. Typical symbols are given on the next page along with some tips for visualizing the fluid flow.

3.1.1
SAFETY NOTES

Before attempting any maintenance or service, be sure to follow these general rules for safety.

1. Never experiment. Before working with or on any equipment, study all bulletins, circuit drawings, manuals, and instructions for equipment on the machine.

2. Protection against accidental starting of the Fletcher Roof Bolter has been provided but personnel in the area of the machine should be warned that service is being performed on the machine.

3. Check pressure gauges to insure that pressure in the system is zero. **NOTE:** even though these machines have what is normally called an open center system there is always a possibility that pressure can be trapped in the system somewhere.

4. Never rush. Study the effects of opening and closing valves or making adjustments before hand to determine the consequences of these actions.

5. Make sure that all parts of a machine are in a down or otherwise safe position. Always block up cylinders holding canopies, crossheads, slides, booms, and other equipment that cannot otherwise be made safe.

6. Disconnect all lines carefully. Plug all lines and valve openings to prevent foreign matter from entering the hydraulic system. Replace all worn or crushed hose.

7. Carefully recheck all hose fittings to insure all lines are tight before starting the machine.

8. In restarting a machine, turn the pump over slowly by jogging the "start" and "stop" switches a number of times. If all hose connections are not secure, leaks will show up, thus the starting and stopping of the pump will prevent a great amount of oil from being spilled in the work area.

9. Check the operation of all systems carefully. If a hose has been crossed (connected to the wrong port of a cylinder or motor) this will prevent possible injury to yourself or other persons. Always completely check the machine before putting the machine into production.

10. Always keep leaked oil cleaned up. Tighten or replace all leaky fittings.

3.1.1.2
SAFETY NOTES
(CONTINUED)

11. Keep your body away from direct contact with hoses, fittings and valves when the machine is running. Bursting hoses can be very dangerous if completely broken into; although a leak is seldom dangerous in some cases high pressure oil escaping through a very very small hole has been known to penetrate the skin when close to the hole.

12. Never attempt to increase the output of a machine by adjusting the valves beyond there rated capacity or the strength of the machine or material being used by the machine i.e. drill steel or bolts.

13. Always be aware of what others are doing. Make sure the operators check with you before starting up the machine. Proper planned maintenance should be considered for the purpose of safety. Replacement of defective, worn, or suspicious parts should take place before and not after an accident occurs.

3.2
TROUBLE SHOOTING

Some of the more common symptoms with suggested check points and possible remedies follow as a trouble-shooting guide.

PROBLEM - MACHINE NOT FUNCTIONING

1. Inspect the pump drive. Check the coupling between the motor and the pump to assure that the two units are properly connected. Check for correct direction of the pump rotation. Check to determine if the drive key or one of the coupling elements is sheared. Check the pump for the correct drive speed.

2. Check the fluid level in the reservoir.

3. Remove the pump pressure line and install a flow meter. Determine if the pump is delivering any fluid. See if the intake filter is plugged or restricted in any way. Determine whether the suction pipe might be leaking. See if the reservoir breather or air vent is restricted.

4. When pressure lines pass through contained areas in the reservoir or machine housing, check for broken lines, kinks, or other restrictions.

5. Check to see if foreign matter in the relief valve has caused the valve to stick open.

6. If the pumps are delivering oil but no systems are operational, check the electrical solenoid dump valve, since this controls the pilot pressure for the check and relief valve cartridge which in turn dumps all pump output to the hydraulic reservoir.

PROBLEM - EXCESSIVE PUMP NOISE

1. Check the fluid level in reservoir, see section 1.3.
2. Check the inlet strainers and lines for clogging.
3. Make sure the fluid is at operating temperature.
4. Check for vacuum leak in the suction line.
5. Check for vacuum leaks in the pump-shaft packing if the pump is internally drained. Flood the pipe connections to the pump with the fluid being pumped.When the noise stops or abates momentarily, the point of air entry has been located.
6. Inspect alignment with the drive motor. Misalignment will cause seal and bearing wear and a subsequent high operating noise level. Excessive misalignment can increase power requirement.
7. Study the manufacturer's specification relative to wear. High noise levels may be an indication of wear.

3.2.1
TROUBLE SHOOTING
(CONTINUED)

8. Make certain the fluid used in the machine conforms to the Manufacturer' recommendations.

9. Check to see if the relief or unloading valve is set too high. A reliable gauge must be used to check operating pressure. The relief or other pressure control valve may have been set too high with a damaged gauge. Determine if the system unloading valves that control pump delivery are at the desired settings.

PROBLEM - PRESSURE - CONTROL VALVE NOISE

1. Check to see if the flow is in excess of the valve capabilities. Check to see if the fluid temperature is beyond normal the level or if the valve piston permits too much control oil to pass through the integral pilot because of surface damage or scored walls.

2. Determine whether the control chamber orifice within the relief valve is too large for the viscosity of the fluid in the system. Consequently, this condition often results in a high pitched whistle, chatter, or both.

3. Check for rapid changes in back pressure for internally drained pilot relief valves, which will create a flutter of the primary valve element.

4. Look for a worn or damaged pump with erratic delivery. The delivery from the pump can become sufficiently unstable to prevent the relief valve from leveling out pulsations.

5. Flutter and noise in the relief valve can be caused by high frequency shock loadings.

NOTE: Relief valves for particular pump sections should have at least 100 psi difference between valve sections.

3.2.1.1
TROUBLE SHOOTING
(CONTINUED)

Excessive heat may be caused by incorrect fluid supply and pressures on the system or component, fluid bypassing, or a malfunctioning component.

PROBLEM - EXCESSIVE FLUID HEAT

1. See if the pump is being operated at a higher pressure than required. Reduce the pump pressure to the setting given on the circuit schematic.
2. Check the fluid level. See section 1.3.3.
3. Check the condition of the filters. See section 4.3
4. Make sure the correct fluid is being used.
5. Check for excessive heat in a particular component.

PROBLEM - EXCESSIVE PUMP HEAT

1. Make sure the problem is not due to excessive fluid heat.
2. Check inlet strainers and lines for clogging.
3. Check for a vacuum leak in the suction line or pump shaft packing. (See step 5, excessive pump noise).
4 Check the pressure to see if it is higher than required. Reduce it if necessary.
5. Inspect the alignment and check the condition of seals and bearings.
6. Check for high work loads. When no operations are being performed the pressure should drop to under 300 p.s.i.

PROBLEM - EXCESSIVE MOTOR HEAT

1. Make sure the problem is not due to excessive fluid heat.
2. Check the motor supply and return pressure to see if it is higher than normal.
3. Check the alignment and the condition of seals and bearings.
4. Check for excessive loading or mechanical binding.
5. If the motor is worn or damaged, replace or overhaul as necessary.

3.2.1.2
TROUBLE SHOOTING
(CONTINUED)

PROBLEM - EXCESSIVE RELIEF VALVE HEAT

1. Make sure the problem is not due to excessive fluid heat.
2. Check the pressure setting and correct it if necessary.
3. Check the valve for wear or damage. Replace it if necessary.

PROBLEM - NO FLOW

1. Check the remedies for machine not functioning (no movement of actuators)
2. Make sure the directional control valve is in the right position.
3. Check for flow passing over the relief valve. Adjust it if necessary.

PROBLEM - LOW FLOW

1. Check the flow control setting and adjust it if necessary. (causes flow movement).
2. Check for flow passing over the relief valve. Adjust if necessary.
3. Check manually operated controls for bypassing due to incorrect position.
4. Check for external leaks in the system. Tighten fittings and replace hoses as necessary.
5. The problem may be due to bypassing at worn or damaged valves, motor, cylinder or other component.

PROBLEM - EXCESSIVE FLOW

1. Check the flow control valve for improper setting or damage.
2. An improperly sized pump may have been used as a replacement or lines to the pump sections may be crossed.

PROBLEM - NO PRESSURE

1. See the "Problem - No -Flow paragraph of this section. There must be flow to create resistance that in turn builds pressure.

3.2.1.3
TROUBLE SHOOTING
(CONTINUED)

PROBLEM - LOW PRESSURE

1. See the "Problem - Low Flow" paragraph of this section
2. The pressure reducing valve or relief valve may be set too low or damaged.
3. A component of the system is excessively worn or damaged.

PROBLEM - ERRATIC PRESSURE

1. Check the tank for air in the fluid. If air is present, tighten leaky connections and check the fluid level.
2. The relief valve may be worn or erratic back pressure may cause a pilot operated relief to behave this way.
3. Check for contaminated or dirty fluid. Replace filters and fluid if necessary.
4. Worn pumps, motors, or cylinders can also cause erratic pressure variations.

PROBLEM - EXCESSIVE PRESSURE

1. Check the pressure relief, unloading, or reducing valves for maladjustment, wear, or damage.

PROBLEM - FOAM IN PETROLEUM - BASE FLUIDS

1. Determine if the return-to-tank line is above the fluid level. The return pipe may be broken or the line may have been omitted between a bulkhead coupling and the bottom of the tank after the tank was previously cleaned.
2. The fluid may be contaminated.
3. The pump suction line or shaft seal may be leaking.
4. The discharge lines may be too close to the pump suction line.

PROBLEM - FOREIGN MATER IN FLUID MEDIUM

1. The components and over all system may not have been properly cleaned after servicing.
2. All rust and pipe scale may not have been completely removed from the system.

3.2.1.4
TROUBLE SHOOTING
(CONTINUED)

3. Pipe dope or tape sealer may have been allowed to get inside fittings and subsequently circulated throughout the system.

4. Check for burrs inside the piping and components.

5. Check for inadequate or damaged screening in the fill pipe.

6. See if the air intake or breather has been left off. Perhaps no air breather was initially provided, or there may be inadequate protection of the air cleaner.

7. The tank may not be properly gasketed, or the cover may be warped.

8. Determine if frayed ends of the packing may have come loose.

9. Check to see if the static seals have been extruded into the fluid lines because of excessively high pressures. Damaged or omitted backup rings may permit the seal to flake or extrude into fluid lines.

10. Maintenance personnel may have created the condition by not protecting the system components properly while doing repair work. Open lines may have been left unprotected.

11. Determine whether the filter is continually bypassing because of a need for cleaning or replacement of element.

12. Determine whether the magnetic devices have been cleaned at suitable intervals, Perhaps the collected materials have migrated because of vibration within the system.

SLOW OPERATION, MARGINAL PERFORMANCE

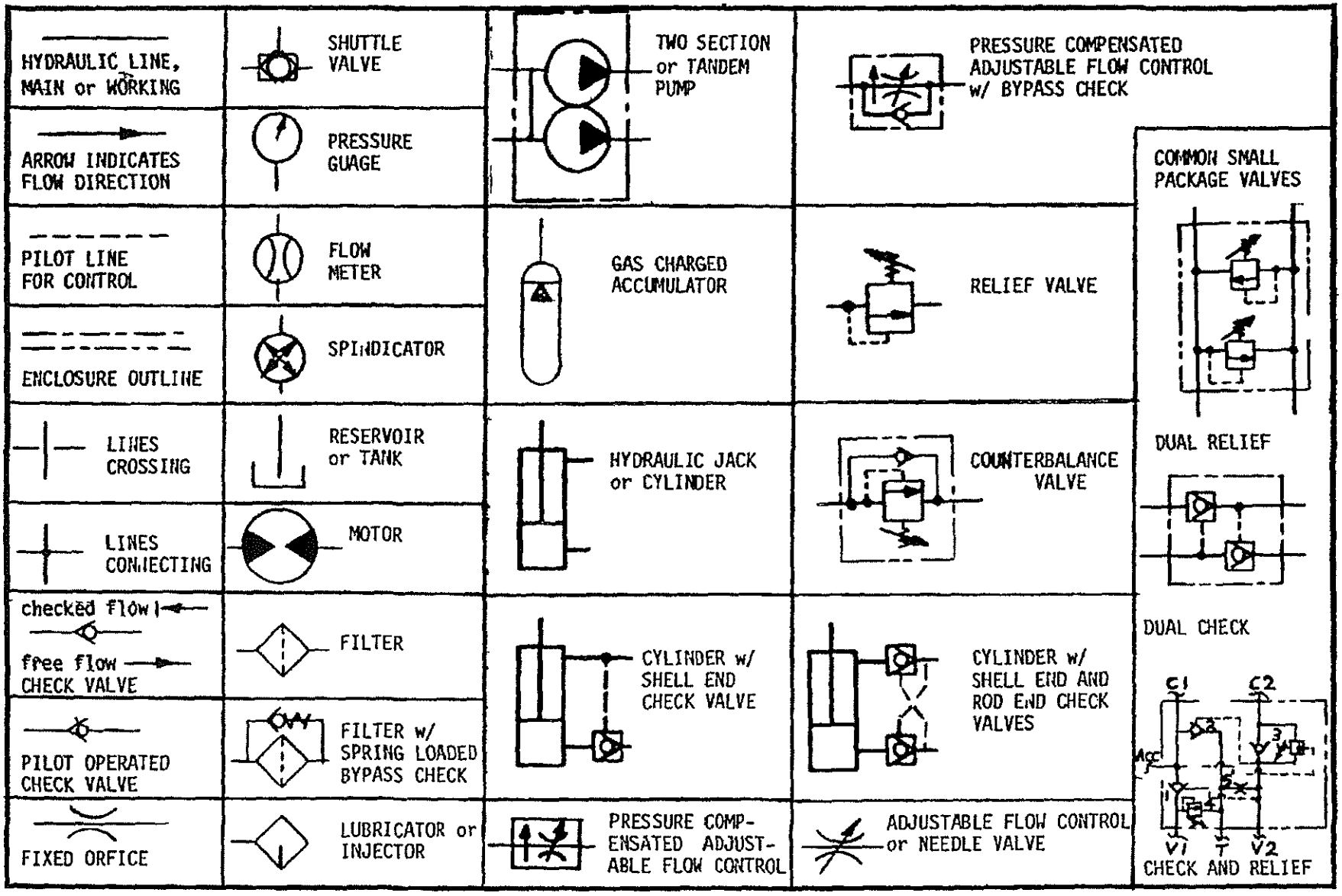
1. Check the output of the pump because wear may be reducing the pump flow.

2. Check for an internal leak that may cause a hot pipe or localized heat on a component.

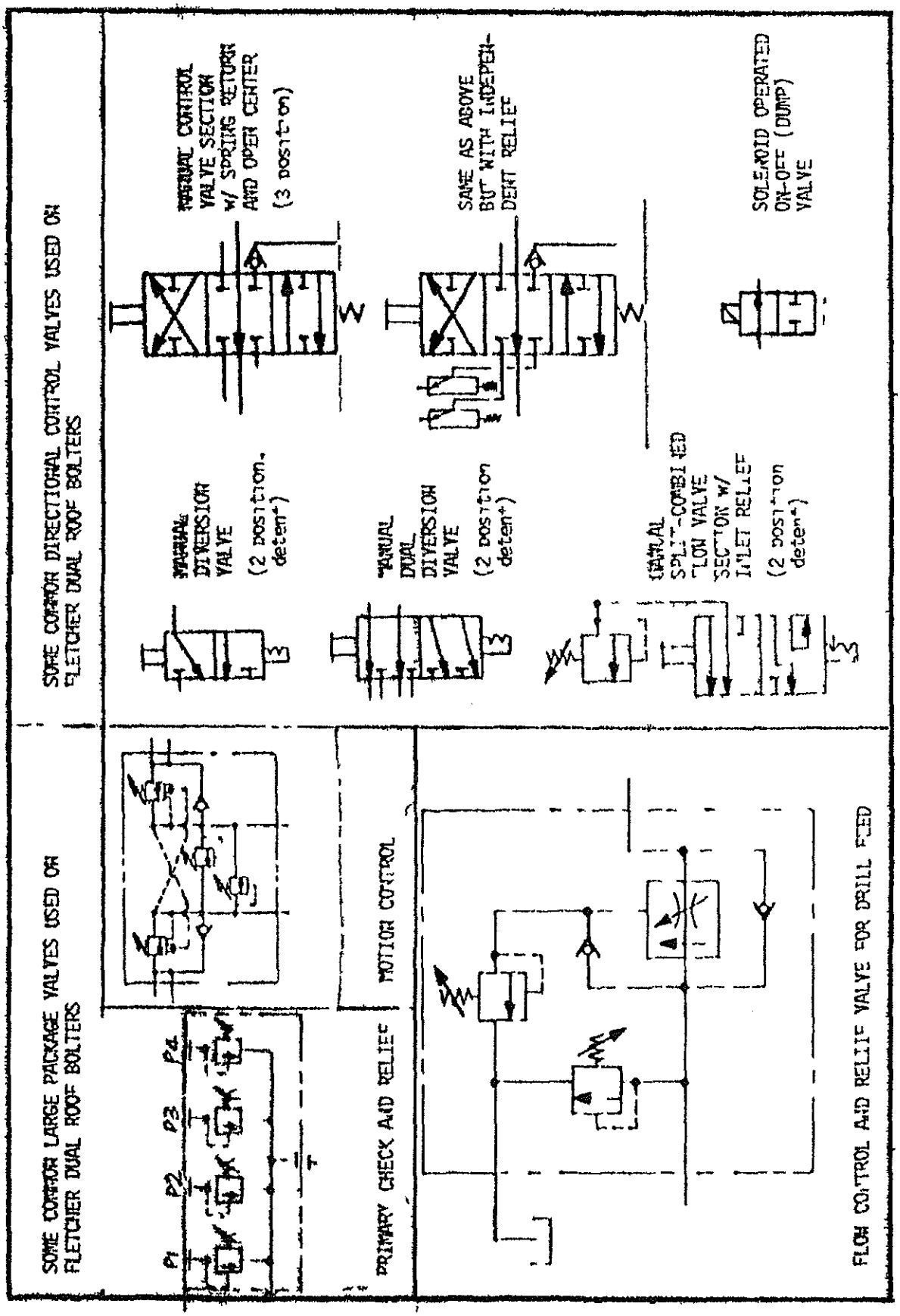
3. Check the setting of the unloading valves. Check to see if the high volume pump is cutting out too soon or if an unloading valve is not closing completely.

4. To check a cylinder for bypassing of oil, actuate the cylinder to the end of the stroke. Turn off the machine. Disconnect one line to the cylinder and plug the line. Operate the control handle and if oil comes out of the cylinder port the cylinder must be replaced.

3.3 HYDRAULIC SCHEMATIC SYMBOLS



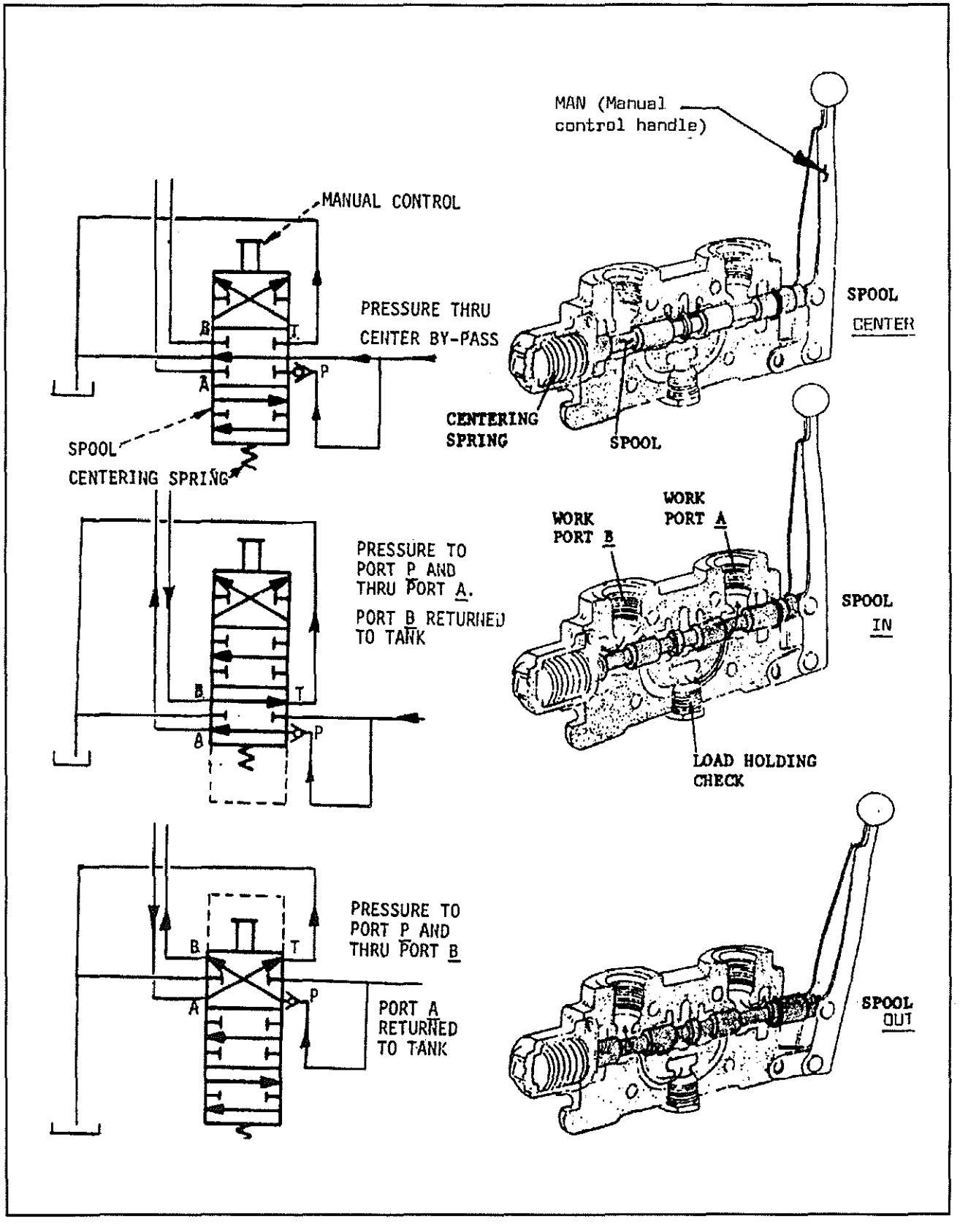
HYDRAULIC SCHEMATIC SYMBOLS CONTINUED



3.3.1 HYDRAULIC SCHEMATIC SYMBOLS CONTINUED

3.3.2
HOW TO READ THE HYDRAULIC SCHEMATIC

All valves are shown in the neutral position on the hydraulic schematics. To follow oil flow through a system, visually imagine the valve spool shifting as shown below.



3.4
MACHINE HYDRAULIC CIRCUIT

By following the machine hydraulic circuit schematic, the flow of hydraulic fluid can be traced through the system. The hydraulic fluid, specified in section 1.3.2, is stored in a sealed metal tank and held under slight pressure by a 5 p.s.i. vent cap. Four outlets in the lower portion of the tank feed the pumps through inlet lines and magnetic filters (the magnetic filters are not shown on the schematic). The right and left hand pumps each have separate 9 g.p.m. and 27 g.p.m. sections. The two 27 g.p.m. units push fluid through pressure line filters to a dual diversion valve that routes the oil to either respective boom valve banks or through a check valve in each line to the tram valve bank. The right hand 9 g.p.m. pump section feeds the right boom control valves of the position control valve bank and is switched by a diversion valve at the position control area. The left hand 9 g.p.m. pump section feeds either the cable reel take-up motor or the control valve bank in the tram area and the left boom control valves and is switched by a diversion valve in the tram area. All four sections split after leaving the pump, go to pressure gauges, and then to the primary check and relief valve package. Individual circuits pertaining to each section of the control vale banks are covered separately.

F HIGH VOLUME
G LOW VOLUME
H RETURN OIL
I CASE DRAIN
J LOW PRESS RETURN
E LOW PRESS RETURN
D CASE DRAIN
C RETURN OIL
B LOW VOLUME
A HIGH VOLUME
4X96
8X195
4X60 B
4X60 A
4X77 B
4X77 C
ATRS RAISE
FRONT LIFT
REAR LIFT
L.H. TRAM
R.H. TRAM
PUMP CONTROL
2400 PSI
147923 CONTROL VALVE ASSEMBLY
8X25
8X124
38198 DUAL DIVERSION VALVE
18289 GAUGES
FILTER
8X124
8X26
36924 FLOWMETERS
6X32
12X134
10X144
143879 PUMP
48833 MAG STRAINERS
2531 CHECK VALVE
8X114
6X32
12X138
10X148
6X122
38208 MAIN PUMP RELIEF
6X114
37198 DIVERSION VALVE
176917 MANIFOLD
41818 CABLE REEL MOTOR
4X44
4X78
31468 TRAM CHAIN OILERS
4X108
6X114
8X116
2X76
2X72
2X86
2X84
3X58
8X72
4X36
37195 CHECK VALVE
4X110
31468 FLOW CONTROL
38145 FLOW CONTROL AND RELIEF VALVE ADJUST 700-1100 PSI TO GIVE PROPER SPEED ON CABLE TAKE-UP
4X33
176917 ORIFICE MANIFOLD
120366 3/64 ORIFICE 2 REQUIRED
2X66
120365 1/32 ORIFICE
2X42
147093 CONTROL VALVE ASSEMBLY
2400 PSI
CABLE REEL
FILL
REAR LIFT
FRONT LIFT
18288 GAUGE
1100 PSI
37195 CHECK VALVE
37764 CAM VALVE
2X124
4X12
6X
36854 ATRS PKG.
45414 ACCUMULATOR
4X56
4X54
4X138
56719 TRS FOOT CYLINDER W/2 31577 P.O. CHECK VALVES
152124 TRS RAISE CYLINDER W/ 31577 P.O. CHECK
45414 ACCUM.
2X88
2X32
3X30
3X80
56912 REAR LIFT CYLINDER W/ 31577 PILOT CHECK (2 REQ'D)
31508 FLOW CONTROL W/ BYPASS CHECK
2X72
3X72
2X86
2X84
3X96
3X30
56912 FRONT LIFT CYLINDER W/ 31577 PILOT CHECK (2 REQ'D)
31508 FLOW CONTROL W/ BYPASS CHECK
2X152
3X148
4X122
4X166
TANK
8X80
8X44
8X40
143835 HAND PUMP
150272 HAND PUMP FILTER
8X72
OIL
OIL
2400 PSI
R.H. TRAM
2400 PSI
L.H. TRAM
2700 PSI
148221 CONTROL VALVE
8X140
8X136
8X106
8X130
41913 VENTURI FILL PUMP
37197 SHUTTLE VALVE
2X22
2X38
37806 PRESSURE REDUCING VALVE
1500PSI
2X18
18289 GAUGE
2X118
37157 MOTION CONTROL VALVES
8X30
8X32
53777 DISC BRAKE CALIPERS
2X64
198387 ADAPTER BLOCK (2 REQ'D)
36845 TOWING VALVE (2 REQ'D)
41803 TRAM DRIVE MOTOR
3X40
2X32
41803 TRAM DRIVE MOTOR
P103 HAND PUMP
18289 GAUGE
CHI-6405 PILOT CHECK
37197 SHUTTLE VALVE

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HYDRAULIC CIRCUIT, CHASSIS
JOB 36163 S/N 94032

			DRAWN	GWR	DATE 2-16-05
			SCALE FULL	SHEET 1 OF 1	SIZE D

DRAWING NO 36163-100

LEFT BOOM

38140 FAST FEED ON-OFF VALVE
2X52
41842 DRILLHEAD MOTOR
6X36
6X74
8X35
148542 CONTROL VALVE
FEED
4X59
4X50
6X36
37876 PILOT DIVERSION VALVE
54109 FEED CYLINDER
2X12
2X60
37765 FLOW CONTROL VALVE
ROTATION
6X45
6X31
2X48
2X38
8X32
4X22
31569 BOLT TIGHTENER ON-OFF VALVE
38058 PRECLEANER PACKAGE VALVE
38214 THROTTLE VALVE
152378 FOOT CYLINDER W/ 31577 PILOT CK
6X14
2X40
37788 TORQUE & THRUST VALVE PKG TORQUE: 700-1100 THRUST: 600-800
1800 PSI
STAB FOOT
3X58
3X26
3X31
3X28
2X100
152352 PRECLEANER CYLINDER
BOOM EXTEND
2X86
56642 BOOM SUMP CYLINDER
152244 BOOM SWING CYLINDER
BOOM SWING
3X30
3X32
31538 FLOW CONTROL AND RELIEF VALVE ADJUST 700-1100 PSI TO GIVE PROPER DRILL THRUST
4X32
4X36
M
T
P
4X34
2X59
2X30
2X58
CANOPY
900 PSI
56960 CANOPY CYLINDER W/ 31577 P.O. CHECK
4X58
8X34
8X58
37759 RELIEF VALVE
1800 PSI
3X89
3X76

B LOW VOLUME OIL
A HIGH VOLUME OIL
C RETURN OIL
E LOW PRESSURE RETURN
D CASE DRAIN RETURN

RIGHT BOOM

38140 FAST FEED ON-OFF VALVE
2X52
2X
41842 DRILLHEAD MOTOR
6X36
6X74
6X31
8X38
148643 CONTROL VALVE
4X59
4X50
4X22
54109 FEED CYLINDER
37876 PILOT DIVERSION VALVE
2X12
8X32
2X48
2X38
31569 BOLT TIGHTENER ON-OFF VALVE
37765 FLOW CONTROL VALVE
FEED
ROTATION
6X31
6X45
6X14
38214 THROTTLE VALVE
152378 FOOT CYLINDER W/ 31577 PILOT CK
38058 PRECLEANER PACKAGE VALVE
37788 TORQUE & THRUST VALVE PKG TORQUE: 700-1100 THRUST: 600-800
2X40
3X31
3X58
3X26
3X28
STAB FOOT
152352 PRECLEANER CYLINDER
2X110
BOOM EXTEND
2X86
152244 BOOM SWING CYLINDER
56641 BOOM SUMP CYLINDER
3X30
3X32
BOOM SWING
31538 FLOW CONTROL AND RELIEF VALVE ADJUST 700-1100 PSI TO GIVE PROPER DRILL THRUST
4X32
4X36
M
T
P
4X34
2X58
2X30
56960 CANOPY CYLINDER W/ 31577 P.O. CHECK
900 PSI
CANOPY
37769 RELIEF VALVE
1800 PSI
LOW VOLUME OIL
G
3X76
3X89
4X30
8X58

I CASE DRAIN RETURN
J LOW PRESSURE RETURN
H RETURN OIL
F HIGH VOLUME OIL

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HYDRAULIC SCHEMATIC, BOOM CIRCUIT
ROOFBOLTER, JOB 36163 S/N 94033

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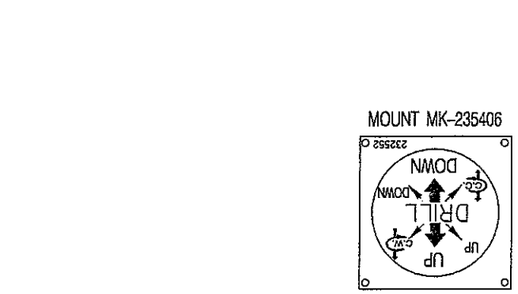
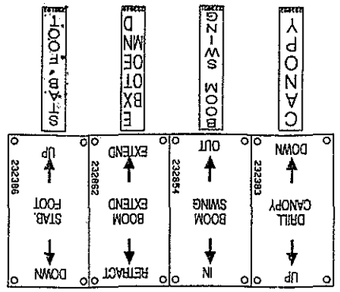
DATE: 2-22-05
SCALE: FULL
SHEET 1 OF 1
SIZE: D
DRAWING NO. 36163-101





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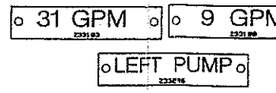

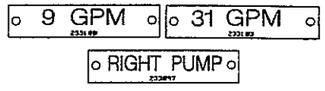

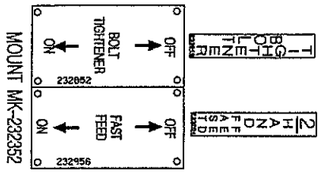

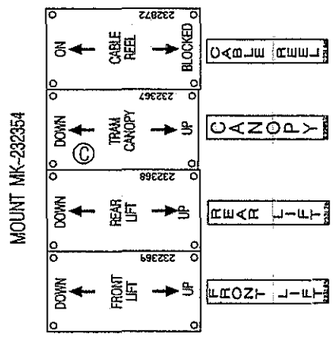

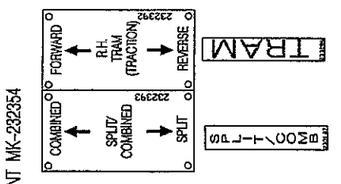

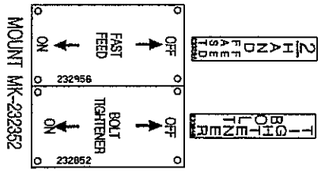

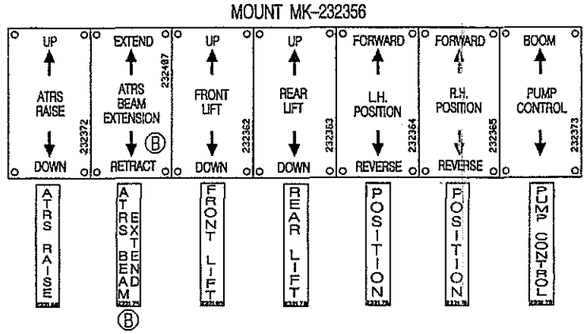

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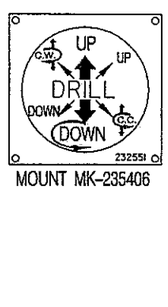
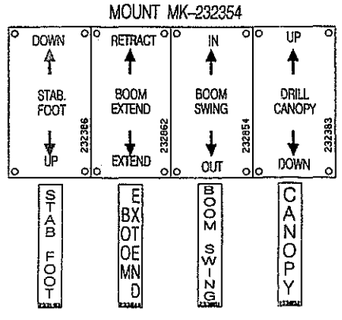


MOUNT MK-235406



MOUNT MK-232354

DIMENSIONAL TOLERANCES IN INCHES UNLESS OTHERWISE SPECIFIED:
BREAK CORNERS 0.005" - 0.015"
PROJECTION ANGLE
DECIMALS
0.XX +/- 0.01
0.XXX +/- 0.005
FRACTIONS +/-1/16" ANGLES +/- 1°

UNLESS OTHERWISE SPECIFIED ALL STEEL SPECIFICATIONS ARE:
HRS PLATE ---- A36
HRS BAR ------ A36 OR 1020
ALLOY BAR ---- 4140/4142 HEAT TREATED

WELDING:
UNLESS SPECIFIED, ALL JOINTS TO BE CONTINUOUS DOUBLE FILLET WELDS AT LEAST HALF THE THICKNESS OF THE THINNEST MEMBER.

J. H. FLETCHER & CO.
HUNTINGTON, W.V

TAG DRAWING FOR
DDO
AEP #2

SCALE NTS
DATE 05/06/98
BY TB
DRAWER 57X
DWG 98312

FILENAME: 98312T_hyd

DO NOT CHANGE MANUALLY

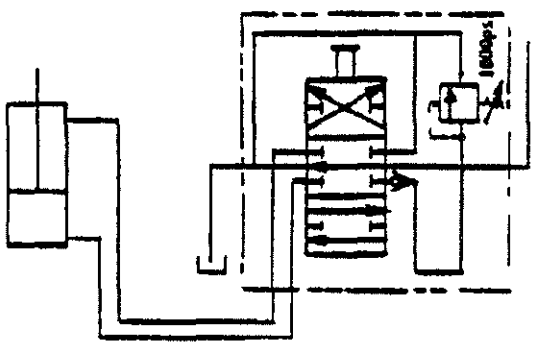
REV	DATE	BY	CHANGE
*	*	*	*
C	07-15-98	TR	232387 WAS 232872 CHECKED AGAINST BODY DS PAPER CHECKED AGAINST
D	...	...	CHANGE

3.5
INDIVIDUAL CIRCUITS

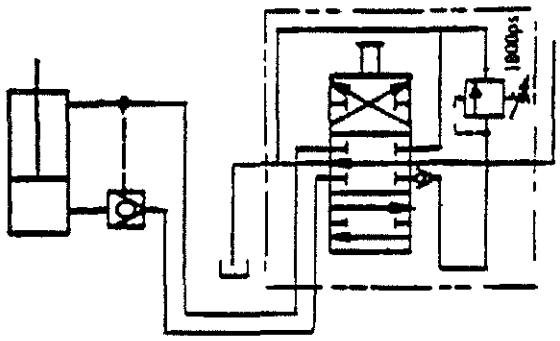
Circuits that are controlled by a single control valve section or that can be singled out in some other manner so they can be described and trouble shot separately are discussed in this part of the hydraulic system section. These individual circuits are somewhat general, therefor, the machine circuit schematic must be referred to for an exact representation of what is provided on your roof bolter.

3.5.1
GENERAL CYLINDER CIRCUITS

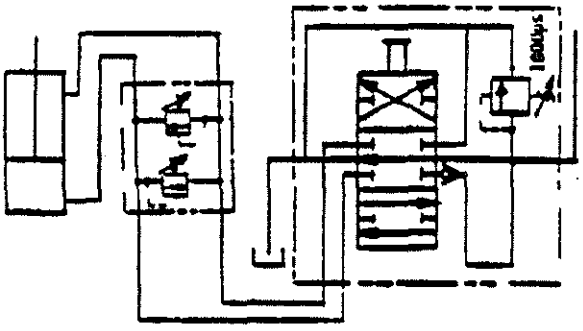
In general, most cylinder circuits are the same, a control valve section pressurizing either one end of the cylinder or the other. Components may be added in one or both lines, however, if one understands the components, the system is easily understood. Some typical combination of a basic cylinder circuits and components are shown below with the additional components effect on the system described.



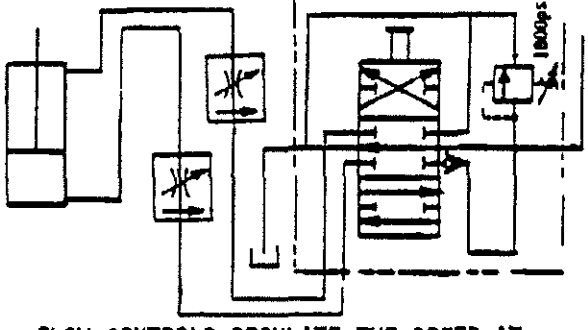
SIMPLE CYLINDER CIRCUIT



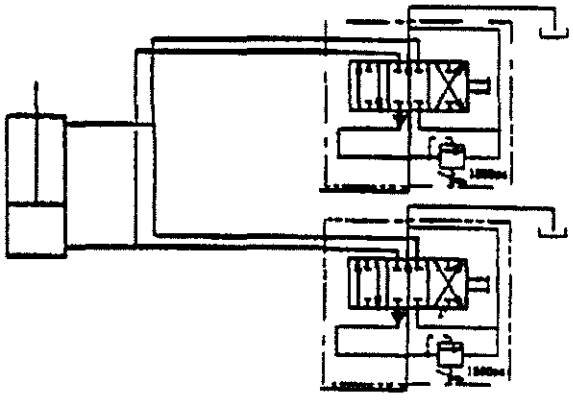
PILOT CHECK PREVENTS CYLINDER FROM RETRACTING WHEN PRESSURE IS REMOVED UNLESS PRESSURE IS SUPPLIED TO PILOT



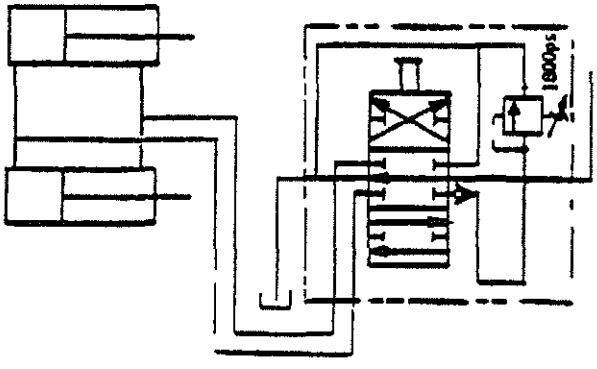
DUAL RELIEF PREVENTS CYLINDER FROM BEING OVERLOADED WHEN CONTROL VALVE IS IN NEUTRAL POSITION



FLOW CONTROLS REGULATE THE SPEED AT WHICH CYLINDERS EXTEND AND CONTRACT



DUAL CONTROL VALVE SECTIONS ALLOW THE CYLINDER TO BE CONTROLED FROM TWO CONTROL VALVE BANK LOCATIONS



TWO CYLINDERS ON ONE CONTROL VALVE SECTION ALLOWS TWO FUNCTIONS TO BE PERFORMED AT ONCE OR TWO CYLINDERS TO WORK ON ONE FUNCTION

3.5.2
ROTATION & BOLT TORQUE/THRUST CIRCUIT

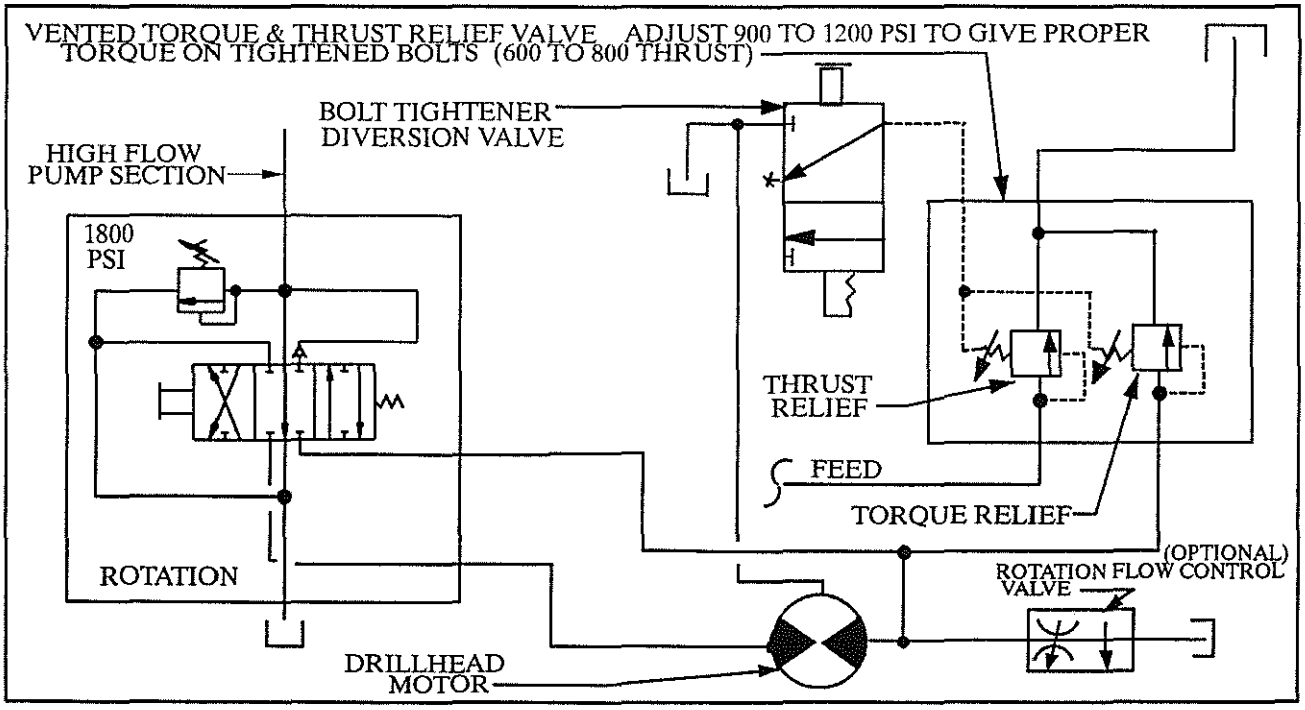
The rotation control valve section supplies fluid to the drillhead motor from the high flow pump section. The maximum torque provided while drilling is set by the relief valve in the control valve bank and the rotation speed is controlled by adjusting the flow control valve. Opening the flow control increases bypass flow to tank and slows the drillhead, conversely, closing the flow control decreases bypass flow and increases the drillhead motor speed. In order to lower the drillhead torque for tightening bolts, a vented relief valve is used to lower the fluid pressure. The relief valve is activated by operating a diversion valve which opens its vent line to tank.

Setting the bolt torque/thrust circuit; start with the thrust setting, loosen the lock nut on the thrust relief valve (the smaller of the two cartridges if using the 36751) and adjust in about 2/3's of the adjustment, turn on the bolt tightener diversion valve. Now run the drillhead all the way up, while holding the drill feed pressure in the feed up position adjust the thrust relief valve out, or reduce pressure, until the drillhead begins to retract away from the roof, then turn the adjustment screw in 1/4 turn and lock down the locking nut and release feed pressure. (Make sure that the proper feed pressure settings have been made before adjusting the thrust relief valve.) [SEE SHEET 3.5.4]

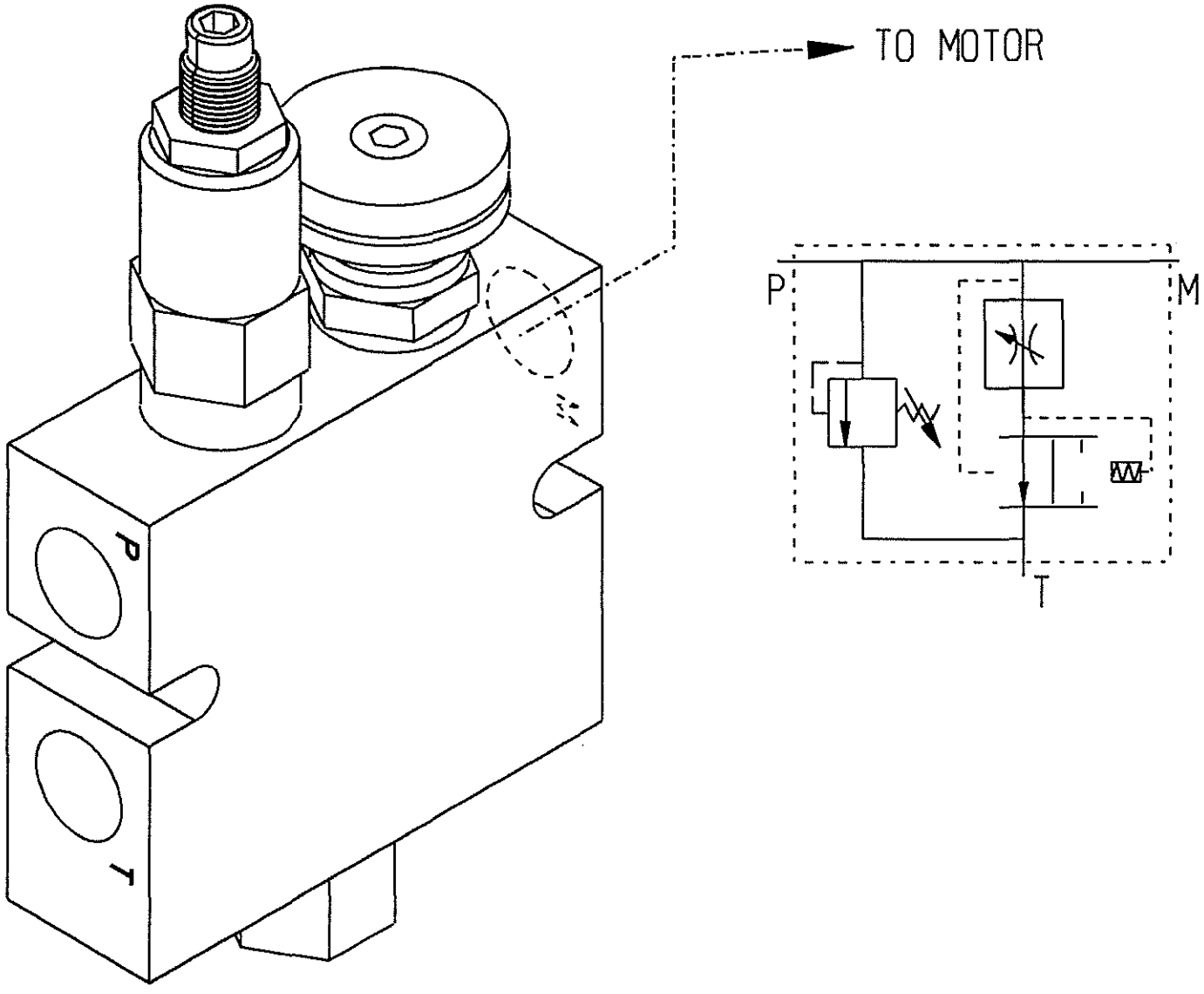
Now to adjust the torque setting, start with bolt torque relief valve adjusted to a low setting, and the bolt tightener diversion valve still turned on, install bolts and gradually increase the setting until the desired torque is achieved in the installed bolt. After this torque has been achieved, continue installing bolts and checking the installed torque until the proper torque setting has been maintained.

If necessary to stall the circuit for trouble shooting purposes, the hoses to the drillhead should be plugged, The circuit must never be stalled by mechanically fouling the drillhead rotation.

DANGER: Do not check the torque output of the drillhead by inserting a torque wrench in the chuck and stalling the circuit. Doing so can result in personnel injury or death.



3.5.3.1
CABLE REEL SPEED CONTROL VALVE

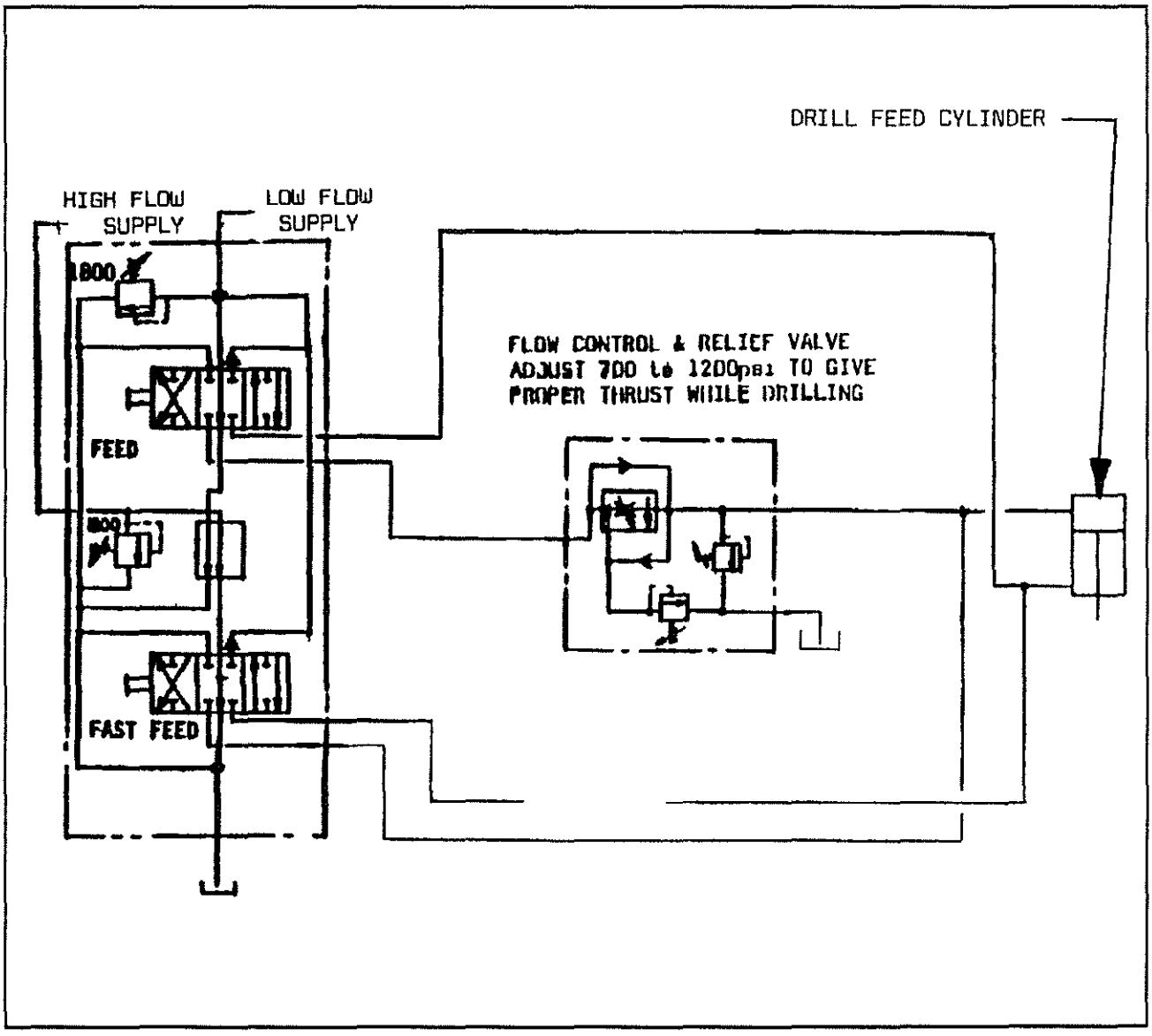


Cable reel valve previously was marked with a "P" at the "M" port and has been hosed with "P" understood to be common. From now on "M" port, or the port on the flow control side of the valve, should be plumbed to the cable reel motor. Pressure should be plumbed to "P" on the relief valve side of the valve body.

2/18/92

3.5.4
FEED CIRCUIT

The feed circuit operates the forward and reverse movement of the drillhead. Two control valve sections supply fluid to the feed cylinder. One supplies fluid from the high flow line and is directly connected to the feed cylinder. It is called the fast feed. No adjustments can be made except the appropriate control valve bank relief valve. The other valve section (**FEED**) supplies fluid from the low flow line and is used when drilling. In this part of the circuit the fluid passes through a priority flow control valve. The flow control adjusts the speed that the feed cylinder travels in or out by dumping an adjustable amount to the tank. This valve should be adjusted under drilling conditions so that the bit advances at the speed desirable for the coal seam being drilled. One of these valves is located on each side of the drill next to the drilling controls. When using the controls on one side the other flow control should be shut completely off.



3.5.5
TEMPORARY ROOF SUPPORT CIRCUIT

Most of our TRS systems are supplied with adjustable rocker pads which allow the width of the support envelope to be varied in six inch increments from eight to ten feet on one model and from ten to twelve feet on another. All of these roof supports are actuated by hydraulic cylinders equipped with integral pilot operated check valves which have a design pressure rating of 10.000 psi. a look at the schematic in figure 4 shows that the circuit is designed to provide maintained thrust against the roof. When the control valve section is actuated to extend the cylinder flow is directed to the v1 port in the relief and check valve package. A built in relief valve on the up-stroke side of the circuit allows the pressure setting on the system to be altered. Downstream from the relief valve there is a pilot operated check valve in the line which acts to keep the accumulator charged. The accumulator usually has a capacity of one gallon and is in the circuit to provide make-up oil to the system which offsets settling of the foot into the floor and minor leakage at the cylinder. The rod end or downstroke pressure circuit passes back through the check and relief valve assembly. In the valve there is a counterbalance cartridge that keeps the cylinder from extending if there is no accumulator or control valve pressure. There is a tee through a small orifice to tank which allows the cylinder to extend under accumulator pressure.

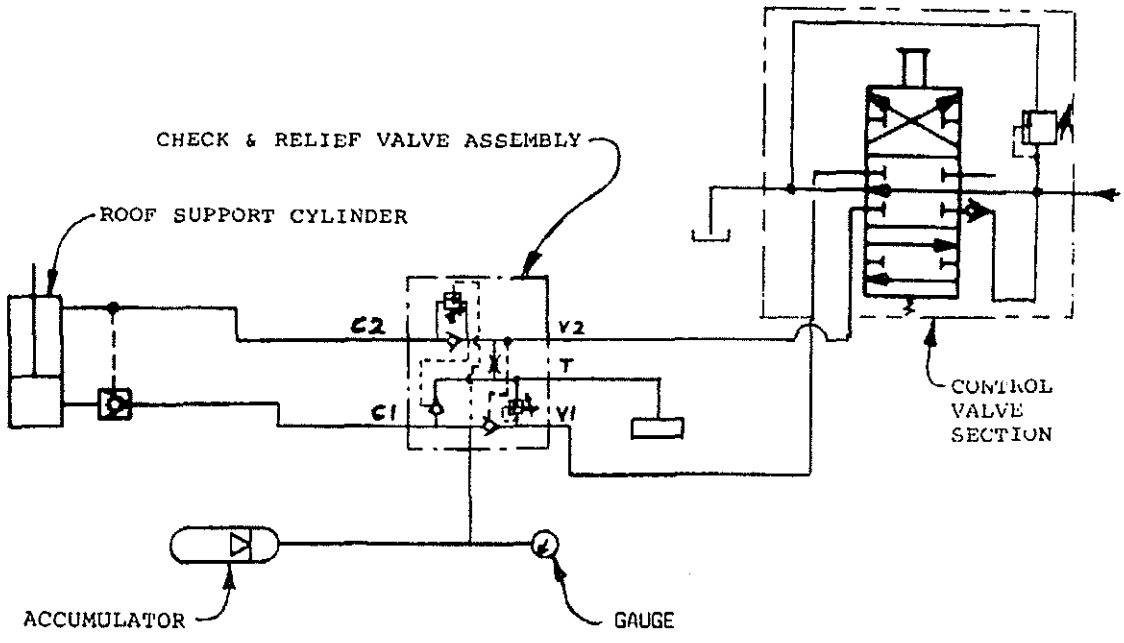


FIGURE 4

3.5.6
TRAM CIRCUIT

When the dual diversion valve is in the tram position, two separate pump sections are directed to the tram control valve bank. This bank consists of an inlet, and outlet, and a split-combined flow section between two control valve sections. One pump section enters at the inlet and the other enters at the split-combine valve section. With the split-combined section in the split flow position, the output of each pump section is only available to its respective tram motor. With the valve in the combined position, the output of both pumps is available to either tram section. This control is provided to allow the machine to be moved with one electric motor or one pump out of service. Two check valves are used before each pump circuit enters the valve bank to prevent oil from flowing back through the unused pump section. Two valve sections in the position control valve bank are tied in parallel to the tram control valve, but only one pump section to allow positioning the machine for drilling.

The motion control valves, stop motor movement unless pressure is supplied from a control valve. The disc brakes are tied into the motor supply lines so they will release when tramming pressure is provided. The shuttle valve allows the brakes to receive pressure in either the forward or reverse direction without the lines crossing over.