REED

TRAINING MANUAL

Basic Concrete Pump Hydraulics and Operation

Training Booklet

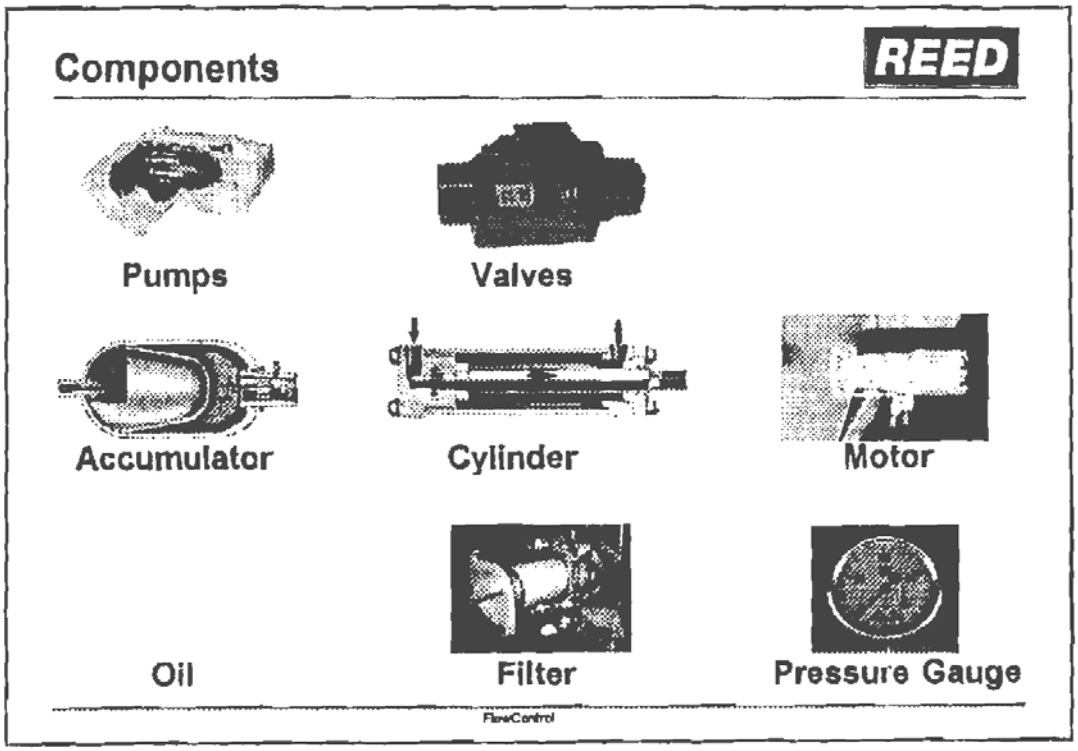
Subjects Covered:

- Safety
- Hydraulic Components
- Symbols
- Circuit Applications
- Operation
- Electrical Circuit
- Maintenance
- Troubleshooting

This Training Manual gives an introduction to the principals of operation on concrete pumps. It is designed to teach the basic understanding of hydraulic operation and function of system components, hydraulic circuits, and the symbols used. The electrical circuit is also mentioned in order to give an understanding of the relationship between hydraulic and electrical components, and how they work in unison. A basic Safety, Operation, Maintenance and Troubleshooting section has also been included for reference.

NOTE: This is only a booklet for training. It does not replace the machinery documentation. The machines manual and safety section must be read and understood prior to operation and maintenance of the equipment.

More Details:



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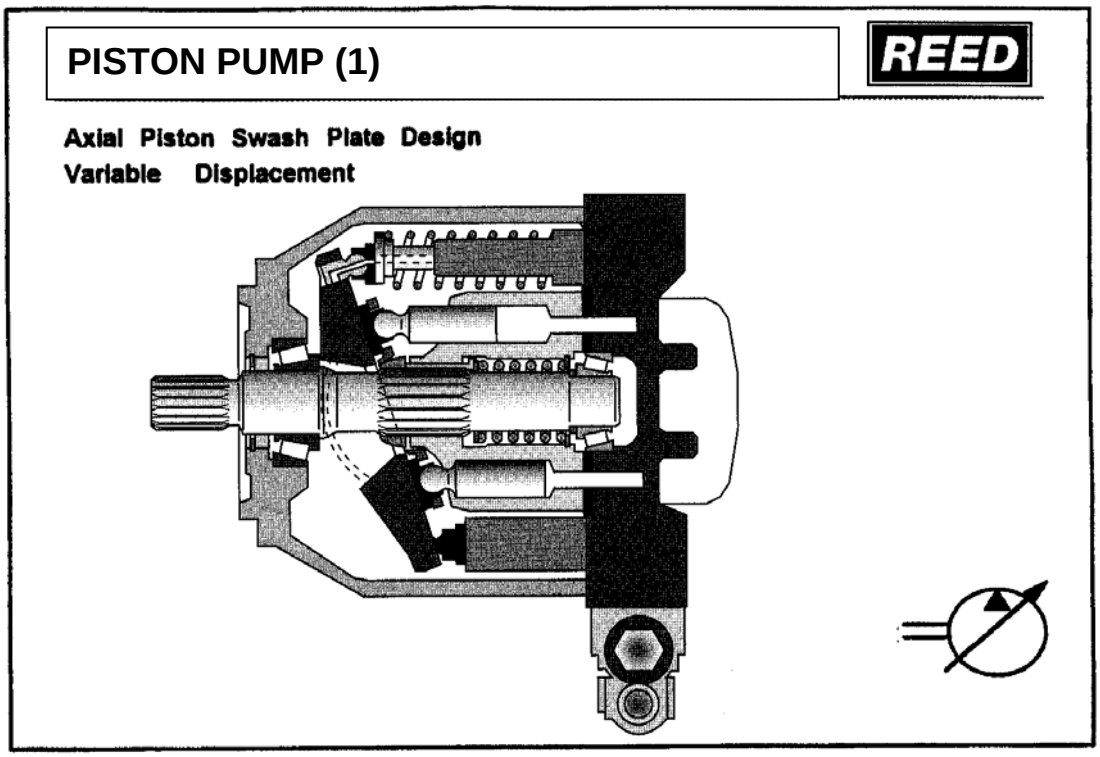


MORE DETAILS:

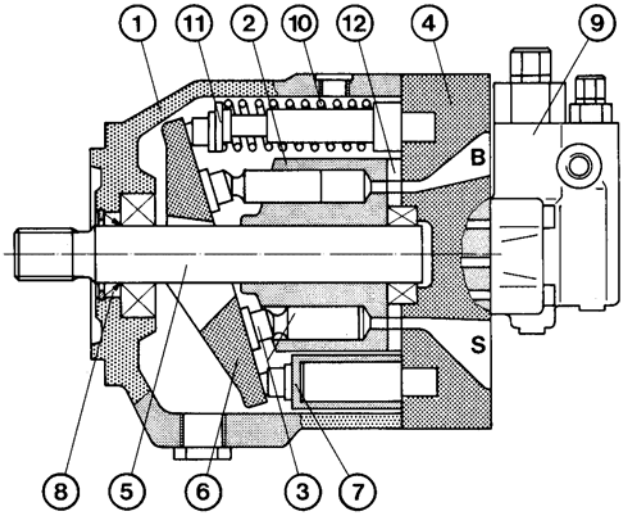
Pumps are the hearts of a hydraulic circuit. Driven by the drive shaft from the engine they run the oil in the circuit driving on their part all the components there. Among various designs piston pumps and gear pumps are the one's used for the concrete pumps.

Piston pumps are pumps that give a high output and build up a high pressure.

Fixed displacement pumps give an output depending on the rpm of their driveshaft.
Variable displacement pumps can give an output that is independant from rpm. This type of pump is used as the main pump.

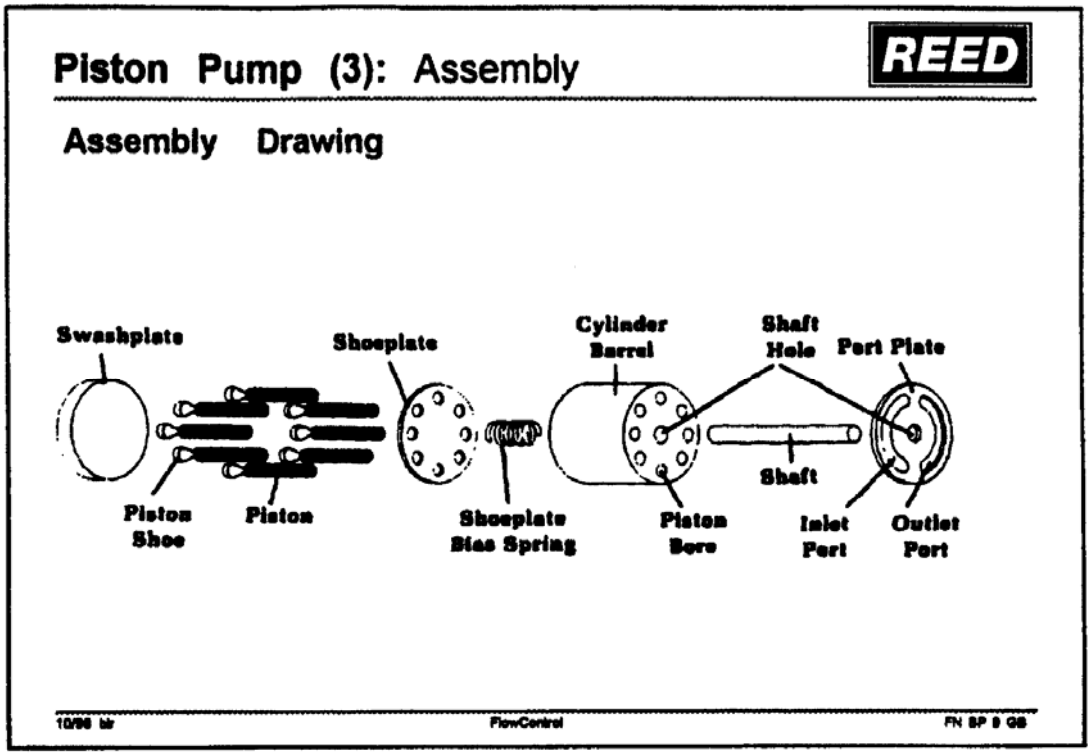
FUNCTIONAL DESCRIPTION

Axial piston pumps model A10VO are swashplate design, variable displacement pumps. They are designed for hydrostatic transmission in open circuit applications. The pump generates fluid flow and imparts to that fluid the necessary pressure forces up to 4570 PSI (315 bar).
They basically consist of the housing (1), cylinder barrel (2), piston and shoes (3), port plate (4), drive shaft (5), swash plate (6), control piston (7), shaft seal (8) and compensator control (9).
Rotation of the drive shaft (5) causes a linear piston movement as the piston shoe (3) slides along the tilted swashplate (6).
As the piston retracts in the cylinder bore (2), fluid fills the developing vacuum cavity from the suction port »S« via the suction kidney in valve plate (12). At maximum retraction of the piston, shaft rotation causes the piston to go beyond the suction kidney and begin communication with the pressure kidney. Continuing rotation then extends the piston into the cylinder bore, forcing fluid into the pressure port »B«.
The stroke length of the piston is directly related to the swashplate angle, which swivels up to a maximum of 17 degrees for stepless flow adjustment.



PRESSURE AND FLOW REGULATION

The swashplate is normally held at maximum swivel angle by a spring (10) as well as system pressure working on the stroking piston (11).
System pressure is also working on the pressure compensator against a setting spring. When system pressure overcomes the spring force, the spool shifts allowing system pressure into the control piston (7). This causes the pump to destroke to a regulating point sufficient to maintain compensator set pressure and lubricating fluid flow.
When the pressure setting is reached, only the amount of fluid necessary to satisfy the load conditions is delivered. If the load condition is such that no flow is required, only cooling and lubricating fluid is delivered. Power usage and heating of the fluid are thus kept to a minimum.
When system pressure falls below the compensator setting, spring force returns the spool back to its normal position, which drains control piston (7) to the pump case. The swashplate is then forced on stroke by the spring (10) and stroking piston (11). The flow control spool FR, also known as load sensing control, functions generally the same as the compensator spool. In the case of the FR spool, however, its response is due to a differential pressure across a flow control device. The spring setting only determines the differential pressure required to maintain constant output flow through a given orifice size.
Many control options including constant power control, electronic proportional flow and/or pressure control, etc. are available.



MORE DETAILS:

The swashplate is put to an angle to the rotation axis by the hydraulic displacement control forcing the pistons to do a stroke back and forth as they rotate. The shoeplate keeps the gliders of the pistons from taking off the swash plate during suction movement. The shoeplate is supported by the shosplate bias spring. The cylinder barrel rotates driven by the shaft. On each rotation a piston does a stroke up and down in the barrel performing a pumping movement and a suction stroke. The port plate divides suction and pressure side. The outlets are kidney-shaped. In the housing of the pump the passages are reduced and lead out to the main ports of the pump.

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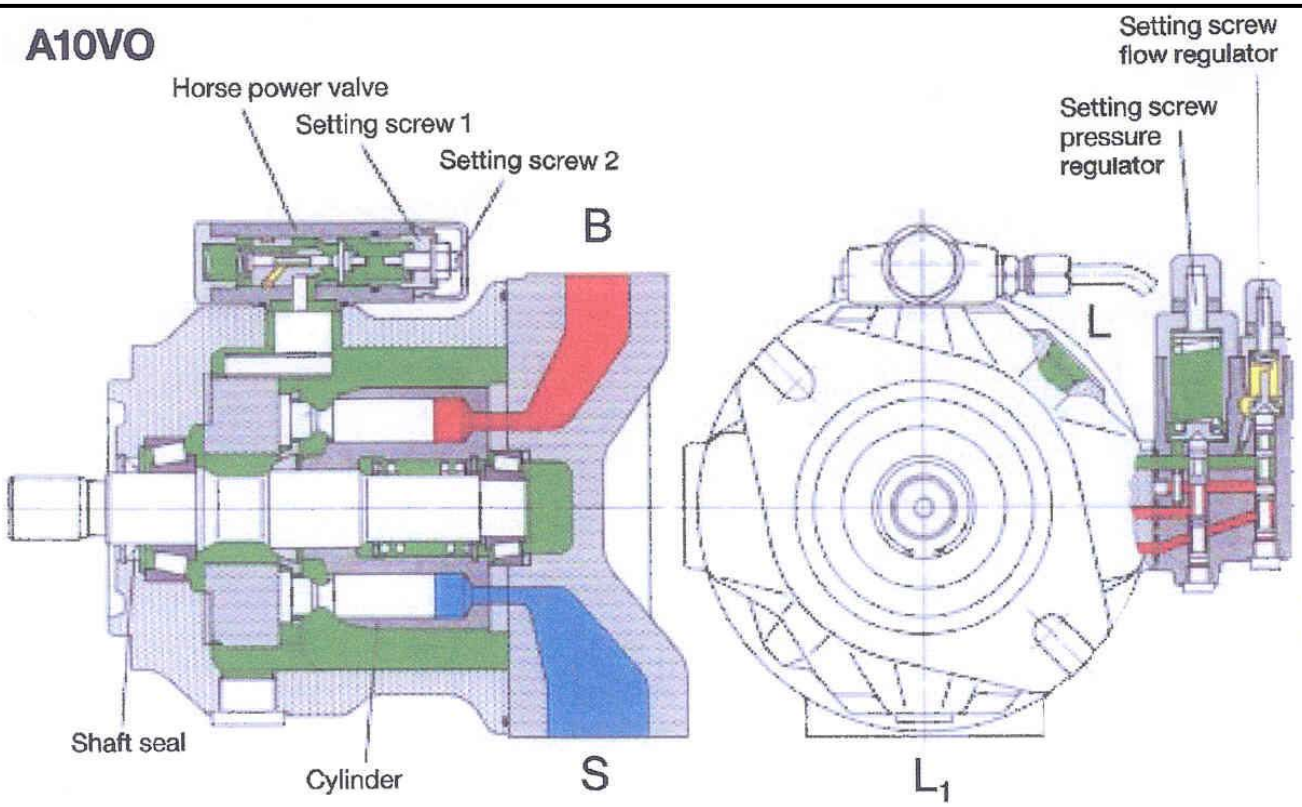
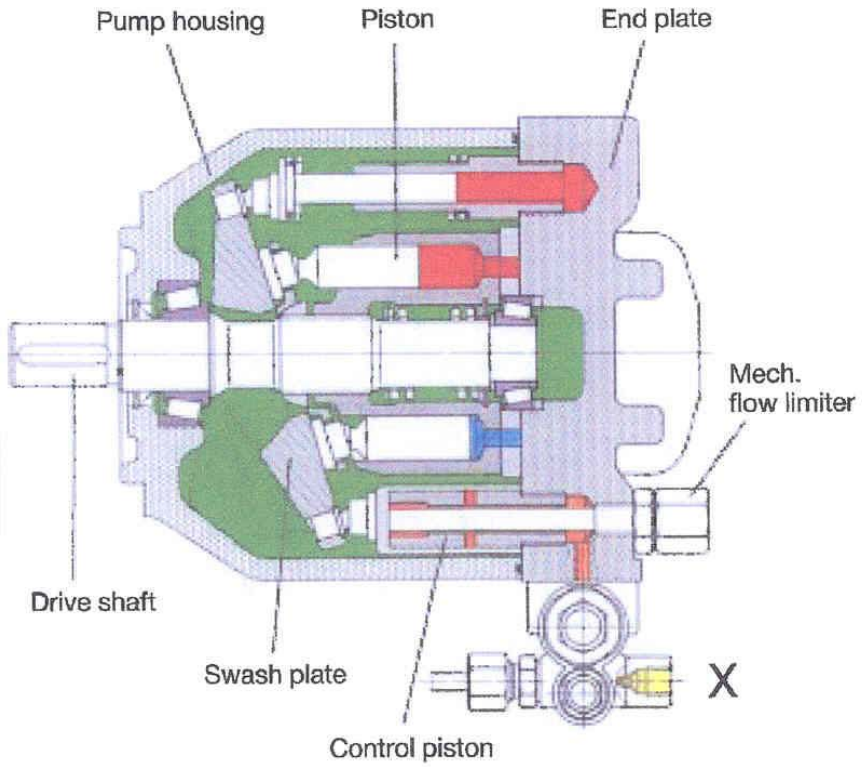
A10VO



A10VSO



Connections

- B service line
- S suction line
- control pressure
- X pilot pressure
- L case drain

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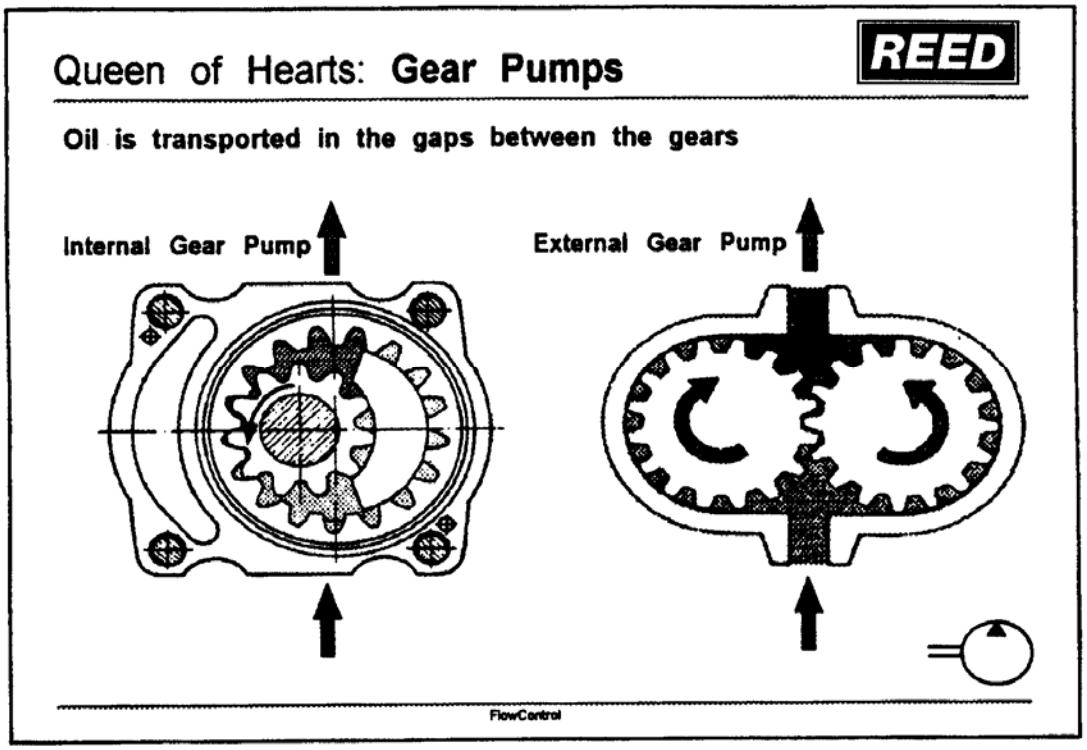
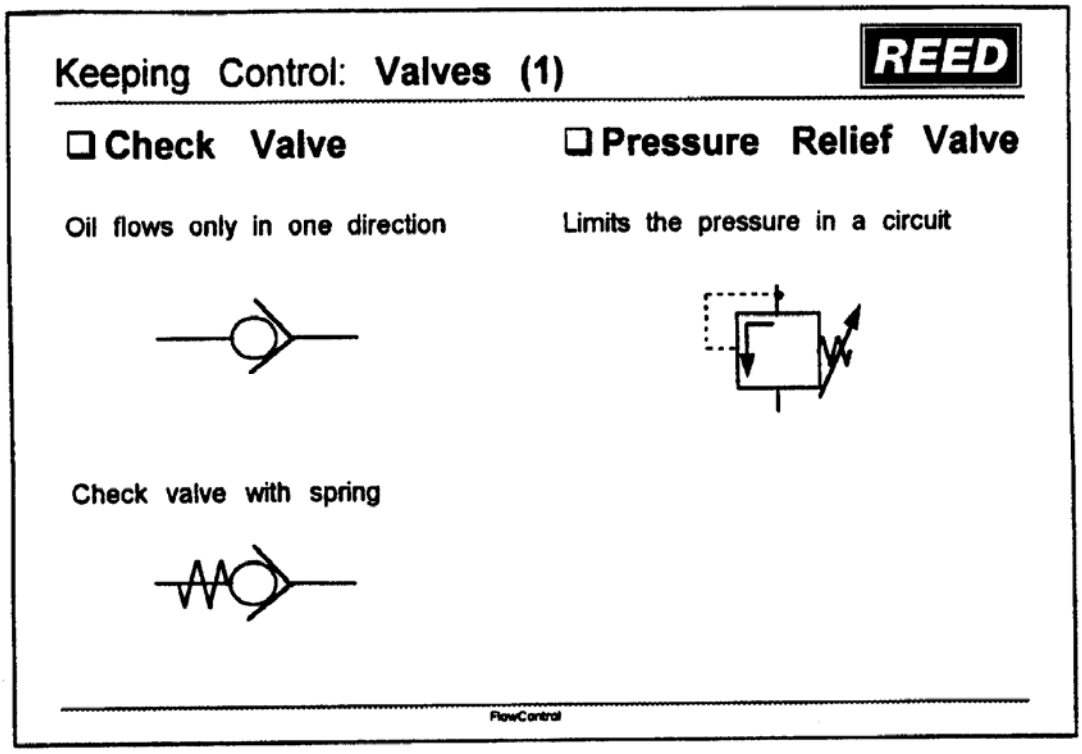


MORE DETAILS:

Gear pumps create an oilflow depending on the rpm and the sense of rotation of the drive shaft. The oil is transported in the gaps between the gears. Gear pumps can be built very small and are robust in design. One wheel is driven by the drive shaft, the other one is driven by the first one. Gear pumps create medium pressures with a medium output.

On the concrete pump an internal gear pump is used as a feeding pump on the main pump. It is located in the endcap.

An external gear pump is used to drive the hydraulic motor of the agitator. It additionally drives accessory parts like water pump, compressor or high pressure water pump. It is located at the end of the main pump unit.



MORE DETAILS:

A check valve is installed where oil is only allowed to flow in one direction. It can be compared to a diode in electrics. The charge of the accumulator is saved by a check valve. A check valve with a spring opens only if an oil flow with a certain pressure is coming.

Pressure relief valves are the fuses in hydraulics. They limit the pressure in a certain circuit. All hydraulic circuits are secured by them.

The basic design is a spring that closes a valve. As soon as the hydraulic pressure outweighs the force of the spring, the valve opens and the oil flows back into the tank allowing to drop down the pressure.
This can happen again and again if the pump is not adjusted back. A howling noise is characteristic for this.

The tension of the spring is usually adjustable or the spring can be exchanged. The adjustement will then be sealed and must be kept that way.

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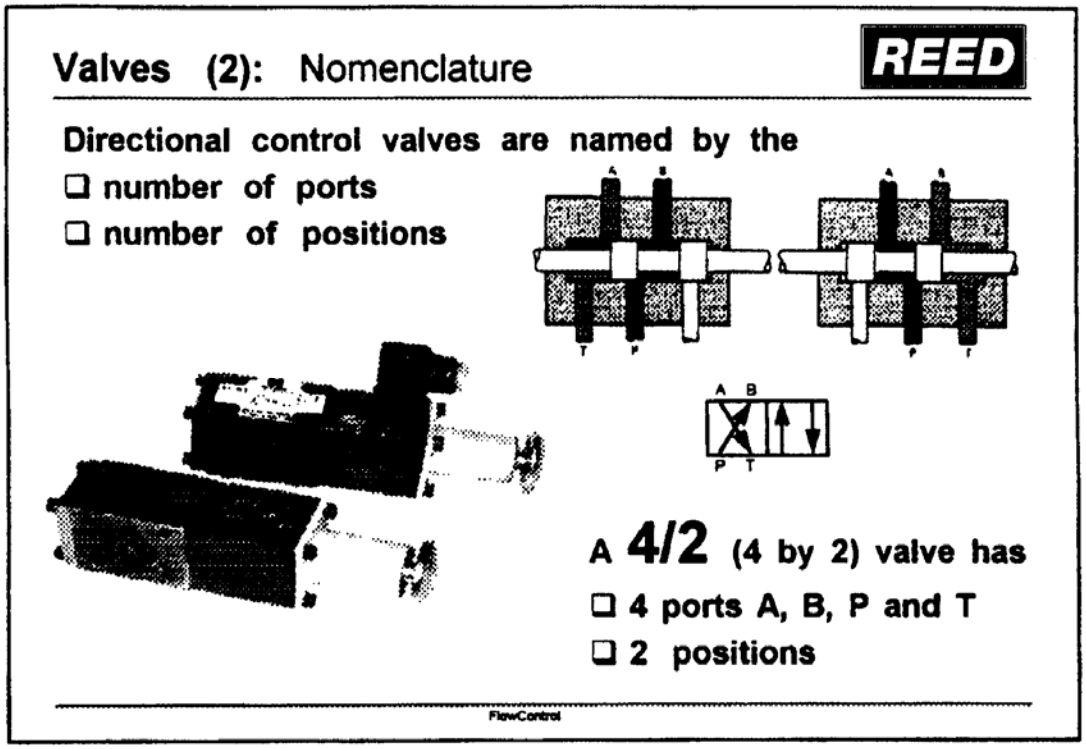

MORE DETAILS:

The name and the symbol of a valve only gives the function of the part. It does not say anything about the design. The ports are named with letters P (pump), T (tank), A and B (out-ports with alternating pressure). These letters are found on the part and on the schematic to ensure correct installation.

Beside the number of ports and positions the way the ports are connected is described by arrows. A plugged port is marked with a T-shaped symbol.

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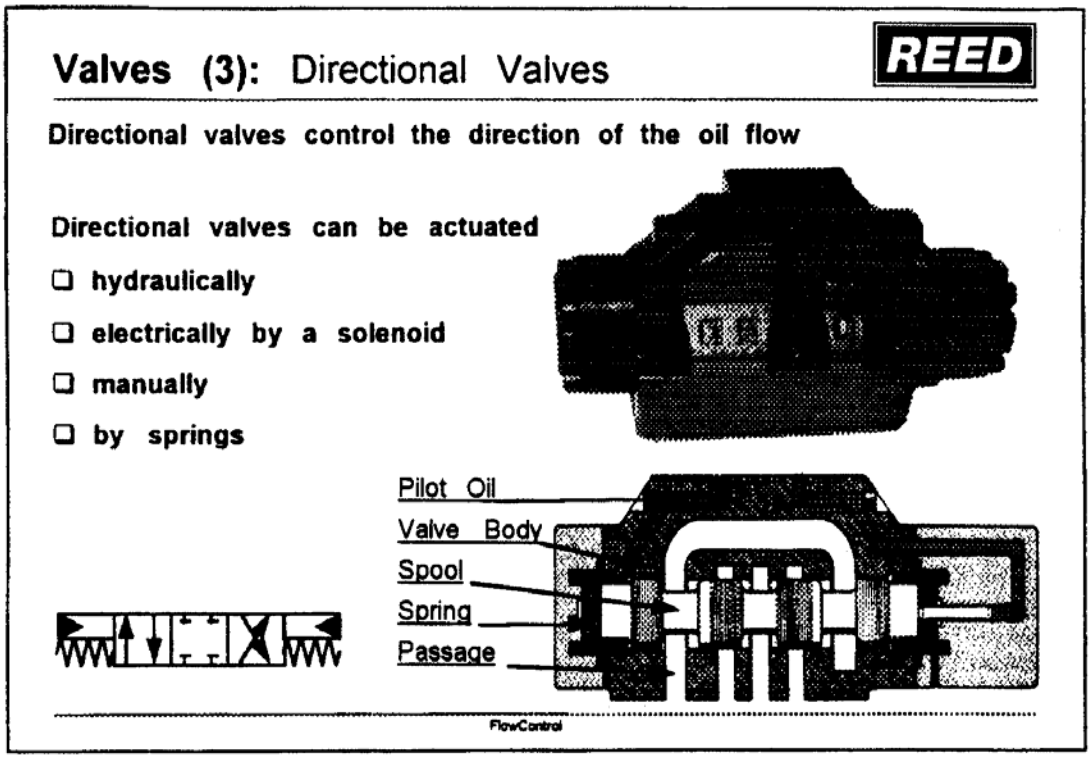

MORE DETAILS:

Valves control the direction of the oil flow. They allow, for example, that a piston goes back and forth without changing the sense of output of the hydraulic pump. They also allow to stop the oilflow in the circuit. In this case the oil flow is turned back in the valve or leaves the circuit via the pressure relief valve.

Within the valve body a spool is shifted that opens or closes the passages for the oil. The spool can be moved in different ways. If it is actuated hydraulically, pilot oil pushes the spool like a piston in a cylinder. An electrical signal is being transferred by a solenoid. Manually shifted valves are also common. Levers or push-buttons are used to actuate the spool.

After the signal cuts off the position of the spool has to be determined somehow. Some spools are locked in the desired position by detents others are shifted to a position by a spring. Springs on both ends shift the spool into the center position: The valve is "spring centered", which is usually a neutral position.

The neutral position *of* a valve can have different characteristics. All passages might be blocked to stop any movement and hold the pressure in the circuit. This type is employed to keep a cylinder in its position preventing a load actuating it after switching off the system. Or all passages are connected to the tank relieving all the pressure. This type is found on the displacement control placing the swash plate of the pump back into center position.

Valves can fail when dirt disables their proper function. Particles can get caught in between the gap *of* the body and the spool blocking its movement or plug fine passages.

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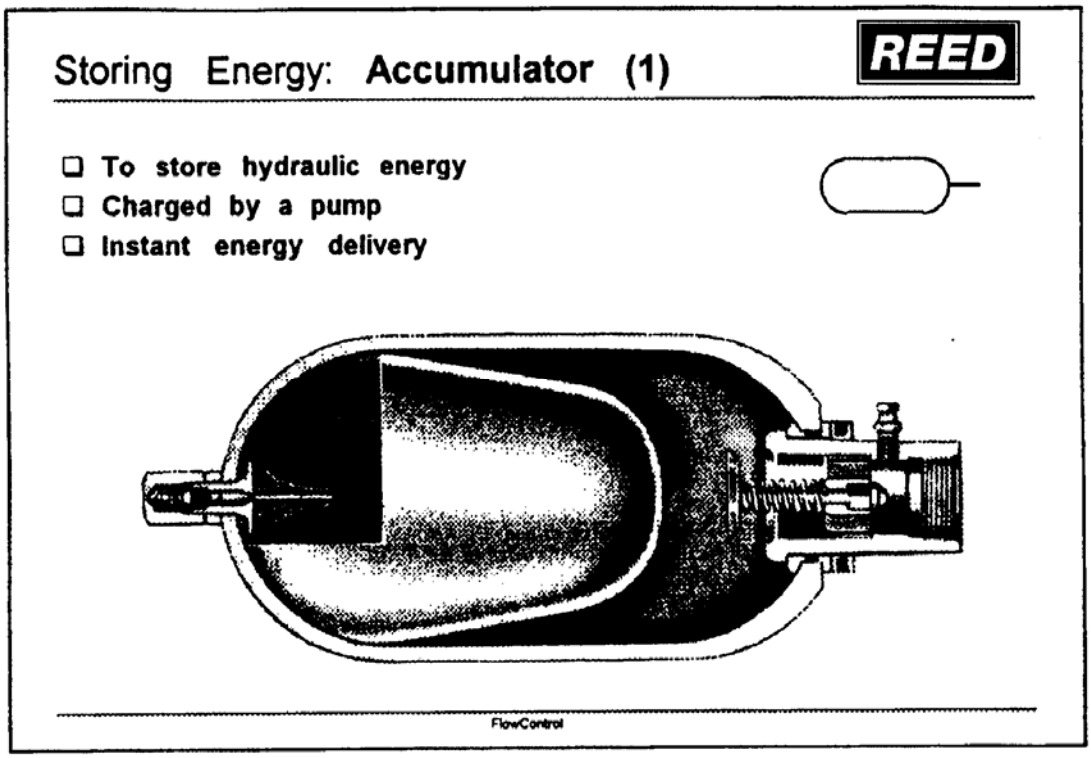
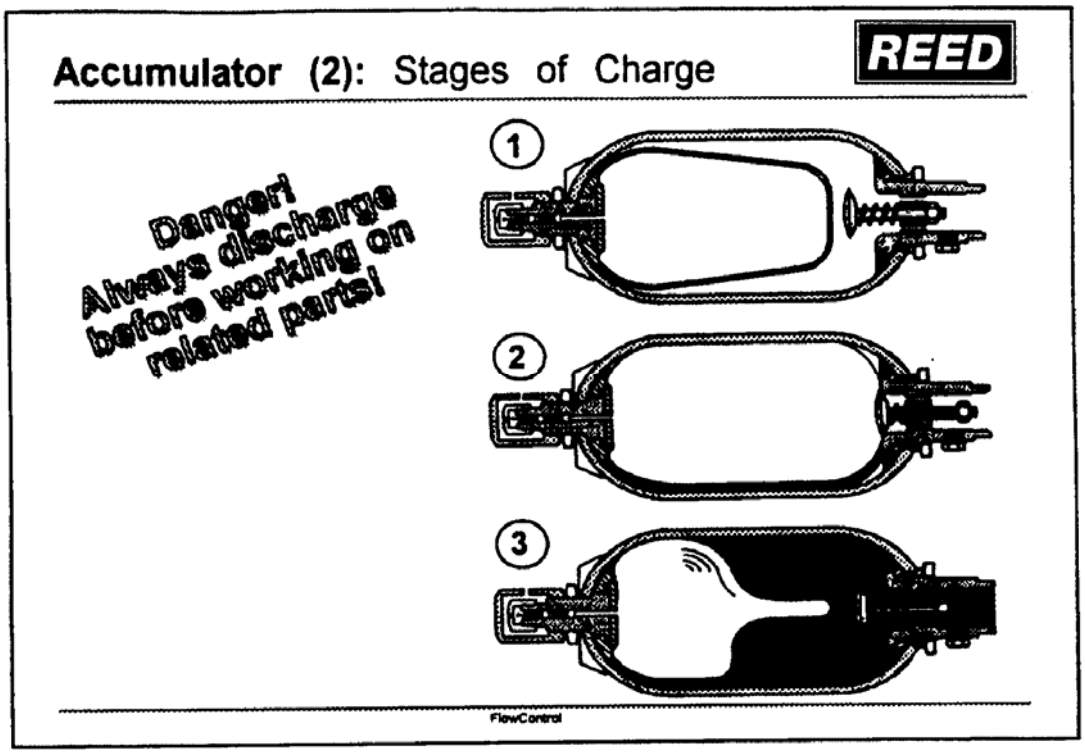


MORE DETAILS:

An accumulator is a reservoir for hydraulic energy. The stored energy can be released instantly.

A rubber bladder inside is precharged with nitrogen. As oil is pumped into the accumulator the gas is compressed and pressure builds up.

The oil is released into the shifting cylinders after every stroke of the delivery piston. During the following stroke the accumulator is charged again. After shutting *off* the concrete pump the accumulator still remains charged. This pressure must be released before working on the swing tube, around the hopper or in the flush box!



MORE DETAILS:

1. Empty accumulator Without precharge

2. Accumulator precharged, no oil charge

Nitrogen is used to precharge the rubber bladder. The precharge has to be checked occasionally.

3. Charged accumulator

As oil flows into the accumulator pressure raises. The pressure can be read on the gauge on the control block. The more oil is inside, the more the nitrogen in the bladder gets squeezed building up pressure. The unloader valve setting determines system pressure. Then there is enough oil inside to shift the cylinders of the s-tube.

If the precharge is too high unloader pressure is reached too soon, filling up the accumulator only partially. The shifting cylinders have not enough oil for a full shifting movement.

If the precharge is too low unloader pressure is reached later, filling up the accumulator with more oil than necessary. The pressure of the oil drops down during shifting too fast giving the shifting cylinder less power. When pumping a stiff concrete there might be a problem to change over the s-tube completely.

Checking the precharge of the accumulator

When the key is shut off, a dump valve opens and the pressure gauge shows a smooth discharge of the accumulator. At a certain reading the pressure drops down to zero. This is the precharge pressure. For powerful change over it should not be less than 100 psi of the original setting.

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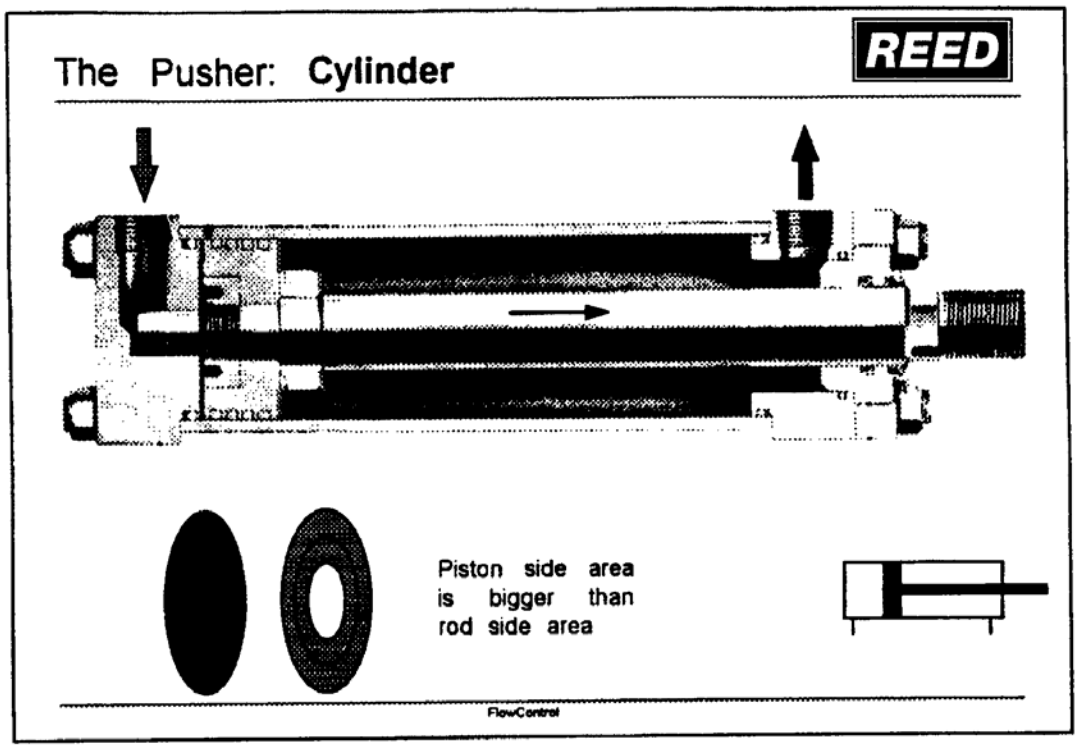


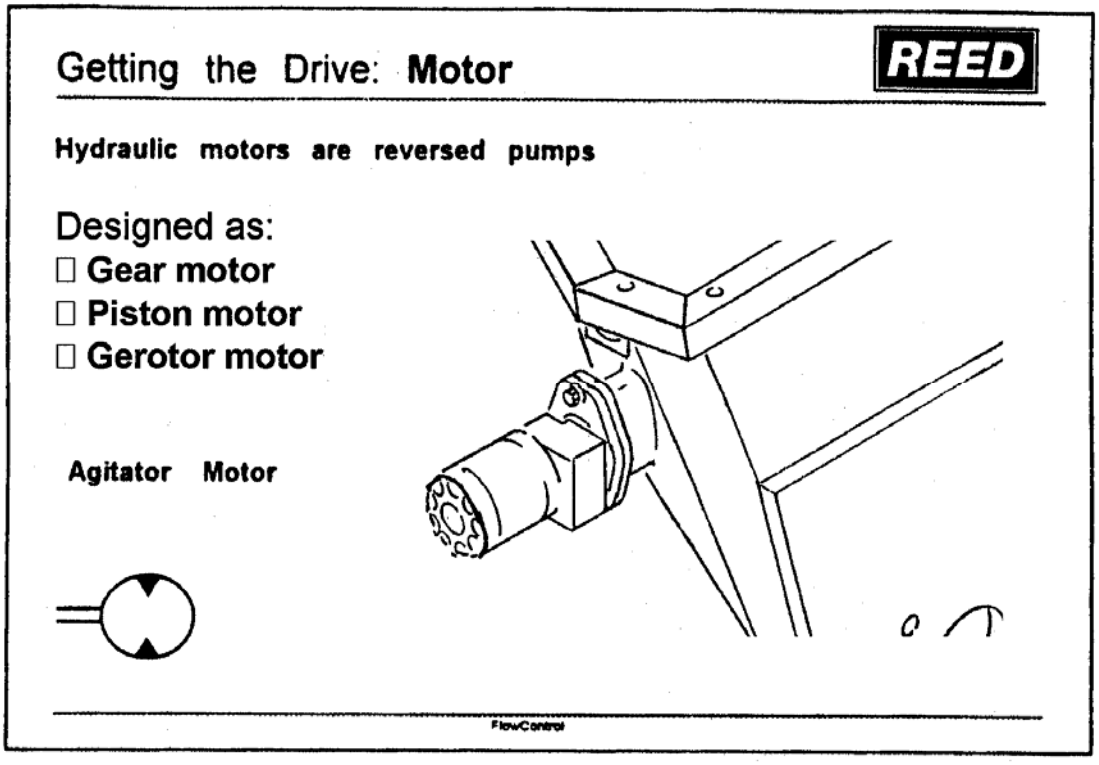
MORE DETAILS:

A liquid in a closed system aplies a certain pressure to the surrounding walls depending on its pressure. If a piston head makes one of the walls this piston will be pushed out with a force according to the pressure. The bigger the diameter of the piston the bigger the force of the piston will be.

The movement of the piston will be slower because the hydraulic pump can only deliver a certain amount of oil. At the end of the stroke the oilflow has is inverted to move the piston back. On the rodside of the piston the area for the oil to push is smaller because the portion of the piston rod can not be used. So the force of the piston going back in is smaller but its movement is faster. This has to be considered when the installation on the drive cylinders is changed from piston side oilflow to rod side.

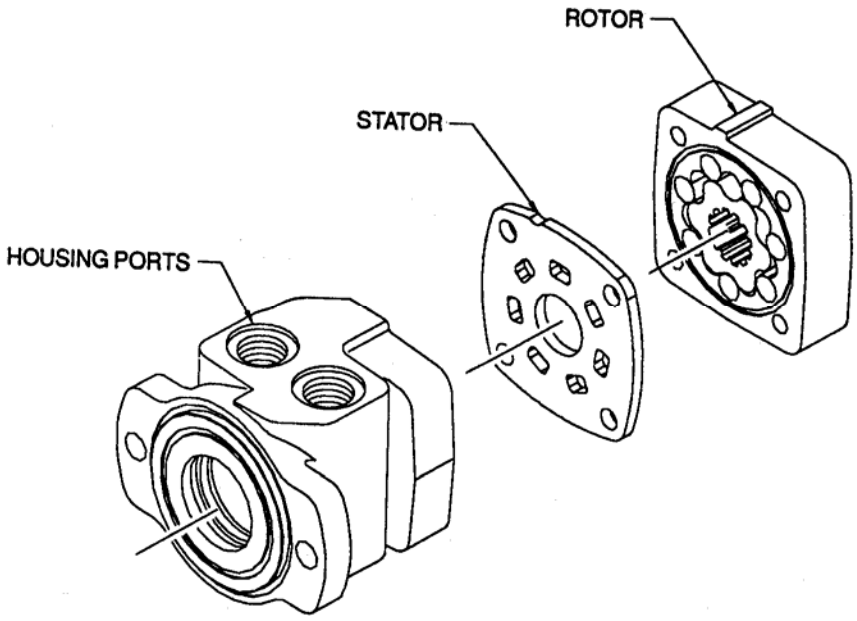
Dirt particles keep a potential danger for seals. They leave scratches on the surface of the cylinder or even damage the seal kit. Leakages are the result and finally time consuming repairwork is necessary to replace the damaged parts.

New seal kits fit very tight. Assembly might be difficult but has to be done with care in order not to damage the new seals.



More Details:

Hydraulic motors are pumps that work in reverse. Oil arriving from the pump drives the shaft of the motor. So, basically, they have the same design.



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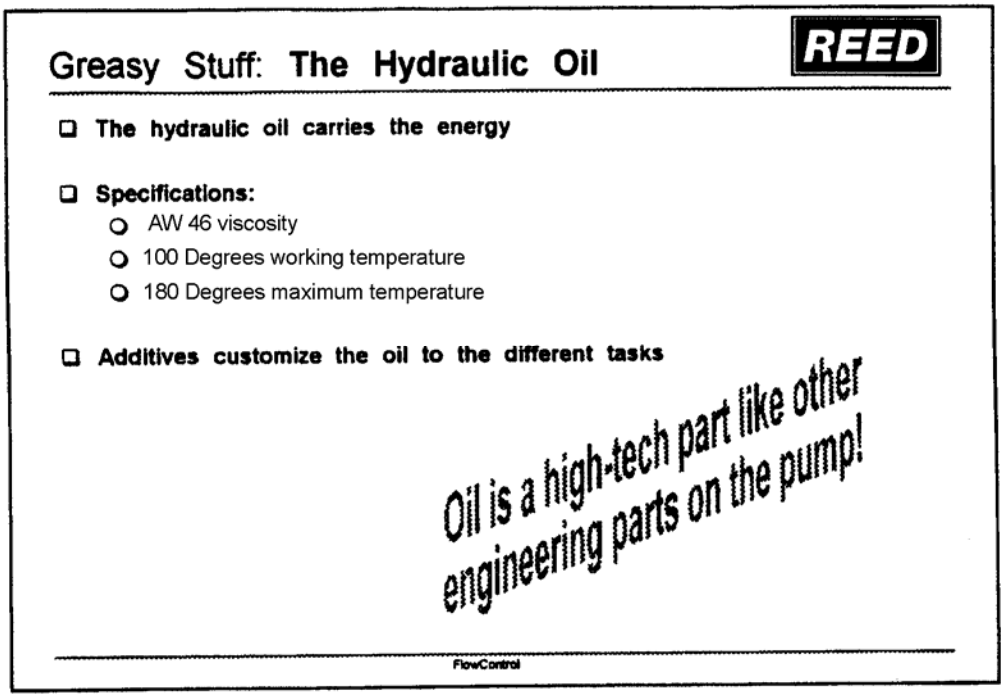


More Details:

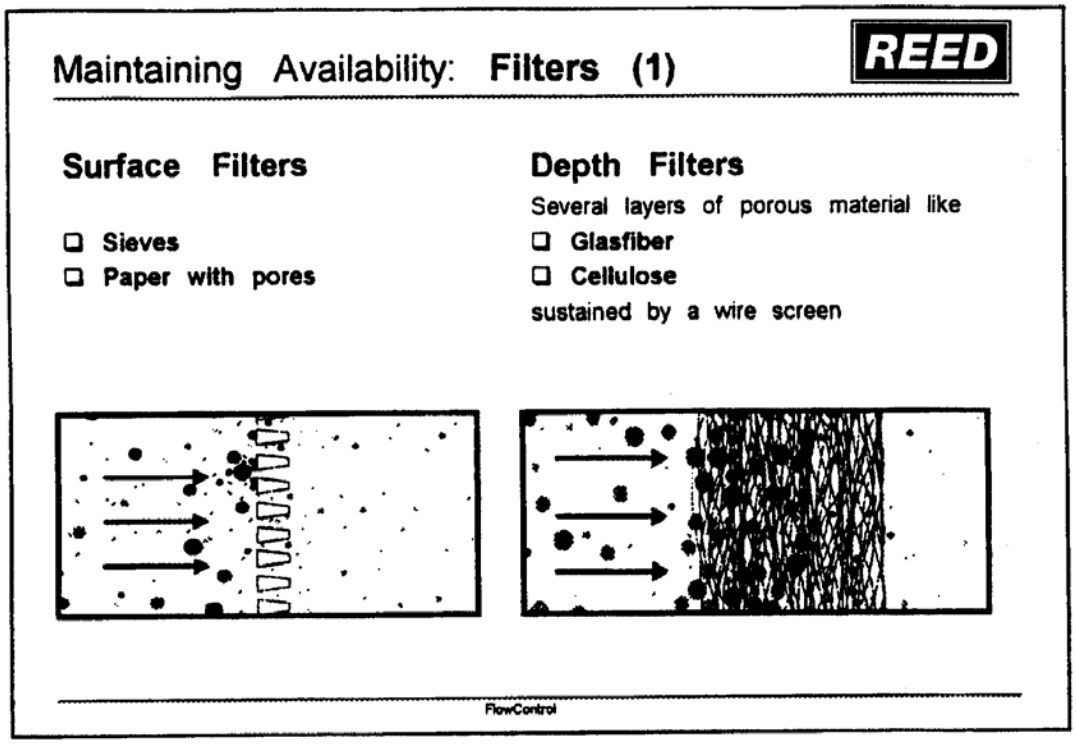
Oil Is used in hydraulics because it is not compressible and it can be chemically customized to mostly any demand. The viscosity determines its property of flowing. A thick oil will build up a save cushion for lubrication but is hard to pump. On the concrete pump the standard viscosity class is AW 46. Temperature has a big influence on the viscosity. The higher the temperature, the lower is the viscosity and the thinner the oil. The working temperature is 100 degrees. Before operation the concrete pump In cold weather the oil has to be heated up by circulating it without pumping concrete. The maximum temperature is 180 degrees.

The lifetime of synthetic oil is much higher than the one of mineral oil. The condition of the oil can be checked by an oil analysis. This analysis also gives information about the condition of major hydraulic components like wear on the swivel plate of the hydraulic pump.

Oils that match the standards are mixable among each other and provide attributes like the following. Some 20 additives

- give the oil compatibility with seal materials
- give the oil lubrication qualities
- prevent corrosion
- liberate solved air
- prevent foam in the tank
- separate water from the oil
- keep dirt particles floating until they reach the filter
- make the oil compatible with paint

Different kinds of oil must never be mixed (e.g. hydraulic oil with ATF or motor oil).



More Details:

Modern hydraulic components are made with a high accuracy. The gaps between moving parts are very small. Dirt particles that get in between can block the movement and cause the component to fail. Damage can even occur by scratches caused by dirt particles.

The purity of oil is measured either by ISO 4406 or by NAS 1638. The required rating of 17/13 (ISO) or 9 (NAS) can be reached by a 10 micron filter. Even fresh oil out of a barrel is not pure enough and should therefore be filtered before filling it into the hydraulic tank.

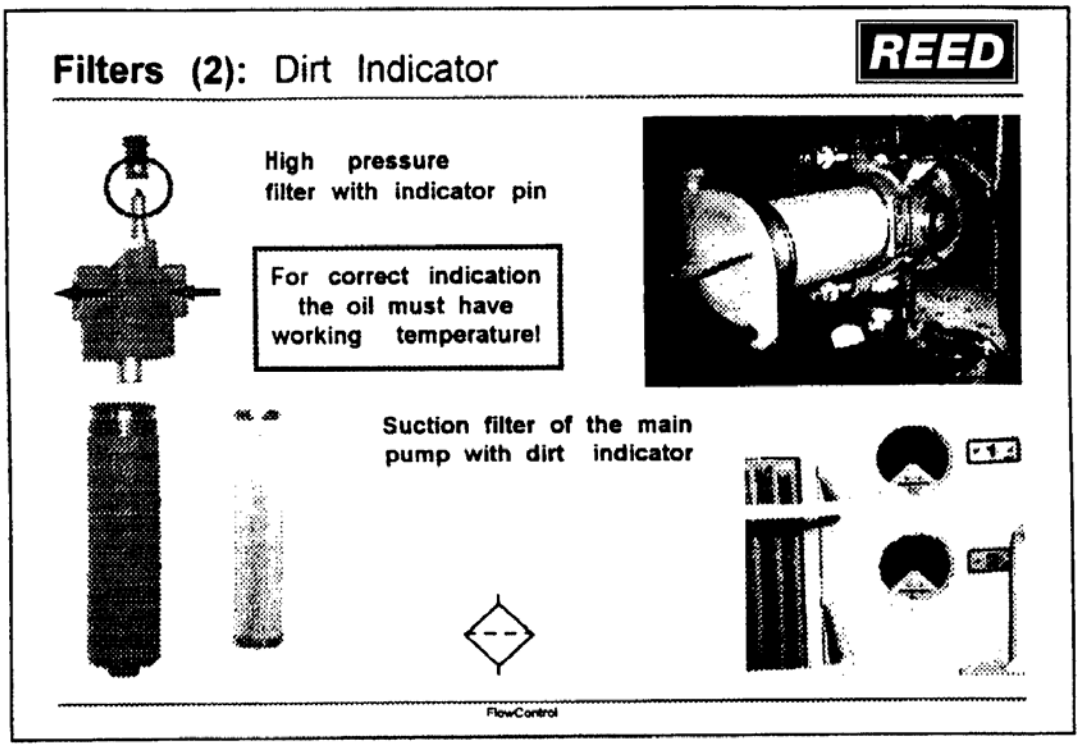
Surface Filters

are usually metal sieves that give special components an additional protection. They are small, cheap and can usually be rinsed.

They are filters with "nominal ratings" which means that pin-shaped particles can pass through even if they are longer than the mesh width

Depth Filters

are either installed as high pressure filter to protect the boom circuit or as suction filter before the main pump unit. Several layers of fabric or fibers provide many windy ways for the fluid to flow through. Trapped particles can not be washed out again, cartridges have to be exchanged. When changing cartridges the sustaining wire screen must not be damaged. Depth filters have a defined direction of oil flow, usually marked with an arrow.

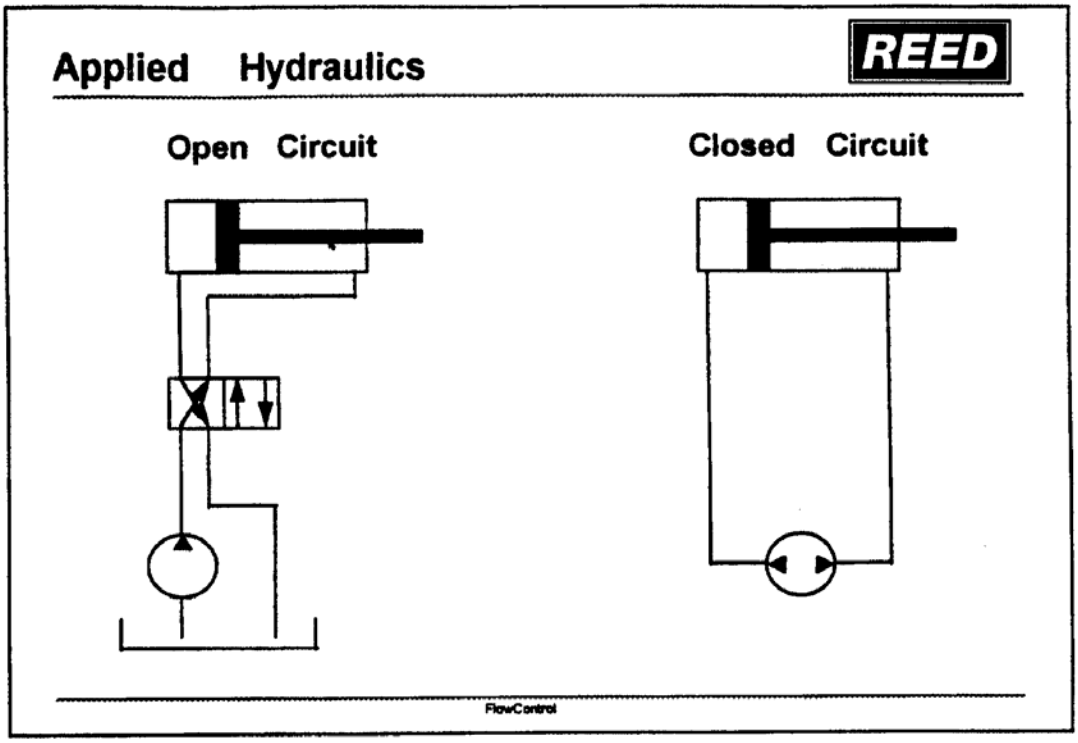


More Details:

As dirt builds up on the filter it gets more and more difficult for the oil to pass through. Pressure is raising before the filter and dropping down behind it. A certain amount of dirt on the filter gives a certain difference in pressure. It can be determined when the filter capacity is at an end and therefore it is time to change the cartridge. On the high pressure filter the red pin comes up, on the suction filter the needle of the dirt indicator reaches the red area.

Do not wait too long to change cartridges because the steadiness of oilflow is no longer guaranteed. High pressure filters are protected with a bypass that opens if the cartridge is not exchanged. When it opens all the oil passes without being filtered.

In cold weather the indicator can show up even when the cartridge is still clean. This happens because the thick oil has difficulties to pass the filter. In such a case the system should be warmed up by running it on idle. After reaching working temperature the indicator can be pushed in and should stay in.



More Details:

Open Circuit

A one directional pump gets oil from the tank and feeds it into the circuit. The valve behind controls the oil supply and leads it either to the piston side or the rod side of the cylinder. At the end of the cylinder's stroke the valve switches and reverses the movement of the cylinder. The oil leaving the cylinder goes back to the tank.

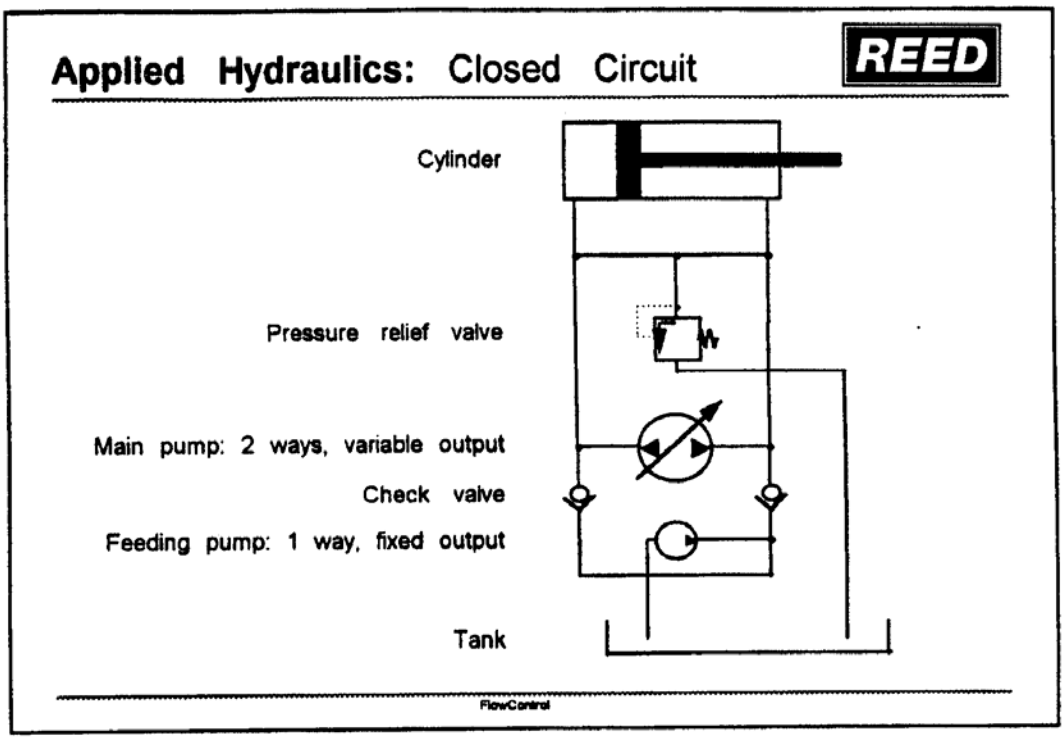
This simple design uses basic components. Disadvantages are the loss of energy in the oil when it has to pass the valve and the big oilflow running through the tank.

Closed Circuit

In the closed circuit a two directional pump circles the oil back and forth according to the required movement of the cylinder.

Here no valve is needed for control of the main flow because the pump can be put in reverse. The loss of energy is smaller. The volume of the tank can be reduced. The controls for the pump are more complicated but only small dimensions are necessary for piloting the pump.

The actual circuit needs more controls . See next page for more details.

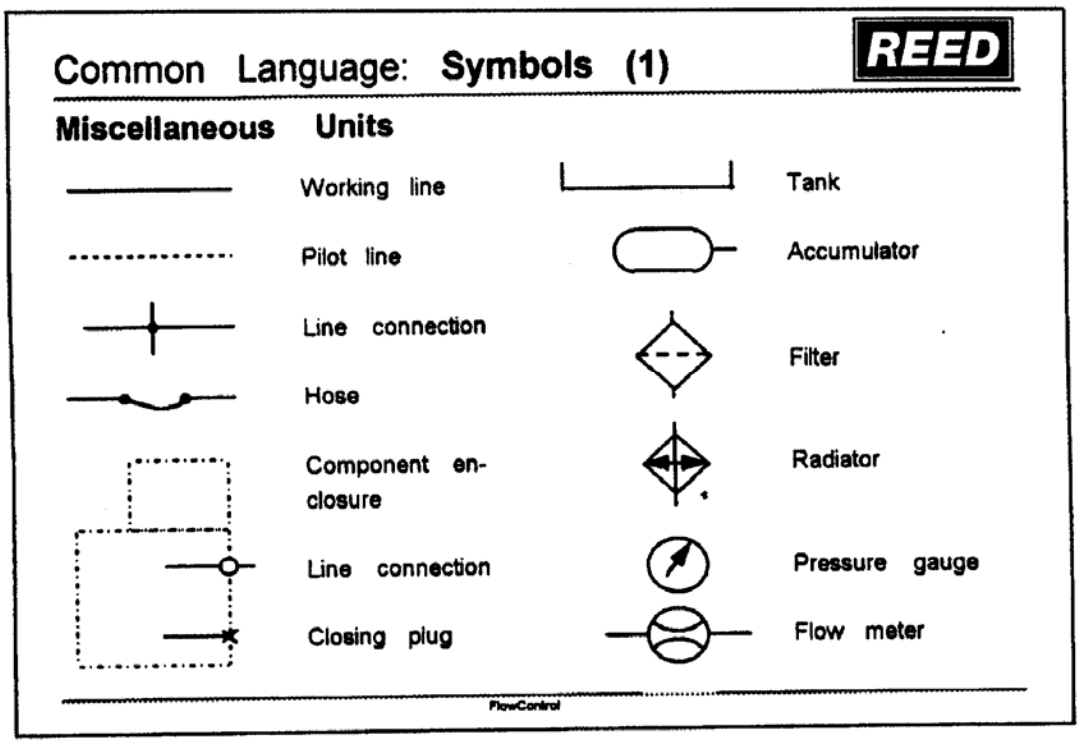


More Details:

The main pump is variable in output to vary the speed of the cylinder. It is controlled by an output control setting the angle of the swash plate. The signal for reverse action is obtained by the proximity switches. A pressure relief valve is component of every hydraulic circuit. it works as a fuse to limit the pressure in the system protecting its components from damage.

The closed circuit is not completely closed. Part of the oil is constantly removed for cooling and filtration. These losses are replaced by the charge pump. This small pump is integrated in the housing of the main pump. Check valves are needed to control the feeding oil, bringing it back into the circuit always on the low pressure side.

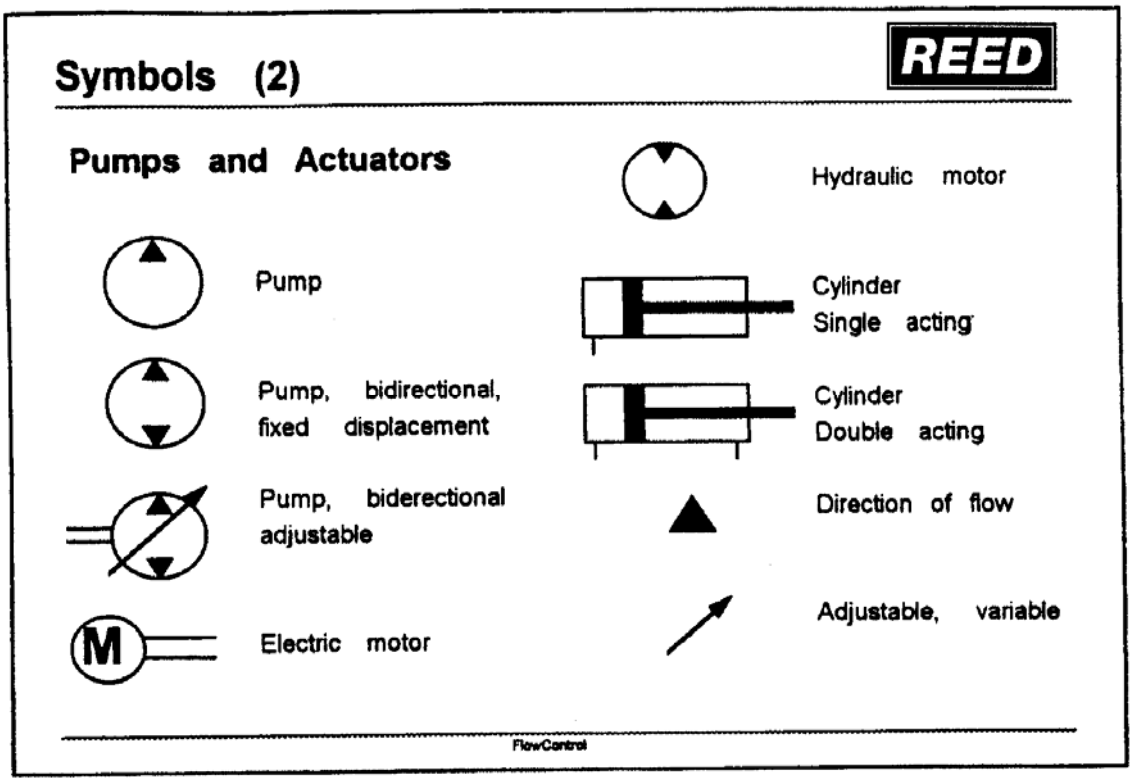
The size of the tank depends on the flow rate of the feeding pump and not of the main pump.



More Details:

Hydraulic symbols are used to describe the function of the controls without using words. The symbols used in the schematics conform to international standards. The following list concentrates on the symbols used in the schematics of our concrete pumps. However, it covers most of what is used on other machinery.

Symbols only give the function not the design of components. Specifications are found in the data sheet and the spare part list.


Symbols (2)
REED
Pumps and Actuators
Pump
Pump, bidirectional, fixed displacement
Pump, biderectional adjustable
M
Electric motor
Hydraulic motor
Cylinder Single acting
Cylinder Double acting
Direction of flow
Adjustable, variable
FlowControl

Symbols (3)

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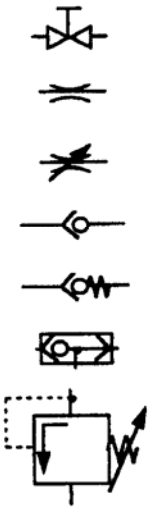
Valves for control of flow and pressure



Stop cock, manual

Orifice, flow control

Orifice, adjustable

Check valve

Check valve, preset

Double check valve

Pressure relief valve, adjustable

FlowControl

Symbols (4)

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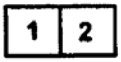
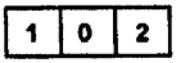
Directional Valves

Positions

2 way valve

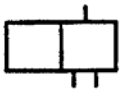


3 way valve
center is neutral

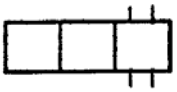


Ports

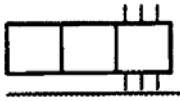
3 ports
3/2 valve

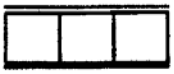


4 ports
4/3 valve



6 ports
6/3 valve





Proportional valve

Names of ports

A, B line to actuator
P from Pump
T to Tank

Passages

Direction of oilflow

⊥ T Passage blocked

FlowControl

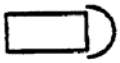
Symbols (5)

REED

Valve Actuators

Hand lever

Pneumatic signal



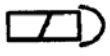
Push button

Electric signal (solenoid)

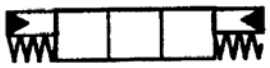
Detent, 2 steps

Spring

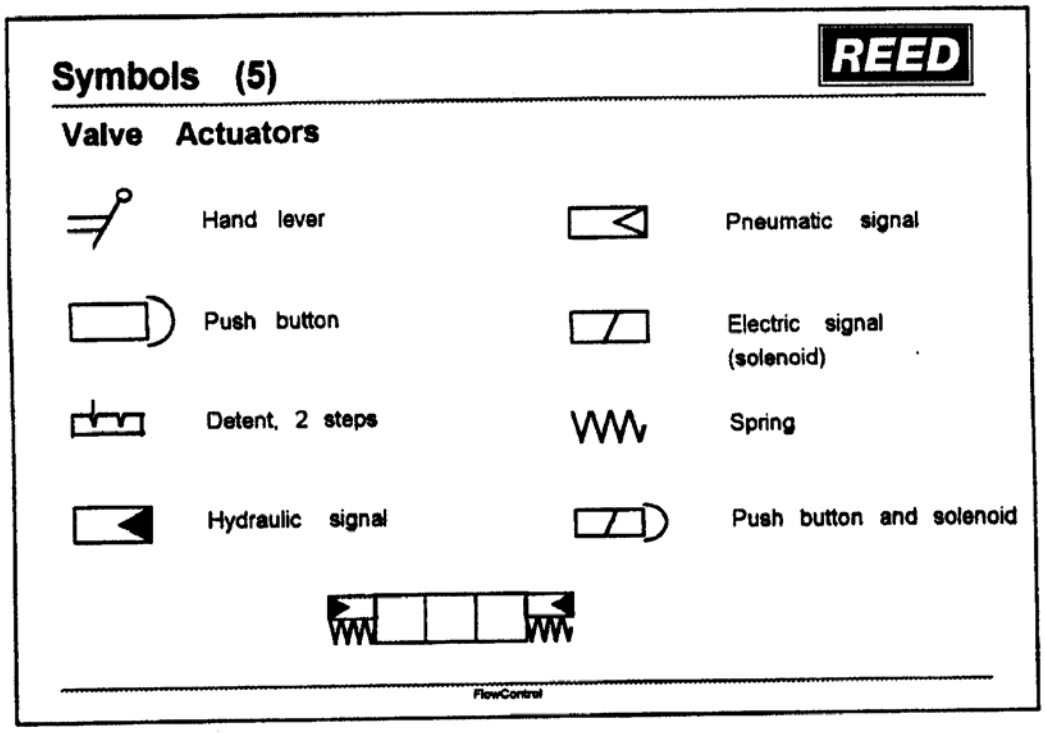
Hydraulic signal

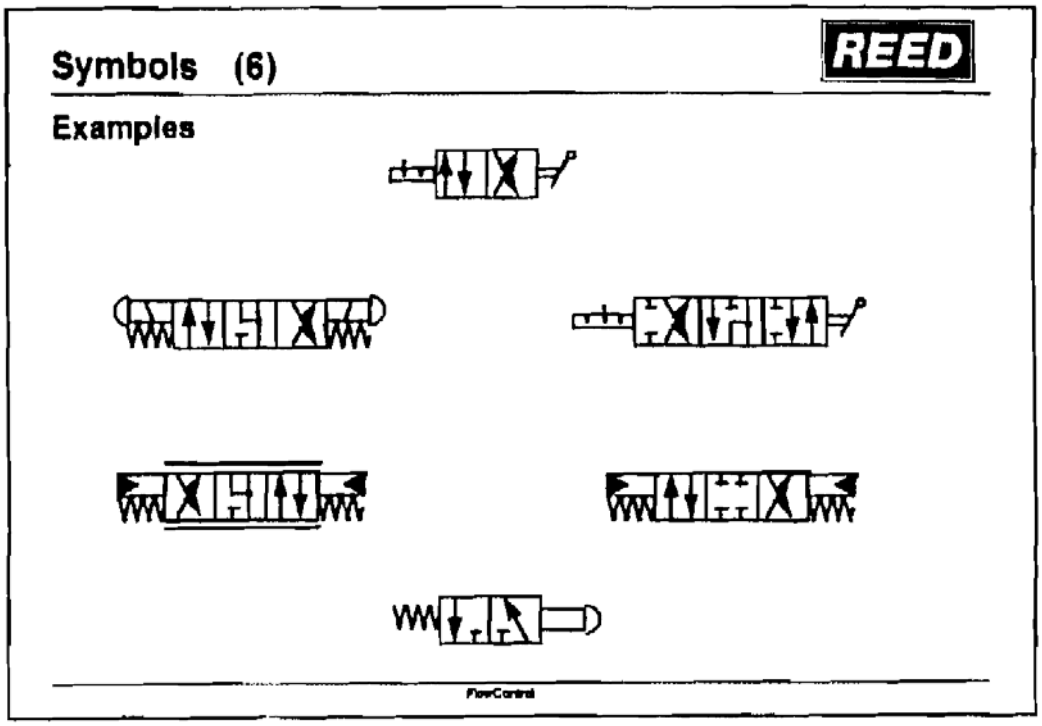


Push button and solenoid



FlowControl


Symbols (5)
REED
Valve Actuators
Hand lever
Pneumatic signal
Push button
Electric signal (solenoid)
Detent, 2 steps
Spring
Hydraulic signal
Push button and solenoid
FlowControl



More Details:

4/2 valve, hand lever, detent

4/3 valve, actuated by push button or solenoid, spring centered

6/3 valve, hand lever, detend

4/3 valve, proportional, hydraulically actuated, spring centered

4/3 valve, hydraulically actuated, spring centered

3/2 valve, push button, left is position is neutral

TRAINING MANUAL

DESCRIPTION OF HYDRAULIC SYSTEM

The hydraulic system of the ***REED*** **CONCRETE PUMP** consists of three separate circuits and although integrated, each is designed to perform a particular function within the operation of the concrete pump. The three circuits utilized are:

- **Main Pump Circuit -** It controls the function for operation of the hydraulic drive cylinder and material cylinders.
- **S-tube Shift Circuit -** It controls the function for operation of shifting the S-tube from one material cylinder to the other during concrete pumping.
- **Auxiliary Circuit -** This controls the operational function for the agitator.

For the purpose of making the operation of each circuit easier to understand, they are being described separately.

SPECIFICS – PRESSURES

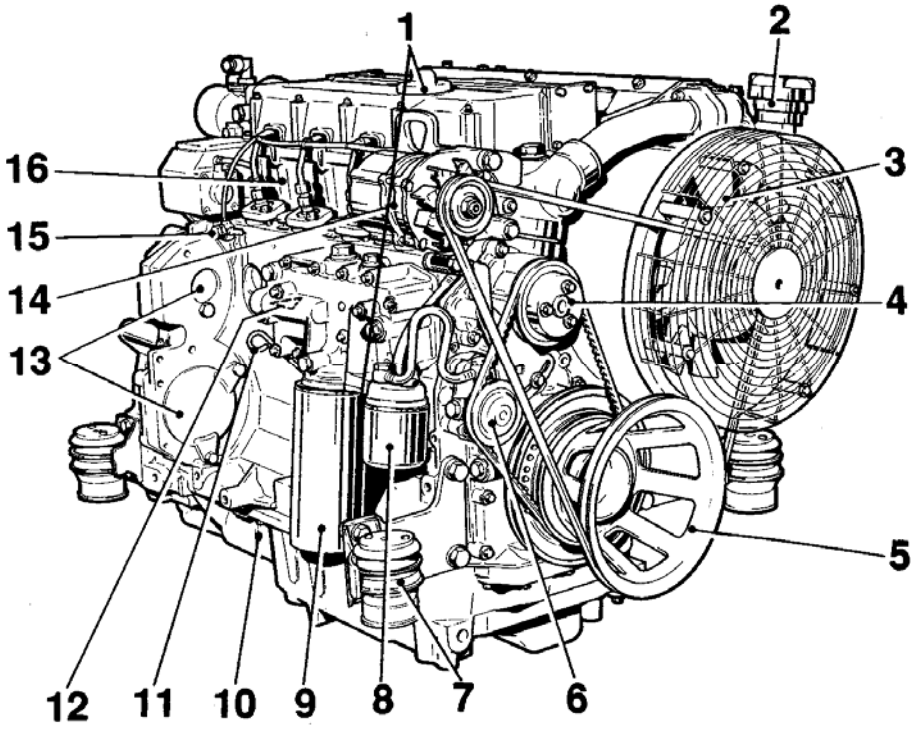
- Main Pump Standby Pressure = 230 PSI (16 Bar)
- Main System Max. Pressure = 4000 PSI (275 Bar)
- Main System Relief Pressure = 4500 PSI (310 Bar)
- S-tube Shift System Relief Pressure = 2000 PSI (138 Bar)
- Accumulator Pre-Charge Pressure = 1000 PSI (69 Bar)
- Auxiliary System Relief Pressure = 1500 PSI (105 Bar)

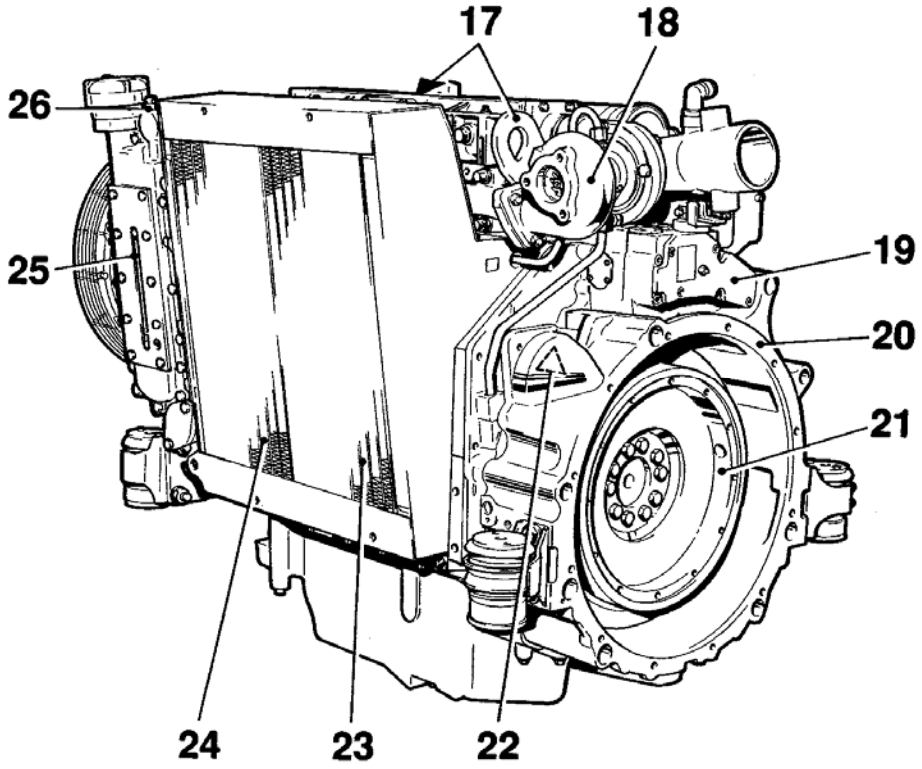
SYSTEM FILTRATION

The hydraulic tank has a capacity of 55 gals (208L) of **SHELL TELLUS #46** hydraulic fluid. The start of system filtration begins inside the tank where two (2) magnetic type suction strainers are installed. The system return fluid must pass through a 10-micron filter element before returning to the tank and after passing through the oil cooler.

REED

TRAINING MANUAL

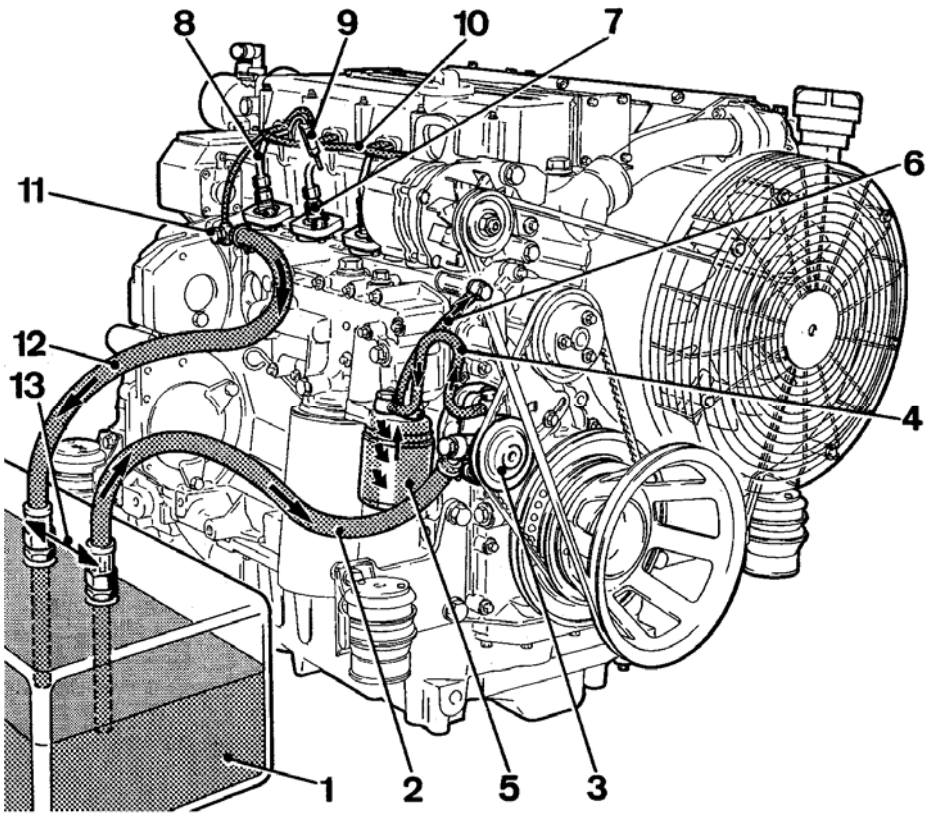


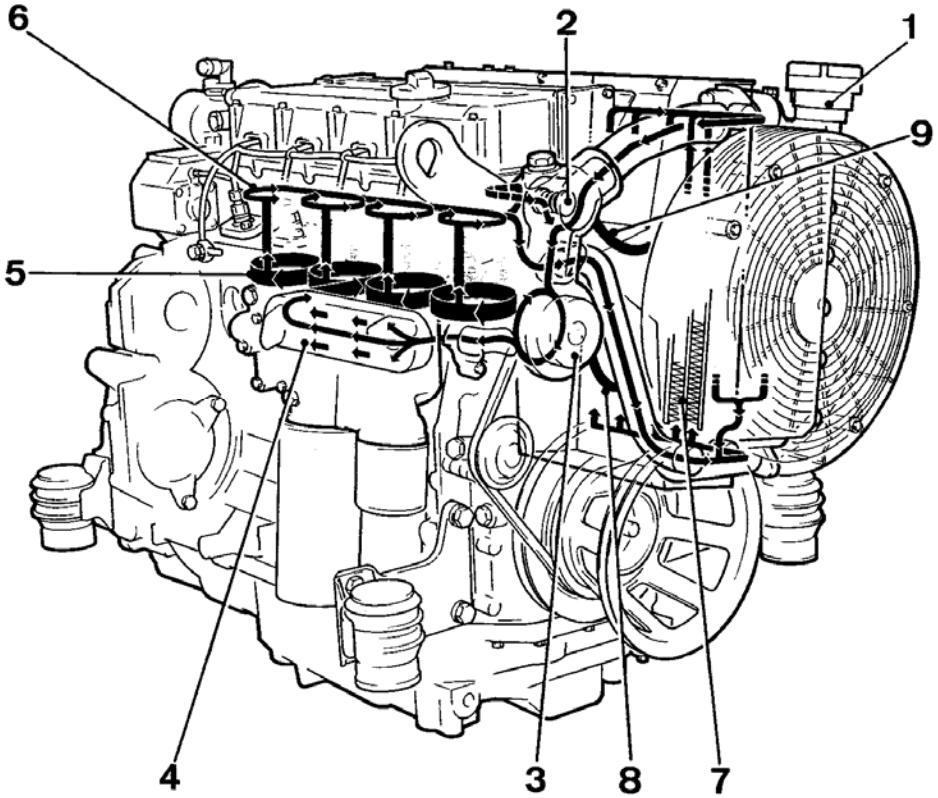


REVISION:

REED

TRAINING MANUAL





REVISION:

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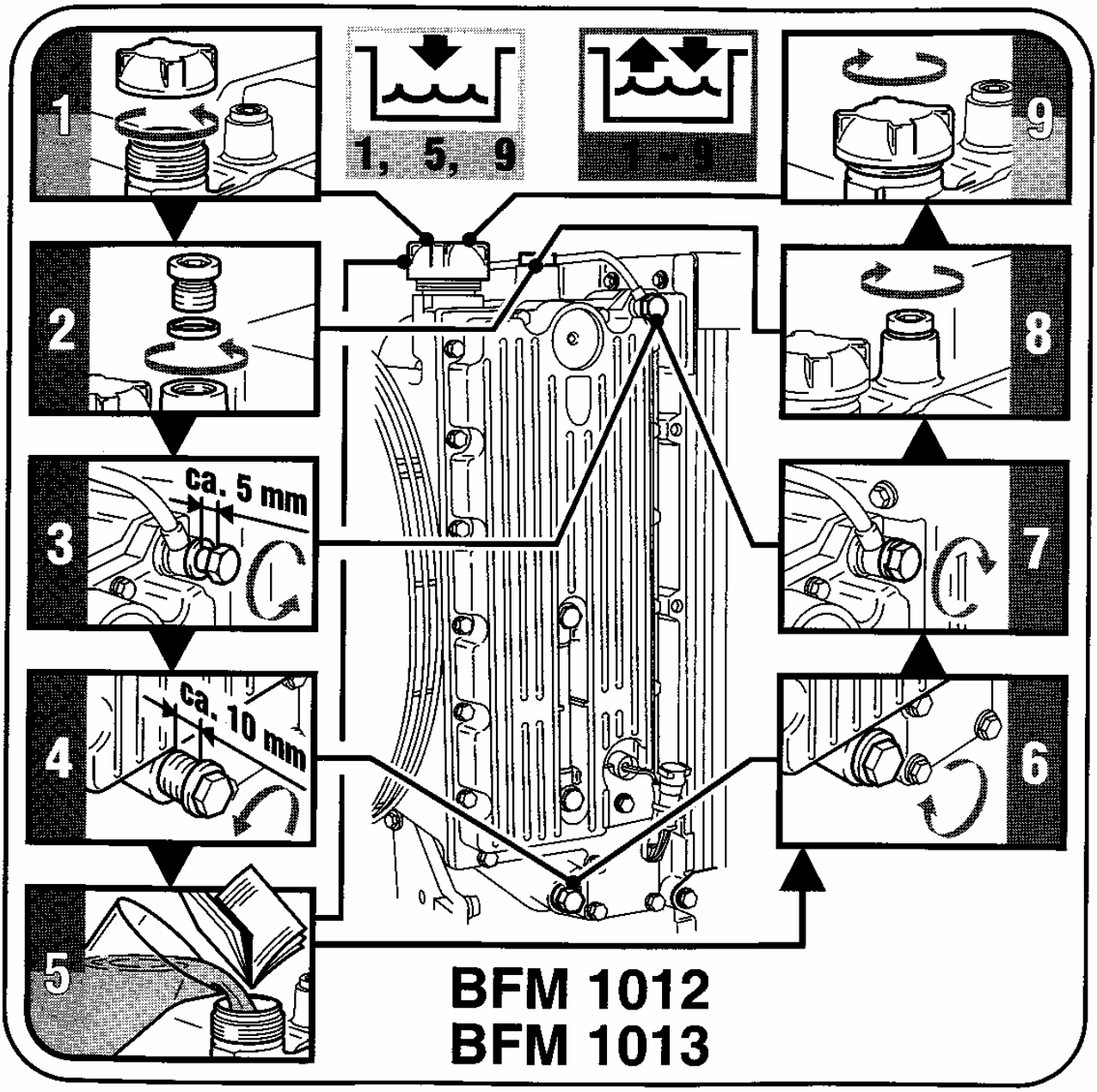
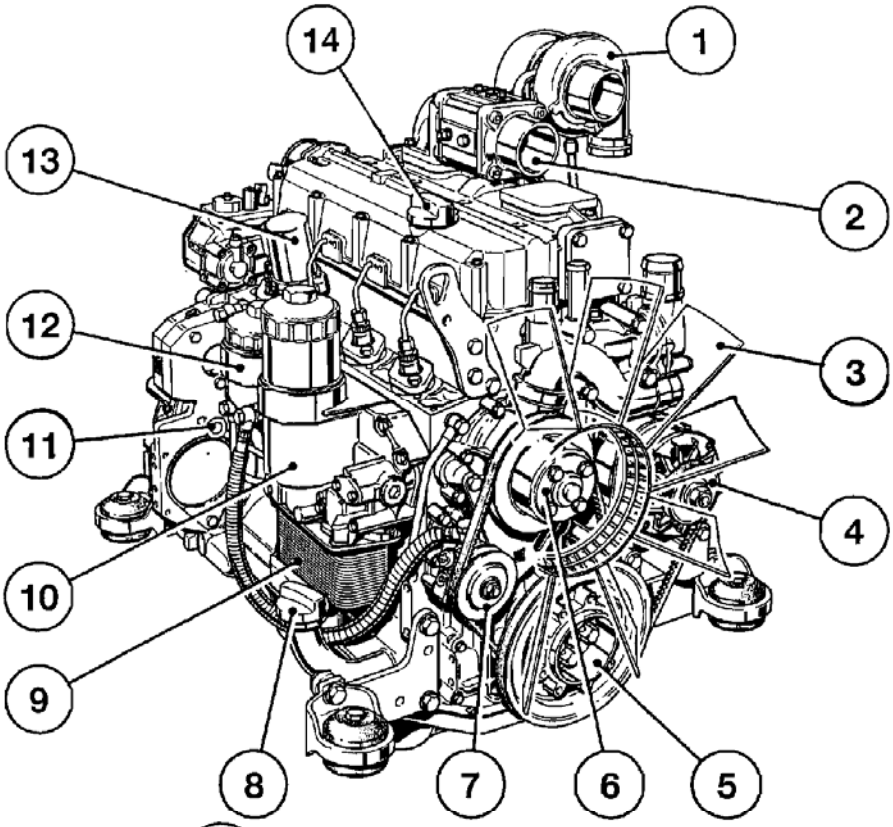
TRAINING MANUAL

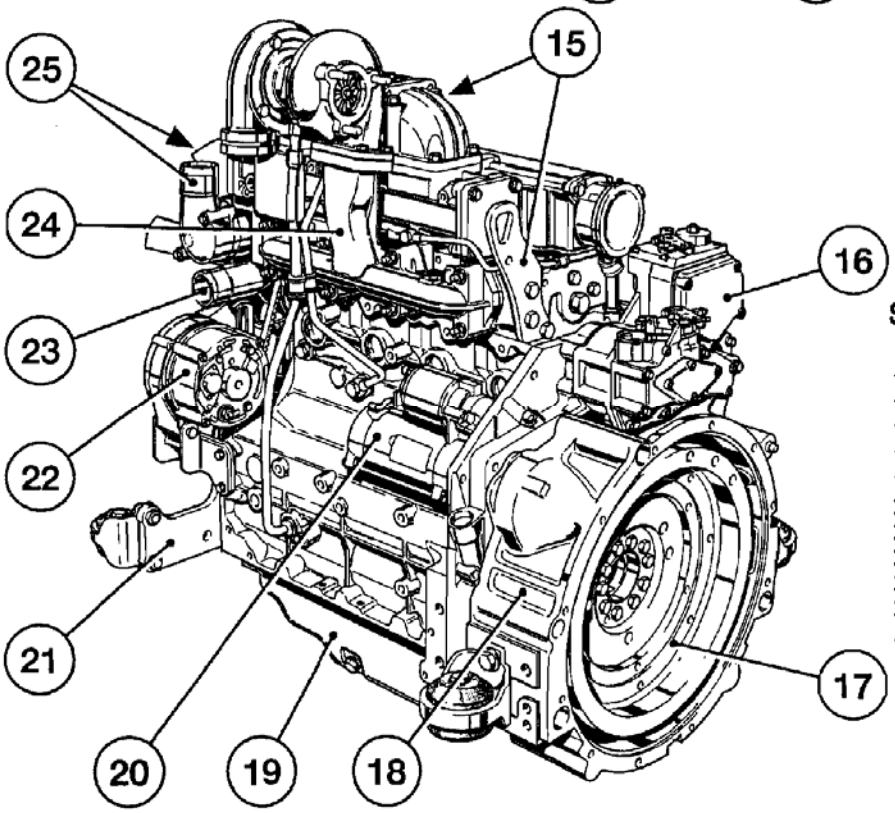


REVISION:

Operating Side 2012

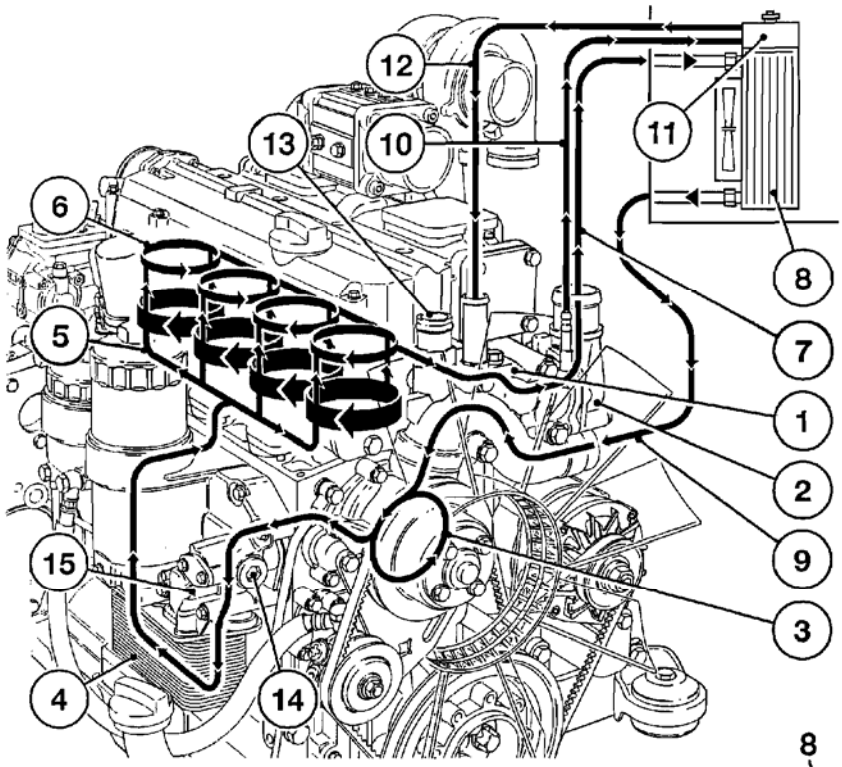
1 Turbocharger
2 Heater flange
3 Fan
4 Alternator
5 V-belt pulley on crankshaft
6 Coolant pump
7 Fuel pump
8 Oil filler
9 Oil filter housing with engine oil cooler
10 Oil filter housing with oil filter cartridge
11 Oil dipstick
12 Fuel filter
13 Tractive electromagnet
14 Oil filler neck





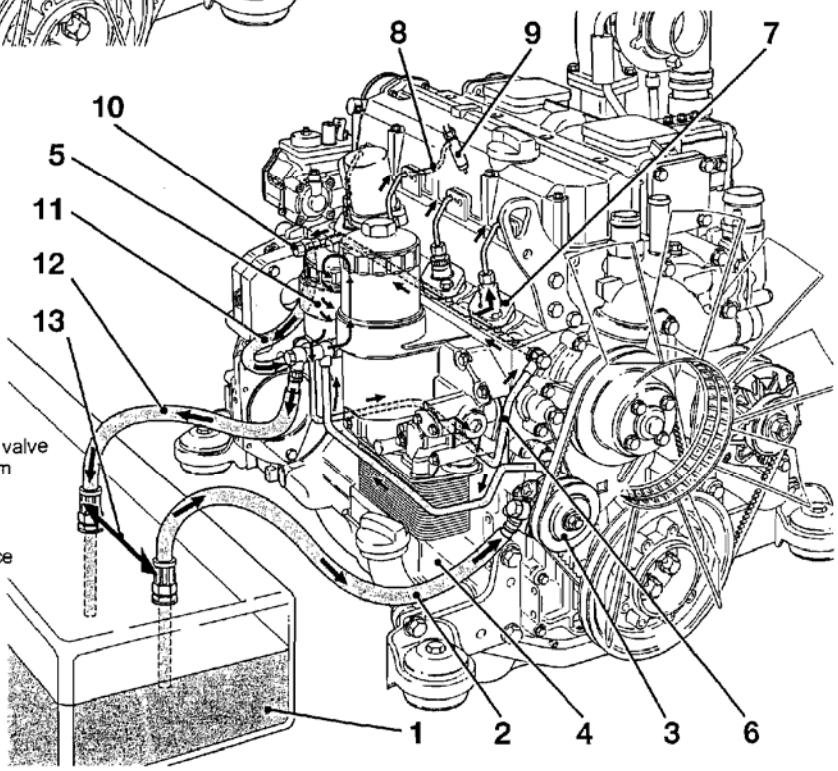
Starter Side 2012

15 Engine suspension
16 Speed regulator
17 Flywheel
18 SAE housing
19 Oil pan
20 Starter
21 Feet
22 Alternator
23 Coolant inlet
24 Exhaust manifold
25 Coolant outlet



Coolant block diagram 2012

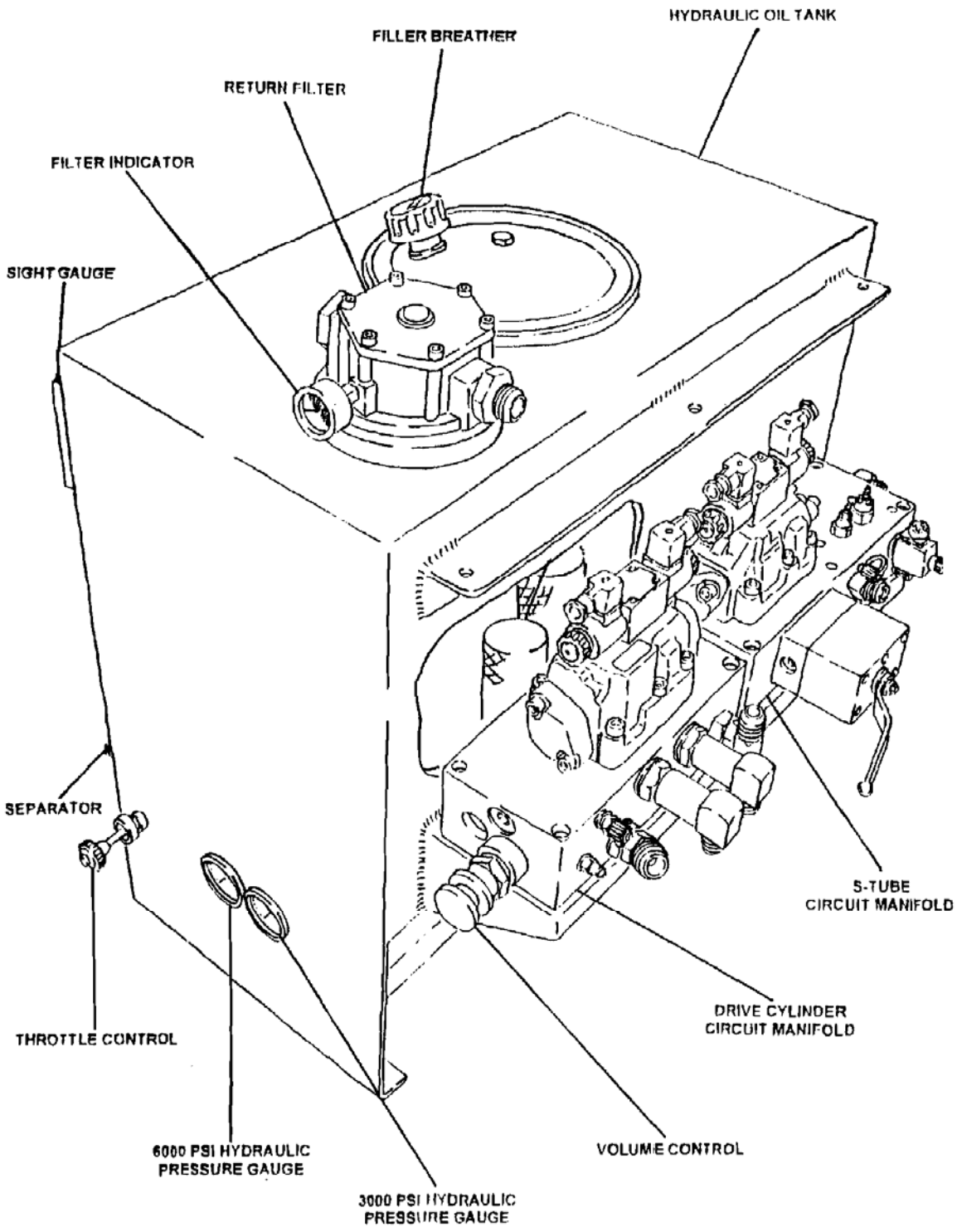
1. Thermostat housing
2. Outlet neck cover
3. Coolant pump
4. Lube oil cooler
5. Cylinder cooling
6. Cylinder head cooling
7. Line from engine to heat exchanger
8. Heat exchanger
9. Line from heat exchanger to thermosta
10. Ventilation line to the compensation tar
11. Compensation tank
12. Coolant compensation line
13. Coolant return from heater
14. Coolant supply to heating at V-belts
15. Coolant supply to heating at ribbe V-belts



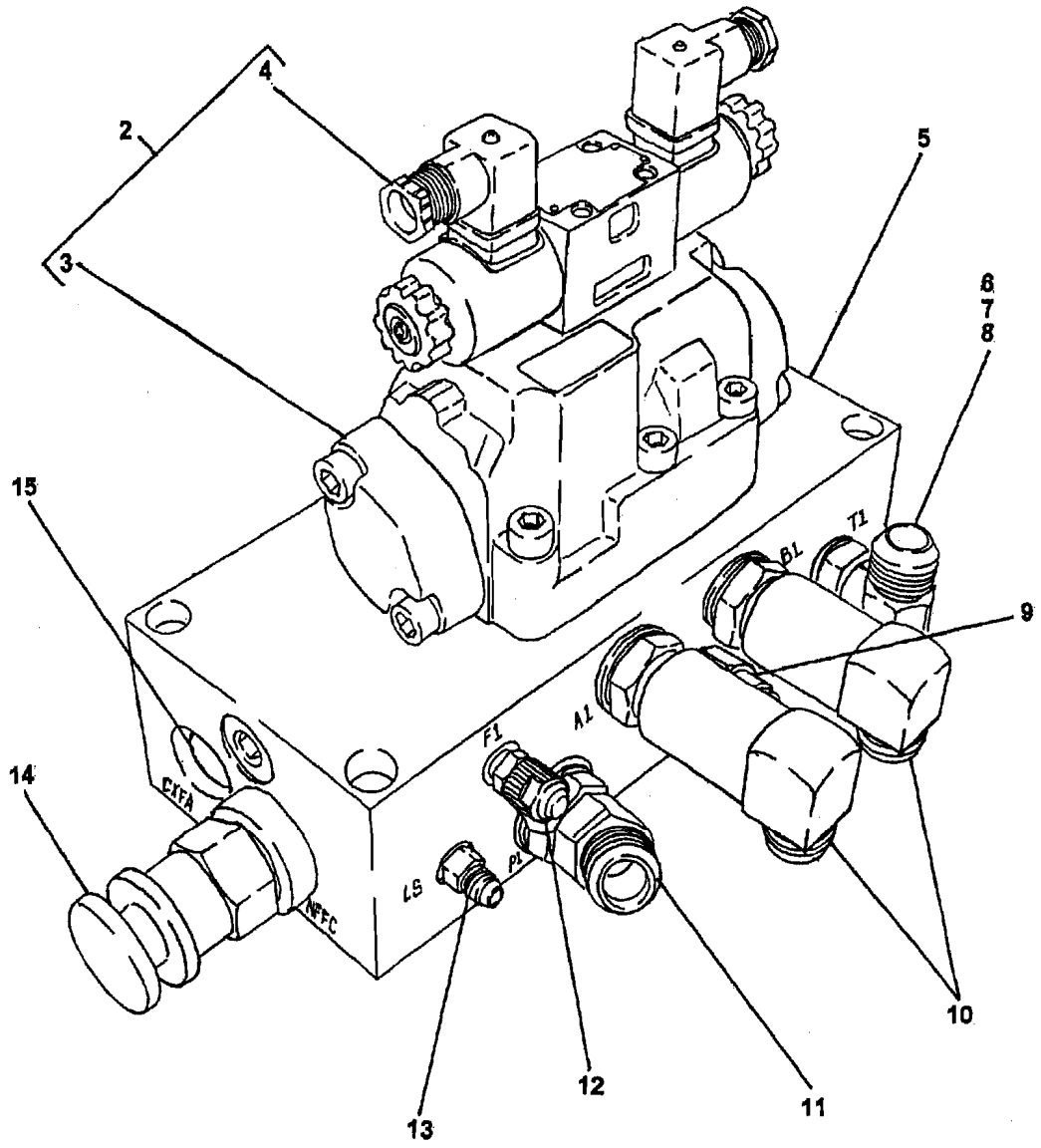
Fuel System

1 Fuel tank
2 Line to fuel pump
3 Fuel pump
4 Line to fuel filter
5 Fuel filter
6 Line to the injection pumps
7 Injection pump
8 Line to injection valve
9 Injection valve
10 Banjo bolt with pressure maintenance valve
11 Return line to fuel filter housing from pressure maintenance valve (with cup filter installation only)
12 Return line to fuel tank
13 Maintain maximum possible distance

HYDRAULIC TANK ASSEMBLY



REED TRAINING MANUAL

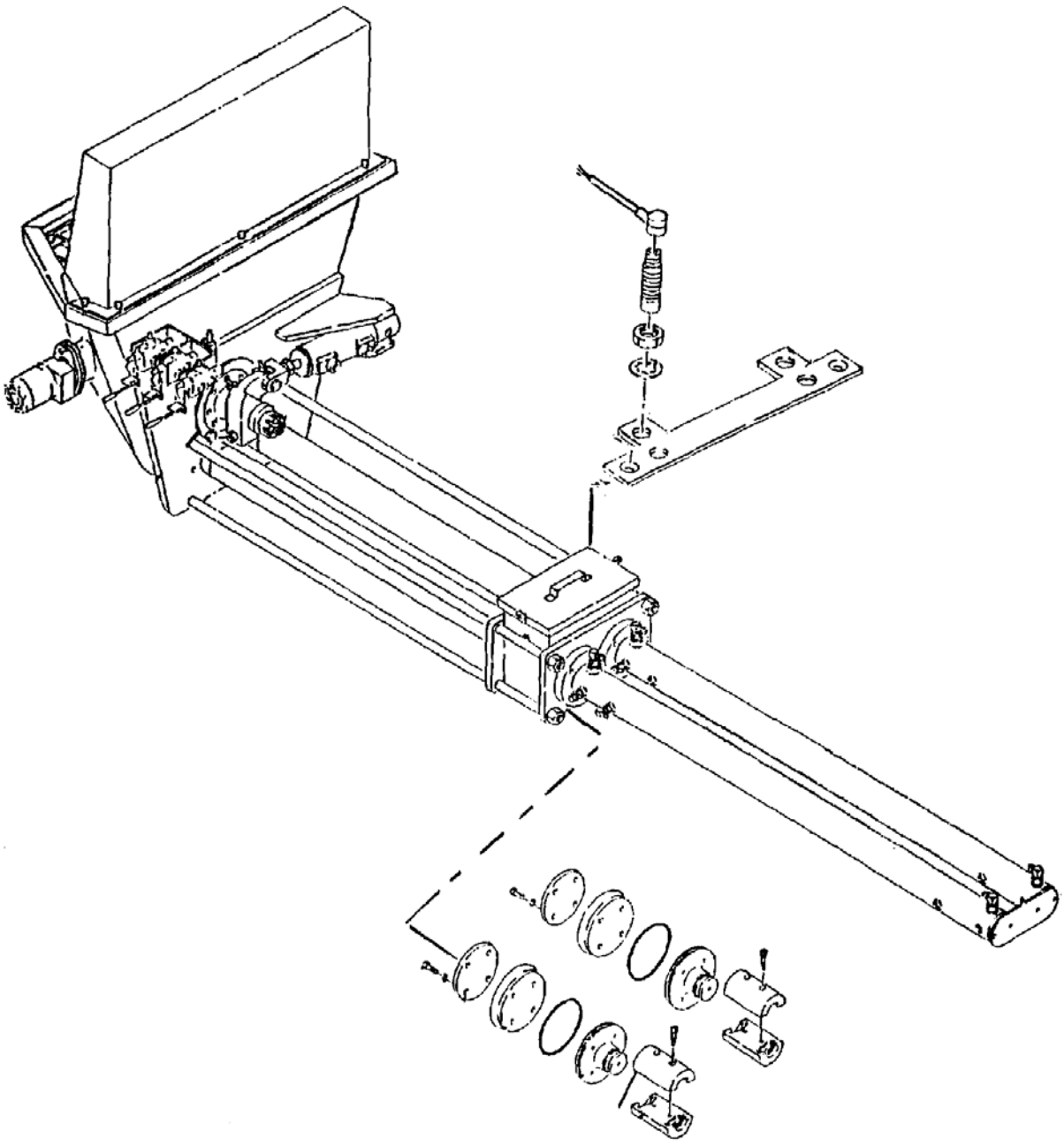


DRIVE CYLINDER CIRCUIT MANIFOLD ASSEMBLY

REED

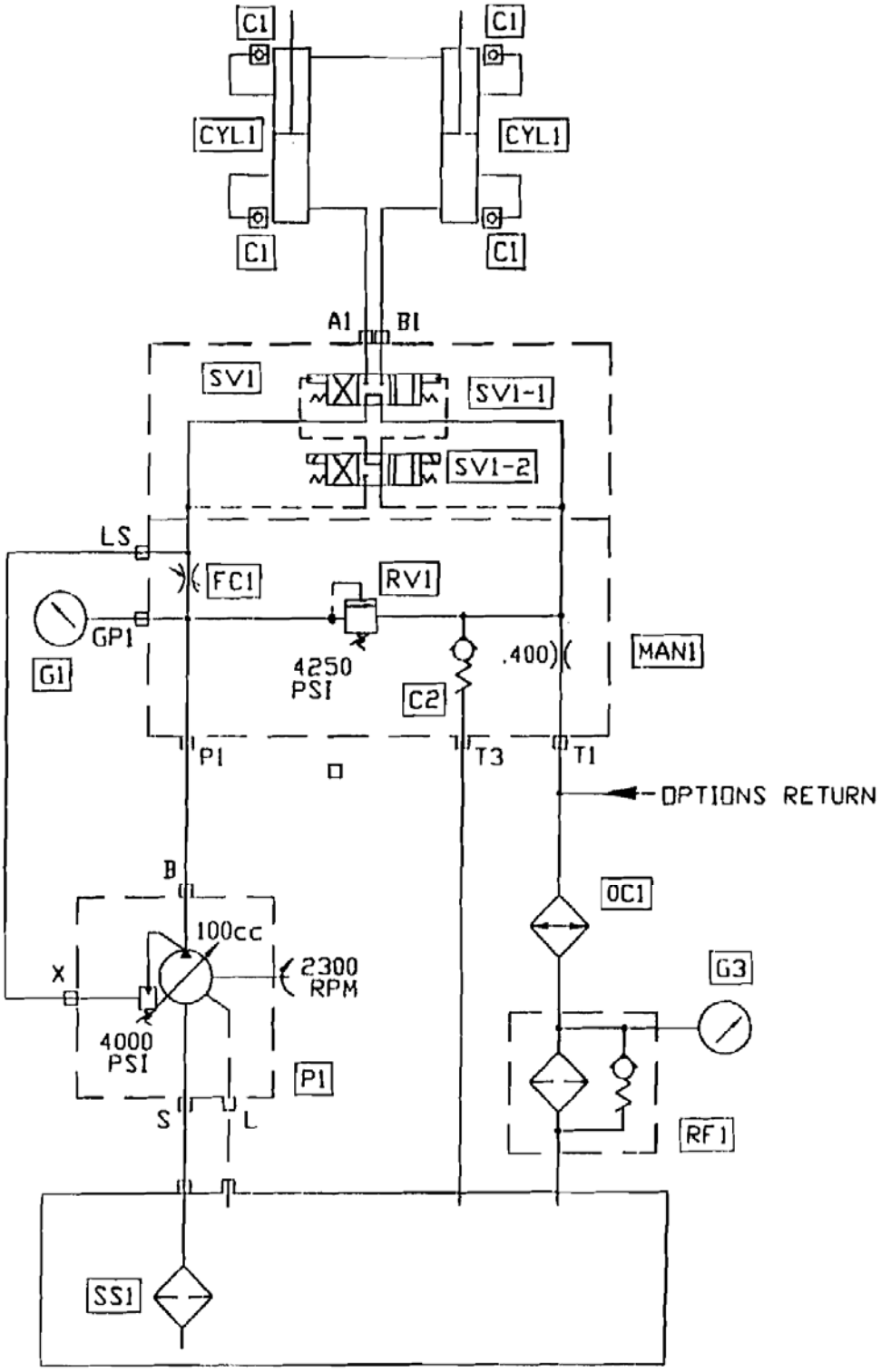
TRAINING MANUAL

PUMPING TRAIN INSTALLATION



REVISION:

DRIVE CYLINDER CIRCUIT HYDRAULIC SCHEMATIC



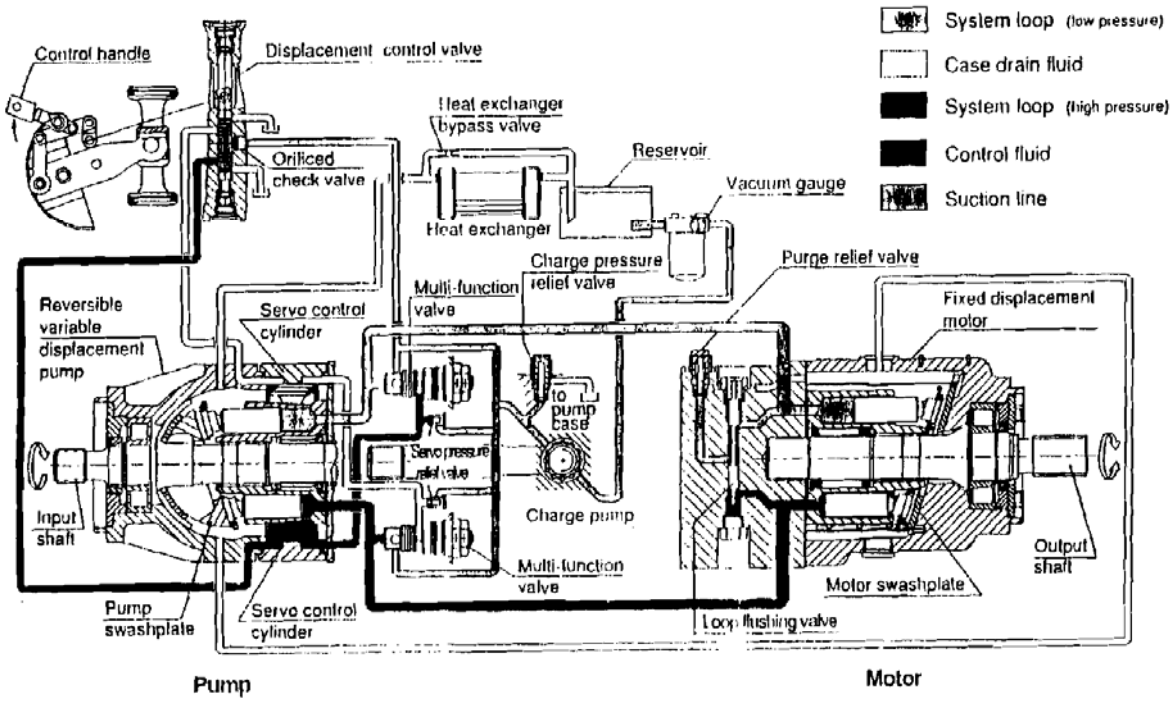
The Basic Closed Circuit

The main ports of the pump are connected by hydraulic lines to the main ports of the motor. Fluid flows, in either direction, from the pump to the motor then back to the pump in this closed circuit. Either of the hydraulic lines can be under high pressure. The position of the pump swashplate determines which line is high pressure as well as the direction of fluid flow.

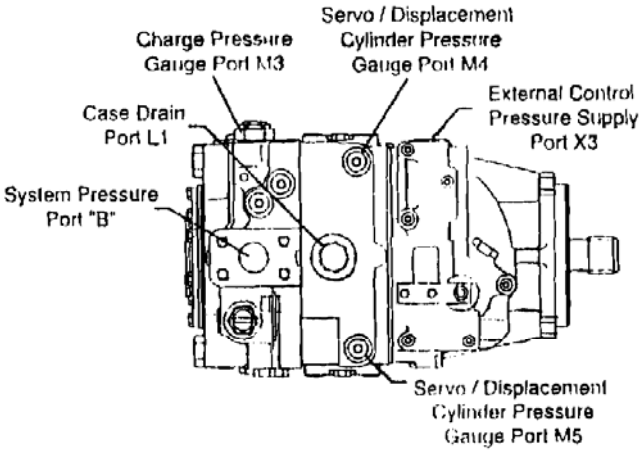
Case Drain and Heat Exchanger

The pump and motor require case drain lines to remove hot fluid from the system. The motor should be drained from its topmost drain port to ensure the case remains full of fluid. The motor case drain can then be connected to the lower drain port on the pump housing and out the top most port. A heat exchanger, with a bypass valve, is required to cool the case drain fluid before it returns to the reservoir.

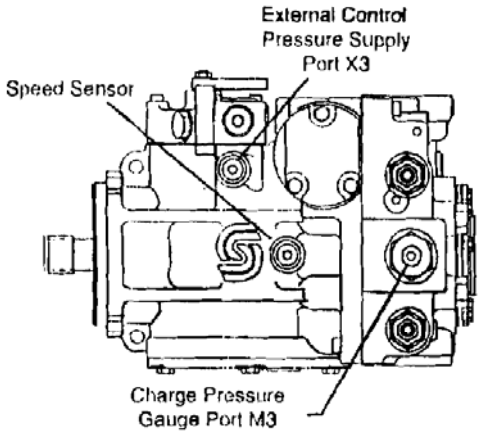
The System Circuit



SUNSTRAND MAIN PUMP AND RELATED COMPONENTS

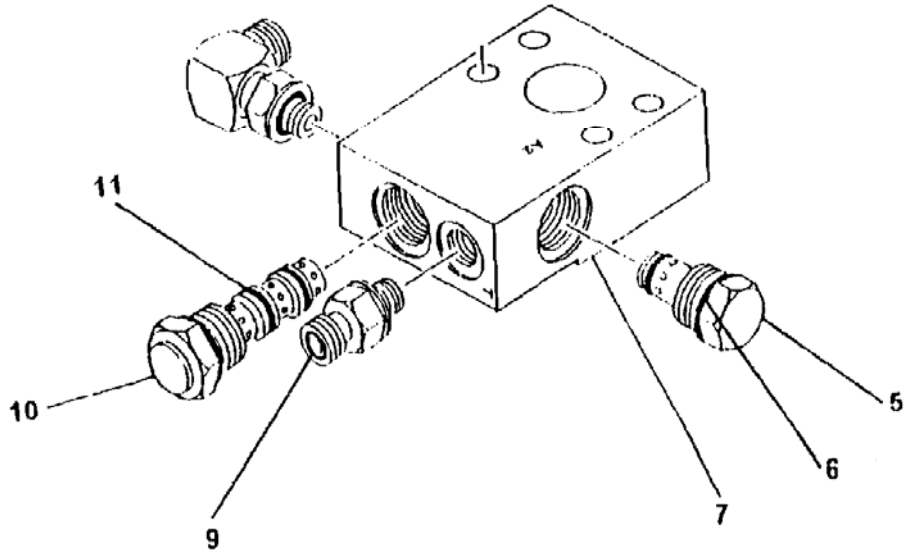


Top View

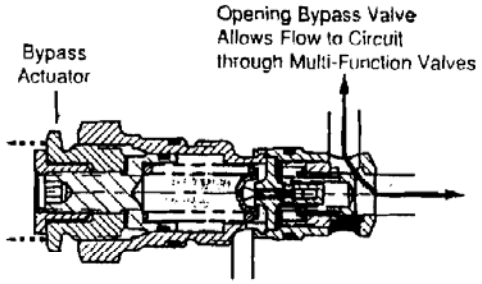


Right Side View

HOT OIL SHUTTLE MANIFOLD



SUNSTRAND MAIN PUMP AND RELATED COMPONENTS



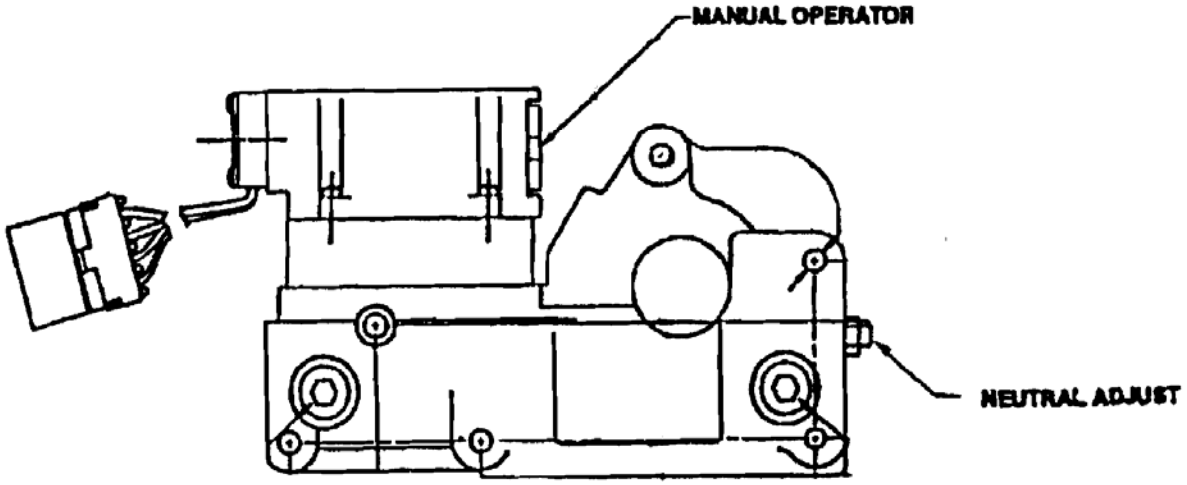
Multi-Function Valve with Bypass Function Engaged

Multi-Function Valves

All Series 90 pumps include two multi-function valves. The multi-function valve incorporates the system check valve, the pressure limiter valve, the high pressure relief valve, and the bypass valve in a replaceable cartridge. These functions are described separately. There are two multi-function valve cartridges in each Series 90 pump to handle functions in either direction. See Secs. 8.1.2 and 9.2.1 for adjustments and repairs.

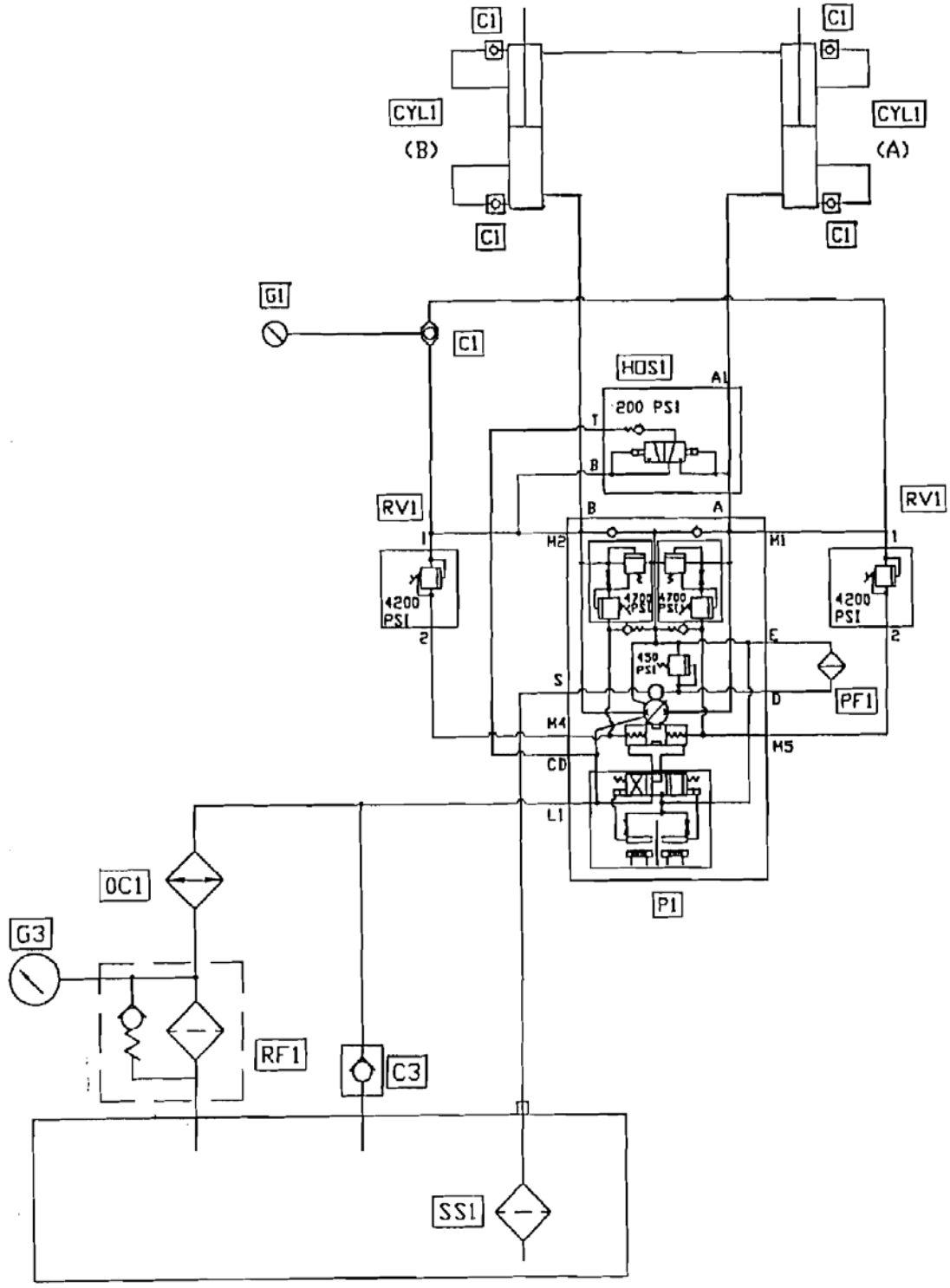
Electric Displacement Control (EDC)

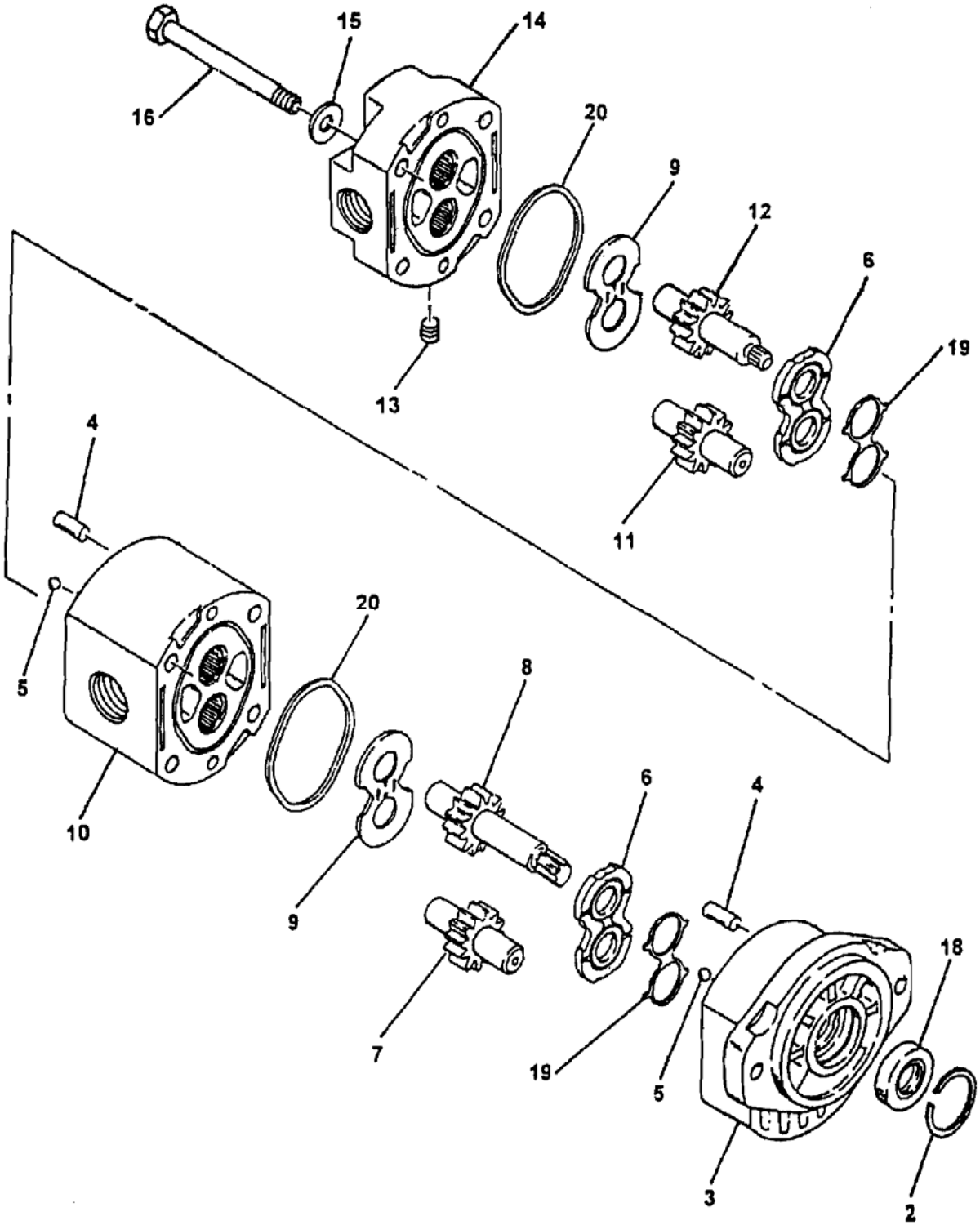
The electric displacement control is similar to the hydraulic displacement control with the input signal pressure controlled by a pressure control pilot (PCP) valve. The PCP valve converts a DC electrical input signal to a hydraulic signal which operates a spring-centered four-way servo valve. This valve ports hydraulic pressure to either side of a dual-acting servo piston. The servo piston rotates the cradle swashplate through an angular rotation of ±17°, thus varying the pump's displacement from full displacement in one direction to full displacement in the opposite direction. The control is designed so the angular position of the swashplate is proportional to the EDC input.



C50 HPS

CONCRETE PUMP SYSTEM




15
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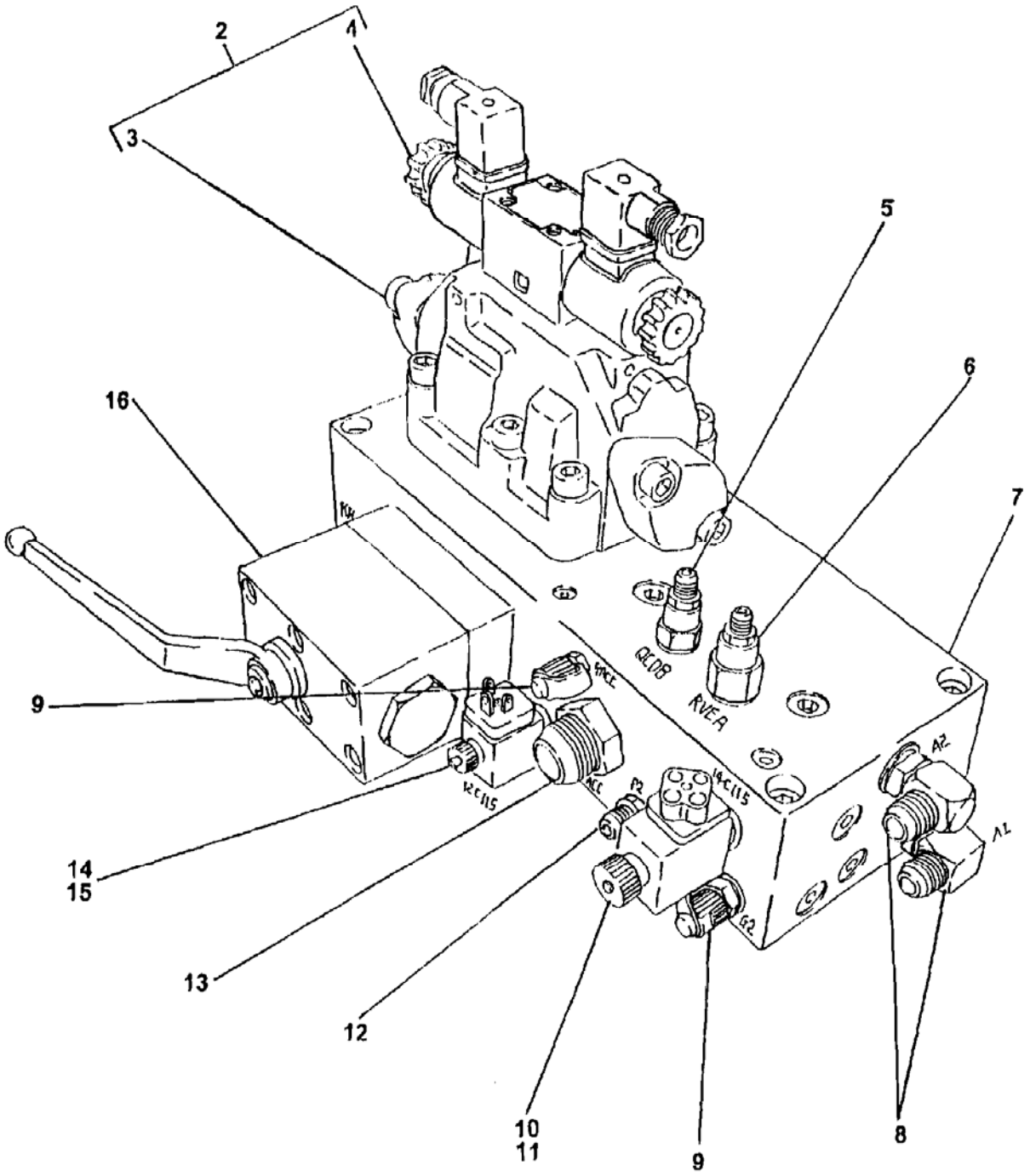
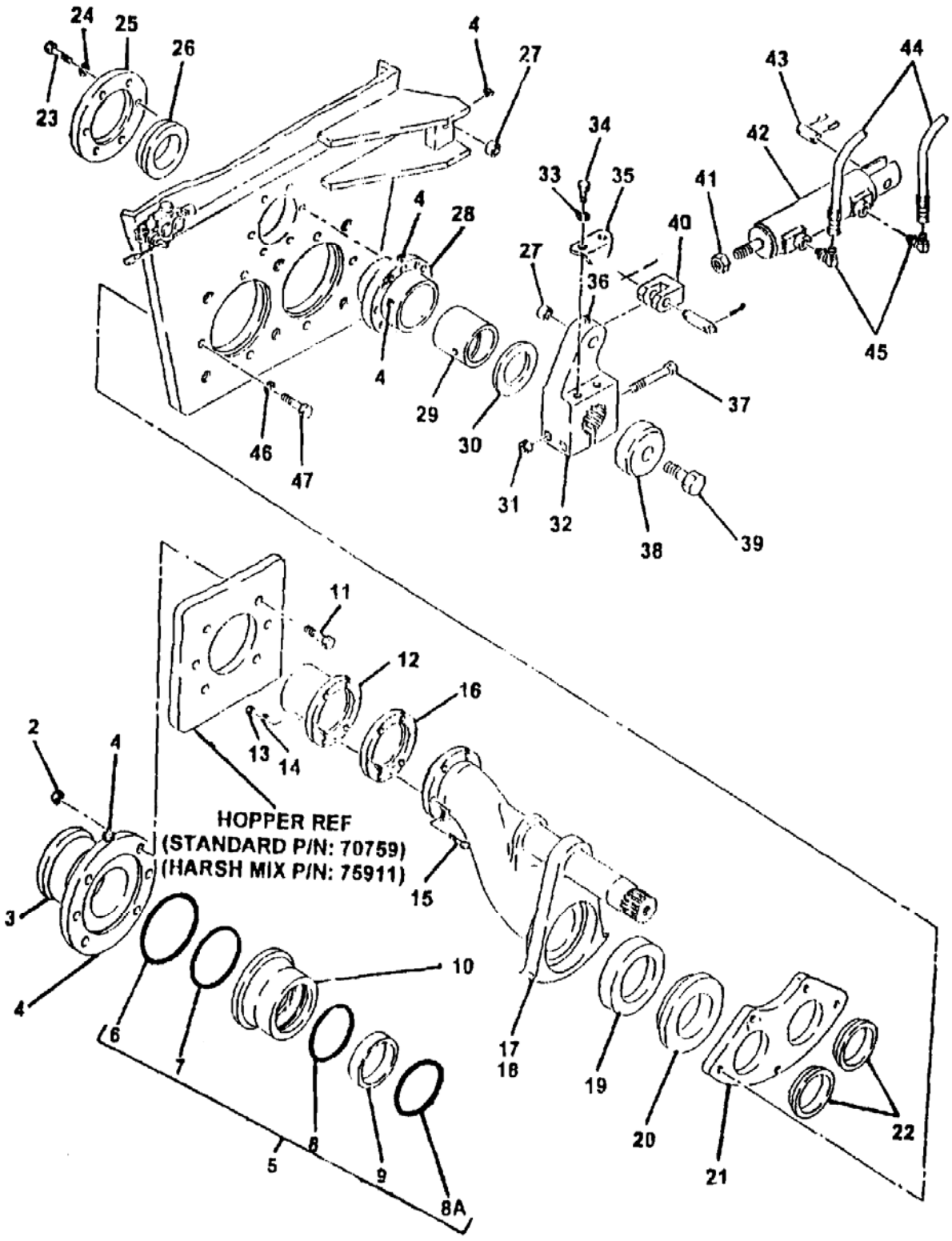
2

SWING TUBE CIRCUIT MANIFOLD ASSEMBLY



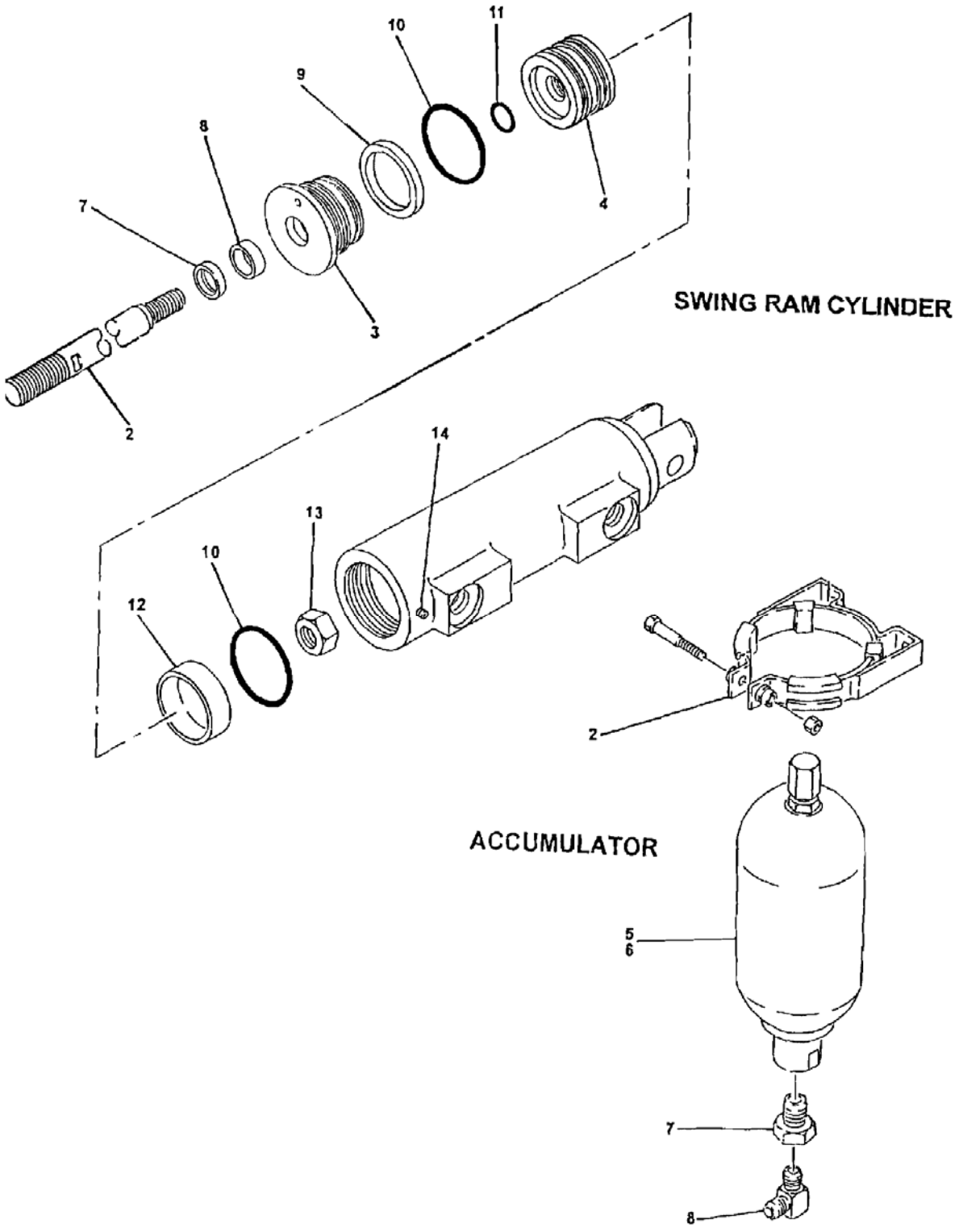
TRAINING MANUAL

SWING VALVE ASSEMBLY



REVISION:

TRAINING MANUAL

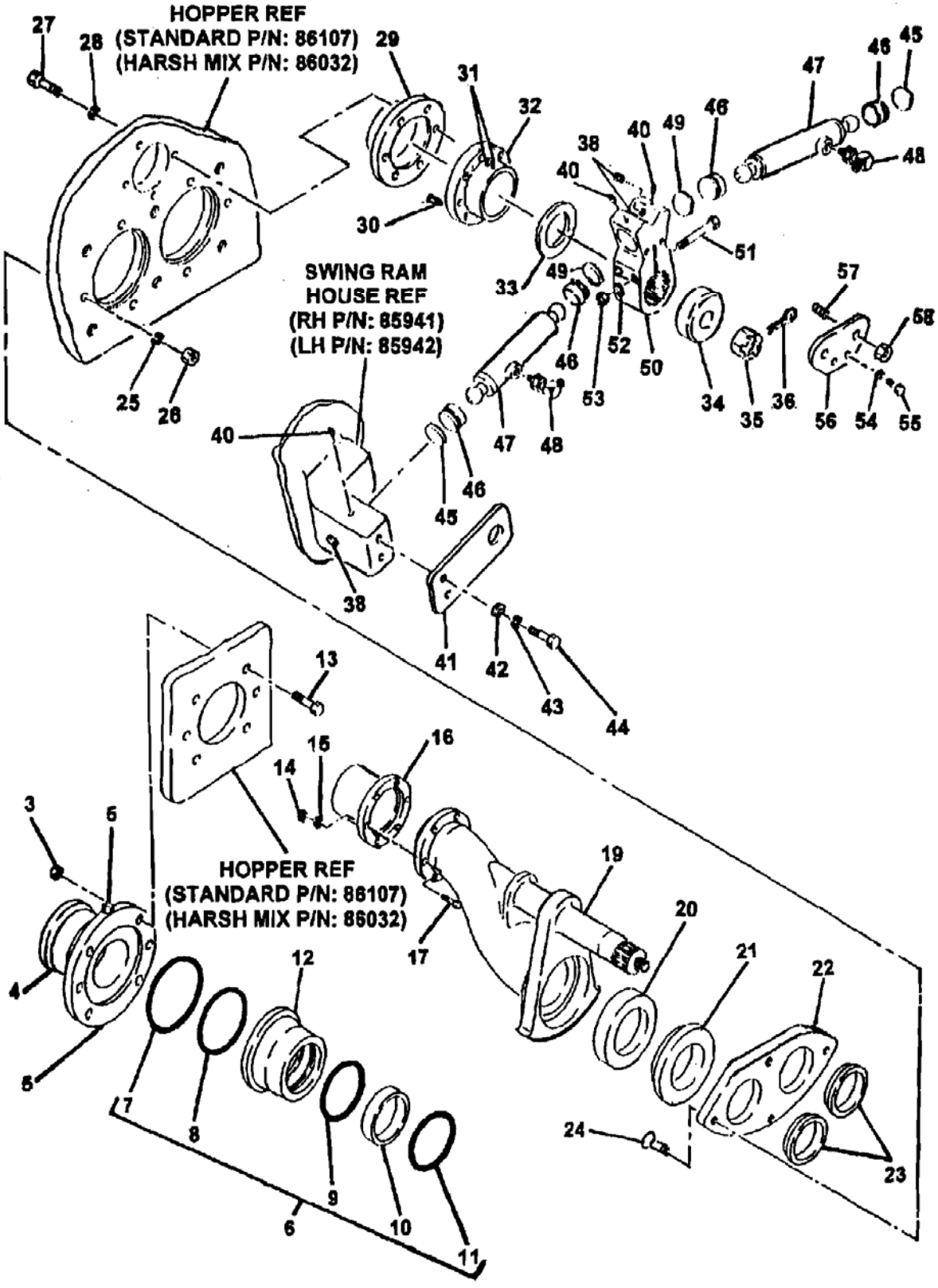


REVISION:

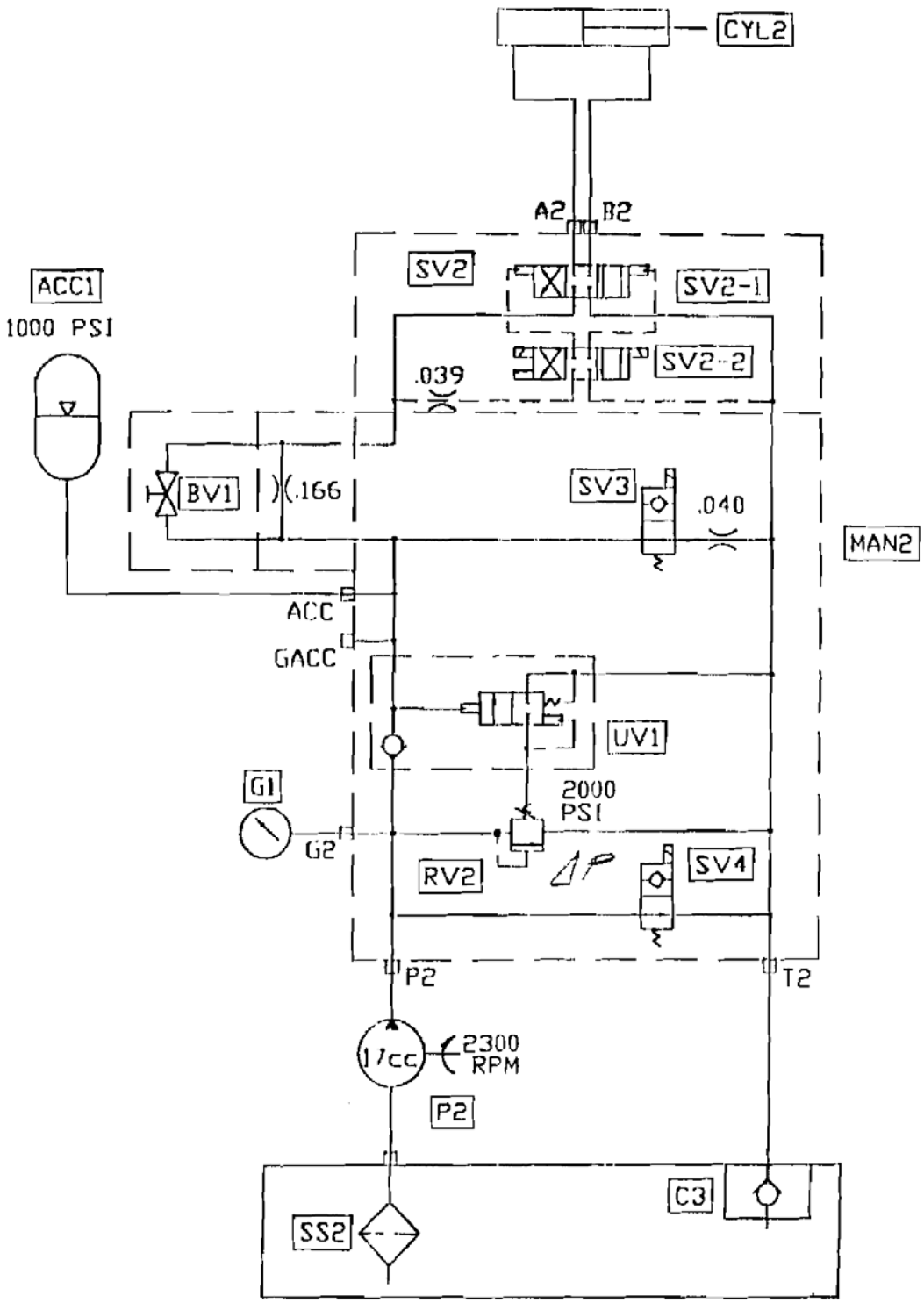
REED

TRAINING MANUAL

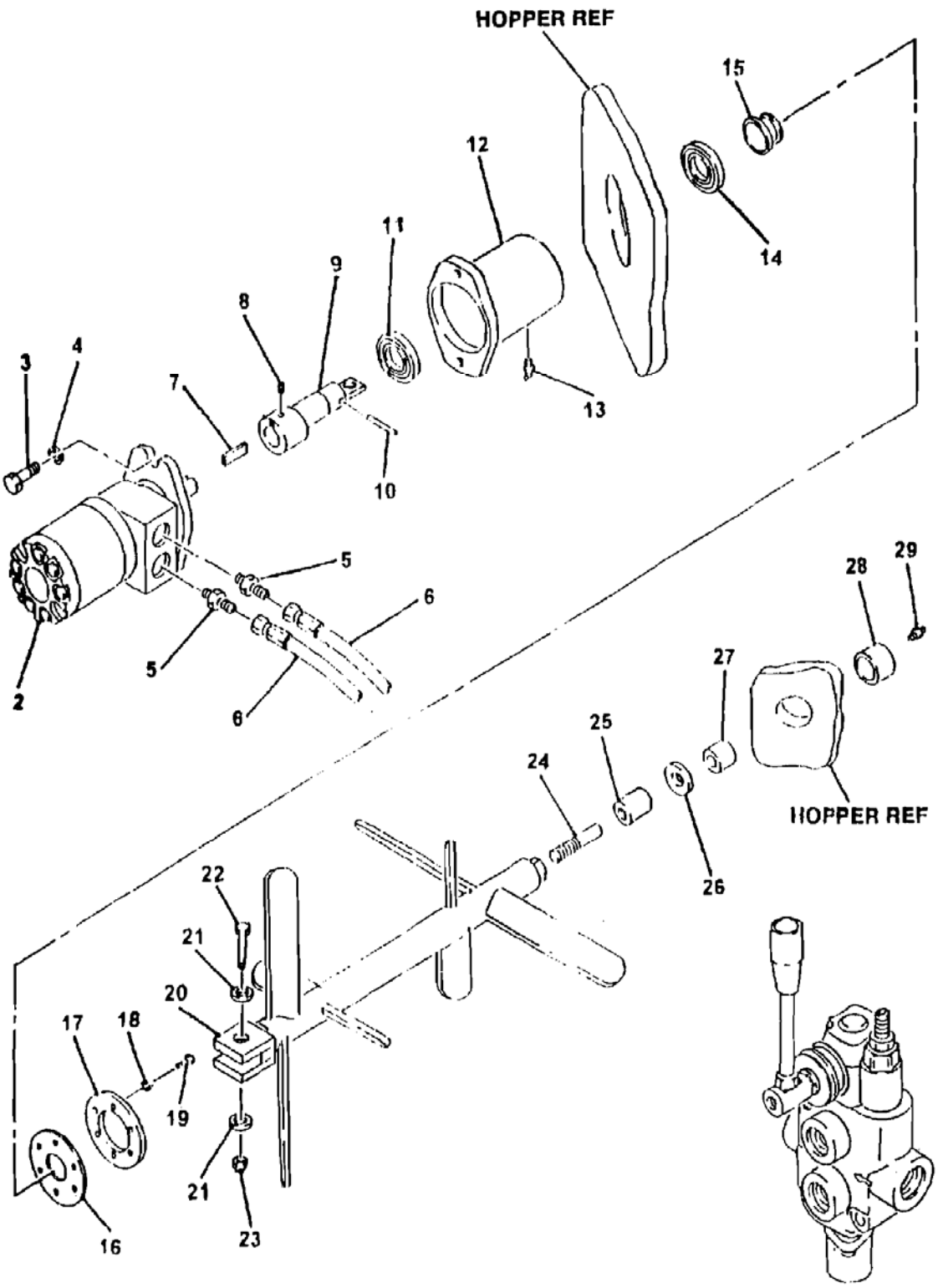
DUAL RAM SWING VALVE ASSEMBLY



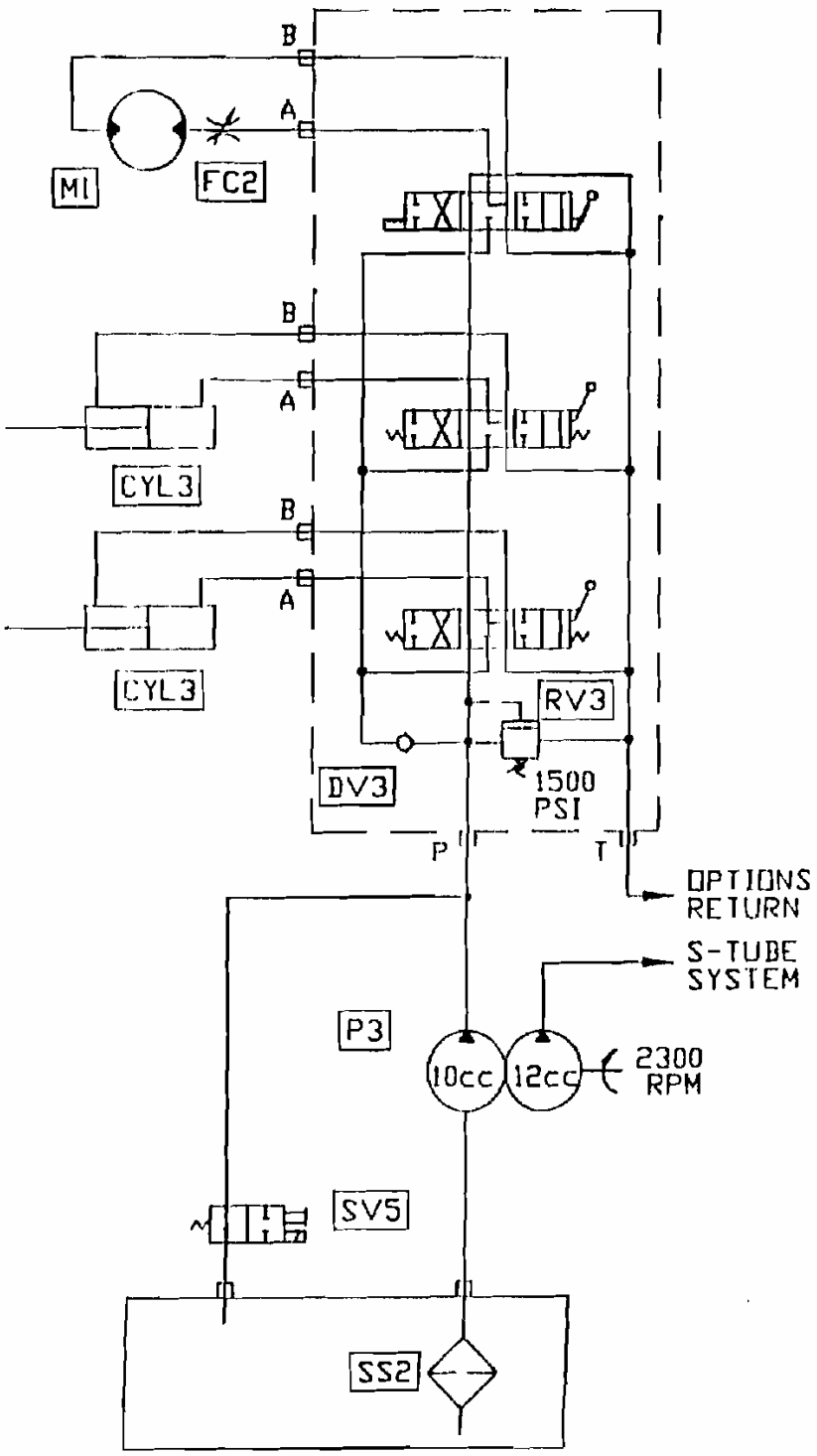
REVISION:


S-TUBE CIRCUIT
HYDRAULIC SCHEMATIC
CYL2
A2
B2
SV2
SV2-1
SV2-2
ACC1
1000 PSI
.039
BV1
.166
SV3
.040
MAN2
ACC
GACC
UV1
G1
2000
PSI
G2
RV2
SV4
P2
T2
11cc
2300
RPM
P2
C3
SS2

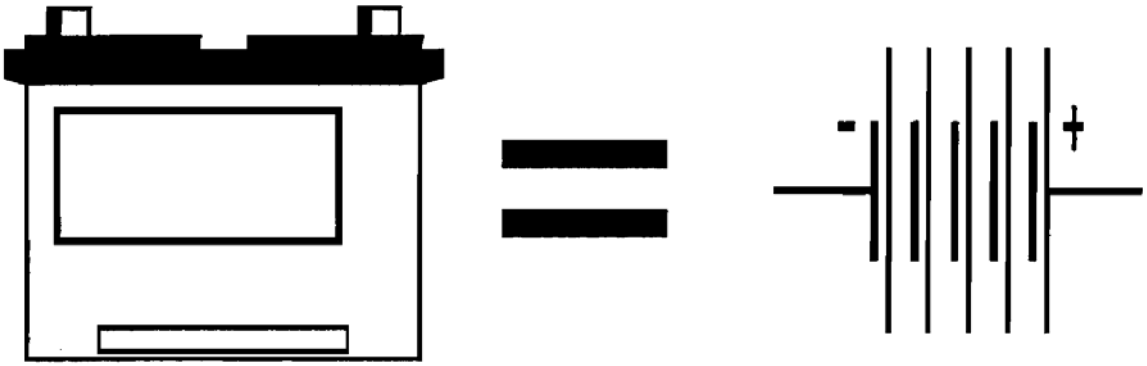
AGITATOR ASSEMBLY



AGITATOR / OUTRIGGER OPTION
HYDRAULIC SCHEMATIC



Battery



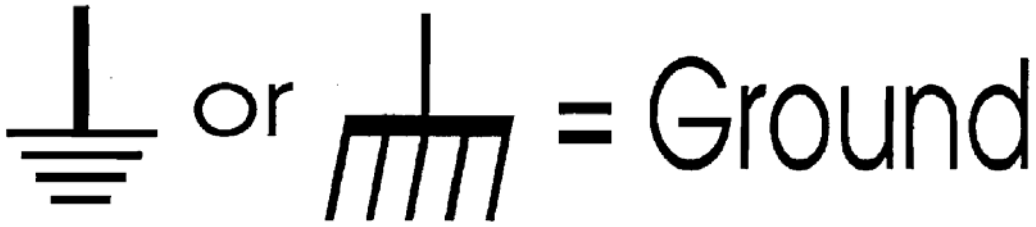
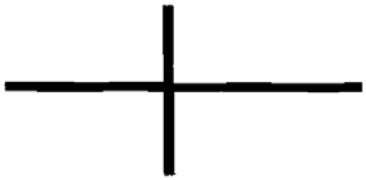


Figure IV.A.1

CONDUCTORS

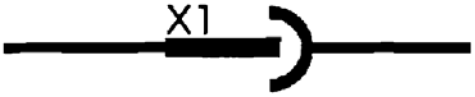
Conductor

No Connection

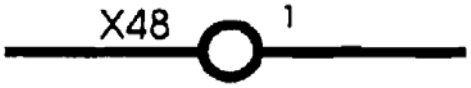


CONNECTIONS

Plug-In

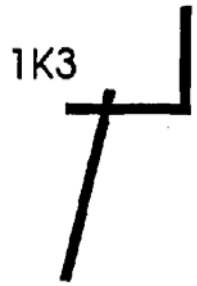


Screw Terminal



Junction

NC Contact



Tee Junction

Tee Junction

Figure IV.B.1&2

EXAMPLES OF LOADS

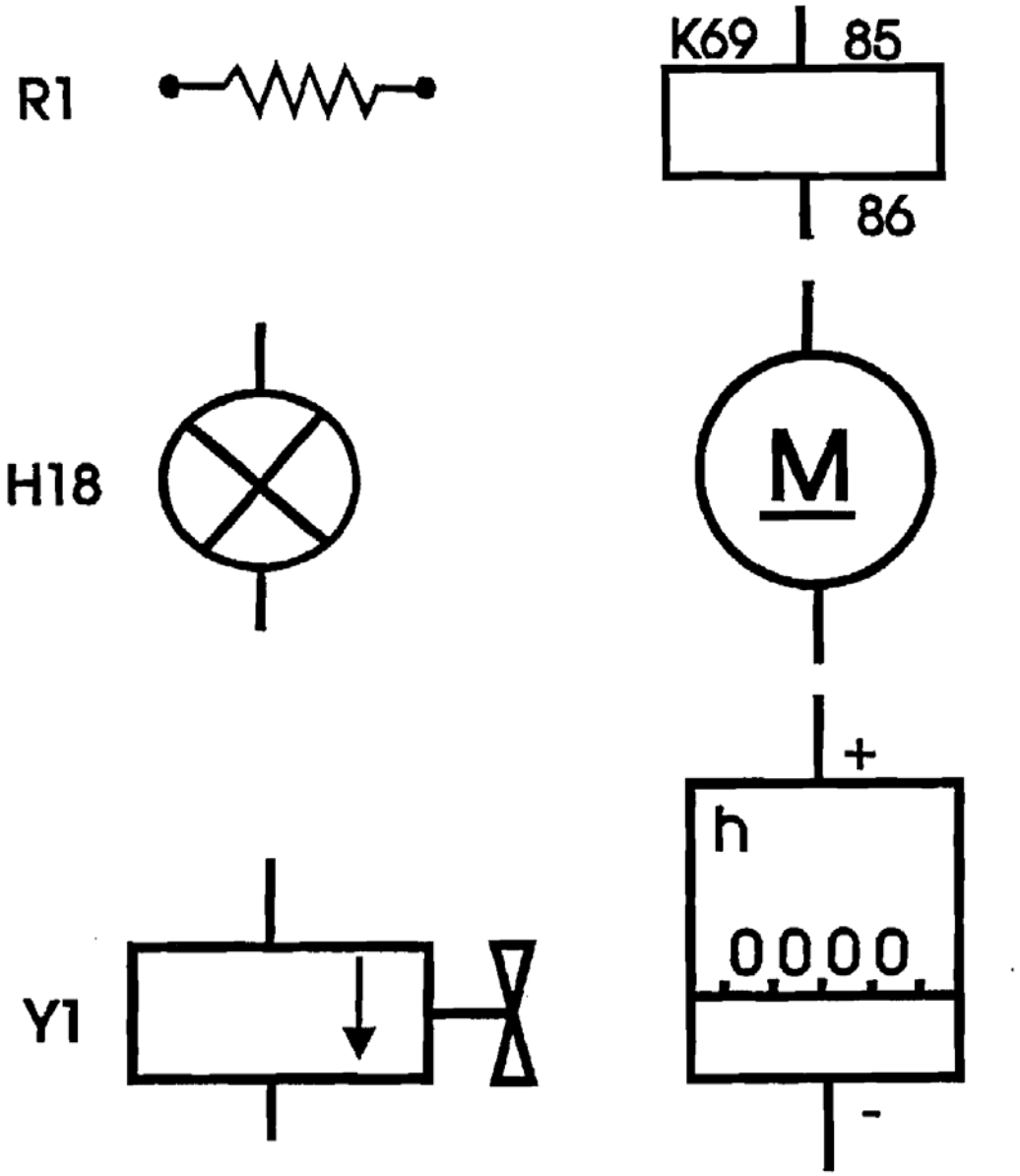


Figure IV.C

FUSES

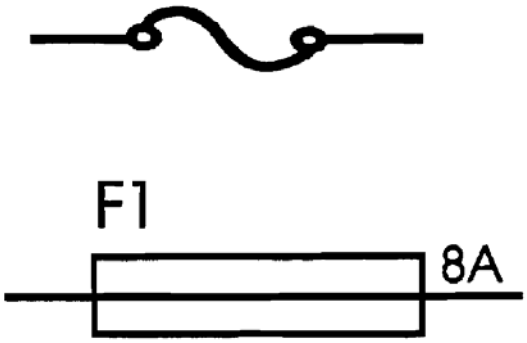


Figure IV.D

SPST

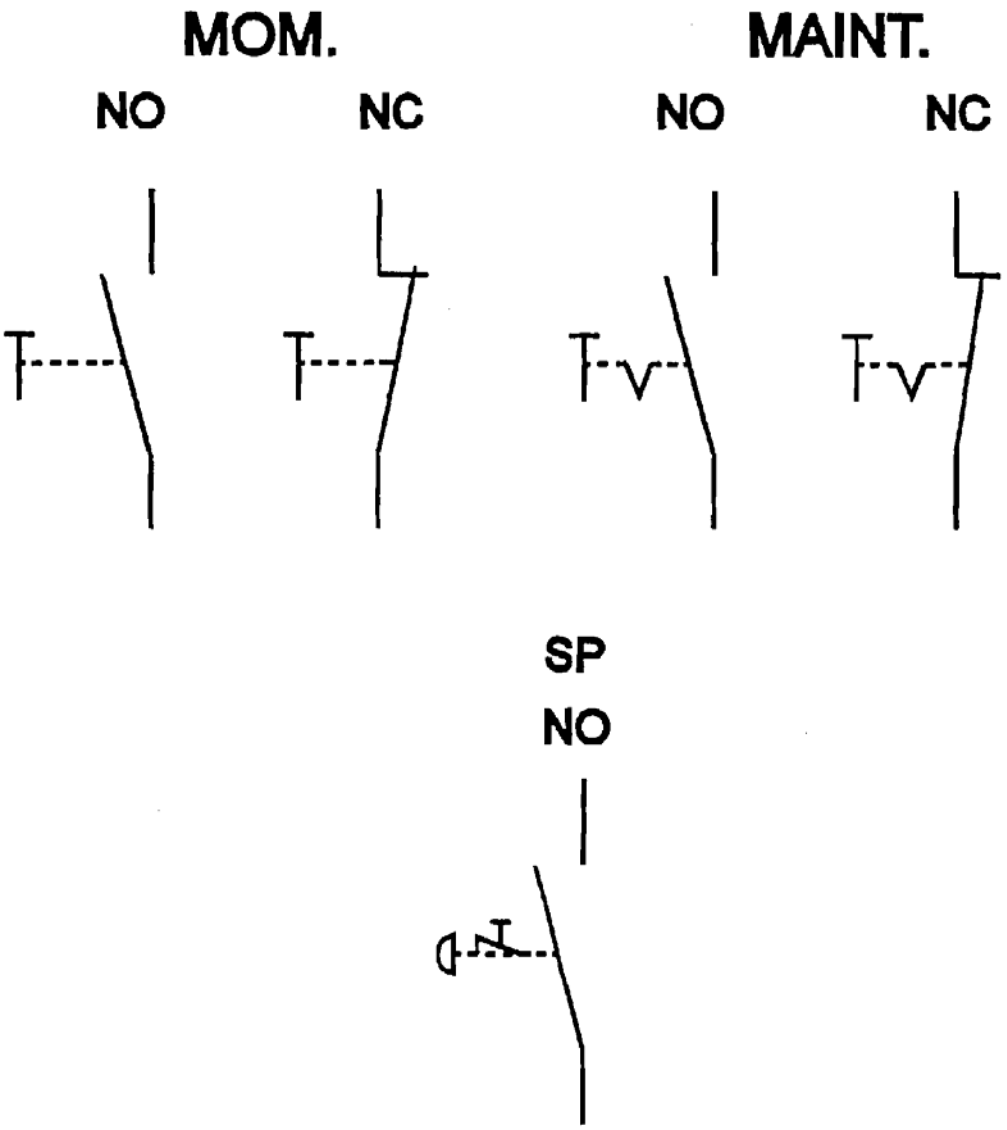


Figure IV.D.2.i

DPST

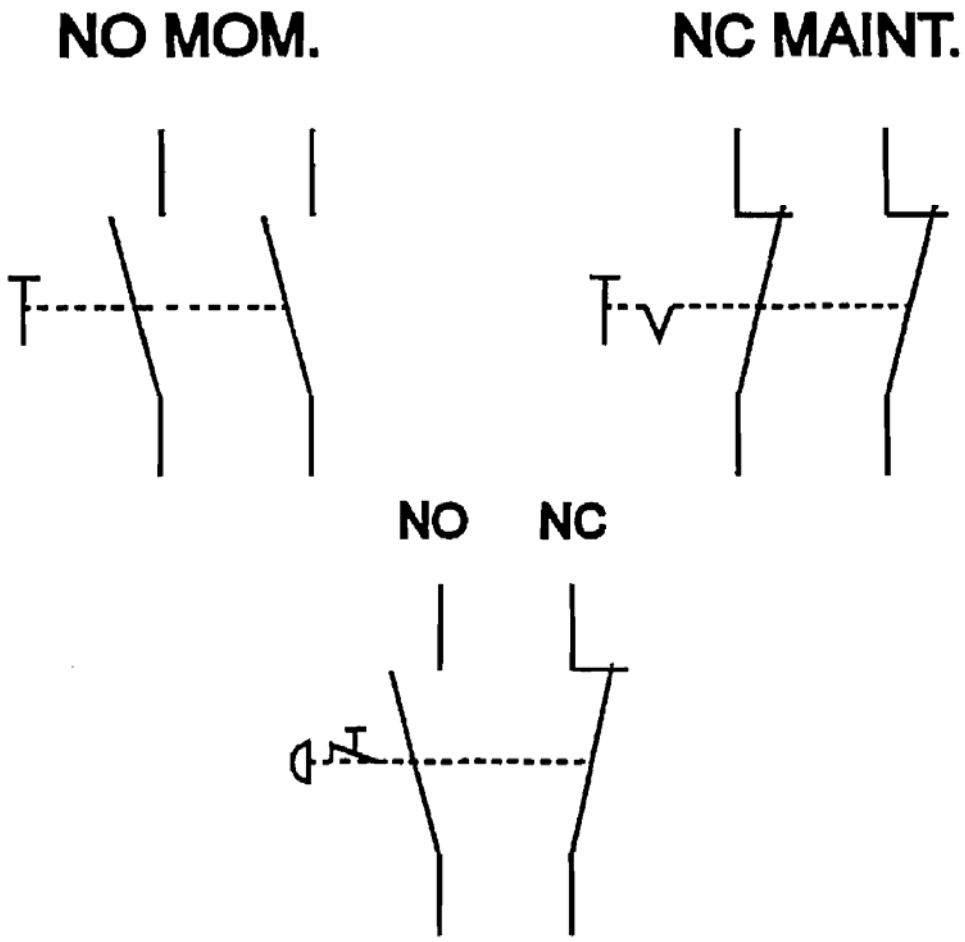


Figure IV.D.2.ii

DPDT

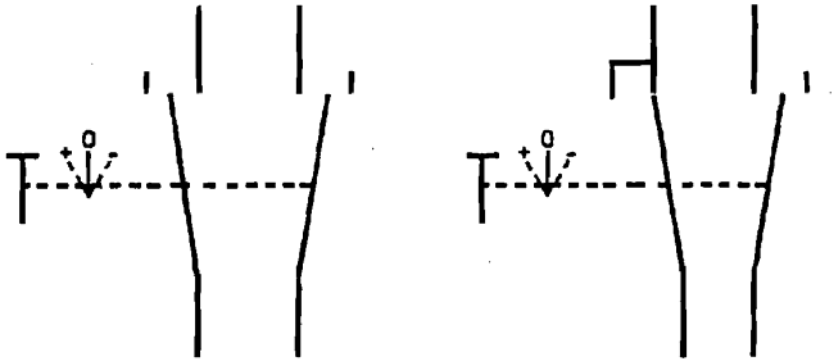


Figure IV.D.2.iii

COMPLETE CIRCUIT
SWITCH BEFORE LOAD

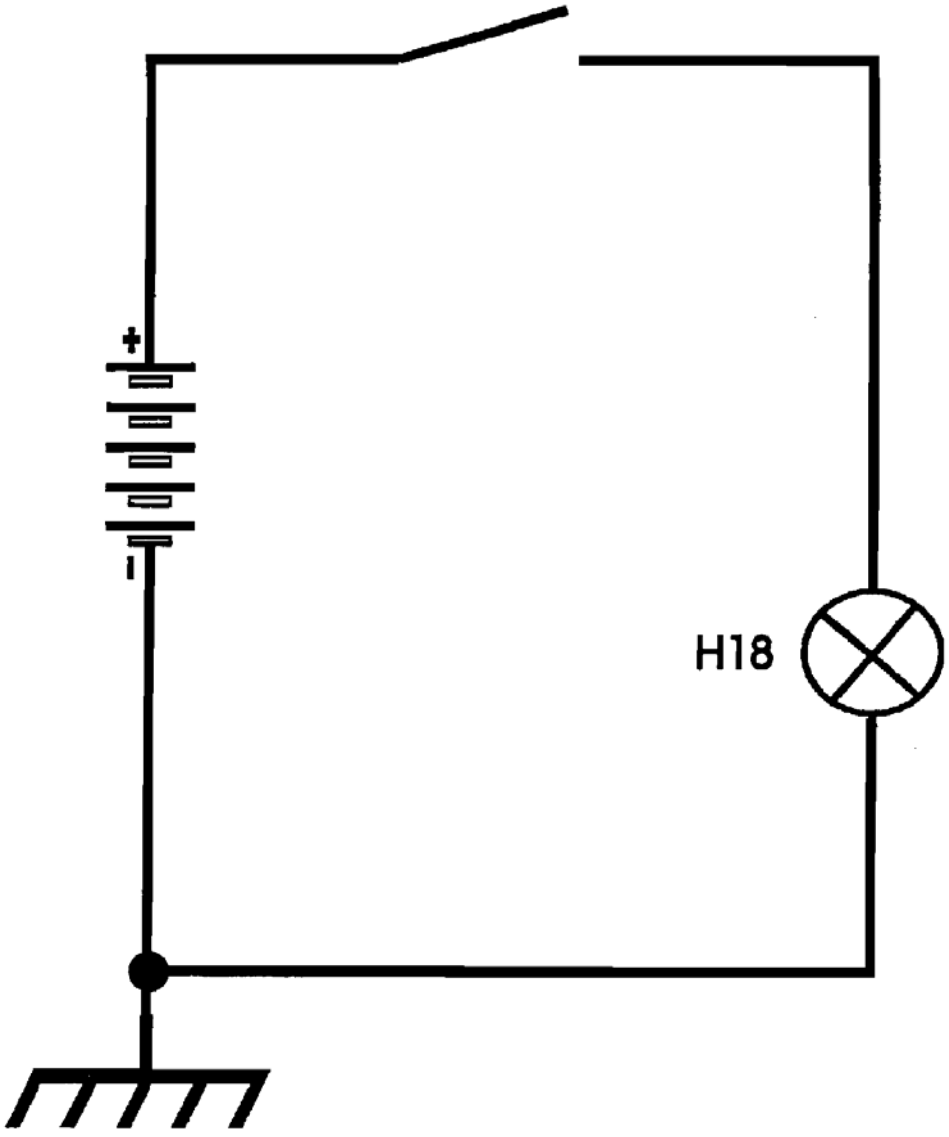


Figure V.A

COMPLETE CIRCUIT
SWITCH AFTER LOAD

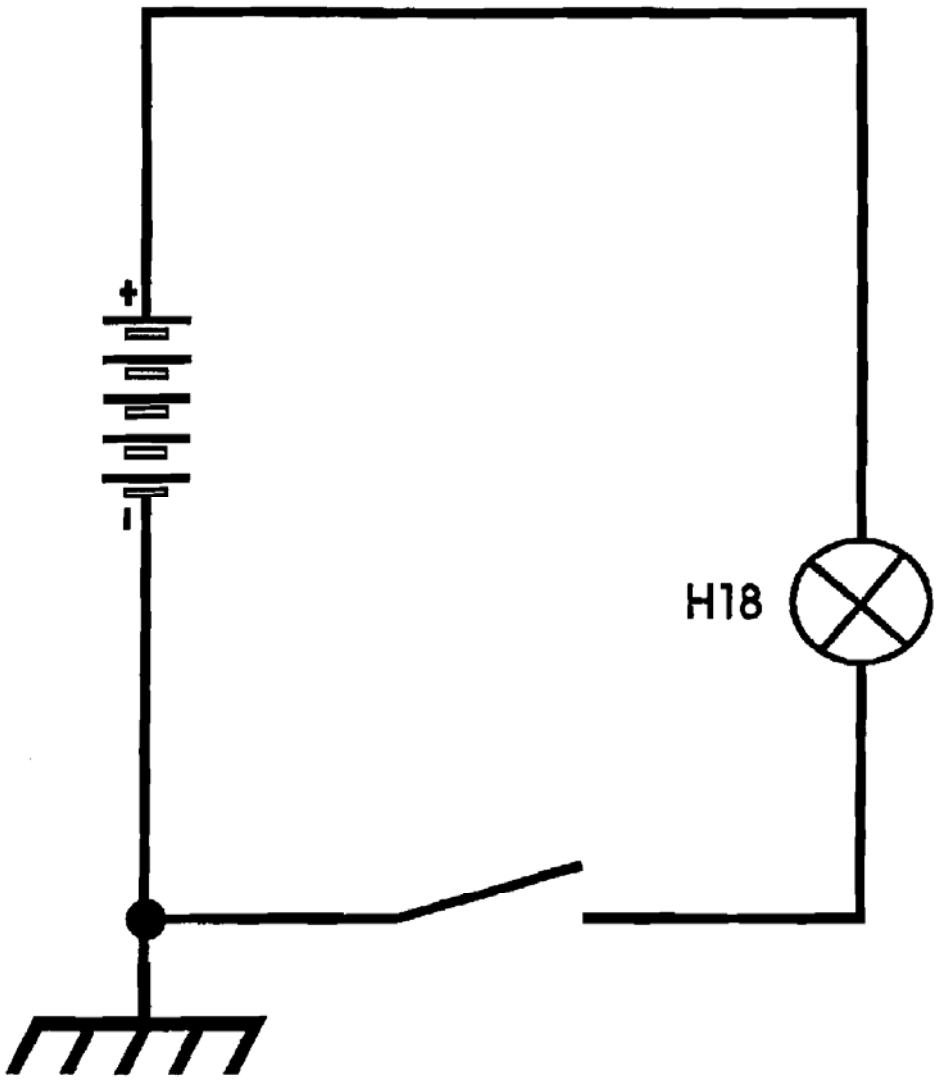


Figure V.B

OPEN CIRCUIT

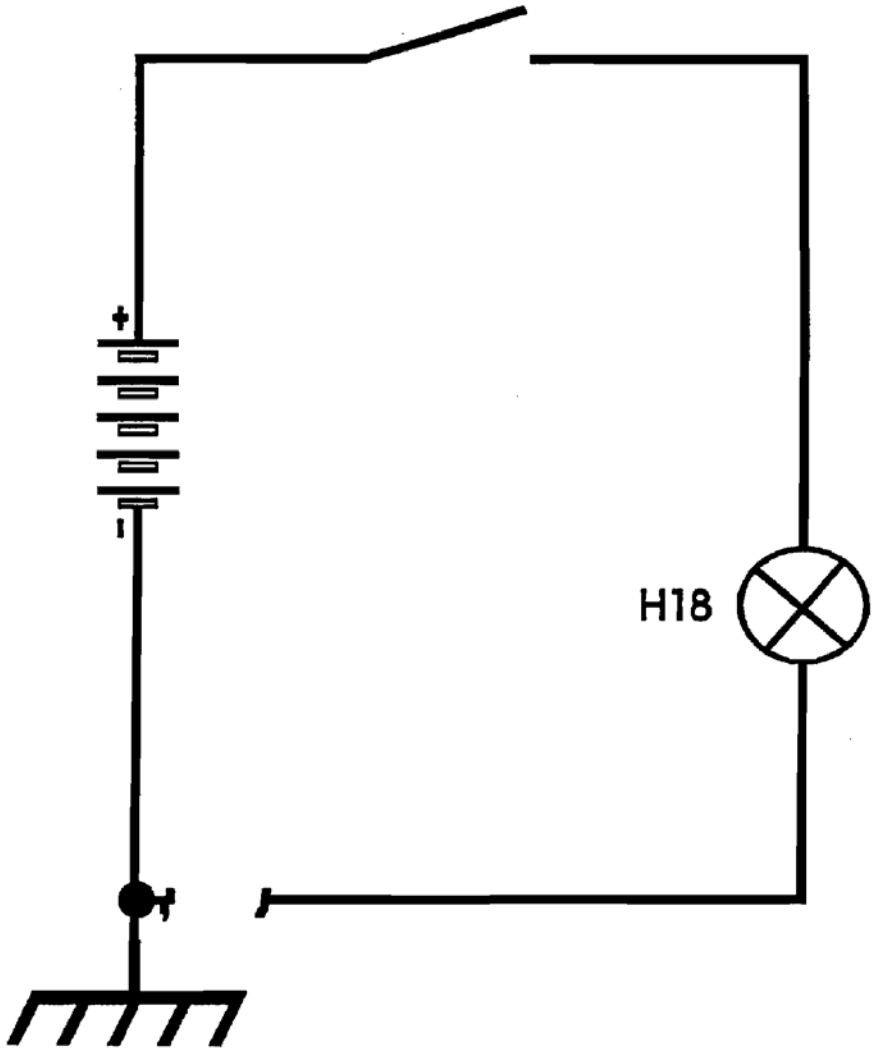
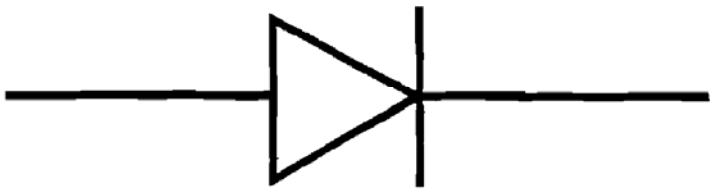
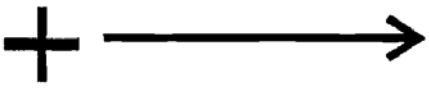


Figure VI

DIODE





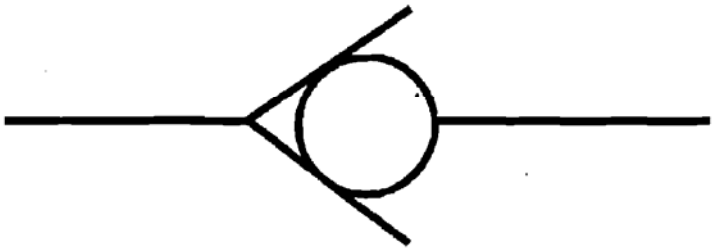
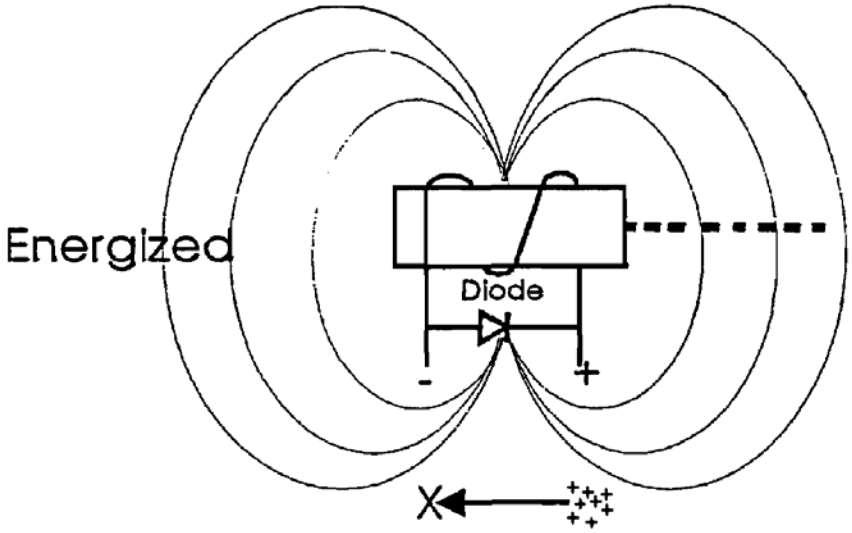


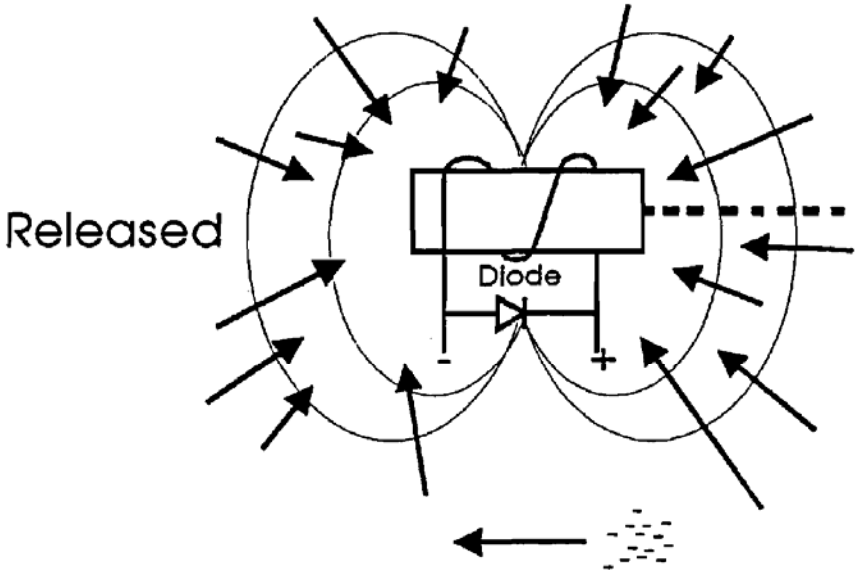
Figure XII.A

DIODE PROTECTION

Diode Blocks Positive Voltage From Grounding



Field Collapses Creating Negative Voltage



Negative Voltage Grounds Through Diode

Figure XII.B C & D

SOLENOID SYMBOLS

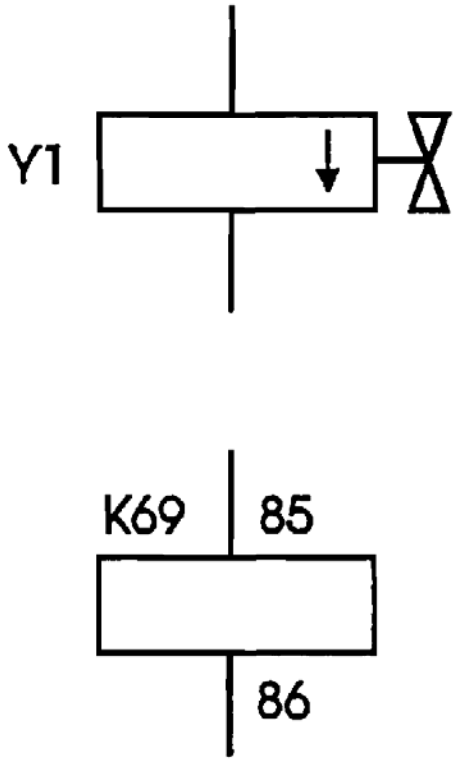


Figure XIII

Relay

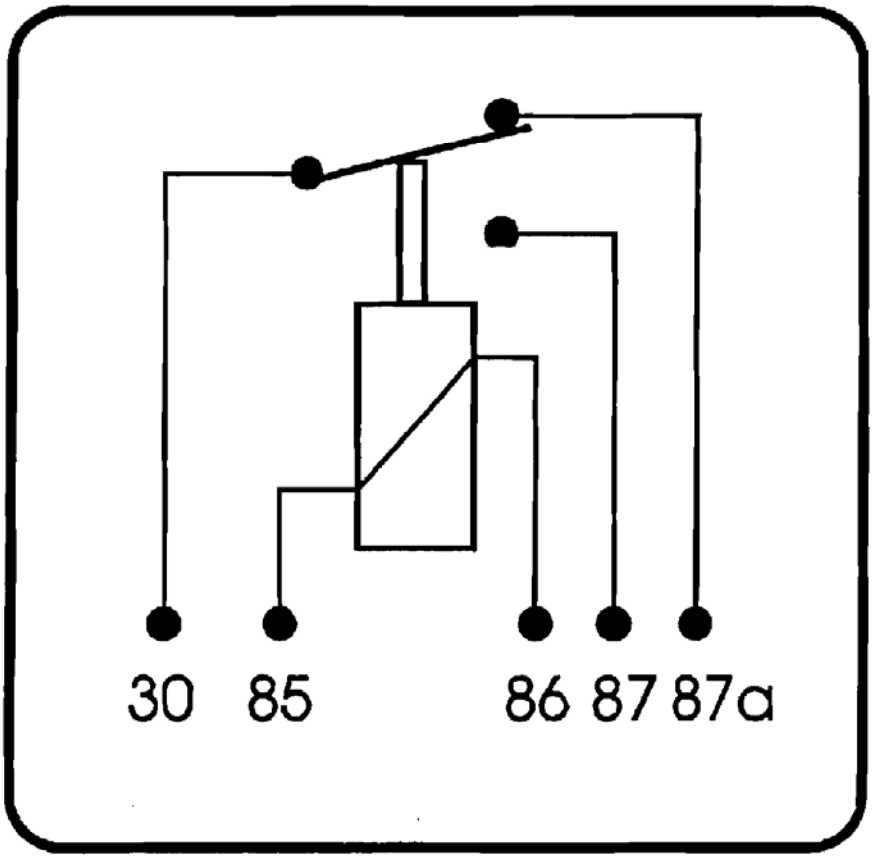


Figure XIV.A.1

SPDT Relay

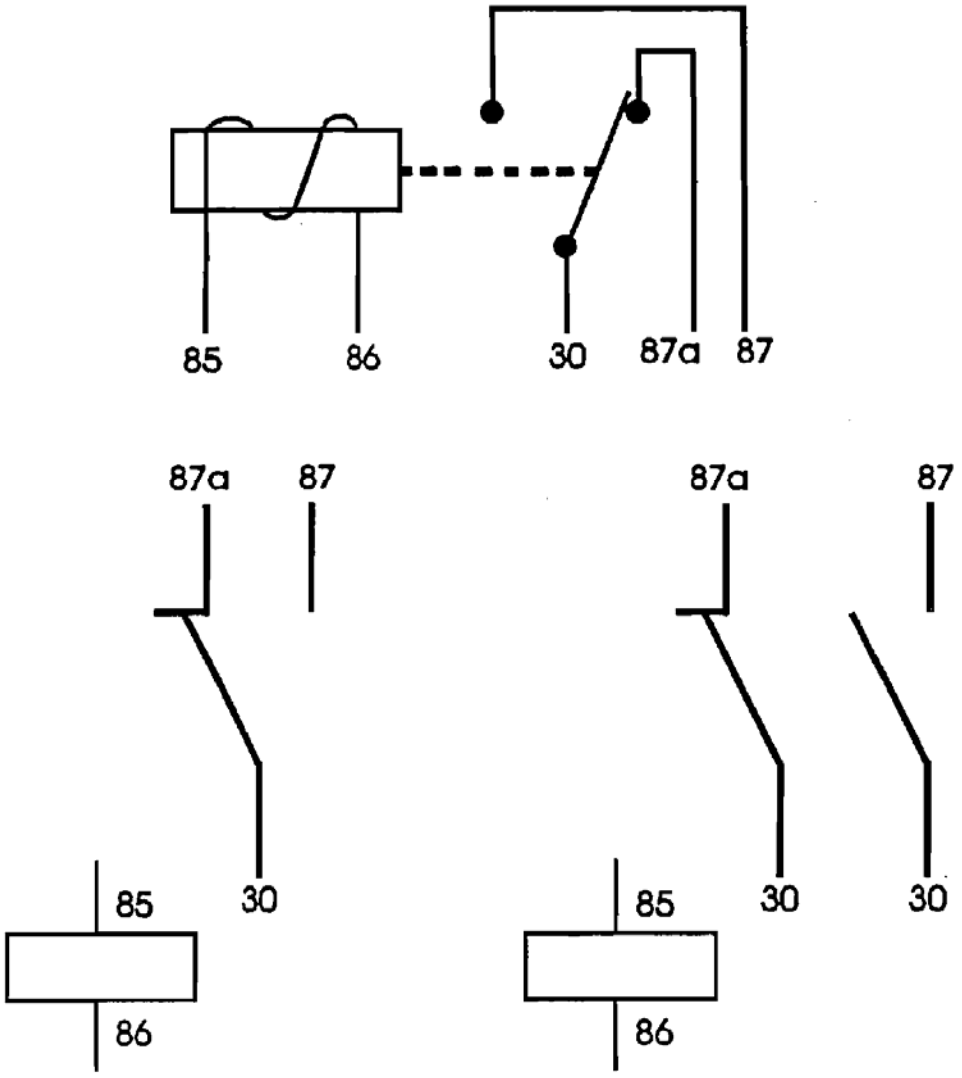


Figure XIV.A.2 & 3

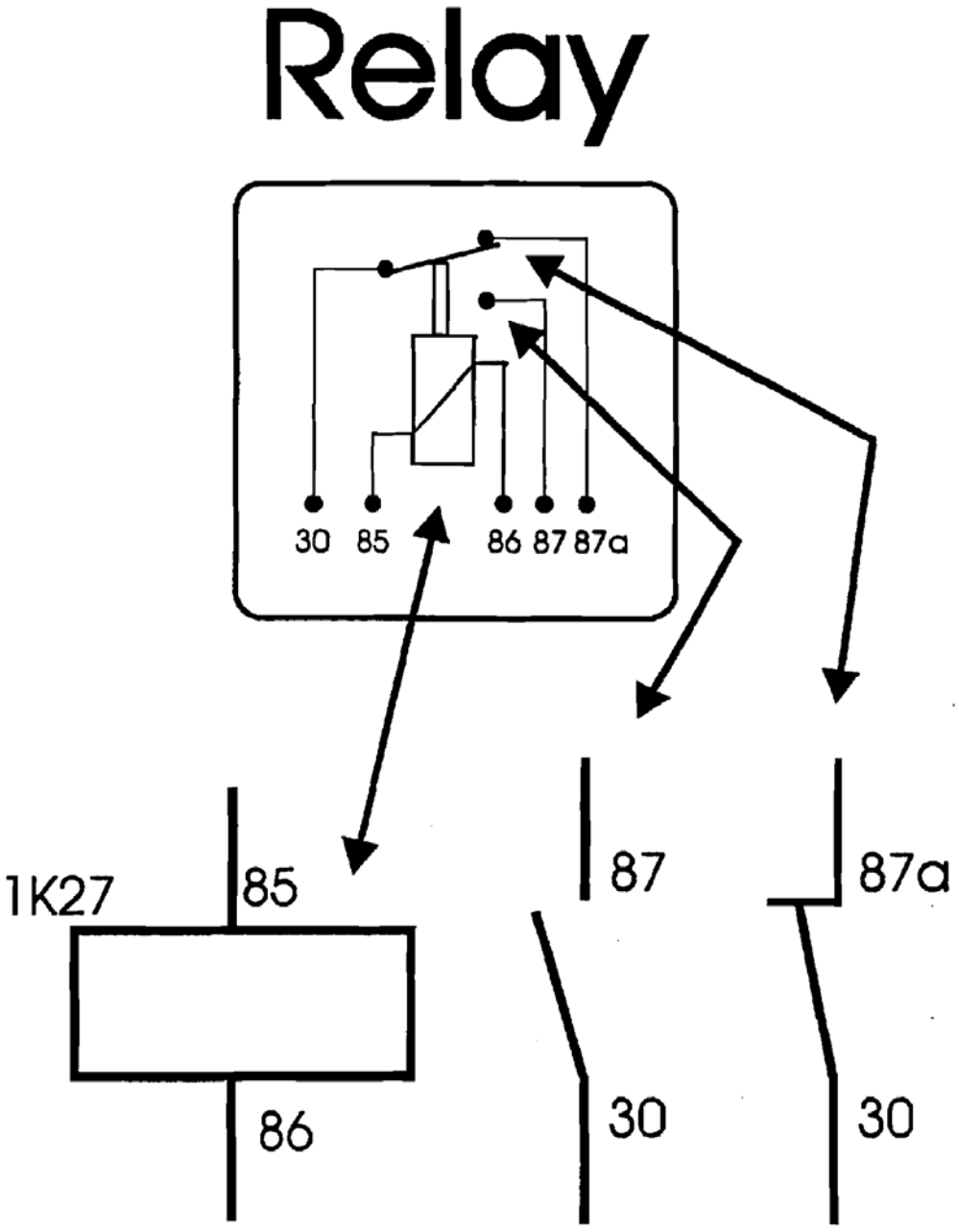


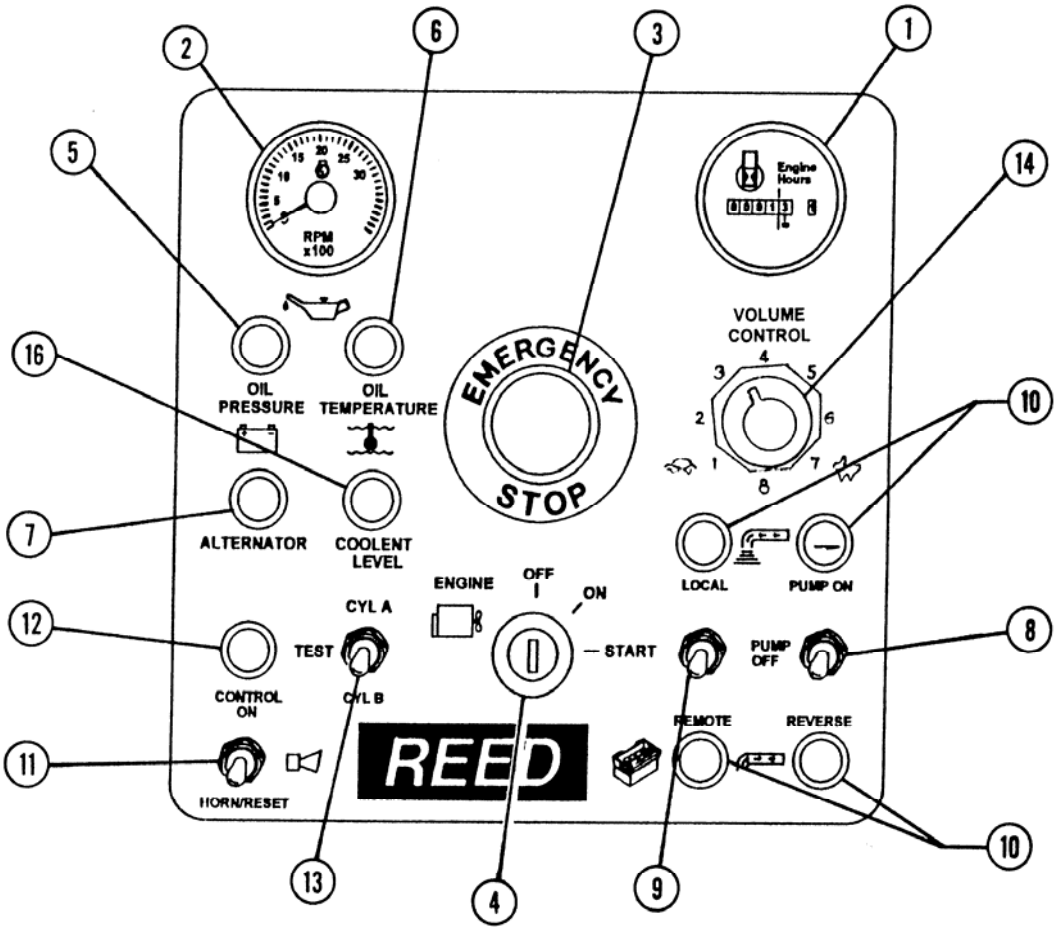
Figure XIV.B

ELECTRIC	HYDRAULIC
Diode	Check Valve
Switch	Valve
Wire	Tubing or Hose
Fuse	Relief Valve
Solenoid	Cylinder
Battery	Pump
Resistor	Orifice
Relay	Pilot Valve
Adjustable Orifice	Potentiometer

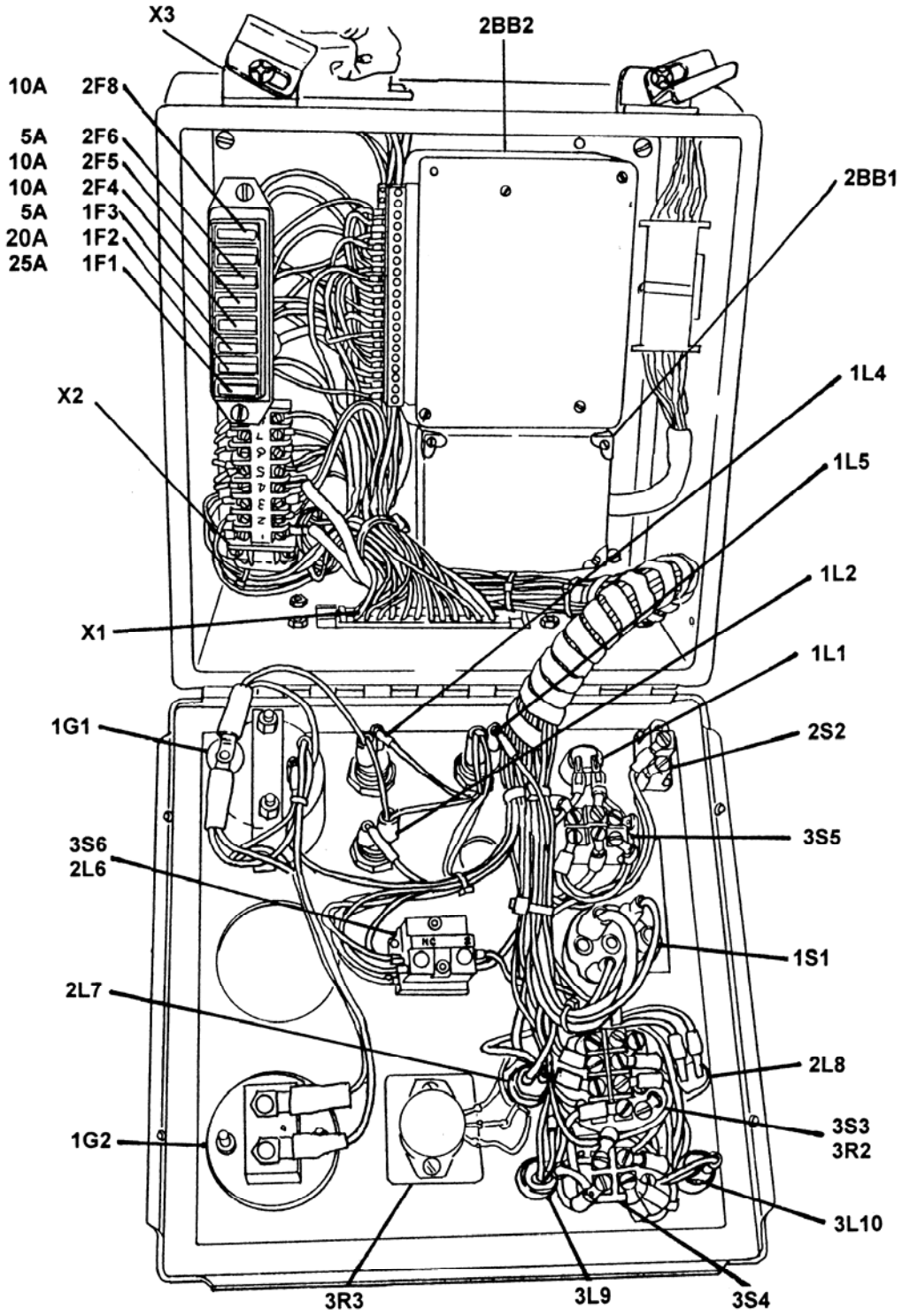
Figure XV

CONTROL FAMILIARIZATION

The controls for operation of the ***02 MODEL C50HPS*** can be found and are located on the right (curb) side of the machine. A control box is provided and contains all the main function instruments, switches, and indicators. Hydraulic gauges and throttle control are on lower portion of hydraulic tank. The volume control is adjacent to the main control. Each location or panel is dedicated to the operation of certain functions. These are noted herein:

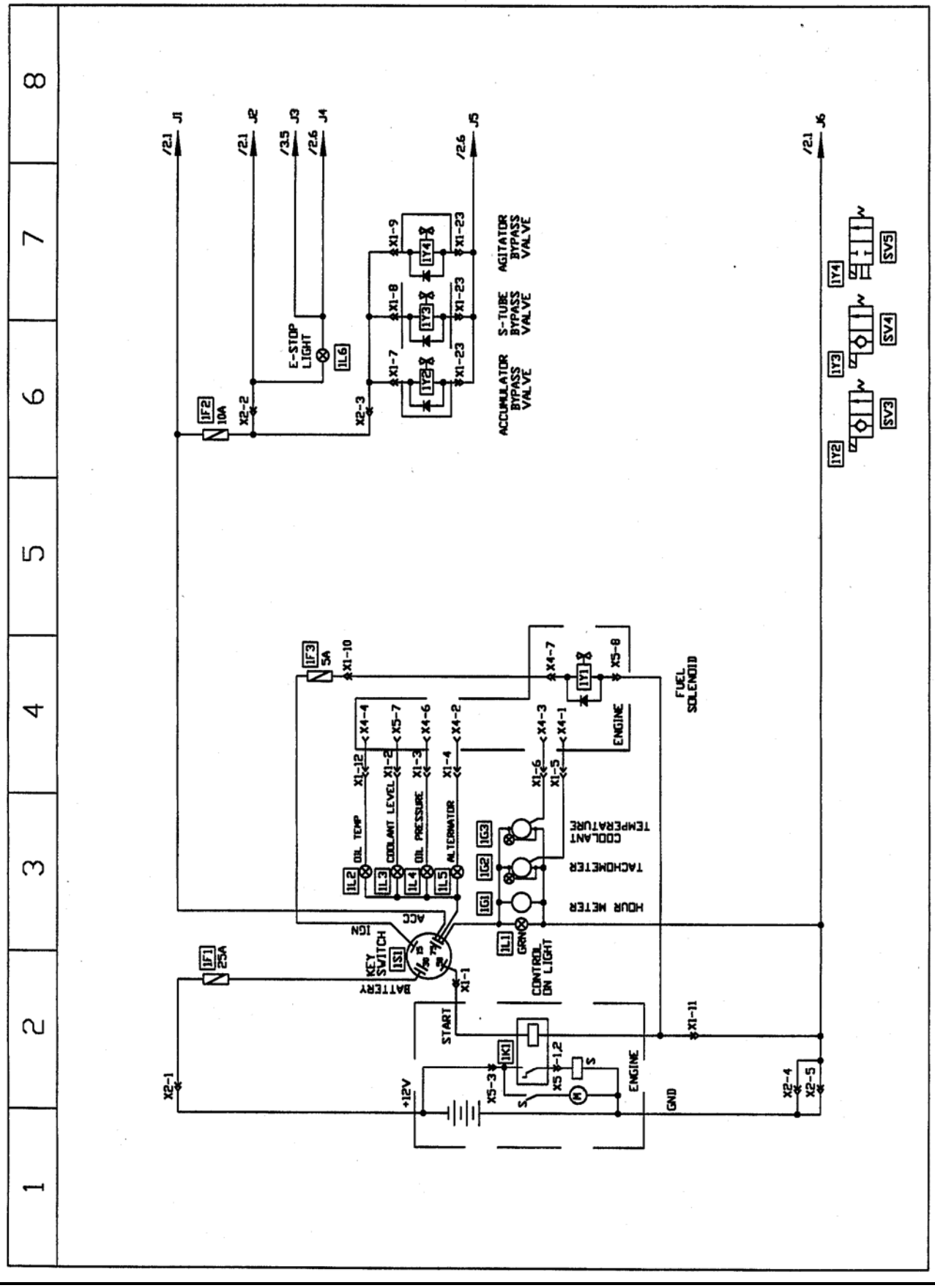


CONTROL BOX
ELECTRICAL COMPONENTS



REED

TRAINING MANUAL



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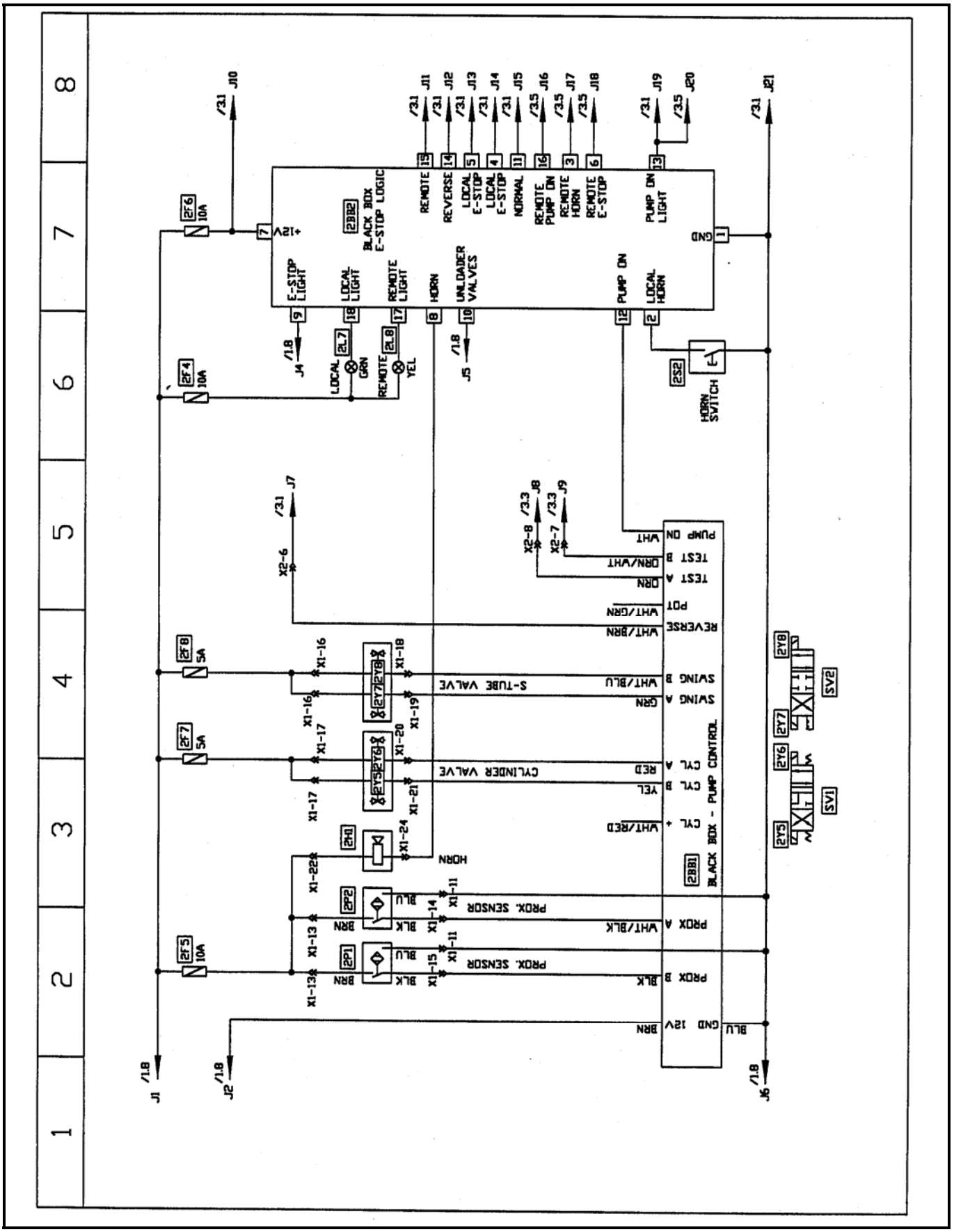
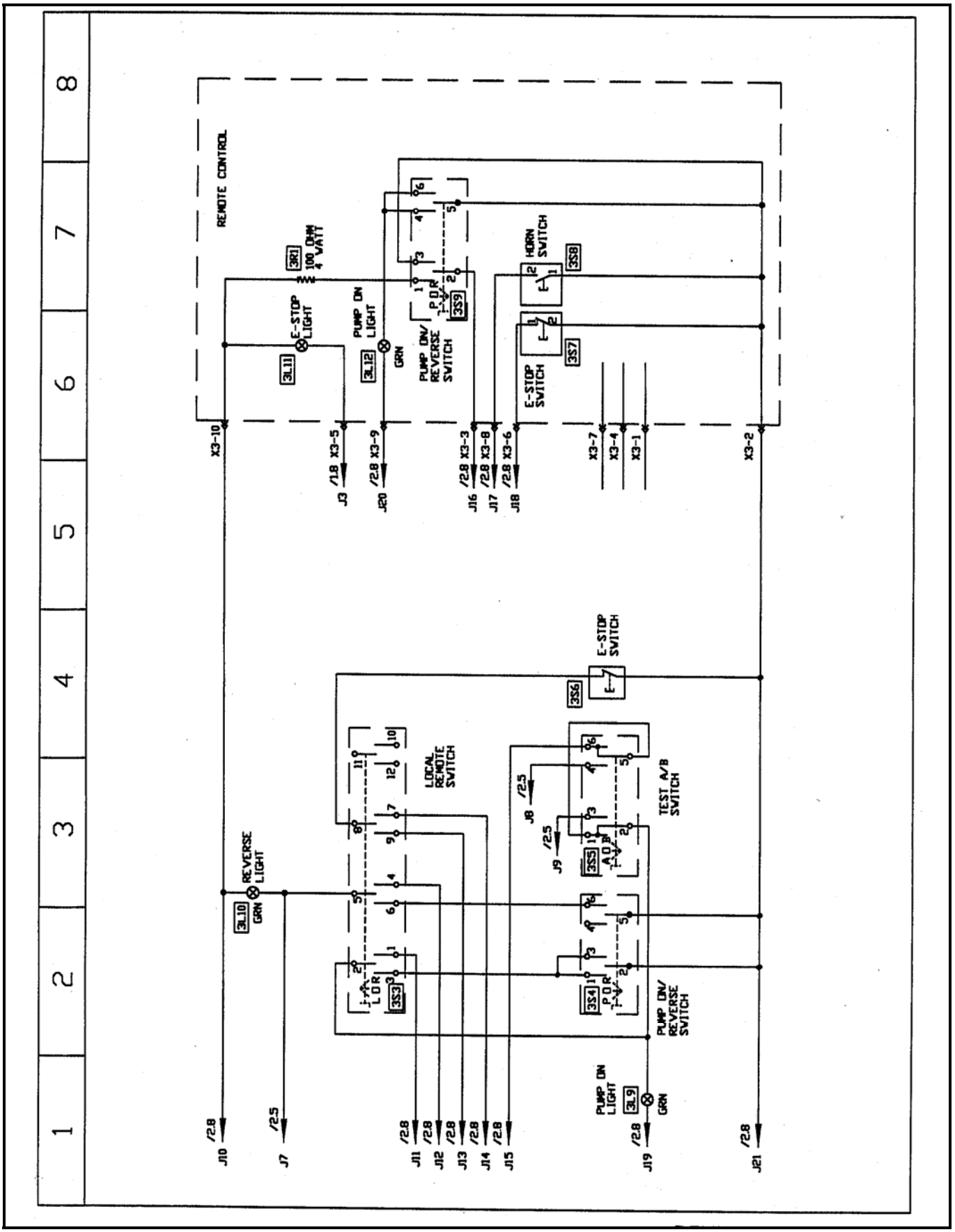

BLACK BOX E-STOP LOGIC
2BB2
+12V
GND
REMOTE
REVERSE
LOCAL E-STOP
LOCAL E-STOP
NORMAL
REMOTE PUMP ON
REMOTE HORN
REMOTE E-STOP
PUMP ON LIGHT
E-STOP LIGHT
LOCAL LIGHT
REMOTE LIGHT
HORN
UNLOADER VALVES
PUMP ON
LOCAL HORN
2F6 10A
2F4 10A
2F8 5A
2F7 5A
2F5 10A
2S2
HORN SWITCH
2L7
2L8
LOCAL
REMOTE
GRN
YEL
2H1
HORN
2P2
2P1
PROX. SENSOR
PROX. SENSOR
2Y8
2Y7
2Y6
2Y5
SV2
SV1
S-TUBE VALVE
CYLINDER VALVE
2BB1
BLACK BOX - PUMP CONTROL
PUMP ON
TEST B
TEST A
PORT
REVERSE
SWING B
SWING A
CYL B
CYL A
CYL +
PROX B
PROX A
GND 12V
J1
J2
J4
J5
J6
J7
J8
J9
J10
J11
J12
J13
J14
J15
J16
J17
J18
J19
J20
J21

REVISION:


REMOTE CONTROL
3R1
100 OHM
4 WATT
E-STOP
LIGHT
3L11
PUMP ON
LIGHT
3L12
GRN
P.D.R.
3S9
PUMP DN/
REVERSE
SWITCH
HORN
SWITCH
3S8
E-STOP
SWITCH
3S7
X3-10
X3-5
X3-9
X3-3
X3-8
X3-6
X3-7
X3-4
X3-1
X3-2
/1.8
/2.8
J3
J20
J16
J17
J18
E-STOP
SWITCH
3S6
LOCAL
REMOTE
SWITCH
TEST A/B
SWITCH
/2.5
J8
J9
3S5
A.D.R.
REVERSE
LIGHT
3L10
GRN
3S3
L.D.R.
3S4
P.D.R.
PUMP DN/
REVERSE
SWITCH
PUMP ON
LIGHT
3L9
GRN
J10
J7
J11
J12
J13
J14
J15
J19
J21
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8

REVISION:

REED TRAINING MANUAL

SAFETY AWARENESS AND PRECAUTIONS

The ***REED 01 MODEL B40*** pump unit is only to be used for the purpose of pumping concrete or other material of a plastic consistency through an arrangement of delivery pipeline or hoses to the designated placement site.

All personnel assigned to operate, repair or troubleshoot the ***01 MODEL B40*** must be thoroughly familiar with this Technical Manual (P/N: 86689). For the protection of yourself and others around you, it is of utmost importance that the **WORK** is done **SAFELY**. One of the best ways to accomplish this is to fully **UNDERSTAND** and **KNOW** the job you do. If there is any doubt about that what you are doing is **UNSAFE**, even marginally, obtain assistance from other trained/qualified personnel.

During operation, troubleshooting or repair, problems may arise or be encountered that seem singular but may in fact be due to several causes. These need to be sorted out and identified before proceeding with the task at hand. The information contained in this technical manual can be used to assist in the safest and best manner of operating and repairing the ***01 MODEL B40***. However **YOU** and **ONLY YOU**, must take the initiative to make yourself thoroughly familiar with the contents of this manual.

Because your job is to operate the equipment does not prevent you from focusing some attention on the maintenance and troubleshooting aspect of the unit. Just being aware of some tell-tell signs, unusual noises or the ability to make a tweak here or there may enable you to complete the pumping job instead of shutting down and losing all that concrete.

ADVISORY LABEL LOCATION

Cautionary signal word (Warning-Caution) may appear in various locations throughout this manual. Information accented by one of these signal words must be observed to minimize the risk of personal injury to service personnel, or the possibility of improper service methods which may damage the pump or render it unsafe. Additional Notes are utilized to emphasize areas of procedural importance and provide suggestions for ease of repair. The following definitions indicate the uses of these use of these advisory labels as they appear throughout the manual:

⚠ *CAUTION*

Directs attention to unsafe practices, which could result in damage to equipment and possible subsequent personnel injury or death if proper precautions are not taken.

REED TRAINING MANUAL

⚠ WARNING

Direct Attention to unsafe practices, which could result in personnel injury or death if proper precautions are not taken.

NOTE

An operating procedure, practice, condition, etc., which is essential to emphasize.

--------T H I N K S A F E T Y -------- T H I N K S A F E T Y --------

No matter how often it is said or pointed out, there are people who have a tendency to **IGNORE** safe operation until it becomes too **LATE**. Don't be this type of person. Keep **SAFETY** utmost in your mind.

The following points out some pretty **COMMON** conditions and situations that you might encounter at one time or another. **BE ALERTED** to these and try to **PREVENT** the inevitable. They may seem simple but are often the **MOST OVERLOOKED**.

- Use only qualified operators who know the machine
- Use only qualified maintenance personnel who understand the systems
- Wear protective equipment and helmets
- Keep work area clear of unauthorized personnel
- Level trailer on uneven terrain or slopes
- Do not operate pump in traffic lanes. Always place cones and barricades around trailer
- Don't clean, lubricate or make adjustments while unit is in operation.
- Keep safety decals and operation instructions legible

- Do not alter or disconnect safety devices
- Maintain specified tire pressure
- Report items that need attention or require service

⚠ WARNING

BETTER SAFE THAN SORRY - DON'T TAKE CHANCES THAT COULD CAUSE INJURY TO YOU AND/OR OTHERS

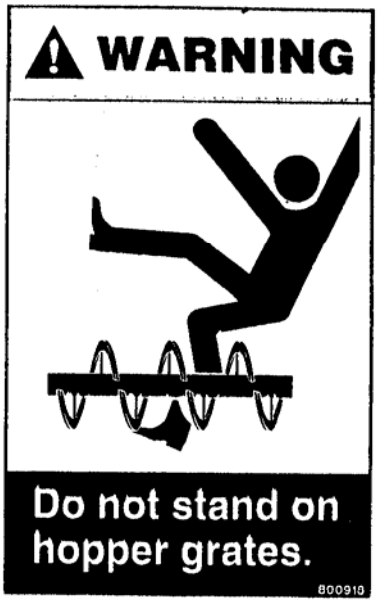
- Never **REMOVE** the hopper grill cover when the pump is in **OPERATION**. It protects against accidental contact with the agitator and other moving parts inside the hopper.
- Never enter the hopper with any parts of your body. It is a **DANGER** area and physical **INJURY** can occur even if the engine is shutdown.
- The concrete delivery system should not be **OPENED** without relieving the pressure. This can be done by reversing the pump and pumping backwards.
- Hydraulic oil systems can be dangerous. Know the circuit you are repairing, it may contain high pressure and injury could occur. If in doubt, stop the machine and allow sufficient time for the oil pressure to zero. Check system pressure gauge.
- Do not pour material into the hopper without having grate in place. Operator must monitor material being dumped into the hopper, keeping a watchful eye out for unmixed or dry material, sticks, pieces of metal and other foreign objects.

YOUR SAFETY IS OUR UTMOST CONCERN AND YOUR RESPONSIBILITY

SAFETY ALERT DECALS

D A N G E R ------ C A U T I O N ------ W A R N I N G decals are designed for your protection. They are placed at appropriate areas on the machine to be constant reminders of the ever-present dangers. Know and adhere to the information they provide.


WARNING
Keep hands out of hopper and valve assembly. See operation manual if access is required.
800917


WARNING
Do not stand on hopper grates.
800918


WARNING
Do not operate at pressures exceeding the rating of the entire material delivery system.
800921


WARNING
Before opening a blocked pipeline, relieve pressure by reversing pump. See manual.
800922


WARNING
Do not operate this machine without training. Understand the warnings in safety manuals and on decals.
SAFETY
MANUAL
800928


CUIDADO WARNING
800929


WARNING
This machine is remote controlled and may start at any time. Stop engine before servicing unit.
800924

MAINTENANCE

MAJOR COMPONENT REPLACEMENT

It is a given fact that due to usage, improper maintenance and environmental conditions that certain parts will wear out over a period of time and will need to be replaced to continue efficient operation. When tell-tell signs indicate that a part is worn, do not delay in the replacement. Continued usage with worn parts may lead to the damaging of other parts.

This section of the manual is provided to assist you in replacing some of the major components that may be worn. A step by step procedure is offered. Please be aware that the possibility exists your machine may be slightly different. If you find this to be the case, contact the ***REED*** Service Department. They will be pleased to assist you.

SWING TUBE & COMPONENTS

The sealing characteristics of the swing tube depends on metal to metal friction of the wear ring, located inside the swing tube, to the wear plate installed on the inside of the hopper at the material cylinders. This friction and the abrasiveness of the pumping material mixes will cause wear and a breakdown of the sealing action. As this breakdown occurs, periodic adjustments to the swing tube can be made as described in the **ADJUSTMENT SECTION**. This will help to improve the sealing quality, however, eventually the components will need to be replaced.

Some tell-tell signs or identifying symptoms that adjustment is needed or parts are worn might be:

- When deep grooves have developed on the face of the wear plate and/or on the wear ring.
- When the output volume at the end of the delivery line noticeably begins to decrease or eventually stops for no apparent reason.
- When the material being pumped is being forced back into the hopper under pressure.

WEAR RING AND WEAR PLATE REMOVAL/REPLACEMENT

- Turn off engine to shut down the system. **BE SURE ACCUMULATOR PRESSURE IS RELEASED**.
- Remove the cover over the shift cylinder and bell crank.

MAINTENANCE

PISTON ADAPTER O-RING REMOVAL/REPLACEMENT

Installed on the piston adapter, is an o-ring that is used as a second seal for the material cylinders. This o-ring will need replacing and a tell-tell sign is if the material cylinders only partially fill with material. This o-ring cannot be replaced from the hopper end, but must be done at the flush box end. To change the piston adapter o-ring, the following is offered:

- Cycle machine until one of the cylinders is completely retracted. Turn off engine and allow the pressure to subside.
- Drain all oil or water from the flush box.
- As a precaution, mark location of proximity sensor adjusting bracket. Remove proximity sensor cross bracket.
- Mark the end of the piston coupler so that on reassembly, it can be placed in the same relation.
- Unbolt and remove top half of coupler. Pull the piston assembly toward you.
- Inspect piston cup , clean up or if necessary replace.
- Remove old o-ring from adapter and smear some clean grease on the new o-ring. Install on adapter.
- Place piston cup assembly into material cylinder at an angle so that center of adapter is angling toward bottom of flush box.
- Pull up on adapter to square up piston assembly.
- Install coupler halves and bolt together.

Follow same procedure to remove and replace the o-ring on the other cylinder. After this installation proceed to:

- Replace proximity sensor cross bar and check position of adjustment bracket to previous mark.

Refill flush box with water or oil.

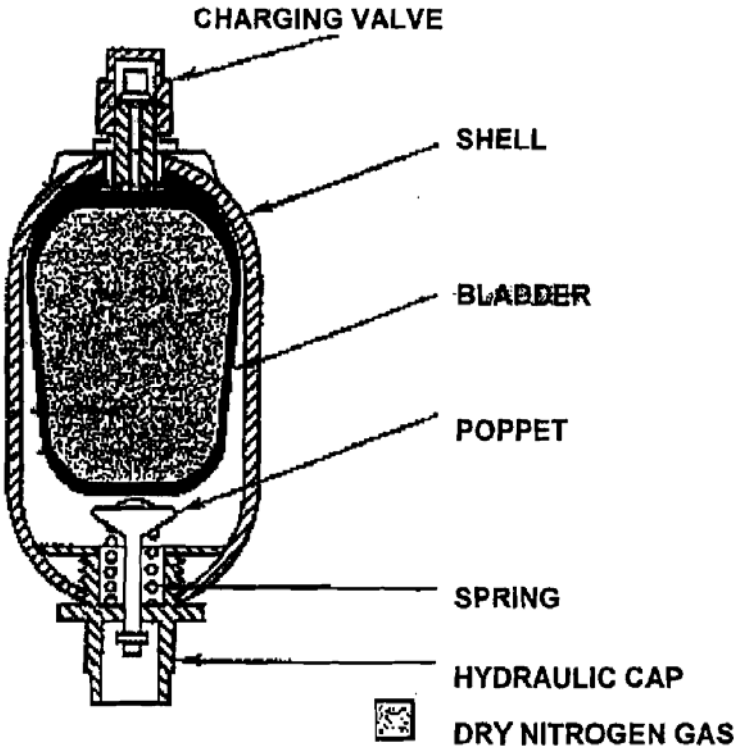
MAINTENANCE

ACCUMULATOR

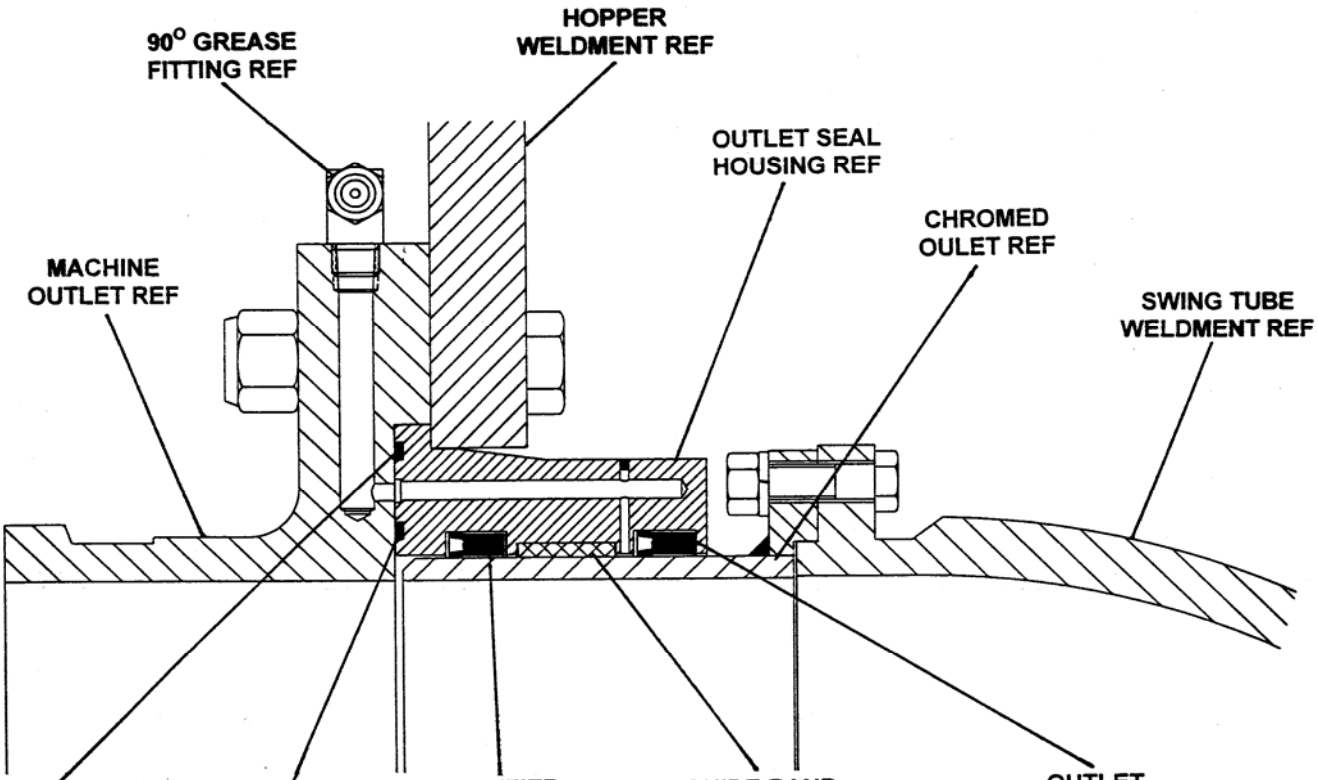
It was noted in the **S-TUBE SHIFT CIRCUIT** description that the S-tube must shift alternately from one cylinder to the other in a synchronized operation. In addition this shift must be almost simultaneously. This instant pressure and volume cannot be provided by the system itself. To compensate for this an accumulator is used.

This is made up with an outer shell or tank, a rubber bladder installed inside the shell, a gas valve with port on top of the shell and a fluid port at the bottom of the shell complete with the necessary valves and seals.

To successfully work in the system and do the job intended the accumulator must first be pre-charged. This operation involved the induction of **DRY NITROGEN GAS** into the bladder to a pressure of 1250 PSI (87.5 BAR). This pressure will vary with each ***REED*** pump. Check the specifications noted in **MAINTENANCE SECTION, HYDRAULIC DESCRIPTION CHAPTER** of the appropriate manual. This dry nitrogen gas is inserted prior to installation of the accumulator and is used to inflate the bladder much like a balloon.



MAINTENANCE

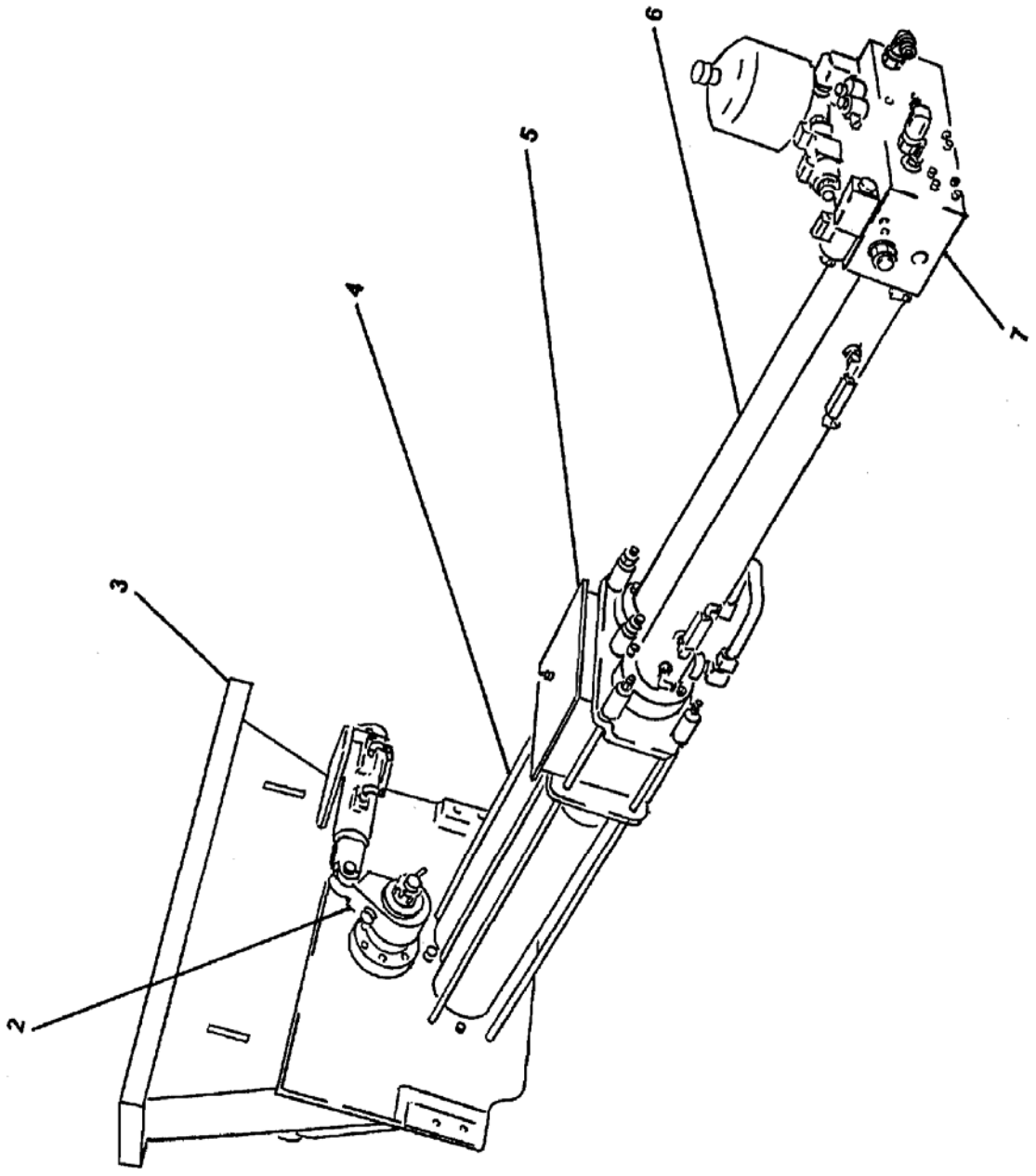


OUTLET HOUSING SEAL KIT INSTALLATION SECTIONAL VIEW

REED

TRAINING MANUAL

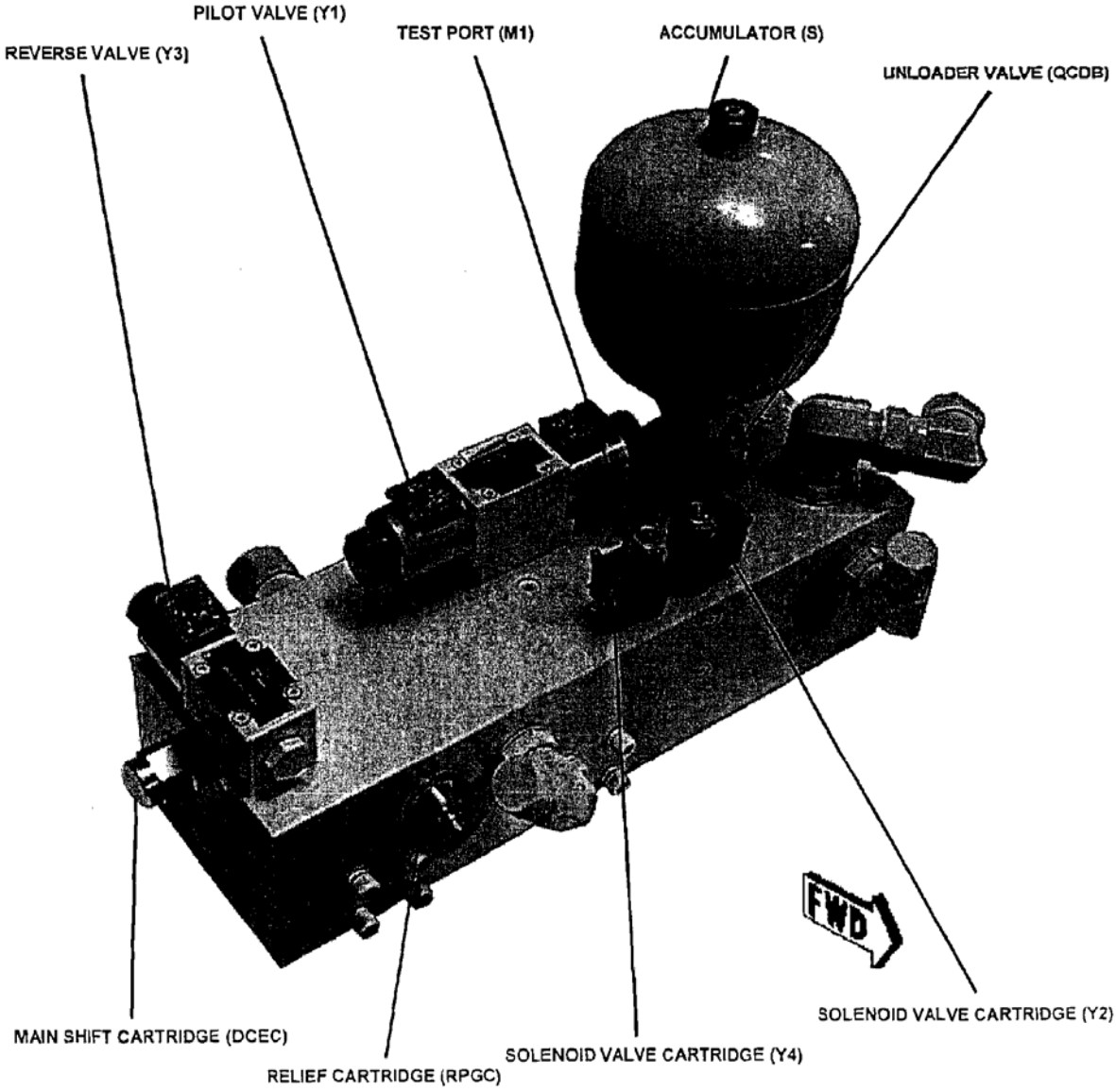
REED ROCK MASTER *A30*



REVISION:

SHIFT CIRCUIT MANIFOLD *REED* ROCK MASTER *A30*

Like the main hydraulic circuit, the shift circuit is incorporated into the manifold block. This block is flange mounted to the drive cylinders. It contains a shift cartridge, relief cartridge, (2) two solenoid valve cartridge, and unloading valve cartridge. The directional cartridge valve is mounted in the block. Each of these components is designed to perform a particular function in the swing circuit as explained in the following descriptions:

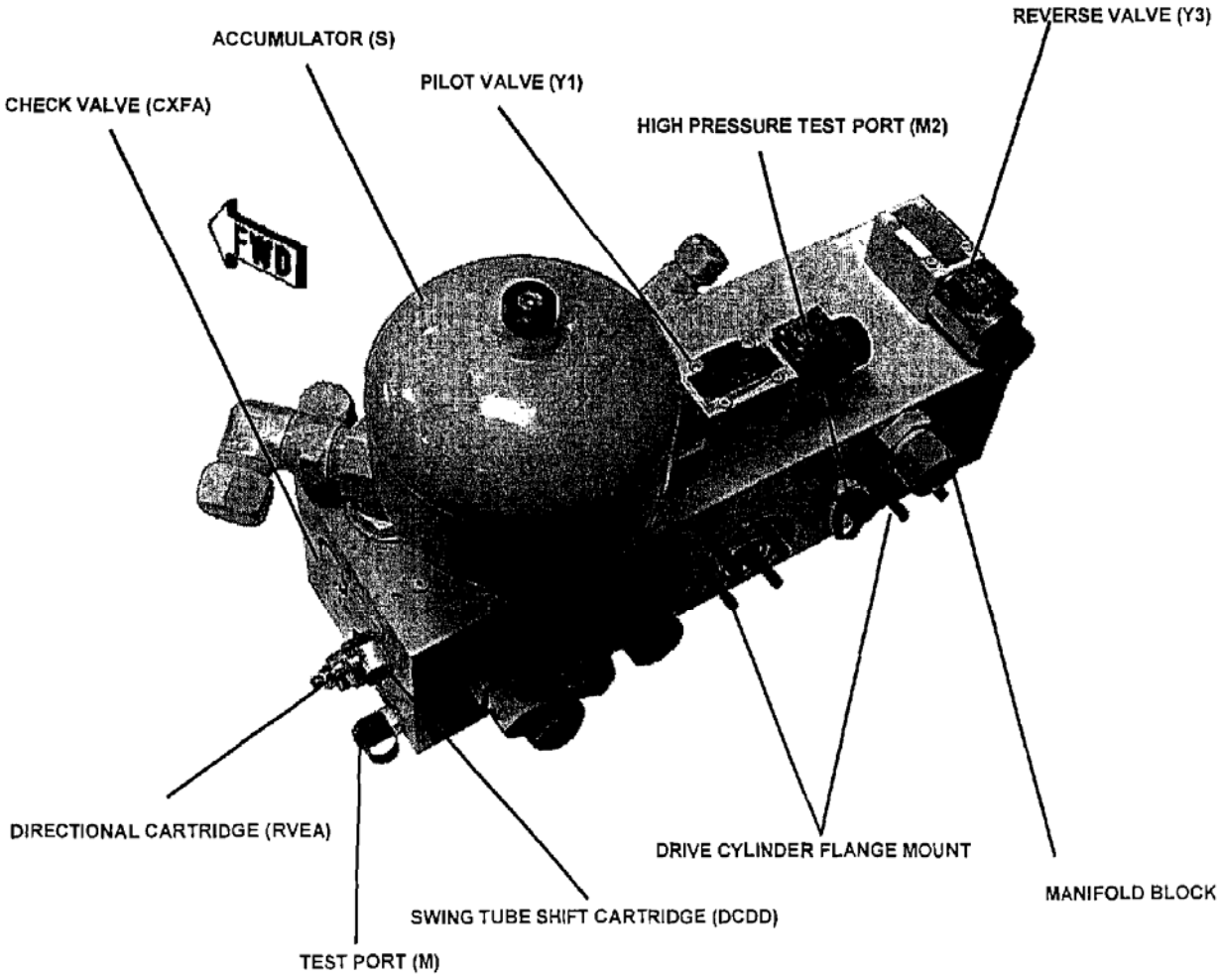


REED ROCK MASTER *A30*

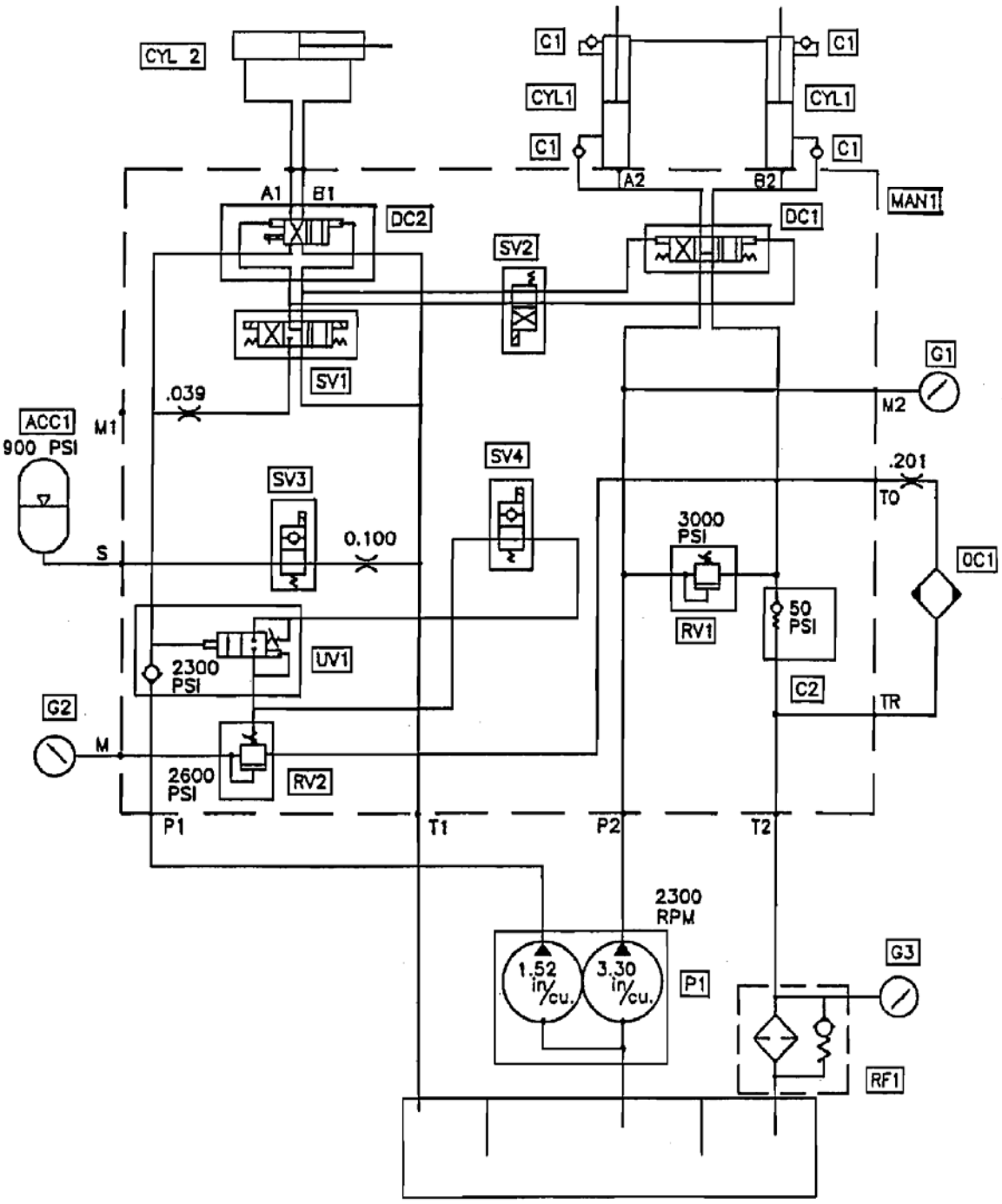
- **RELIEF CARTRIDGE -** This cartridge is located on the top side of the manifold block and is used to protect the system from excessive pressure and to limit the amount of pressure being applied to the accumulator and is set at 2300 PSI (158 Bar)

- **DIRECTIONAL CARTRIDGE** –This cartridge is used to direct the flow of oil from the accumulator to one or the other end of the shift cylinder based on the hydraulic signal it receives from the pilot valve as is the main cycle cartridge.

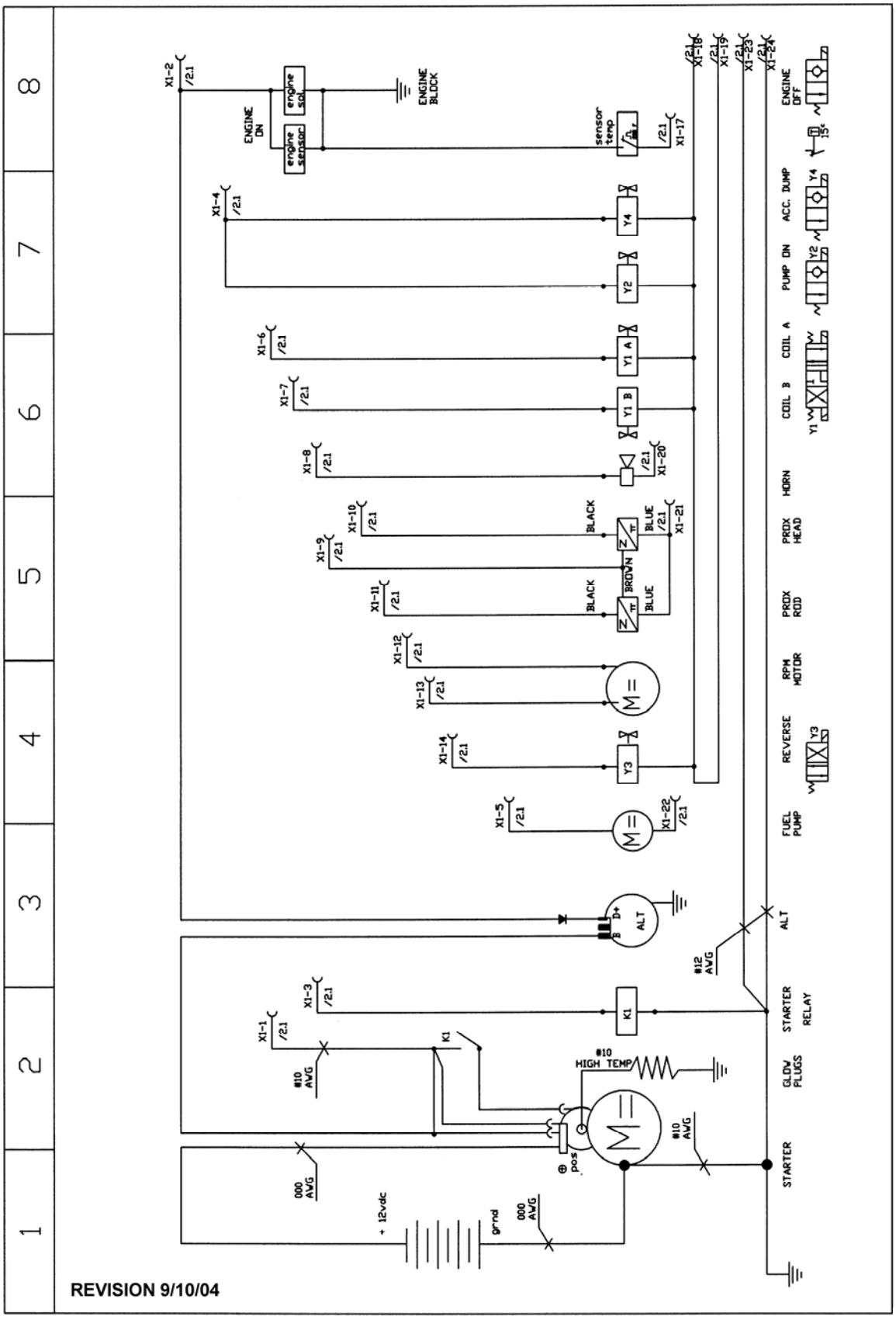
- **UNLOADER VALVE -** This cartridge is used to divert the pump flow from going to the accumulator once its capacity has been reached, directing it back to tank. It becomes operational when the differential setting has been reached (Working value).



REED A-SERIES HYDRAULIC SCHEMATIC

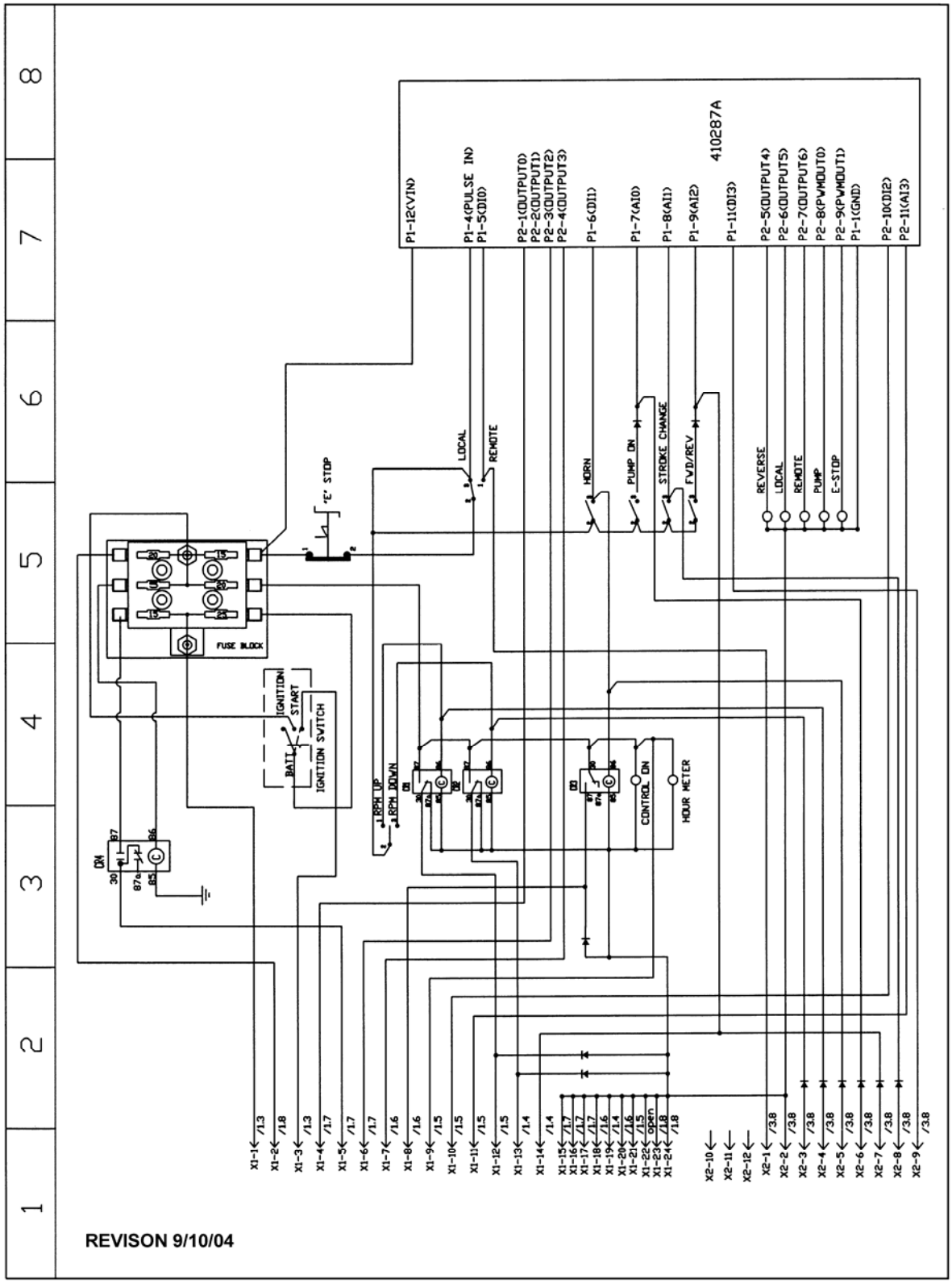


TRAINING MANUAL



REVISION:

TRAINING MANUAL



REVISION:

TROUBLESHOOTING

The previous sections of this **SERVICE MANUAL** dealt with the various aspects of Operation, Preventative Maintenance, System Care and Maintenance, Component Adjustment, Repair and Replacement. However, like anything mechanical and due to the application of pumping concrete, the possibility exists that at one time or another conditions may arise that will cause the machine to malfunction. These conditions may not be as apparent as a broken part, etc., but recognizing the symptoms will assist in determining the cause and repair and reduce the downtime.

The **TROUBLESHOOTING SECTION** depicted herein is designed to assist you in recognizing the possible symptoms, a probable cause and a suggested corrective action. The format used identifies a major component or system and categorizes the potential failure for that specific area with the symptom.

The items listed are based on symptoms and malfunctions derived from our experience with the ***REED*** Pump and from your calls to our Service Department. It is also our intent to up-grade this section periodically. Any new information will be shared with you by means of Service Bulletins.

TROUBLESHOOTING
TRAILER MOUNTED CONCRETE PUMP

ENGINE

The ***REED*** Concrete Pumps, depending on the model, are equipped with a Deutz Diesel air-cooled or water-cooled engine. The troubleshooting items depicted herein for the engine, only pertain to general items and those which may be caused by pump operation. For more serious malfunctions, consult your local Deutz Diesel Service Center.

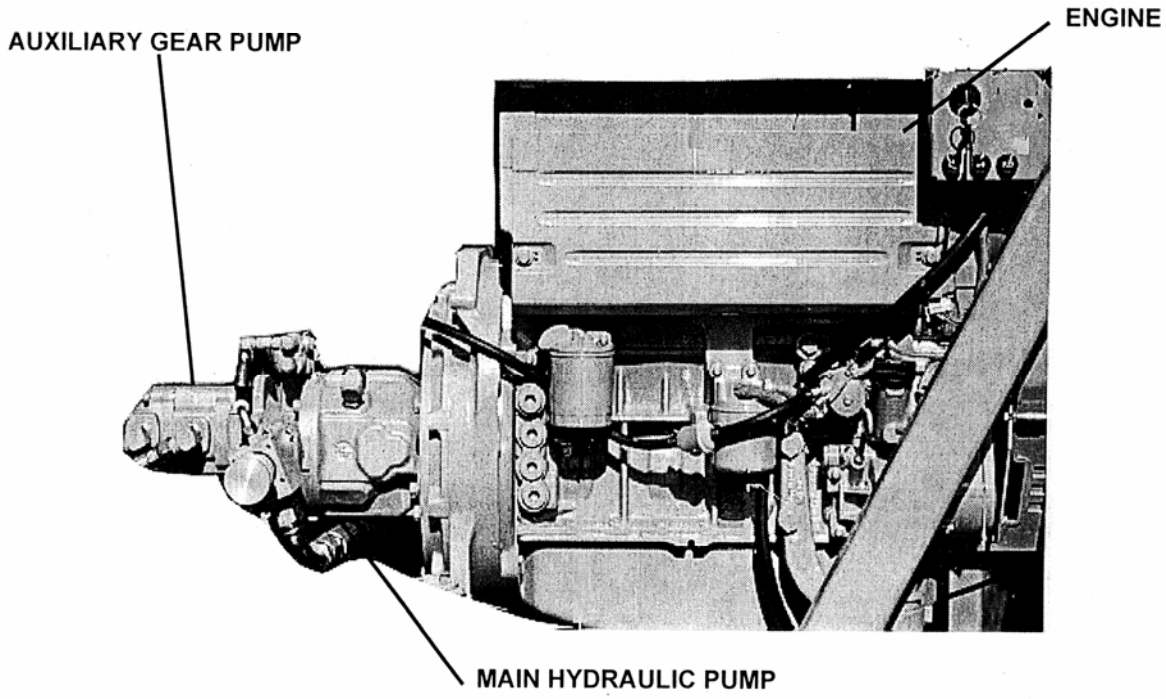
1. **SYMPTOM – Engine cranks, but fails to start**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - No fuel
     - Fill up fuel tank with a good grade of diesel fuel
   - Dirty fuel filter
     - Replace filter
   - Clogged fuel line
     - Check and clean in-line filter
     - Disconnect fuel line and air blow clean
   - Leak in fuel supply line
     - Check all connections and hoses
     - Pressure test if necessary
   - Fuel solenoid
     - Check for voltage
     - Remove and see if trigger activates
   - Dirty injectors
     - Clean or replace injectors

2. **SYMPTOM – Engine does not crank**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Battery cables loose
     - Clean and tighten cables, check ground connection
   - Low Battery
     - Check battery output, recharge or replace
   - Ignition key switch is faulty
     - Check power across contacts, replace if damaged
   - Starter faulty
     - Check for power at starter
     - Replace

3. **SYMPTOM – Engine operating at too low RPM**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Throttle not adjusted properly
     - Reset using throttle control
   - Throttle lever on engine sticking
     - Check movement, apply lubricant
     - Spring binding – check connection

- Throttle control cable
  - Check that cable moves freely when control is pulled
  - Check cable for any kinks
  - Check connection at throttle lever
- RPM speed not preset properly
  - Adjust to correct speed; idle speed 800 RPM
  - Maximum high speed no load (Refer to specification sheet)

4. **SYMPTOM – Engine bogs down with full throttle, full volume and PUMP switch ON.**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Dirty air cleaner
     - Clean or replace
   - Dirty fuel filter
     - Check or replace
   - Main relief valve set too high
     - Readjust as necessary
   - Engine overloaded or subject to extremely high pressure conditions
     - Back off (decrease) volume control of main pump
   - Horsepower limiter on main pump misadjusted (Units with HA10V071 Pumps – Model B30HO, B40, M40B, 4040B)
     - Contact ***REED*** Service.



MAIN HYDRAULIC PUMP

1. **SYMPTOM – Pump fails to deliver required volume and pressure**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Engine speed too low
     - Adjust throttle control to full open
     - Readjust engine maximum no load speed to specified RPM
   - Volume control set too low
     - Adjust control to full on (open)
   - Pressure gauge defective
     - Install test gauge to verify
     - Replace if defective
   - Load sense valve not working properly
     - Improper adjustment
     - Contamination, remove and clean
     - Defective – replace
   - Pressure settings incorrect
     - Check pressure and adjust accordingly – Ref to **ADJUSTMENT Section** in this manual for proper pressures.
   - Excessive pump wear
     - Loose or worn parts
     - Flow test to determine if pump output is satisfactory

2. **SYMPTOM – Pump is excessively noisy**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Insufficient oil
     - Check oil level in tank
     - Suction strainer clogged – clean
   - Air in system
     - Check for vacuum leak in suction line, connection
     - Aeration – bubbles of fluid in reservoir
   - Excessive system pressure – above pump rating
     - Check relief valve operation and setting
   - Excessive pump wear
     - Loose or worn pump parts – replace
   - Engine RPM higher than pump RPM rating
     - Adjust RPM as necessary

REED

TROUBLESHOOTING
TRAILER MOUNTED CONCRETE PUMP

AUXILIARY GEAR PUMP

1. **SYMPTOM – Pump fails to deliver required volume and pressure**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Insufficient oil
     - Suction strainer clogged – clean
   - Air in system
     - Check for vacuum leak in suction line, connection
     - Aeration – bubbles of fluid in reservoir
   - Worn or damaged gears
     - Replace pump
   - System relief set too low or by passing (if applicable)
     - Install pressure gauge in circuit and dead head. Adjust relief

CONCRETE PUMP PISTONS

1. **SYMPTOM – The cylinders will not stroke**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Pump switch not **ON**
     - Turn to **ON** position
   - Engine speed too low
     - Increase RPM to maximum
   - Volume control too low
     - Open to full on
   - Electrical –
     - Check fuses
     - Check connection to pump switch, continuity to terminals
     - Check for broken wires, dirty terminals
     - Check electrical connection and voltage on main cycle valve
     - Proximity sensor gap too large – Check using key gauge
     - Proximity sensor faulty
     - Check prox switches on machine by passing a piece of steel under each prox switch with engine running and pump switch off. S-tube should swing each time either prox switch is signaled.
     - Low voltage – Check battery, voltage to solenoid main cycle valve
     - Faulty black box – replace
   - Main cycle valve
     - Defective solenoid coils – Check coils by manually pushing on override button of the solenoid. If cylinders stroke – replace coil
     - If solenoid valve spool does not shift manually, remove valve clean or replace
     - Sticky main body spool – Remove end caps, check for free movement – Clean or replace

2. **SYMPTOM – Concrete cylinders do not fully extend – short stoke**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Proximity switches are misadjusted
     - Check that switches are positioned for full stroke – reposition. Do not exceed 200 PSI spike on pressure gauge when at full volume and full RPM. Pressure spike indicates cylinders are bottoming out.
     - Check that both switches are positioned in identical positions
   - Too much hydraulic oil on rod side of hydraulic cylinders
     - Actuate and hold **TEST** switch, turn pump switch **ON** and actuate either **CYL A – B** switch until cylinder being extended bottoms out (full extension) Resume normal operation
     - Inspect check valve on barrel side of cylinder – Clean or replace if faulty
     - Cylinder piston seals are leaking – replace

3. **SYMPTOM – Material cylinders not filling with concrete**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Bad concrete mix
     - Check mix design
   - Pump speed too fast
     - Adjust to suit type of mix
   - Faulty piston o-rings/piston cups
     - Replace
   - Pump operating in reverse
     - Place pump switch in**FORWARD**

4. **SYMPTOM - Slurry in water box**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Piston cups in material cylinder are worn or loose
     - Check tightness
     - Replace with new cups
   - Concrete cylinders excessively worn
     - Replace

5. **SYMPTOM - Piston cups squeal in operation**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Improperly installed cups
     - Piston plate mounting bolts over tightened causing piston cups to distort

   Note – During break in of new cups, squealing is normal.

SWING TUBE SHIFTING

1. **SYMPTOM - S-tube does not shift properly**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Concrete build-up in area of wear ring or wear plate in hopper.
     - Clean out and remove concrete build-up
   - S-tube adjusted too tight
     - Loosen large nut at bellcrank one-two flat turns.
   - Binding caused by material build up behind thrust ring and wear ring
     - Remove and clean up area – replace thrust ring if damaged
   - Insufficient lubrication
     - Check and lubricate shaft housing and outlet housing
   - Accumulator pre-charge pressure too low
     - Pre-charge to 1000 PSI
     - Replace bladder if pressure does not hold
   - Shift circuit pressure too low
     - Check engine RPM
     - Check system pressure – relief to be set at 2000 PSI
     - Check gear pump – Replace if faulty
   - Unloader manifold
     - Check relief valve cartridge – Works properly free of contamination
     - Solenoid cartridge connections - tight
     - Solenoid coil in good condition and shows 12 volts
     - Solenoid spool shifts easily
     - Directional control valve in working condition
     - Inspect check valve for contamination
   - Shift cylinder – seals by passing oil
     - Check by disconnecting one of the hoses from cylinder. As example: If rod is extended, disconnect rod side hose. Pressure barrel side of cylinder. If oil comes out of rod side port or hose then seals are by-passing oil.
     - Replace seals or cylinder
   - Swing valve not shifting properly
     - Check voltage to solenoid, 12 volts or more
     - Check for contamination – clean or replace

2. **SYMPTOM – S-tube does not completely shift over covering material cylinders.**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Check for obstacle in hopper such as concrete, wear plate, wear ring binding, ect.
     - Clear obstacle
   - Shift cylinder out of adjustment
     - Adjust cylinder rod at clevis. Loosen locknut and turn rod with wrench. Make sure wrench is place on flats provided on cylinder rod.
   - Bellcrank not installed properly

- Disconnect attaching parts and remove bellcrank from spline – Adjust S-tube and reposition bellcrank on spline. Reinstall attaching parts, adjust cylinder.

HYDRAULIC SYSTEM

1. **SYMPTOM – Hydraulic fluid gets hot**
   PROBABLE CAUSE – CORRECTIVE ACTION
   - Oil cooler not functioning properly
     - Restricted air flow to cooler – clean outside cooler fins
     - Open engine compartment doors (if applicable) to dispense hot air
     - On electric fan unit, check fuse and electrical connection, fan rotating in wrong direction, motor burned out
   - Filter element clogged
     - Replace
   - Breather cap on tank clogged
     - Remove, soak in solvent, air blow dry
   - Suction strainers clogged
     - Drain tank, remove strainers, clean or replace
   - Relief valve set too low
     - Reset to proper specified pressure
     - Replace cartridge if faulty
   - Operating too long at high pressure
     - Use larger size delivery line over long distances
     - Mix may be bad causing higher pump pressure
   - Hydraulic oil level too low
     - Fill to proper level

REMIXER

SYMPTOM – Remixer will not rotate
PROBABLE CAUSE – CORRECTIVE ACTION

- Check connection of agitator to drive shaft
  - Broken or missing bolt
- Frozen idler pin
  - Remove, clean, and lubricate
- Broken key in drive shaft coupling
  - Check and install new key or coupling
- No hydraulic flow to motor
  - Needle valve closed – open
  - Control valve malfunctioning – Check valve operation
- No or very little oil flow to control valve
  - Check flow – replace tandem pump
- Hydraulic motor faulty
  - Replace