



Technical Manual

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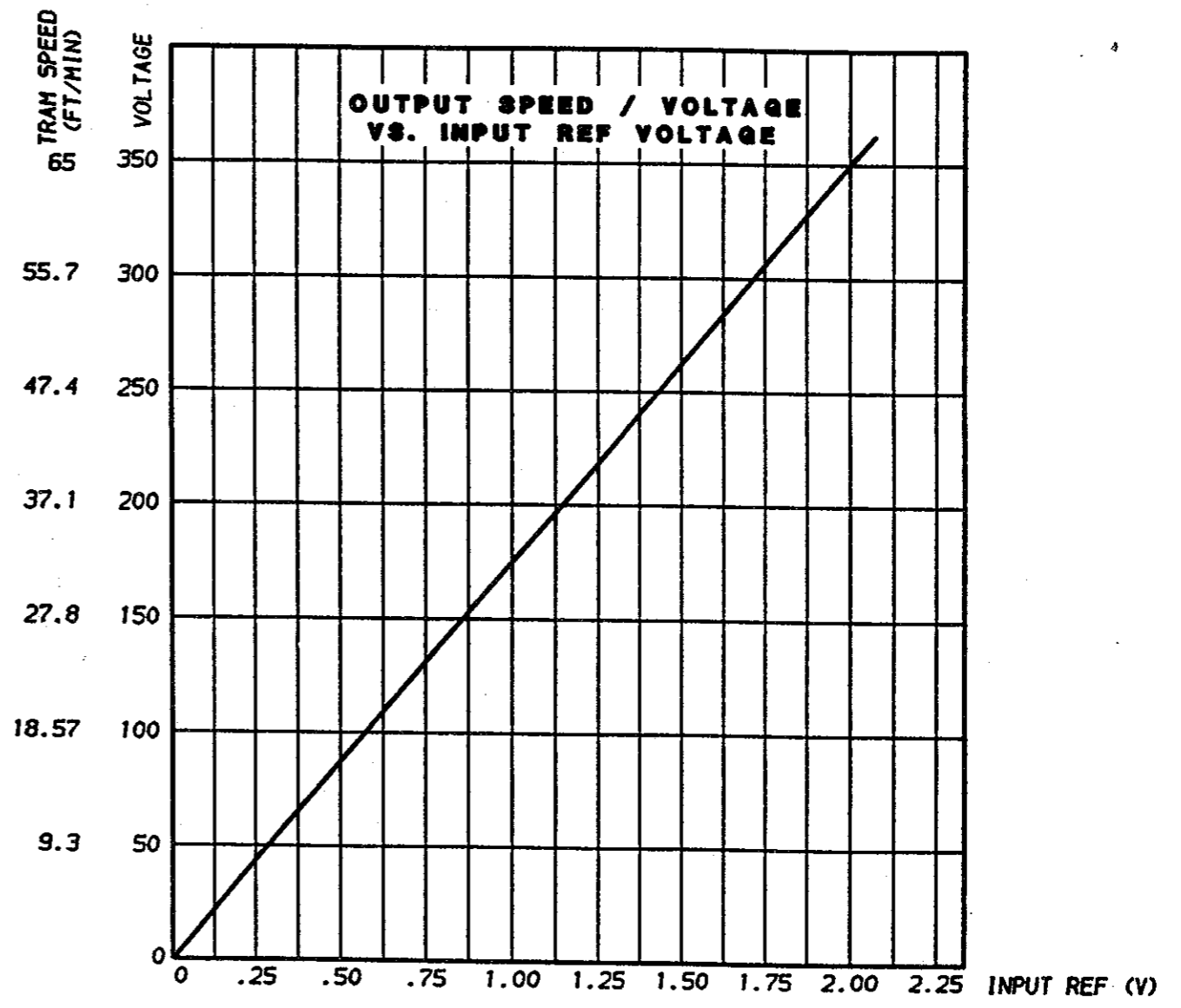
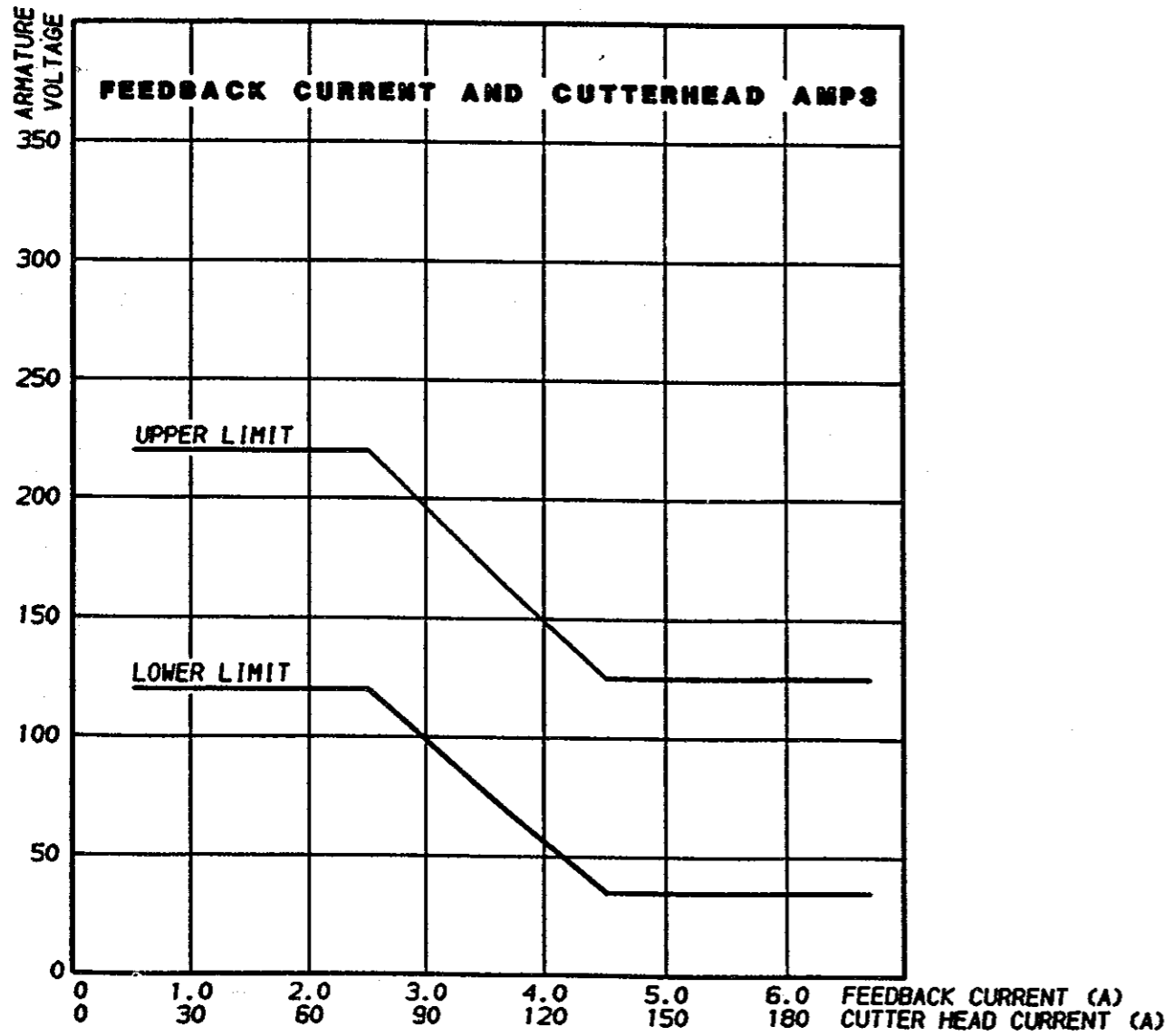
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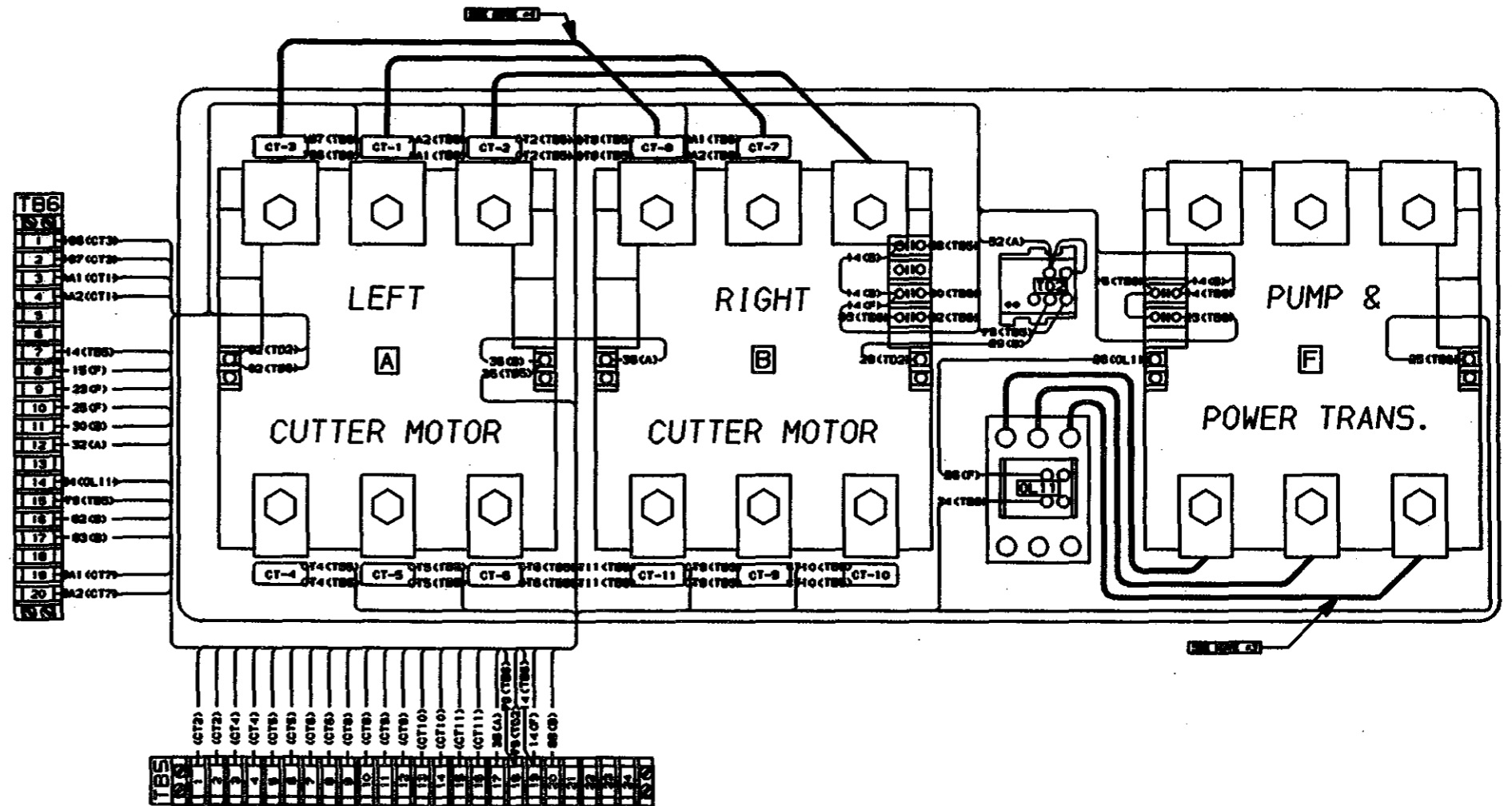
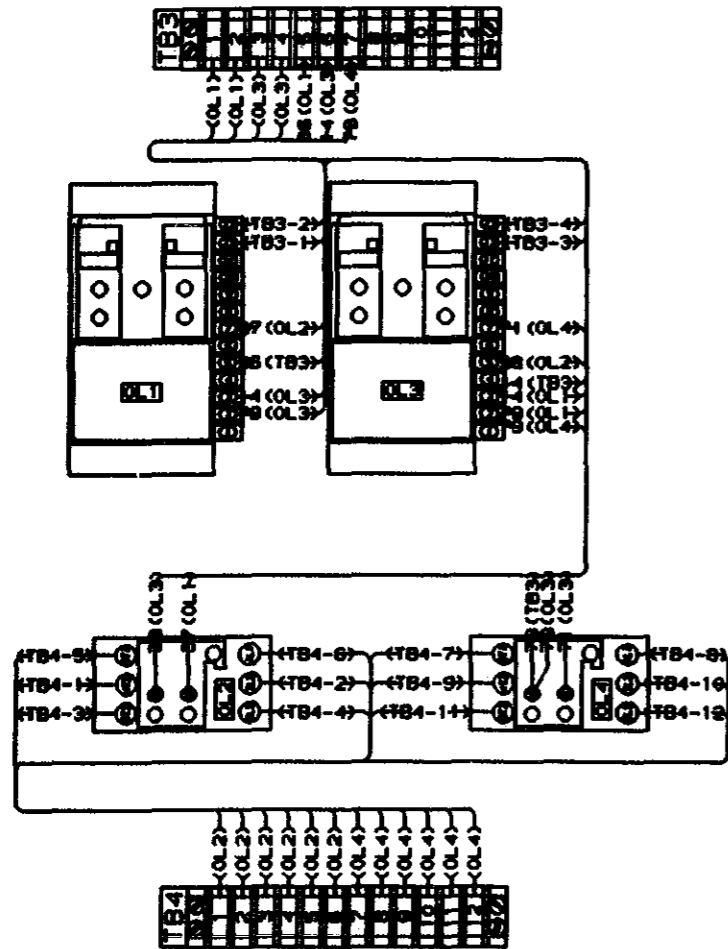
VOLTAGE / REF GRAPHS



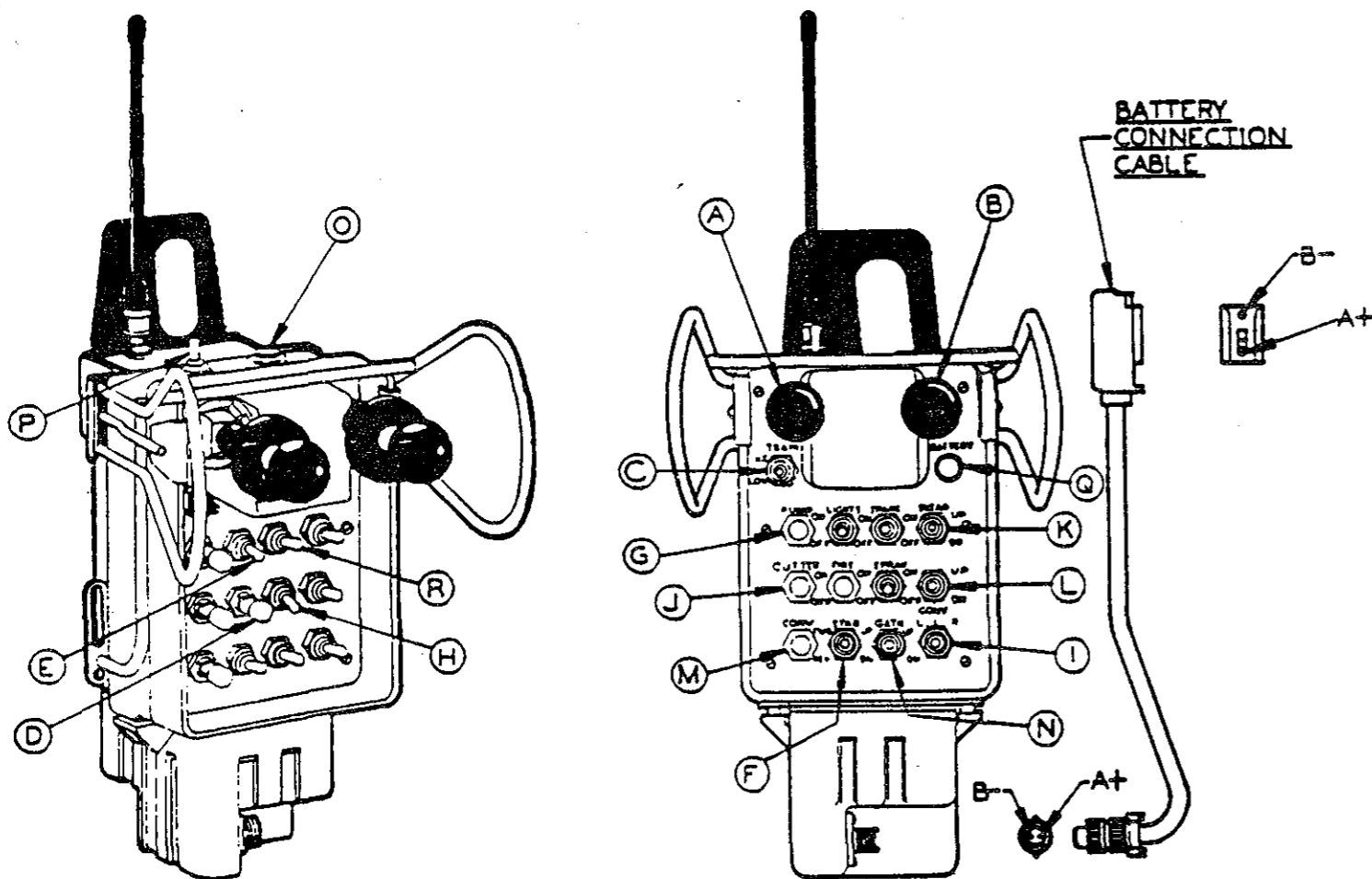
CONTACTOR PANEL

MAIN CONTROLLER CASE

OVERLOAD PANEL

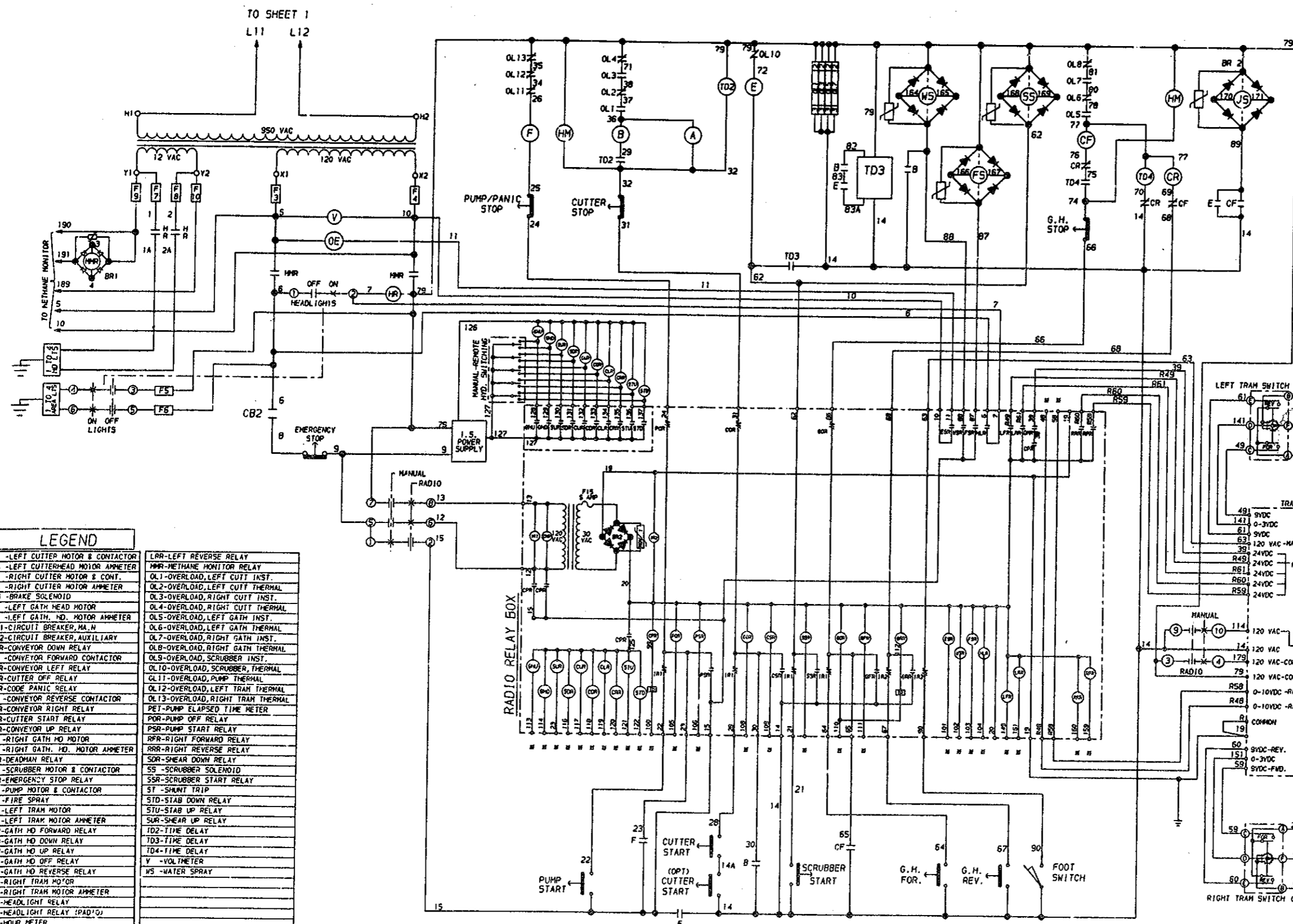


2810 RADIO CONTROL TRANSMITTER



ITEM	PURPOSE	MEANS OF OPERATION
A.	Activates left tram motor, thus making left track go forward or backward.	Pull tram lever out of detent, then push lever away for forward and pull back for reverse, lever is spring activated so it will return to neutral when released.
B.	Activates right tram motor, thus making right track go forward or backward.	Pull tram lever out of detent, then push lever away for forward and pull back for reverse, lever is spring activated so it will return to neutral when released.
C.		
D.	Activates fire suppression system.	<p>(Earlier Style) Normally remains in centered position. Push toggle switch away to activate, pull back to stop. When released, switch spring returns to center position.</p> <p>(Latest Style) Pull toggle switch out of detent and push away to activate. When released, switch will spring return to a centered position. To turn off, pull switch back.</p>

BILL OF MATERIAL				DWG NO 1610272	
ITEM NO	PART NO.	QTY/U/M	DESCRIPTION	BM	REV



VOLTAGES SHOWN ON TRAM INTERFACE BOX IN <> INDICATES OUTPUTS.

LEGEND	
A - LEFT CUTTER MOTOR & CONTACTOR	LRR-LEFT REVERSE RELAY
AA - LEFT CUTTERHEAD MOTOR AMPMETER	MHR-METHANE MONITOR RELAY
B - RIGHT CUTTER MOTOR & CONT.	OL1-OVERLOAD, LEFT CUTT INST.
BA - RIGHT CUTTER MOTOR AMPMETER	OL2-OVERLOAD, LEFT CUTT THERMAL
BS - BRAKE SOLENOID	OL3-OVERLOAD, RIGHT CUTT INST.
C - LEFT GATH HEAD MOTOR	OL4-OVERLOAD, RIGHT CUTT THERMAL
CA - LEFT GATH, HD. MOTOR AMPMETER	OL5-OVERLOAD, LEFT GATH INST.
CB1-CIRCUIT BREAKER, MAIN	OL6-OVERLOAD, LEFT GATH THERMAL
CB2-CIRCUIT BREAKER, AUXILIARY	OL7-OVERLOAD, RIGHT GATH INST.
CD-CONVEYOR DOWN RELAY	OL8-OVERLOAD, RIGHT GATH THERMAL
CE-CONVEYOR FORWARD CONTACTOR	OL9-OVERLOAD, SCRUBBER INST.
CL-CONVEYOR LEFT RELAY	OL10-OVERLOAD, SCRUBBER, THERMAL
CO-CUTTER OFF RELAY	OL11-OVERLOAD, PUMP THERMAL
CP-CODE PANIC RELAY	OL12-OVERLOAD, LEFT TRAM THERMAL
CQ-CONVEYOR REVERSE CONTACTOR	OL13-OVERLOAD, RIGHT TRAM THERMAL
CR-CONVEYOR RIGHT RELAY	PET-PUMP ELAPSED TIME METER
CS-CONVEYOR START RELAY	POR-PUMP OFF RELAY
CU-CONVEYOR UP RELAY	PSR-PUMP START RELAY
D - RIGHT GATH HD MOTOR	RFR-RIGHT FORWARD RELAY
DA - RIGHT GATH, HD. MOTOR AMPMETER	RRR-RIGHT REVERSE RELAY
DB-DEADMAN RELAY	SR-SCHEAR DOWN RELAY
DC-SCRUBBER MOTOR & CONTACTOR	SS-SCRUBBER SOLENOID
DE-EMERGENCY STOP RELAY	SSR-SCRUBBER START RELAY
DF - PUMP MOTOR & CONTACTOR	ST - SHUNT TRIP
FS - FIRE SPRAY	STD-STAB DOWN RELAY
G - LEFT TRAM MOTOR	STU-STAB UP RELAY
GA - LEFT TRAM MOTOR AMPMETER	SUR-SHEAR UP RELAY
GBR-GATH HD FORWARD RELAY	TD2-TIME DELAY
GHD-GATH HD DOWN RELAY	TD3-TIME DELAY
GHR-GATH HD UP RELAY	TD4-TIME DELAY
GOR-GATH HD OFF RELAY	V - VOLTMETER
GRR-GATH HD REVERSE RELAY	WS - WATER SPRAY
H - RIGHT TRAM MOTOR	
HA - RIGHT TRAM MOTOR AMPMETER	
HR - HEADLIGHT RELAY	
HLR-HEADLIGHT RELAY (PAD'D)	
HM - HOUR METER	
IR1-ISOLATION RELAY	
IR2-ISOLATION RELAY	
JS - JET PUMP SOLENOID	
LFR-LEFT FORWARD RELAY	

NOTE.
* FROM RADIO RECEIVER

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REV	ECH	BY	DATE	REV	ECH	BY	DATE

NEW DRAWING WITH ALL
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SHEET 2 OF 2
MACHINE MASTER B/M
TITLE
SCHEMATIC DIAGRAM
440/550/950 VOLT DC TRAM
WITH SCR, RADIO & DE
DWG NO / PART NO
1610272.SH2

CUTTER MOTOR CIRCUIT - AFTER DELAY
(RADIO OPERATION MODE)

Position On - Control Circuit

In this section of the cutter motor circuit, the circuit is shown as if the cutter start switch on the radio transmitter has been depressed for more than 2 seconds. Timer TD2 has had 120 V AC applied, and TD2 normally open contact has timed closed. The SCR (current start relay) coil in the radio relay box is still energized. The CSR contact is still closed. At this time 120 V AC is provided to the normally closed COR contact. Current flows through the COR contact through the normally closed stop pushbutton to the timed closed TD2 contact. After TD2 has timed closed, the left or "B" cutter motor contactor coil becomes energized, providing no overload condition exists. The cutter circuit will seal in or latch through "B" auxiliary contact. A set of normally open contacts in off delay timer TD3 will also close. When "B" contactor closes, a normally open set of auxiliary contacts on "B" contactor also close, supplying 120 V AC to the water spray solenoid bridge rectifier. The rectifier provides 108 V DC to the explosion proof water spray solenoid, which lets water flow to the dust sprays. See water section.

Power Circuit

When the "B" coil in the control circuit is energized, the "B" or left cutter motor contactor closes, providing 3-phase line voltage through the thermal overload to the 175 HP left cutter motor.

GATHERING HEAD FORWARD
(RADIO OPERATION MODE)

Position Off - Control Circuit

This section of the gathering head circuit is shown de-energized in the radio mode. To stop the gathering head, place the gathering head switch on the radio transmitter to the off position. When the switch is in the off position a signal is sent to the radio receiver which in turn sends an output to the radio relay box (wire #110). This input energizes the GOR (gathering head off relay) coil inside the radio relay box. When the GOR coil is energized, the normally closed GOR contact in the gathering head forward circuit opens. Thus the control circuit feeding the CF contactor coil is broken. The "CF" contactor will become de-energized, thus allowing the now closed seal in or latch auxiliary contact to open and the now open interlock auxiliary contact in the conveyor reverse circuit to return to a normally closed position. The normally open auxiliary contacts supplying power to the scrubber jet pump solenoid will open, de-energizing the solenoid and stopping the water supply to the jet pump.

Power Circuit

In the power circuit the conveyor forward contactor will open, interrupting 3-phase line voltage to the thermal overloads and conveyor motors.

Introduction

The radio tram circuitry on the opposite shows the inputs and outputs as well as voltages to the tram interface box in the radio mode. When troubleshooting, all voltage checks should be performed in reference to the circuits respective common.

This section of the radio tram control is shown in a cutter on position. The initial set up requirements of the tram interface box are considered satisfied. When the tram switch on the transmitter is moved off center a signal is sent to the radio receiver. Inside the radio receiver are variable output, isolated, 0 to 10 V DC power supplies, that supply an input through the radio relay box to the tram interface box (wire #R48). This input is fed into the cutterhead feedback circuitry. The cutterhead feedback circuitry is activated by a current transformer input from the right cutter motor (wire #196 and 197). This input will result in a reduced reference voltage out to the drive unit (wire #41).

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**CUTTER MOTOR CIRCUIT
(MANUAL MODE ON POSITION-
BEFORE DELAY**

Control Circuit

In this section of the cutter motor circuit, the circuit is shown as if both the normally open optional cutter start and the normally open cutter start have been depressed for less than 2 seconds. 120 V AC is supplied through the normally open optional cutter start and cutter start pushbuttons to a normally closed IR1 (isolation relay) contact then to a normally open COR (cutter off relay). Current flows through the COR contact through the normally closed stop pushbutton, energizing the hour meter (HM) and the right or "A" cutter motor contactor coil providing OL1, 2, 3, and 4 contacts are closed. Power will also be supplied to timer TD2.

Power Circuit

When the "A" coil in the control circuit is energized, the "A" or right cutter motor contactor closes, providing 3-phase line voltage to the thermal overload and the 175 HP right cutter motor.

GATHERING HEAD FORWARD
(MANUAL MODE ON POSITION)

Control Circuit

In this section the gathering head forward circuit is shown with timer TD4 energized through a normally closed set of CR (conveyor reverse) contacts. When the normally open momentary gathering head forward pushbutton is depressed, current flows through the contact to a normally closed IR1 (isolation relay) contact and a normally closed GOR (gathering head off relay) contact to the normally closed manual gathering head stop pushbutton. Power from the stop pushbutton will energize the gathering head hour meter in the operator control station. Timer TD4 will have timed in supplying power through the now closed TD4 contact, through the normally closed CR (conveyor reverse) contact or interlock to the CF (conveyor forward) contactor coil. The coil will become energized providing OL5, 6, 7, and 8 contacts are closed, indicating no instantaneous or thermal overload condition exists. When CF (conveyor forward) coil becomes energized, the normally open auxiliary contact on the contactor closes which forms holding or latch circuit for the gathering head forward circuit. A second set of normally closed CF auxiliary contacts will open in the conveyor reverse circuit preventing the CR (conveyor reverse) coil from being energized (interlock circuit). When CF contactor closes, a second set of normally open auxiliary contacts on CF also close. This supplies 120 V AC to a bridge rectifier which transforms it to approximately 108 V DC. The DC voltage is applied to an explosion proof jet pump solenoid which allows water to flow through the jet pump in the scrubber sump. See water section.

Note: The function of timer TD4 is to allow a delay from the conveyor reverse circuit to the conveyor forward circuit. This delay helps prevent conveyor chain damage due to accidental conveyor reverse.

Power Circuit

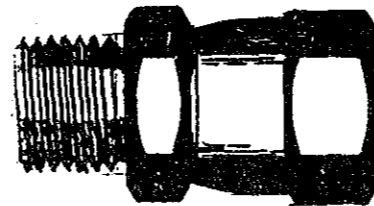
In this power circuit when the CF (conveyor forward) coil in the control circuit is energized, the CF (conveyor forward) contactor closes, providing 3-phase line voltage through the thermal overload to the two 50 HP gathering head motors. CT-12 and CT-18 energize the left and right gathering motor meters at the operator control station.

This section of the manual tram circuitry is shown in the forward position. The initial setup requirements of the tram interface box are considered satisfied. 9 V DC from the tram interface box is supplied to the manual I.S. tram direction switches (wire £200). When the tram switch is moved in a forward direction, a normally open set of contacts close allowing current to flow back into the tram interface box (wire £49). This 9 V DC input from the I.S. tram direction switch is used to switch an input from the drive unit. This input is generated through an internal power supply in each drive unit. This 24 V DC input (wire £46) is fed back into each drive unit (wire £43) where the forward SCR's will be gated.

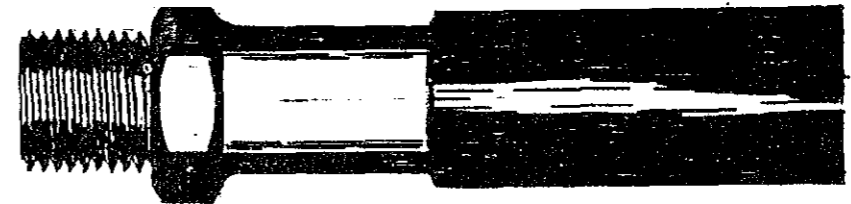
WATER PIPING SYSTEM

STANDARD WATERHOSE USED IS MPT.

The hose end is a stationary male adapter. A male MPT adapter connects to a swivel type female fitting.



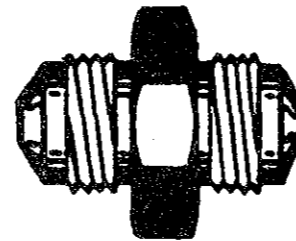
MPT



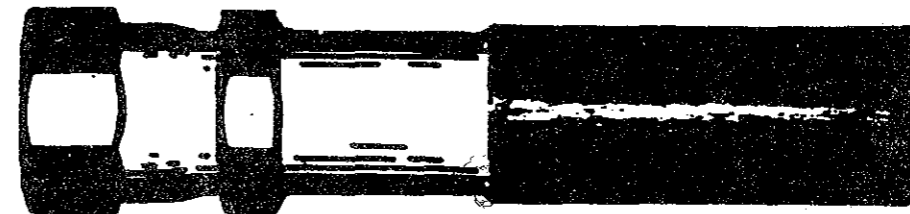
✓ HYDRAULIC PIPING SYSTEM

STANDARD HYDRAULIC HOSE USED IS JIC (37 DEGREES).

The hose end has a female swivel adapter. A female JIC adapter connects with a stationary male fitting.



JIC



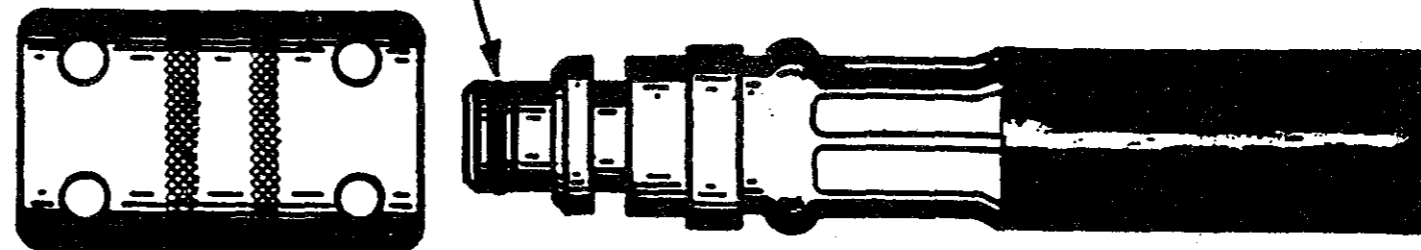
OPTIONAL HYDRAULIC HOSE USED IS STAPLE-LOCK TYPE.

COMMENTS:

Hose lengths are designated by numbers.
Fitting type and size are designated by letters. A metal tag is attached to each hose end. A number is stamped on it which will correspond to the hose number.

O-RING &
BACK-UP RING

STAPLE

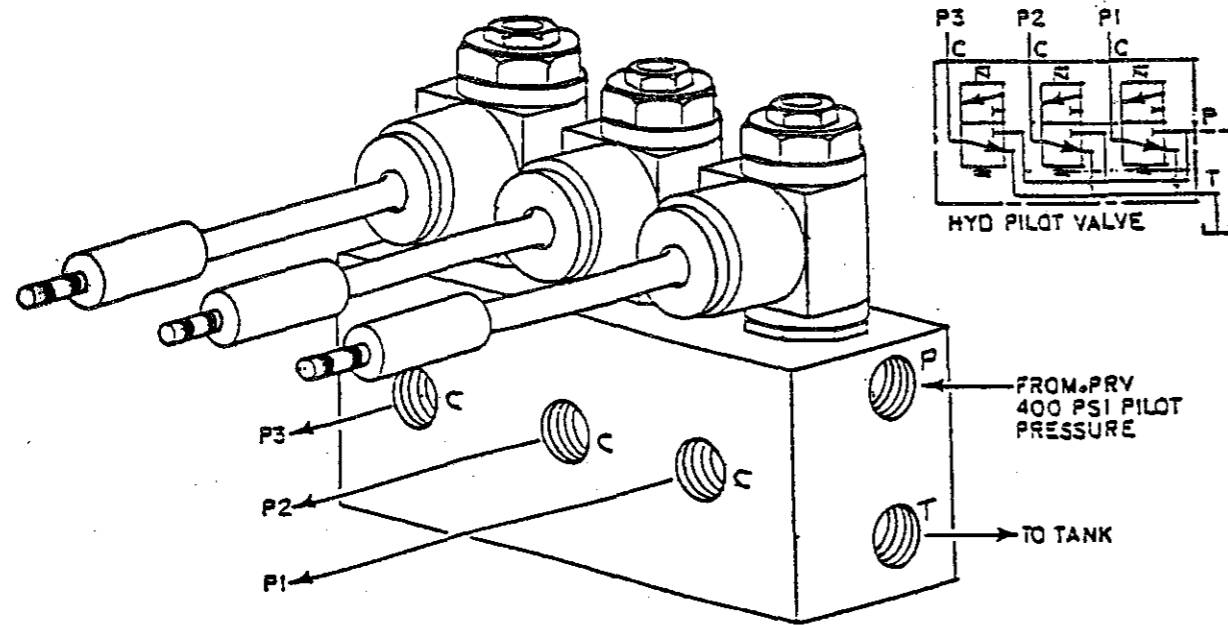


STAPLE

HYDRAULIC PILOT VALVE

Introduction: Radio remote and manually controlled miners with optional scrubber system use this valve. This valve provides hydraulic pilot pressure to hydraulic pilot operated water valves located in the fire suppression, scrubber water and headspray water circuits. Pilot pressure to the water valves is controlled by three 120 Volt DC solenoids.

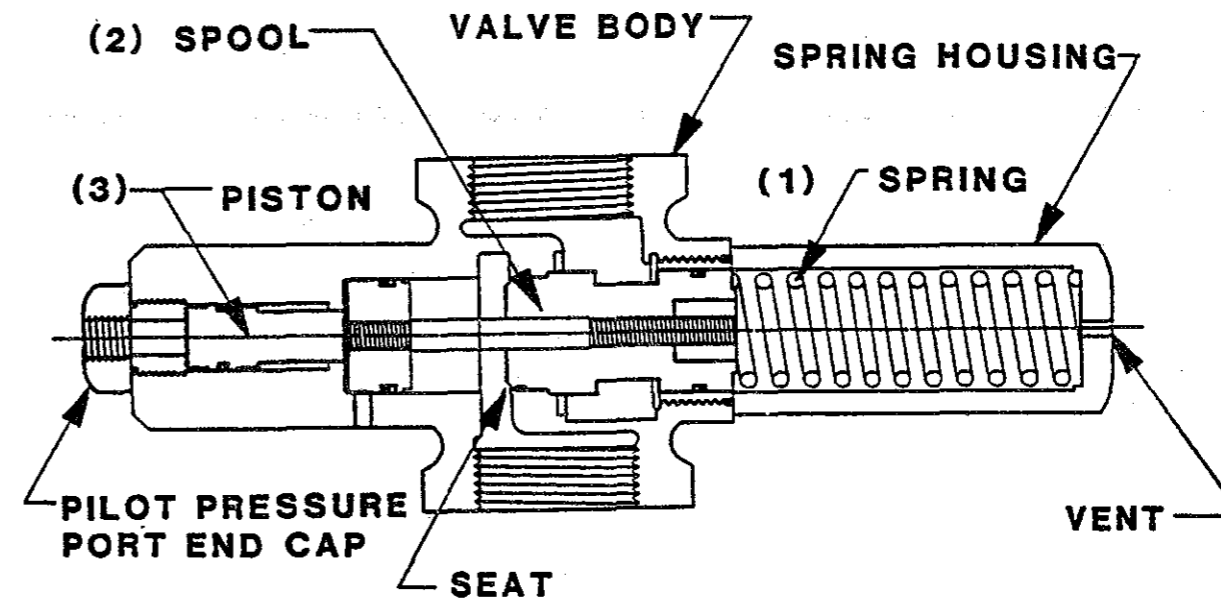
- Operation:**
1. When the solenoids are in a deenergized position, pilot pressure enters port P and is directed internally to each closed solenoid spool.
 2. When one or all three of the solenoids are energized, the respective solenoid spool is positioned to connect pilot pressure from port P to port C-P1 or C-P2 or C-P3.
 3. Ports C-P1, C-P2 and C-P3 are connected to tank port T when solenoids are deenergized.



PILOT OPERATED WATER VALVE

Introduction: The function of the hydraulic pilot operated water valve is to control water flow to a particular circuit by means of "pilot pressure".

- Operation:**
1. In the "OFF" position, an internal spring (1) acts against the spool (2) forcing the spool to a closed position. Water flow is blocked.
 2. To turn valve "ON", pilot pressure acts against the piston (3) which overcomes the valve spring (1), forcing spool (2) to an open position. Water flows through valve.
 3. To turn "OFF", remove pilot pressure. Repeat Operation 1.

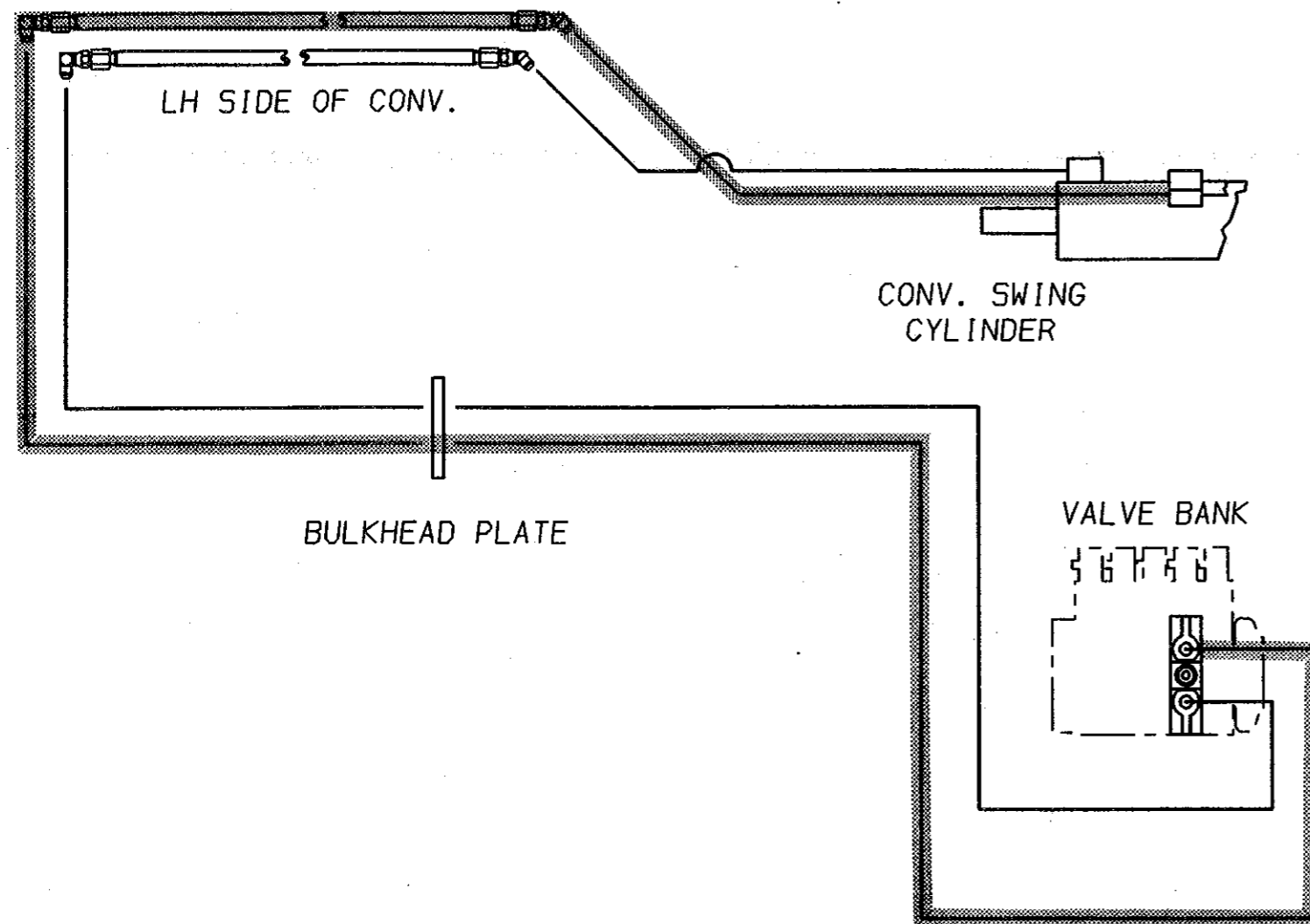


- WHERE USED:**
- A. Motor Cooling Circuit
 - B. Dust Suppression Circuit
 - C. Fire Suppression Circuit
 - D. Scrubber Water Circuit

Location: Refer to component location diagrams for scrubber equipped and non-scrubber miners.

Location: Refer to component location diagrams for scrubber equipped and non-scrubber miners.

Conveyor Swing "LEFT"



The conveyor tail frame swings 45 degrees in each direction. A single double-acting hydraulic cylinder mounted on the off side of the miner provides this function.

Operation: The pump motor is energized and the control valve spool is moved to the left swing position.

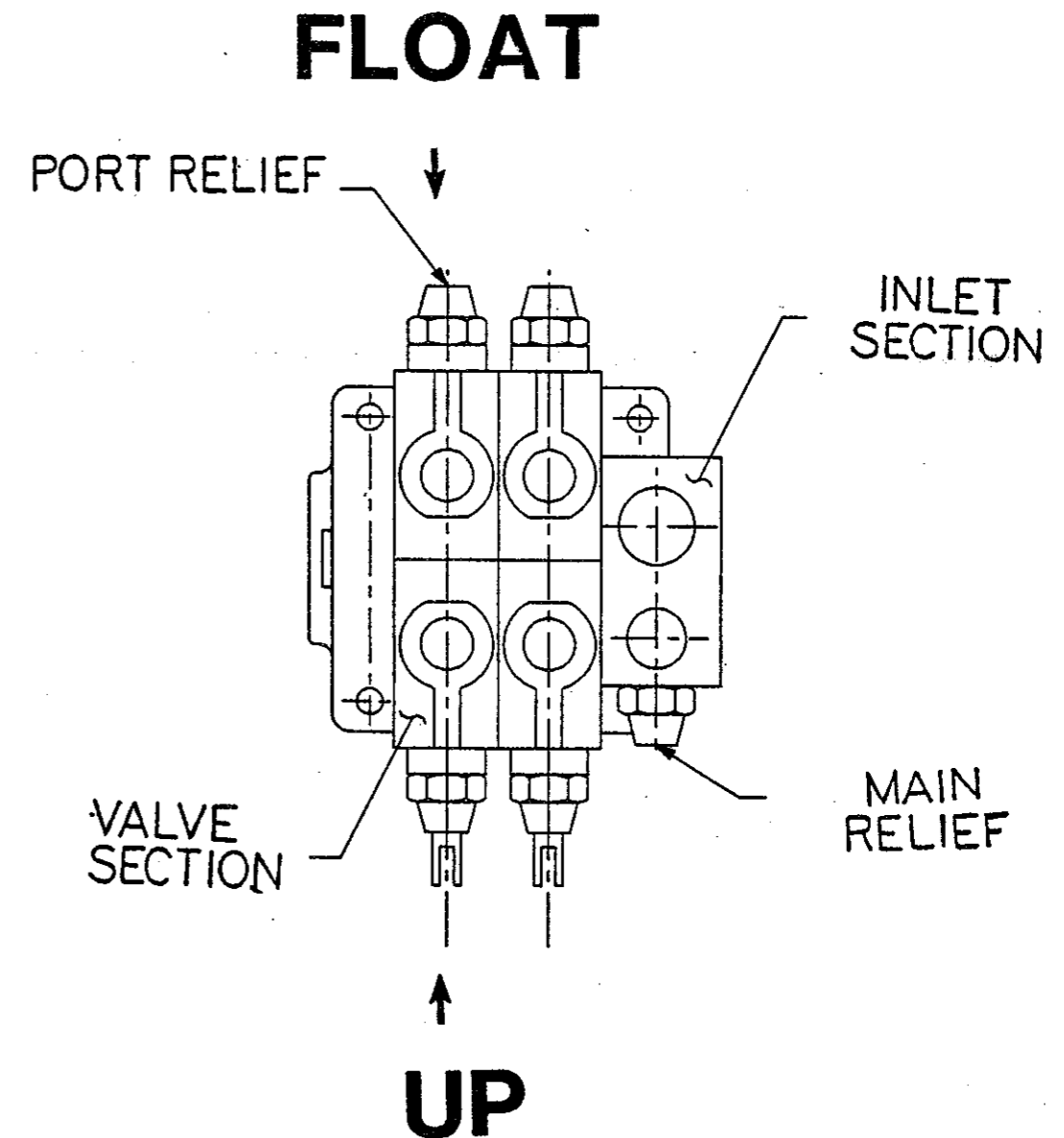
Step	Function
1-9	Refer to basic pump and filtration circuit.
10	When the conveyor valve spool is moved to the left swing position, flow is blocked in the middle passage and is diverted to the upper parallel passage. Pressure build-up from the pump lifts the load hold check and diverts flow across the valve spool to work port "A" and on to the rod port of the swing cylinder.
11	Exhaust flow exits the swing cylinder base port and enters port "B" of the control valve and flows across the valve spool. Exhaust flow returns to tank through the drain manifold and return filter.
12	The conveyor left swing circuit is protected by a port relief. Should the circuit pressure increase to the relief valve setting, the relief will dump over to tank.

PORT RELIEF LOCATION

SETTING PORT RELIEF VALVES CONT.

SETTING CAB SECTION PORT RELIEF VALVE UP:

- | <u>Step</u> | <u>Procedure</u> |
|-------------|---|
| 1 | Loosen jam nut on the cab up port relief valve and turn adjusting screw fully out (counterclockwise). |
| 2 | Start pump motor and move cab control lever to the up position and hold in an activated position. Turn the cab up port relief adjusting screw in (clockwise) until the cab cylinder is stalled and a pressure of 1100 PSI is read on the system pressure gauge. |
| 3 | Retighten jam nut on the canopy port relief and place control lever in the neutral position. |



GENERAL HYDRAULIC TROUBLESHOOTING CHART

Understanding the operation of hydraulic components is the key to successful troubleshooting. Always check the obvious first.

Most hydraulic system failures are due to one of the following:

1. Lack of hydraulic oil
2. Use of wrong type or viscosity of oil
3. Contaminants in the oil
4. Air in the system
5. Internal or external leakage
6. Wrong mechanical adjustments
7. Mechanical or structural damage resulting in component failure.

If the problem is not caused by one of the above, study the hydraulic system schematic, analyzing the relationship each component could have to the problem. In most cases, this will locate the problem.

The following chart is intended for locating a problem in a system which had been working properly.

SYMPTOM	PROBABLE CAUSES	REMEDY
Pump not pumping	1. Lack of hydraulic oil	1. Fill tank to mark
	2. Air leak in suction line.	2. Locate & repair leak.
	3. Suction line blocked.	3. Remove blockage.
	4. Oil viscosity too heavy (oil too thick)	4. Drain tank & replace oil with a lighter viscosity oil.
	5. Faulty pump	5. Repair or replace as needed.
	6. Dirt or foreign objects(s) in pump	6. Dismantle & clean.
	7. Pump rotating in wrong direction	7. Change motor leads immediately.
	8. Pump speed too slow	8. Check for low voltage.
No system pressure	1. Refer to "Pump not Pumping."	1. Refer to "Pump not Pumping."
	2. Relief valve(s) not operating correctly.	2. Check pressure setting sheet & adjust.
	3. Valve leaking	3. Locate leak, repair or replace as needed.
	4. Weak relief valve spring	4. Replace spring.

SYMPTOM	PROBABLE CAUSES	REMEDY
No system pressure Cont'd.	5. Dirt in relief valve	5. Clean or replace
	6. Control valve or cylinder leaking internally.	6. Repair or replace as needed.
	7. Control valve not recentering.	7. Repair or replace as needed.
Noisy pump	1. Suction line partially blocked.	1. Remove blockage.
	2. Air in system from leaky pipes or loose hoses.	2. Test for leaks. Repair or tighten as needed.
	3. Air lock in system	3. Bleed system as required.
	4. Vent or breather blocked.	4. Clean or replace as needed.
	5. Pump gaskets leaking, tie bolts too loose or too tight.	5. Replace or retorque as needed.
	6. Worn or broken internal pump parts.	6. Repair or replace pump.
	7. Pump running too fast	7. Check recommended speed. Check for high voltage.
	8. Oil viscosity too heavy.	8. Drain tank, replace with lighter viscosity oil.
	9. Drive coupling misalignment	9. Realign
External Leakage from Pump	1. Shaft seal(s) worn.	1. Replace seal(s)
	2. Gaskets damaged.	2. Replace gaskets.
Excessive Pump Wear	1. Hydraulic oil contaminated with abrasive	1. Drain tank, replace oil, change all filter elements.
	2. Oil viscosity too low (Oil too thin)	2. Drain tank, replace with higher vis. oil
	3. Hyd. pres. settings above max. for pump.	3. Check & adjust reliefs.
	4. Drive cplg. misalignment	4. Realign
	5. Air in system	5. Locate & repair leaks. Bleed air from system.
Internal Pump Components Damaged	1. Hyd. pres. settings above max. for pump.	1. Check & adjust reliefs.

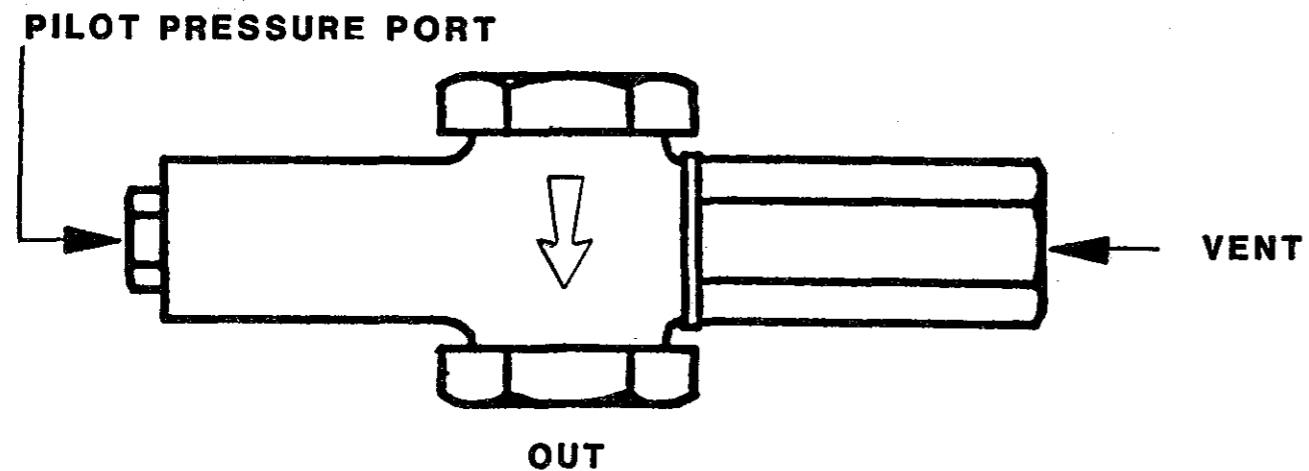
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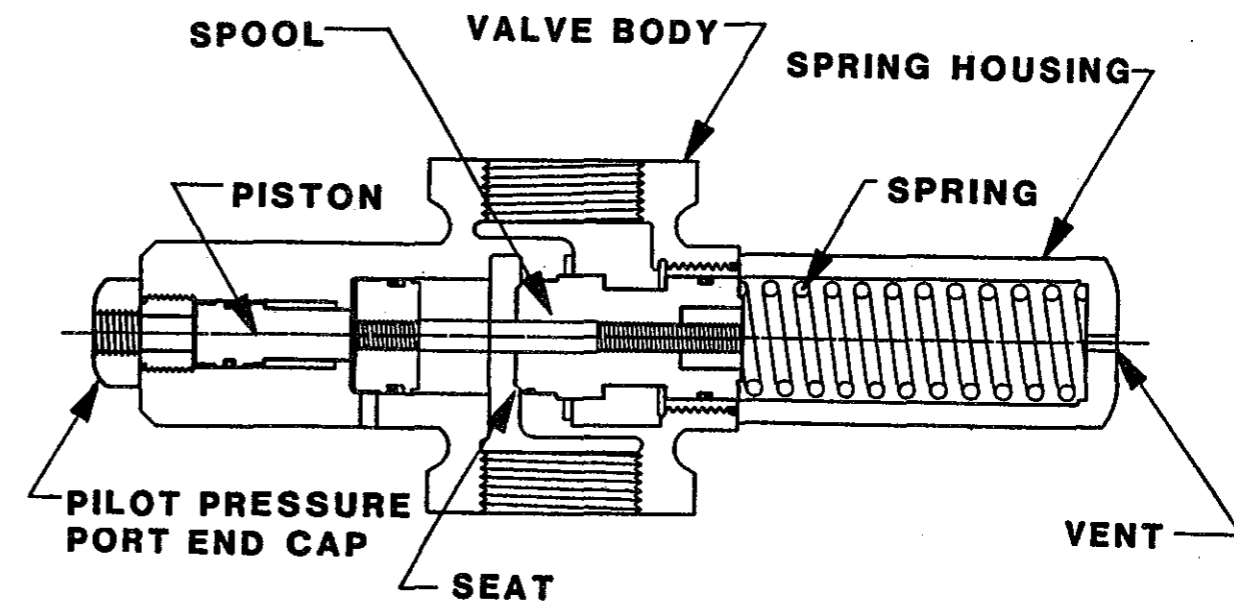
- WHERE USED:**
- A. Motor Cooling Circuit
 - B. Dust Suppression Circuit
 - C. Fire Suppression Circuit
 - D. Scrubber Water Circuit

OPERATION

1. In the "OFF" position, an internal spring (1) acts against the spool (2) forcing the spool to a closed position. Water flow is blocked.
2. To turn valve "ON", pilot pressure acts against the piston (3) which overcomes the valve spring (1), forcing spool (2) to an open position. Water flows through valve.
3. To turn "OFF", remove pilot pressure. Repeat Operation 1.



- COMMENTS:**
1. The valve is normally closed to flow in the "OFF" position and will withstand a static water pressure of 600 PSI at its inlet port.
 2. To turn the water valve fully "ON" requires a pilot pressure of 200-400 PSI (minimum of 200 PSI).
 3. Pilot pressure to the valve may be direct from the machine's hydraulic system or controlled by electric solenoids when operating the miner in Radio Remote Control.



EIMCO 2810 SCRUBBER MAINTENANCE SCHEDULE

INTRODUCTION:

For the most efficient operation, the scrubber system must be properly maintained. The maintenance schedule given below is based on average working conditions. In mines with extremely dusty conditions, the scrubber system will require cleaning more frequently.

PROCEDURES:

TWICE EACH SHIFT- Remove scrubber screen and tap out coal particles, then wash the screen with water in the opposite direction of the air flow.

EACH SHIFT- Replace the scrubber screen with a clean one. Tap coal particles from the dirty screen, wash the screen with water in the opposite direction of the air flow. Place screen in a warm, dry area; when screen is dry, shake the screen to remove remaining particles. The screen can now be reused.

Open access covers for the inlet duct work and flush out with water.

DAILY- Open the three access covers on top of the duct work and flush out inlets and duct work with water. Leave the filter in place or particles will be washed into the sump area.

WEEKLY- Back flush and drain the mist eliminator and sump area.

EVERY 80 SHIFTS- Grease the fan motor with high temperature lubricant.

MAINTENANCE:

- * 1. Filter screens will be cleaned at least twice during a normal production shift to insure proper operation of scrubber system.
- * 2. Scrubber inlet duct work will be flushed out using access covers once in a normal production shift.

Note: Scrubber screen must be in place or particles will be washed into the scrubber sump.

- * 3. Mist eliminator and scrubber sump will be cleaned at least once each week.
- 4. Grease the fan motor once every eight (80) shifts with high temperature lubricant.

NOTE: Mines with extremely dusty conditions will require changing of the scrubber screen and cleaning of the system more frequently.

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