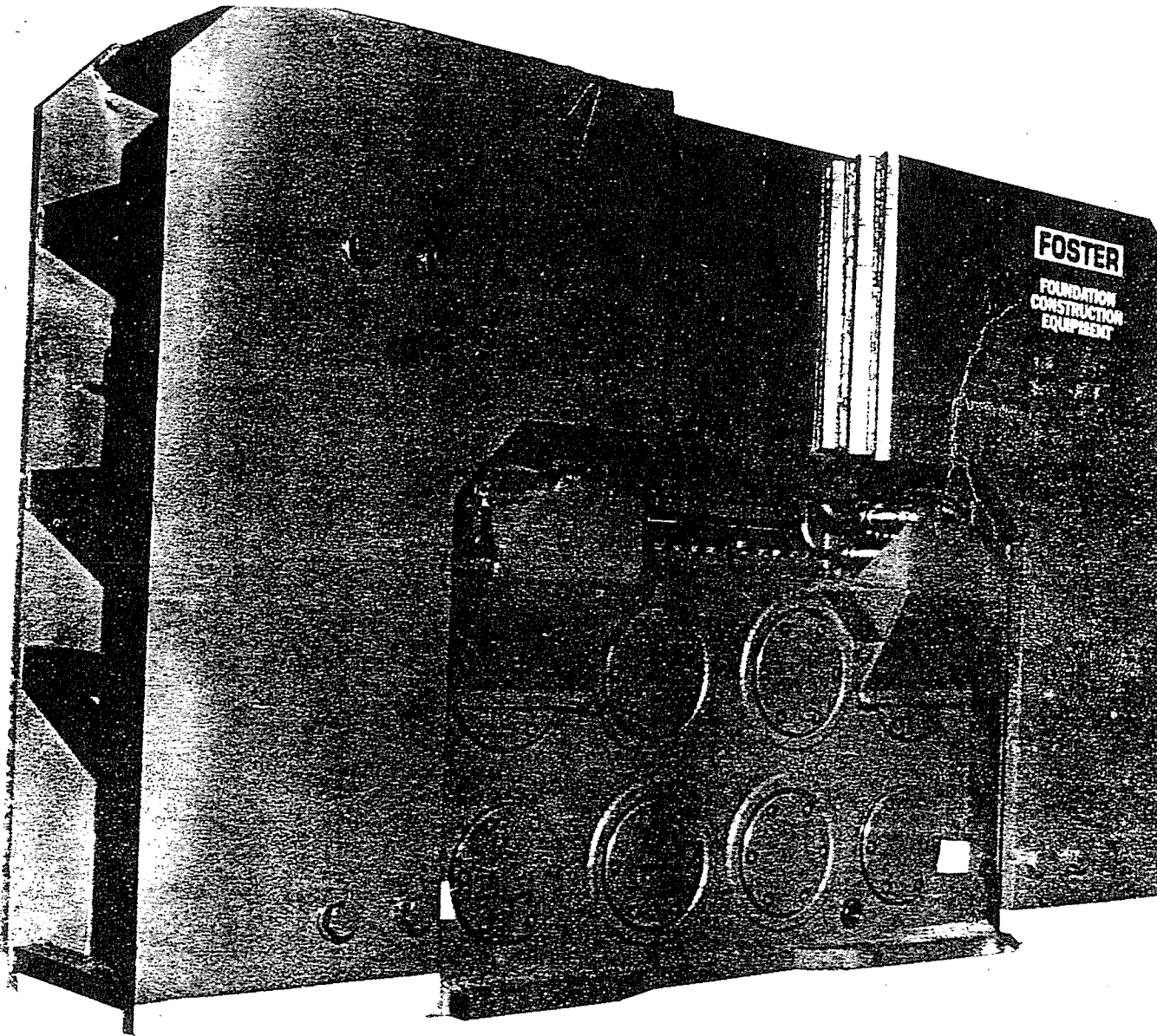


FOSTER

L.B.FOSTER COMPANY

4000 VIBRO DRIVER[®]/EXTRACTOR



OPERATION/MAINTENANCE
MANUAL

L. B. FOSTER
4000
VIBRO DRIVER/EXTRACTOR
OPERATION AND MAINTENANCE MANUAL

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I). GENERAL DESCRIPTION

A). Vibro Driver/Extractor

The Foster 4000 is a low frequency vibrator pile driver designed to drive and extract sheet piling, pipe, timber, and concrete pile, caisson pile, and H, I, and wide flange beams.

The model 4000 operates in a frequency range of 0 to 1400 vibrations per minute to provide maximum pile penetration and extraction rates in a wide variety of soils. Amplitude, the major determinate of pile penetration rate, is governed by the design of the unit and by pile weight and type of soil. Amplitude for the 4000 usually ranges between 5/16 and 1-1/4 inch.

The Vibro/Driver Extractor System consists of two major components - the Drive Extractor itself, with attached driving/extracting head, and the hydraulic power pack with remote control pendant.

The Driver/Extractor consists of two major components - a vibro case, and a suspension case containing a vibration suspension system.

The Vibro case contains eight eccentric weights which rotate in a vertical plane to create vibration. The two hydraulic motors are gear coupled to the eccentrics. The eccentrics and drive shafts are mounted in heavy-duty cylindrical roller bearings. Lubrication is provided by a splash system actuated by the rotating eccentrics and gears.

A unique elastomeric suspension system isolates the suspension case from the vibro case and therefore the crane boom from most vibration.

B). Hydraulic Power Pack

The Hydraulic Power Pack is driven by an Allis Chalmers 25000 Engine. The engine rating is 445 H.P. at 2000 RPM.

The totally enclosed power pack is mounted on a skid type fuel tank sub-base. Located at the rear of the unit is a control panel which houses all operating controls.

and pressure gauges. All 5 hydraulic hoses connect into the power pack below the control panel. The unit utilizes a closed loop hydraulic circuit with rapid response pressure compensation to limit maximum pressure output. A common tank supplies oil for both the hydraulic pumps; one for the clamp in the driving/extracting head and one pump for the vibrator motors. Hydraulic oil temperature is maintained by an oil cooler. The hydraulic system is continually cleaned by 10 micron and 3 micron full flow oil filters.

Control of the output flow is maintained by a hand-held remote control pendant.

C). Driving/Extracting Heads

Various types of driving/extracting heads are available for the 4000 to handle everything from steel sheet piling to the largest caisson pipe. The head bolts to the bottom of the vibrating case and contains one or more hydraulic cylinders to provide up to 200 tons of clamping force. Clamping or unclamping occurs in 5 to 7 seconds.

D). Remote Control Pendant

The Vibro Driver/Extractor is controlled from a hand-held pendant. Switches control clamp and unclamp of the driving/extracting head. A potentiometer controls vibrating speed, and a pressure light indicates that the clamp is closed and vibration can be started.

E). SpecificationsDriver/Extractor

| | |
|----------------------------------|----------------|
| Eccentric Moment | 4000 in.-lbs. |
| Frequency | 0 - 1400 VPM |
| Amplitude | 5/16" - 1-1/4" |
| Pile Clamping Force | 100 - 200 tons |
| Pile Clamping Time | 5 - 7 seconds |
| Working Line Pull for Extraction | 45 tons |
| Oil Capacity - Vibrating Case | 5 gals. |
| Weight with Cable and Hoses | 18,800 lbs. |
| Length | 118" |
| Width | 22" |
| Height | 76-1/2" |
| Throat Width | 12" |
| Maximum Operating Pressure | 5000 psi |
| Maximum Flow | 120 gpm |
| Maximum Output Hydraulic Motors | 299 hp |

Power Pack

| | |
|---------------------------------|----------------------|
| Maximum Pump Pressure | 5000 psi |
| Maximum Flow | 120 gpm |
| Diesel Engine | Allis Chalmers 25000 |
| Engine Power | 445 hp at 2000 rpm |
| Fuel Tank Capacity | 125 gal. |
| Oil Capacity - Hydraulic System | 146 gal. |
| Weight with Fuel | 11,160 lbs. |
| Clamp Pump Pressure | 4500 psi |
| Length | 10'8" |
| Width | 3'10" |
| Height | 6'7" |

II. PREPARATION FOR OPERATION

A. General

When unloading the Vibro Driver, use extreme care. For your protection, make a thorough inspection of the unit immediately on delivery. In case of any damage or shortage, notify the transit agent at once and have the delivering carrier make a notation on the freight bill.

B. Safety Precautions

Safety is a requirement that must be first in the minds of all people who have occasion to operate equipment. Each job or situation has its own problems which cannot be covered by rules. The following is a general guide to safe operation but your knowledge of standard safety precautions will be your best guide to safety.

1. Never adjust or repair the unit while it is in operation.
2. Never operate the hydraulic power pack when it is not connected to the vibrator.
3. Do not smoke or use open flame in the area of the power pack while refueling.
4. Never store flammable liquids near the engine.
5. When charging or servicing the lead acid batteries, have adequate ventilation and do not smoke or use an open flame in the area, because batteries generate explosive gas during charging.
6. Never operate the diesel engine with the governor linkage disconnected. Hydraulic reactions are not fast enough to control the fuel rack.
7. When operating the power pack in an enclosed area, pipe exhaust fumes out or use an approved method of exhaust condensation in water. Continued breathing of exhaust fumes can be fatal.
8. Remove all tools and rags before restarting after adjustments or repairs.
9. Store oily rags in containers.

REMEMBER ---- SAFETY IS EVERYONE'S BUSINESS

C). Rigging of Vibro Driver/Extractor

A steel wire rope sling must be connected to the support pin of the vibration suppressor. The required strength of this sling depends on the capacity of the crane and the work to be carried out. A safety factor of five or cable capacity of five times the weight to be lifted is recommended.

Attach a safety cable from the crane hook to the Driver/Extractor to hold the unit in case the main sling falls.

D). Connection of Driving Extracting Head

When the Vibro Driver is connected to the crane line, lift the Vibro Driver so that the driving/extracting head can be bolted to the bottom of the vibrating case. All bolts must be in place.

E). Connection of Hydraulic Hoses

1). The vibrator and driving/extracting head are connected to the power pack by five hydraulic hoses.

2). It is important to clean all hose connections with a clean cloth before making connections. All hydraulic lines should be capped immediately after disconnection.

3). Connection of the hoses at the Vibro are color coded. Two 1-1/2" hoses; 1 red, 1 blue, and 1 3/4" yellow hose, and two 3/8" hoses; 1 red and 1 blue. Connections at the Vibro are the high pressure flare type and connections at the power pack are of the quick disconnect type.

4). Color coding for the vibro is as follows:

1 red 1-1/2" - high pressure motor hose

1 blue 1-1/2" - return motor hose

1 yellow 3/4" - drain hose

1 red 3/8" - clamp cylinder hose

1 blue 3/8" - unclamp cylinder hose

5). Make sure that all hose connections are tight.

F). Final Check

1). Check the fluid in the hydraulic reservoir.

2). Check oil level in vibrating case, should be 1/2 level of sight glass.

III). OPERATING INSTRUCTIONS

A). Completion of Set-Up

1). Complete set up as described in Section II.

2). Perform any required maintenance as described in Section IV.

B). Start and Warm-up Engine

1). Before starting the engine, read the engine manufacturer's operating and maintenance instructions carefully. Follow the engine starting, operating and maintenance procedures detailed in the manual.

2). Open all enclosure doors and be sure all pre-start checks have been performed.

3). Turn the main power switch on the control panel to the "on" position, and the "off-on-start" switch to "on".

4). Set the engine speed control (throttle) for idle.

5). Set control pendant potentiometer fully counter-clockwise.

6). Ready light on control panel will indicate when potentiometer is fully counter-clockwise.

7). Press the Murphy switch reset and hold in while simultaneously turning the "off-on-start" switch to start. It will be necessary to hold the reset button in until the engine oil pressure exceeds 30 psi. Release the start switch as soon as the diesel starts.

8). As soon as the engine attains normal operating temperature, adjust the speed control for 2000 RPM.

C. Warming the Hydraulic Fluid

1. The Vibro should not be operated at full speed unless the oil temperature is above 60°F. Check the oil temperature on the thermometer in the oil tank.
2. If temperature is below 60°F. set diesel speed at 1200 RPM and rotate the speed potentiometer to No. 3 on the control pendant to start the vibrator. Operate the vibrator until the oil temperature exceeds 60°F. then full speed operation can be performed.

D. Operation of the Remote Control Pendant

1. The operation of the vibratory driver/extractor is controlled by the remote control pendant. The pendant is connected to the power pack by a flexible electrical cable, which allows operation from any convenient location near the vibrator.
2. The pendant has one switch, one light, and one speed potentiometer.
 - a. To clamp to the pile, place the clamping head over the pile and turn the clamp switch to close position and the clamp light will light when adequate pressure has been obtained to permit vibration to begin.
 - b. To start vibration rotate the speed potentiometer clockwise and adjust vibrating speed to match soil conditions for driving or extracting.

CAUTION: DO NOT START VIBRATING UNTIL THE CLAMP LIGHT IN THE PENDANT COMES ON.

3. To stop vibration rotate the speed potentiometer counter clock wise to its full extreme. The vibration will stop in a few seconds. If counter clock wise rotation of the speed potentiometer does not stop the Vibro Driver/Extractor, pull the engine stop knob and move the control off/on switch located on the control panel of the power pack to off, and refer to the trouble shooting section, Chapter

4. To Unclamp the Pile

WARNING: THE OPERATOR MUST WAIT UNTIL A VISUAL CHECK HAS PROVED THAT ALL VIBRATIONS HAS STOPPED.

Turn the clamp/unclamp switch to the unclamp position and the jaws of the clamp will open so the vibrator can be removed from the pile. The clamp light on the pendant will go out, indicating that the pressure in the line to the clamp cylinder has been released.

E. Shut Down

1. Stop the vibrator and open jaws.
2. Reduce diesel engine speed to 1500 RPM and allow engine to run for 5 additional minutes, then slowly reduce speed to idle.
3. Pull out the engine stop knob.
4. Turn the main power switch to off, and the 12 volt switch to off.
5. If the diesel engine is shutdown while the vibrator is clamped to the pile, the clamp check valves will keep the vibrator clamped to the pile. (WARNING IT IS NOT RECOMMENDED TO LEAVE THE VIBRATOR CLAMPED TO A PILE WHEN THE DIESEL ENGINE IS NOT RUNNING, BECAUSE SYSTEM LEAKAGE COULD CAUSE A LOSS IN CLAMP PRESSURE).

IV. MAINTENANCE

FOR ALL L.B. FOSTER VIBRO-DRIVER EXTRA

✓ A. GENERAL

Preventive maintenance includes normal servicing that will keep the engine, vibro driver/extractor and power pack in the peak operating condition and prevent unnecessary trouble from developing. This servicing is periodic lubrication and inspection of the moving parts and accessories of the unit.

Lubrication is an essential part of protective maintenance, controlling to a great extent the useful life of the unit. Different lubricants are needed and some components in the unit require more frequent lubrication than others. Therefore it is important that the instructions regarding types of lubricants and frequency of their application be closely followed.

To prevent minor irregularities from developing into serious conditions that might involve shut down and major repair, several other services or inspections are recommended for the same intervals as the periodic lubrication. The purpose of these services, or inspections, is to assure the uninterrupted operation of the unit.

Thoroughly clean all lubrication fittings, caps, filter and level plugs and their surrounding surfaces before servicing. Prevent dirt from entering with lubricants and coolants. The intervals given in the schedule are based on normal operation; perform these services, inspections, etc., more often (as needed) for operation under abnormal or severe conditions.

✓ B. DAILY

1. Check the entire Vibro Driver System prior to and during start-up each day or at the beginning of each shift. Prior to starting the diesel engine at each shift check the following items.

2. Driver/Extractor

a. Visibly inspect all bolts, nuts and screws, including the bolts fastening the driving heads to the Vibro case to insure they are tight.

b. Check the oil level in the vibro case. The oil level should be in the center of the sight glass. Change oil if milky or black.

✓ 2. Driver/Extractor - Cont'd..

- c. Check the fluid level in the hydraulic reservoir and refill if necessary.
CAUTION: It is absolutely necessary that no dirt or other impurities be permitted to enter the hydraulic system. Any contamination will drastically reduce the life of the high pressure hydraulic system.
- d. Visually check all hose and hose connections for cuts that could cause hose failure during operation. Check all hose connections for tightness.
- e. Perform all daily maintenance checks and lubrication recommended in the Allis Chalmers operating and maintenance manual.

✓ 3. After start up check the following:

- a. Check all hydraulic lines and fittings for leaks.
- b. Check both pumps and manifolds for leaks.
- c. Inspect the indicators for the filters with the oil at operating temperature to be sure the elements do not need changing.
- d. Before operating attach the vibro to the pile, open and close the clamp jaws to ensure proper operation.
- e. Be sure there are no kinks in the hydraulic lines and that they are hanging freely.
- f. Check the lifting cable for fraying.
- g. Inspect the serrations of the gripping surfaces of the hydraulic clamp.
Replace them if worn.

C. 100 Hours

- 1. Drain and refill the vibrating case. Use Exxon (Imperial to Canada) Terresso or equivalent.
- 2. Remove the 10 bearing covers and check the condition of the bearings.
- 3. Perform all maintenance checks and lubrication indicated in the Allis-Chalmers operating and maintenance manual.

D. 1000 Hours

Change the filter cartridge located in the vibro driver/extractor suspensio yoke assembly.

E. SEVERE CONDITIONS

1. The servicing intervals specified are based on normal operating conditions. Operation under unusual conditions, requires some adjustment in servicing intervals.
2. When the average temperature is above 80°F. or below -10°F., reduce servicing intervals to one-half of those specified in Sections B, C, and D. Also, refer to Allis-Chalmers Manual, Topic 5 (F. & G.).
3. When operating in the presence of dust or sand, reduce servicing intervals to one-third, of those specified in Sections B and C. Also, refer to Allis-Chalmers manual, Topic 5-F, and G.
4. When operating in excess of twelve hours per day, reduce servicing intervals to one-half of those specified in Sections B and C. Also, refer to Allis-Chalmers manual, Topic 5-F, and G.
5. When operating in air with high salt or moisture, the servicing intervals need not usually be changed, however, the unit should be inspected weekly to determine if additional servicing might be required.
6. During stand-by or inactive periods, the servicing intervals may be twice those specified in Sections B and C, and D. The unit should be exercised every 30 days or less, depending on conditions. Also, refer to Allis-Chalmers Manual, Topic 5-H.

✓ F. LUBRICATION

1. Diesel Engine

Follow the engine manufacture's operating and maintenance instructions

Recommended crankcase oils are as follows:

| | |
|----------------|---|
| Amoco | 300 |
| Arco | Fleet 53 Plus |
| Cities Service | C500 |
| Exxon | HDX Plus |
| Gulf | Super Duty |
| Lubriplate | Super G.P.O. |
| Mobil | Delvac 1330 |
| Phillips | Super HD |
| Sun | Sun Fleet Diesel Lube or Sunfleet Super C |
| Shell | Rimula |
| Texaco | URSA Super 3 |
| Union | Gardol |

2. Vibro Case

- a. When adding or changing oil in the vibro case - care should be taken to insure no dirt or foreign particles enter the transmission.
- b. The recommended oils for the vibrating case are as follows:

SAE 20 non-detergent type

Exxon-Terresso 53

Gulf Harmony 53

Shell Turbo 33

Sun Sunvis 931

3. Hydraulic Fluid

- a. When adding or changing hydraulic fluid care should be taken to insure no dirt or foreign particles enter the hydraulic system.
- b. Mixing of the two different manufactures oils is not recommended. However if both oils contain the same base and additives it can be done in an emergency situation. Check with oil suppliers on compatibility.

✓ c. It is recommended that the hydraulic fluid be drained and changed at least once a year. It may be necessary to change it more often in severe operating conditions.

Recommended hydraulic fluids are as follows:

| | |
|----------------|--------------------------------|
| Amoco | ATF Type F |
| Arco | ATF Type F |
| Cities Service | ATF Type F |
| Exxon | ATF Type F |
| Gulf | ATF Type F |
| Lubriplate | ATF Type F |
| Mobil | ATF 220 |
| Phillips | ATF Type F |
| Shell | Donax T-7 |
| Sun | Sunoco Type F Transmatic Fluid |
| Texaco | Texamatic Fluid Type F |
| Union | ATF Type F |

H. HYDRAULIC CIRCUITY

A. CLAMP

With the diesel engine running, hydraulic fluid is taken from the reservoir through the intake filter to the pump suction. Low pressure oil is directed from the pump discharge to the clamp circuit manifold. If the clamp switch has not been moved, the oil returns to the reservoir through the clamp system directional valve.

Turning the clamp/unclamp switch to the clamp position energizes the clamp solenoid on the clamp/unclamp directional valve. Hydraulic fluid is then directed through the directional valve to the clamp side of the driving/extracting head cylinder. The clamping pressure switch de-energizes the clamp directional valve solenoid at approximately 4500 psi, and the oil flow returns through the directional valve to the reservoir again.

H. HYDRAULIC CIRCUITRY - CONT'D.+A. CLAMP - CONT'D.

Turning the clamp switch on the control pendant to the unclamp position activates the time delay relay which activates the unclamp solenoid. The pressure in the open clamp circuit opens the clamp check valve allowing oil pressure to be relieved from the clamp close cylinder. The clamp then opens. Pressure in the clamping circuit is limited by the clamp pump relief valve to a setting of 4700 psi.

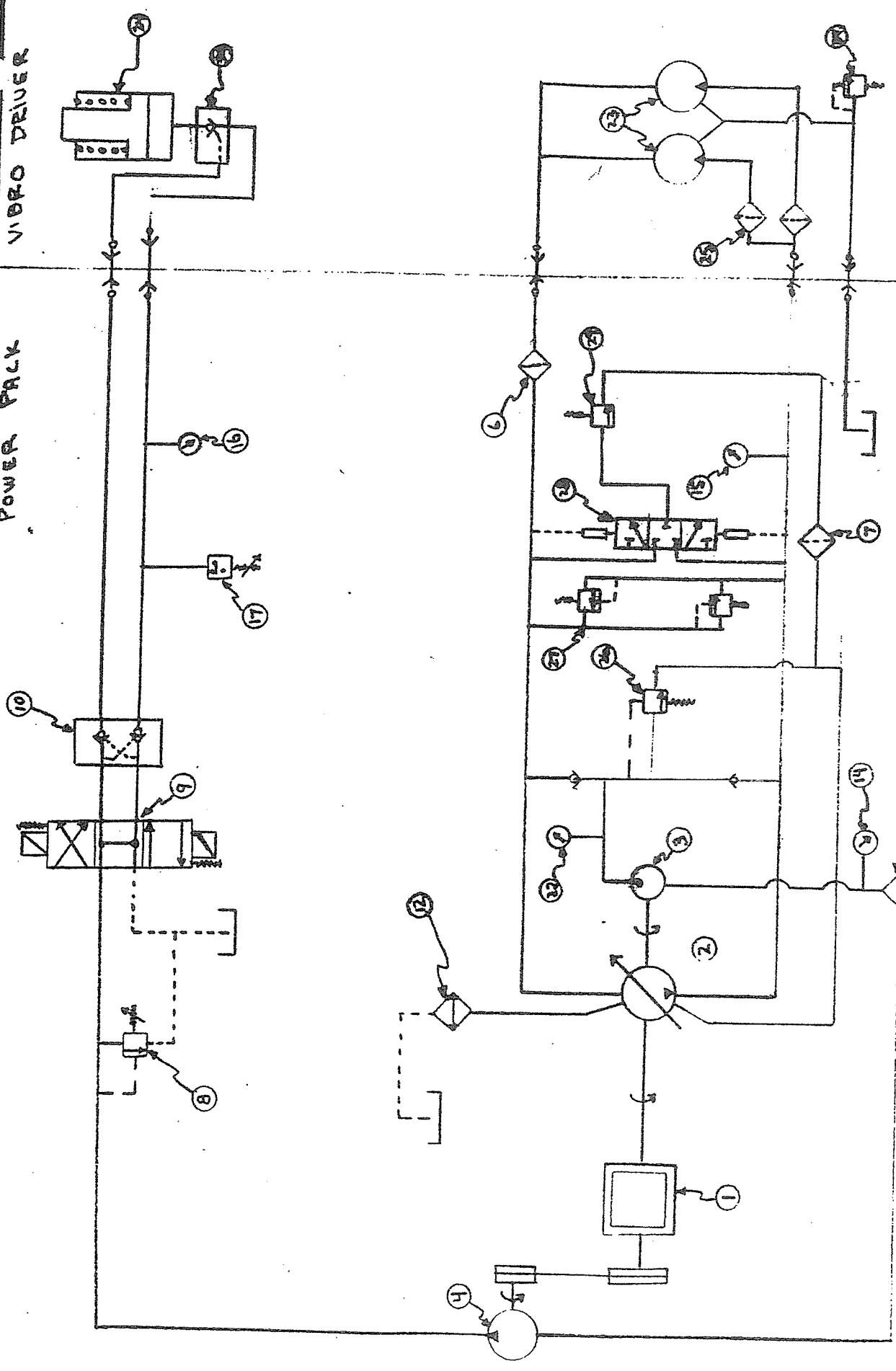
B. MOTORS

With the diesel engine running, hydraulic fluid is taken from the reservoir through the intake filter to the charge pump suction. The purpose of the charge pump is to provide a flow of fluid through the pump and motor cases for cooling purposes, to maintain minimum system pressure, and to supply fluid for control purposes. Charge pump pressure is limited by the charge pump and motor manifold relief valves. Case drain fluid from the motor is filtered to ten microns before entering the pump case. It then passes through the oil cooler before entering the reservoir. The main circuit is a continuous closed loop system. The quantity of fluid flow is determined by pump speed and swash plate angle.

The high pressure main pump section is protected by rapid response pressure compensation and motor manifold relief valves which limit output pressure to 5000 psi.

VIBRO DRIVER

POWER PALK



EQUIPMENT DIVISION
CORAOPOLIS, PENNA. 15108

L.B. FOSTER CO.

1205-C + 4000 HYDRAULIC SCHEMATIC

PROPRIETARY INFORMATION
OF THE L.B. FOSTER COMPANY
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| <u>FIND NO.</u> | <u>ITEM</u> | <u>MANUFACTURER</u> | <u>IDENTIFICATION</u> |
|-----------------|---|---------------------|--|
| 1 | Diesel Engine | Allis Chalmers | 25000 Mark II |
| 2 | Variable Displacement Pump | Sundstrand | Series 26# (262004) |
| 3 | Charge Pump | Sundstrand | 2.0 Cubic Inch |
| 4 | Clamp Pump | Rivett | PF-2006-1807 |
| 5 | Intake Filter | Schroeder | ST-2K10-S-C-Y |
| 6 | Return Filter | Pall | HH9660E20UPTBD-02 |
| 7 | Case Drain Filter | Schroeder | LF-1-1K10-P40-L-D |
| 8 | Clamp Pump Relief Valve | Rexroth | DBDS10G10/400/5 |
| 9 | Clamp Directional Valve | Rexroth | 4WE10H4/G24NZ |
| 10 | Clamp P. O. Check Valves | Rexroth | Z2S101.2-0-3 |
| 11 | Clamp Circuit Manifold | Rexroth | VA10B0-53-10, VA10J2-10 VA10F-53-10, VA10F-00-1 |
| 12 | Oil Cooler | Modine | 1E1866C |
| 13 | Reservoir | | |
| 14 | Intake Vacuum Gage | Lenz | BAC 30HG 25RC-FFC |
| 15 | Output Pressure Gage | Wika-1PG | Type 213, 4"LBM, U Clam with Bezel, 5000 P.S.I. |
| 16 | Clamp Pressure Gage | Wika-1PG | Same as No. 15 |
| 17 | Clamp Pressure Switch | Rexroth | HED 3.0A |
| 18 | Oil Level Gage with Dial Thermometer | Lube Devices | 10", Type L-4, G620, Se 1" Dial |
| 19 | Filler | Schroeder | ATB-780 |
| 20 | Breather | Schroeder | ATB-764 3/4" |
| 21 | Drain | | |
| 22 | Charge Pressure Gage | Lenz | BAC-800-25RC-FFC |
| 23 | Fixed Displacement Motor | Volvo | FIID-110 |
| 24 | Clamp Cylinder | | |
| 25 | Supply Filter | Pall | HH9660F20UPTBD-02 |
| 26 | Charge Pressure Relief Valve | Sundstrand | |
| 27 | Motor - High Pressure Relief | Sundstrand | |
| 28 | Motor Shuttle Valve | Sundstrand | |
| 29 | Charge Pressure Relief Valve | Sundstrand | |
| 30 | Clamp Pressure Check Valve | Sundstrand | |
| 31 | Drain Relief Valve | Sundstrand | |

VI). ELECTRICAL SYSTEMA). Starting the Diesel Engine

The batteries provide 24 volt direct current to start the diesel engine. Turning on the main power switch and rotating the control pendant potentiometer fully clockwise, allows relay RI to be energized and closes its related contacts. Power comes from the on-off-start switch through a closed normally open contact of Relay RI to the start solenoid. Turning on-off-start switch to the start position energizes the starter motor solenoid and turns over the diesel engine. If fuel is available the diesel will start. In order to obtain fuel, the fuel solenoid must be energized. This is accomplished by pressing the Murphy Switch reset. This allows power to go from the on-off-start switch through a normally closed contact in the Murphy Safety Switch to open the normally closed fuel solenoid valve. When the valve is energized fuel flows to the diesel and the engine starts.

Four safety controls shut the fuel supply off, stopping the diesel engine in the event a malfunction occurs. The system operates by the use of a Murphy Safety Switch with manual reset. If any safety switch closes during operation (indicating a malfunction) the Murphy switch coil will be energized interrupting current to the fuel solenoid valve and stopping the fuel to the diesel. The relay is energized by the following devices.

- 1). Engine oil pressure - If oil pressure is below 15 PSI, the contacts of the oil pressure safety switch will close, energizing the Murphy switch coil.
- 2). Engine water temperature - if cooling water temperature exceeds 210°F, the contacts of the water temperature safety switch will close, energizing the Murphy switch coil.
- 3). Engine overspeed switch - if the engine exceeds the recommended maximum speed, the over speed switch will close, energizing the Murphy Switch coil.

The over speed switch is located on the front of the engine and is a manual reset via a button on the switch housing

4). Charge oil pressure - if charge pressure is below 75 psi, the contacts of the charge pressure switch will close, energizing the Murphy switch coil. All safety switches are bypassed at start up by the Murphy switch reset.

B). Stopping the Diesel Engine

The diesel engine is normally stopped with the manual fuel control on the control panel. However, the engine may be stopped by turning the main power switch to off which de-energizes the fuel solenoid valve and shuts off fuel to the diesel engine.

C). Closing the Hydraulic Clamp in the Driving/Extracting Head

With the diesel engine running turn the clamp/unclamp switch to clamp position. Power will go from the on-off-start switch through the clamp/unclamp switch to the normally closed contacts of the clamp pressure switch to the relay R2 coil. This allows hydraulic pressure to close the clamp. When the hydraulic pressure in the clamp hydraulic circuit reaches 4100 psi, the clamp pressure switch energizes the clamp line solenoid. The clamp valve will not move until 4500 psi when the pressure switch de-energizes the clamp line solenoid. If the hydraulic pressure in the close clamp circuit drops below 4100 psi the clamp pressure switch will re-energize the close clamp solenoid to rebuild the hydraulic pressure to 4500 psi. When the pressure reaches 4500 psi, the clamp pressure switch will de-energize the clamp close solenoid. This system then maintains between 4100 and 4500 psi in the clamp close hydraulic circuit automatically any time the clamp/unclamp switch is in the detented clamp position.

D). Opening the Hydraulic Clamp

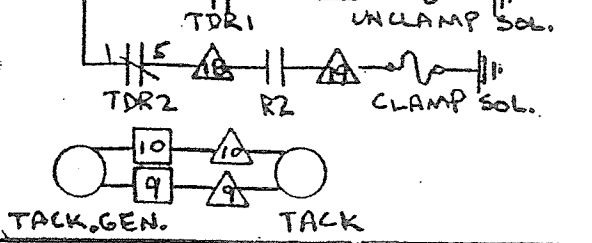
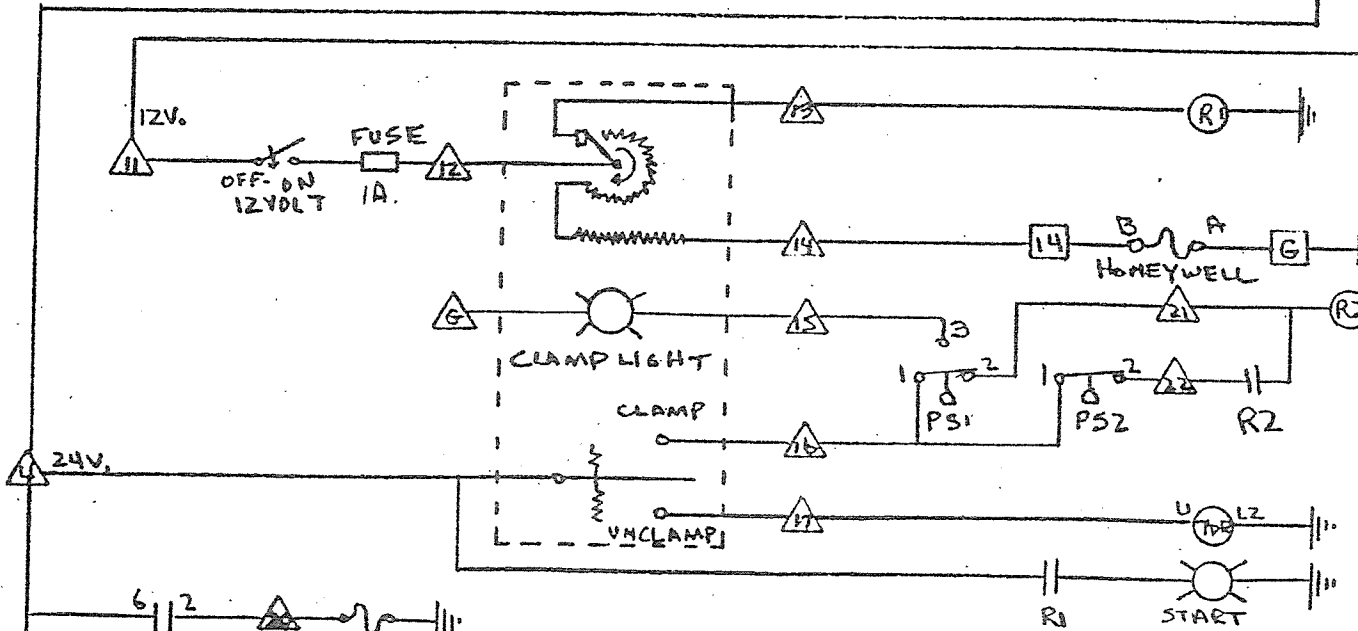
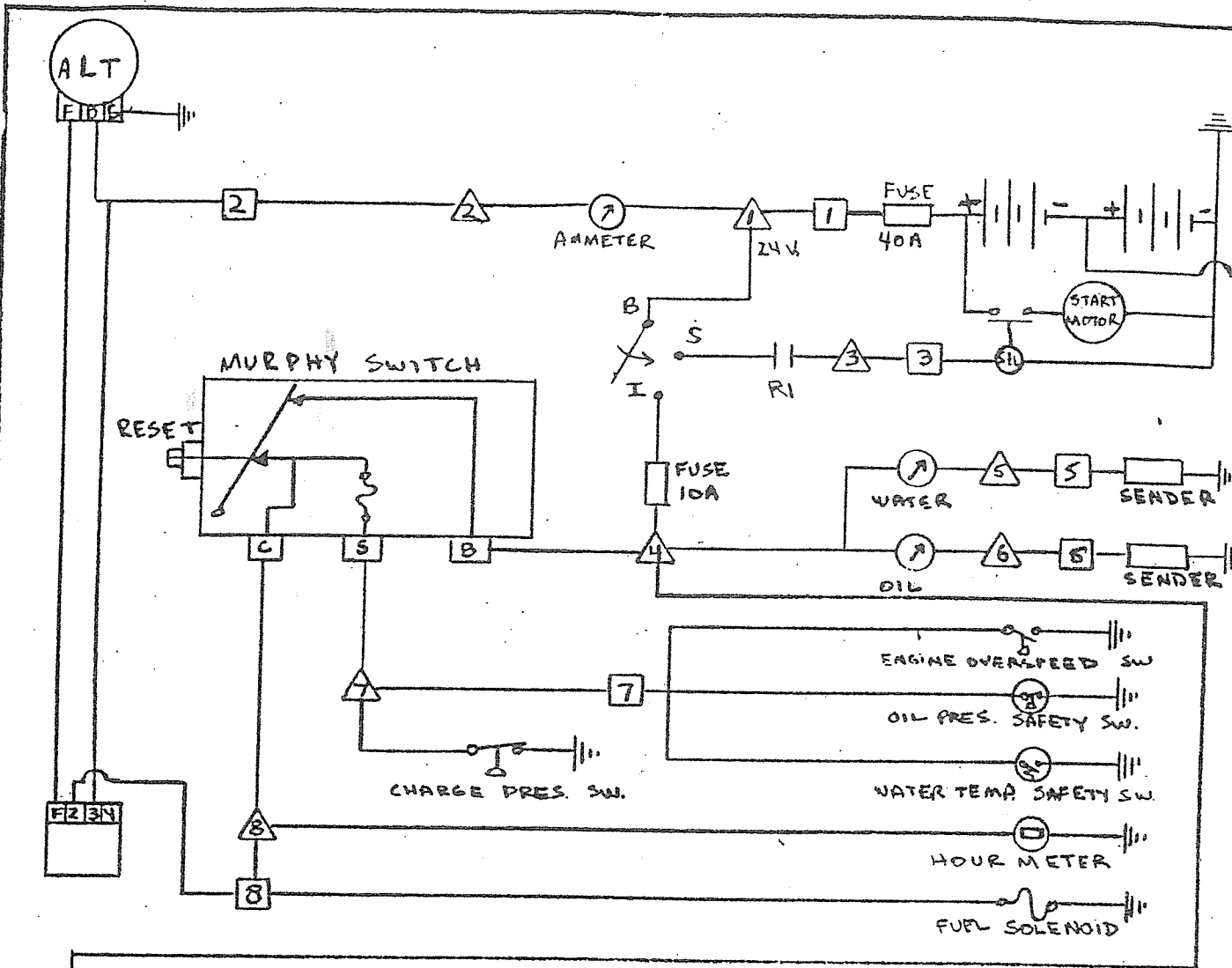
With the diesel engine running, turning the clamp switch to the open position, energizes the time delay relay which closes TDR1 contacts, energizing the unclamp solenoid, opening TDR2 contacts, de-energizing the clamp solenoid if needed. The time delay relay holds the unclamp valve open for about 10 seconds to allow the clamp to fully open. After 10 seconds the TDR2 contacts open de-energizing the unclamp solenoid which centers the clamp valve.

E). Starting Vibrator

With the diesel engine running, rotating the speed potentiometer located in the control pendant allows current to flow to the Honeywell Servo Solenoid. The Honeywell Servo Solenoid positions the swash plate in the hydraulic pump to produce an output which starts the vibrator to operate. By rotating the speed potentiometer clockwise the frequency of the vibrator can be varied from 0 to 1400 vibrations per minute, allowing the operator to best match vibrator frequency to soil conditions for best driving or extracting.

F). Stopping the Vibrator

With the vibrator running, rotating the speed potentiometer fully counterclockwise stops the current flow to the Honeywell Servo Solenoid. This causes the Servo to return the swash plate to the no output position and causes the hydraulic motors in the vibrator to stop.



L.B. FOSTER CO. EQUIPMENT DIVISION
 CORAOPOLIS, PENNA. 15

1205-C WIRING DIAGRAM

| | | | |
|--------------|-----------------|---------|---------------------|
| DRAWN WMG | DATE 8/19/77 | CHECKED | DWG. NO. E-8A-61 |
|--------------|-----------------|---------|---------------------|

VII. TROUBLE SHOOTING

A. GENERAL

It cannot be repeated too often that 90% of difficulties can be prevented by good periodic lubricating, inspection, and maintenance. The time and energy consumed in so doing is only a fraction of what must be put forth when trouble ties up the operator and his operations. To remedy as quickly as possible any trouble that may develop, the following list of difficulties and trouble shooting charts are provided. If the difficulty cannot be corrected by following the trouble-shooting charts, contact your Foster Representative.

B. DIFFICULTIES:

Trouble shooting charts are provided for the following:

1. Diesel engine will not start - Chart A.
2. Diesel engine does not stop when engine stop knob is pulled - Chart B.
3. Driving/Extracting head clamp cylinder will not clamp when clamp/unclamp switch is turned to the clamp position. Chart C.
4. Clamp light in pendant does not come on when clamp closes - Chart D.
5. Clamp light in Pendant comes on but clamp pressure is below 4000 PSI, - Chart E.
6. Clamp light in pendant blinks off and on. Clamp pressure gage oscillates rapidly - Chart F.
7. Clamp will not open when clamp/unclamp switch is turned to the unclamp position - Chart G.
8. Vibrator will not vibrate when speed control is rotated clockwise - Chart H.
9. Vibrator won't come up to expected speed - Chart I.
10. Vibrator won't stop when speed control is rotated fully counter-clockwise - Chart J.

CHART A

Difficulty: Diesel Engine does not start when start button is pressed.

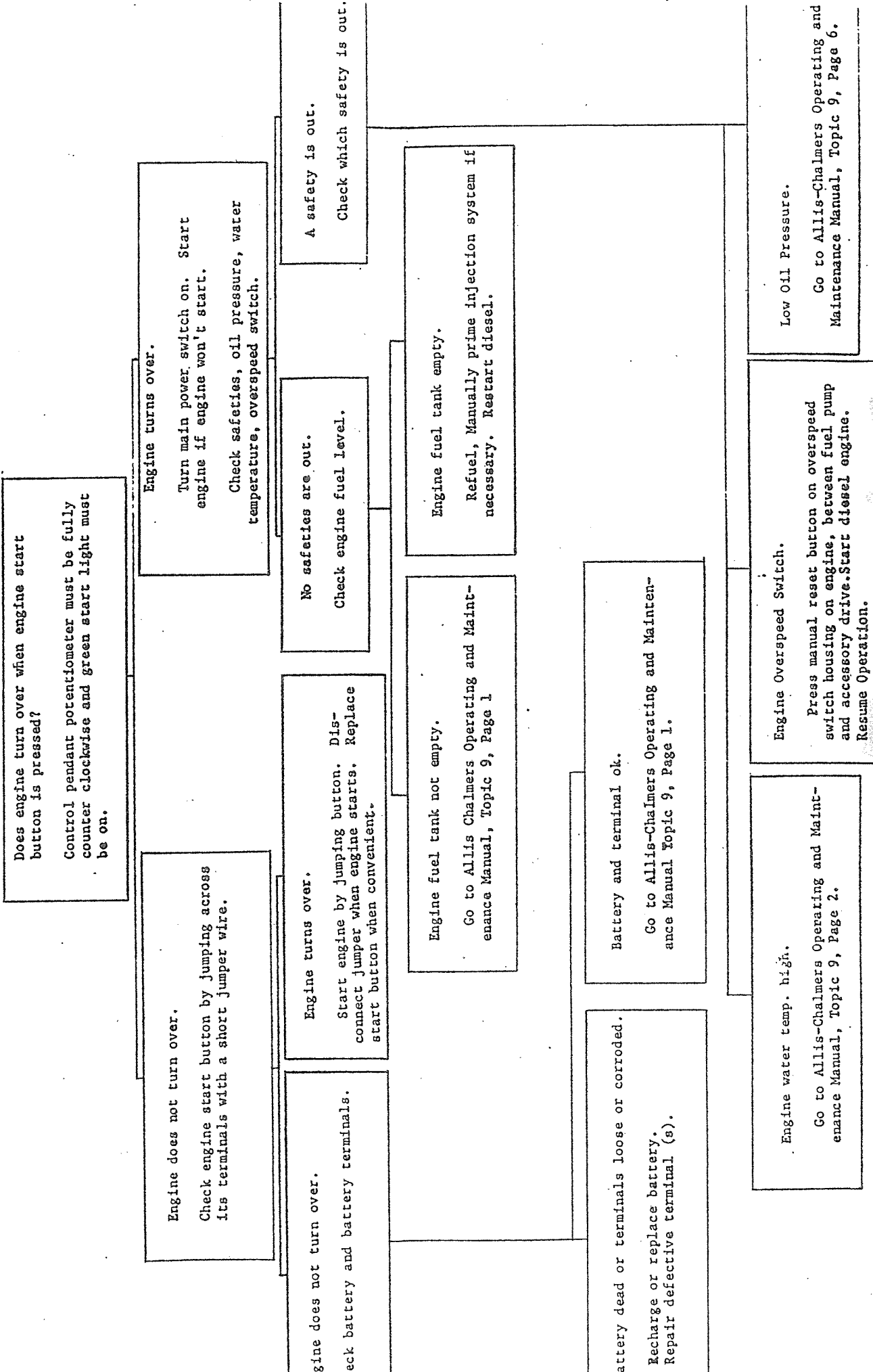


CHART B

DIFFICULTY: Diesel Engine does not stop when stop knob is pulled.

NOTE: Engine may be stopped by turning main power switch to the off position.

Check at fuel pump to see if cable from the engine stop knob is operating the shut off lever. Make sure shut-off lever is tight on shaft.

Shut off lever operating.

Adjust set screw at shut-off lever to increase travel.

Shut-off lever not operating.

Repair or replace engine stop cable. After repairs resume operation.

Engine stops.

Resume operation.

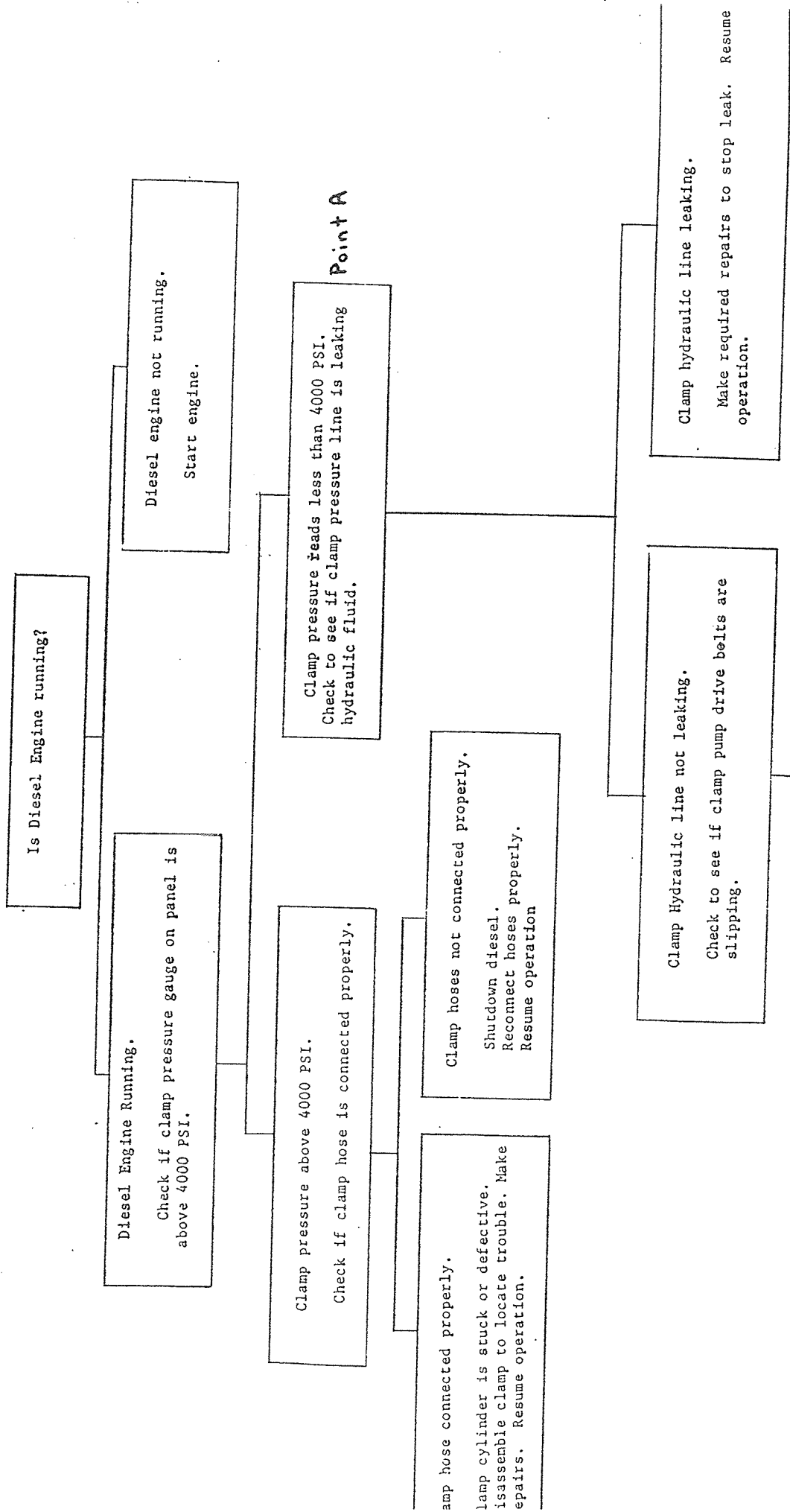
Engine does not stop.

Turn main power switch off. Consult with Allis Chalmers dealer or call your Foster Representative.

CHART C

Difficulty: Driving/Extracting Cylinder will not close when clamp/unclamp switch to the clamp position.

Note: After clamp/unclamp switch is turned to the unclamp position, clamp cannot be closed for 10 seconds.



Point A

Clamp pump belts not slipping.

Turn clamp/unclamp switch to unclamp position, wait 10 seconds shutdown diesel engine. Disconnect clamp hydraulic hoses and plug at hydraulic power pack. Start diesel. Turn clamp/unclamp switch to clamp position.

Clamp pump belts slipping.

Tighten belts or replace.
Resume operation.

Clamp pressure gage reads between zero and 4000 PSI.

Refer to Chart C1.

Clamp pressure gage reads zero.

Manually operate the clamp solenoid - go to the clamp solenoid manifold in power pack and press black button on the end of the inboard solenoid and hold for 5 seconds. If button cannot be moved in, clamp directional valve spool is stuck, replace valve.

Clamp pressure gage reads above 4000 PSI.

Clamp hydraulic cylinder in head is leaking internally. Repair or replace after repairs, resume operation

Clamp pressure gage reads zero while clamp close solenoid button is held in.

Refer to Chart C2.

Clamp pressure gage reads above 4000 PSI only while button is held.

In control box jumper from terminal #1 to Terminal #5 on the time delay relay. Turn clamp/unclamp switch to the clamp position.

Clamp pressure gage reads above 4000 PSI after clamp close solenoid button is released.

Refer to Chart C3.

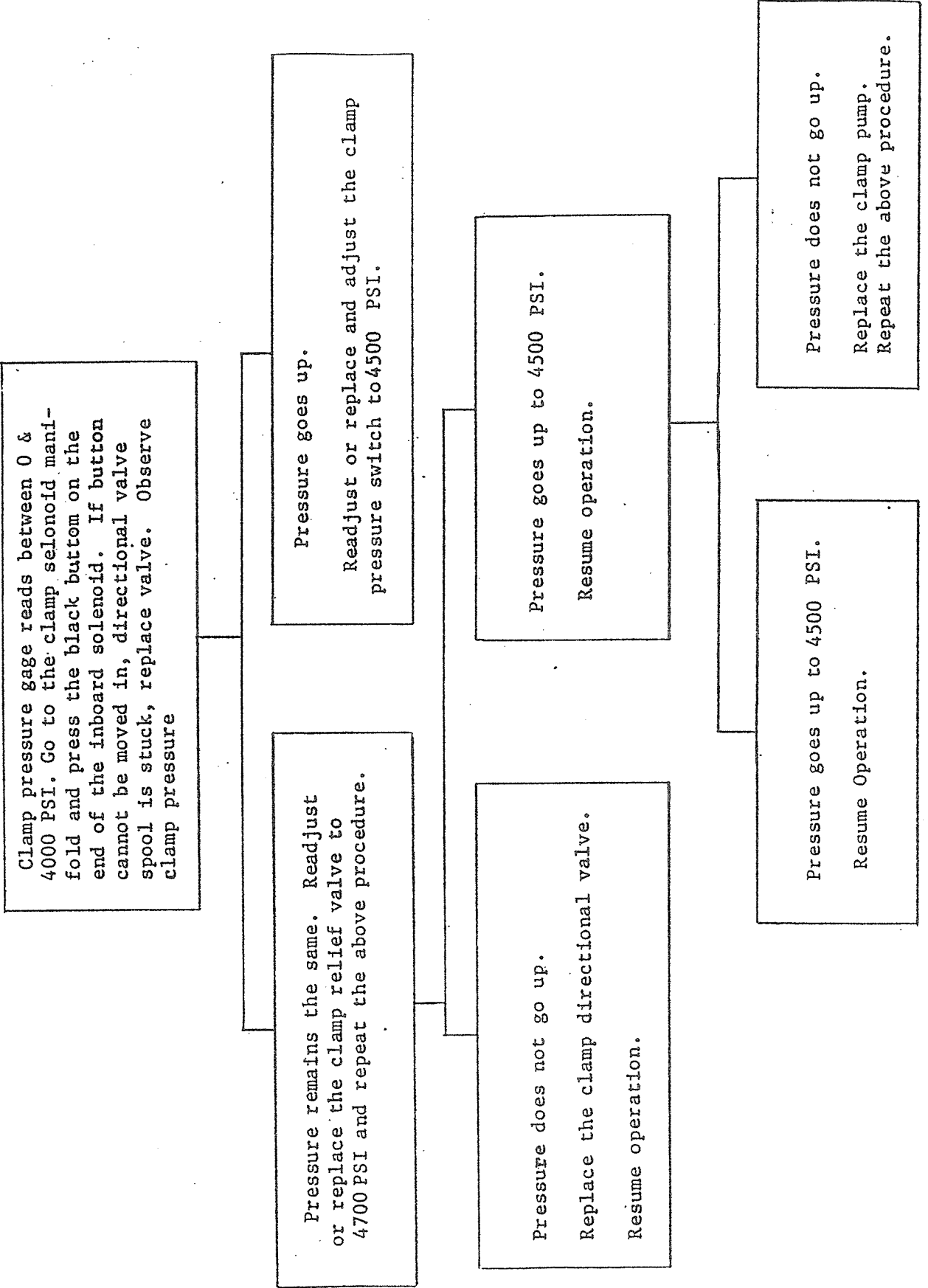
Clamp does not close.

Replace clamp check valve (Item 10) after repairs, resume operation.

Clamp Closes.

Remove jumper wire. Rotate the adjusting knob on the time delay relay back and forth while holding clamp/unclamp switch in the clamp position. If no settings work replace time delay relay. Temporary operation can be performed by jumping from terminal #1 to terminal #5 on the time delay relay. Clamp/unclamp switch must be then held in the unclamp position until clamp is fully opened.

CHART CI



Clamp pressure gauge read 0.
Shut down diesel engine. Remove hydraulic line at clamp pump.
Observe if fluid flows from input line.

Fluid flows from input line.
Reconnect input line. Disconnect pump output line at clamp valve.
Turn diesel engine over by turning main power switch to on and pressing engine start button but not pressing the Murphy Switch reset and Oil bypass button.

Fluid does not flow.
Input hose blocked repair or replace
After repairs resume operation.

Fluid flows from output line.
Replace clamp relief valve (Item 8)
Reconnect clamp pump output line.
After repairs, restart diesel engine.
Turn clamp/unclamp switch to the clamp position.

Fluid does not flow
Replace clamp pump. After repairs resume operation.

Clamp still does not close.
Replace clamp valve (Item 9) After repairs, resume operation.

Clamp Closes
Resume operation.

NOTE: The clamp relief valve (Item 8) was most likely operational and maybe reused.

CHART C3

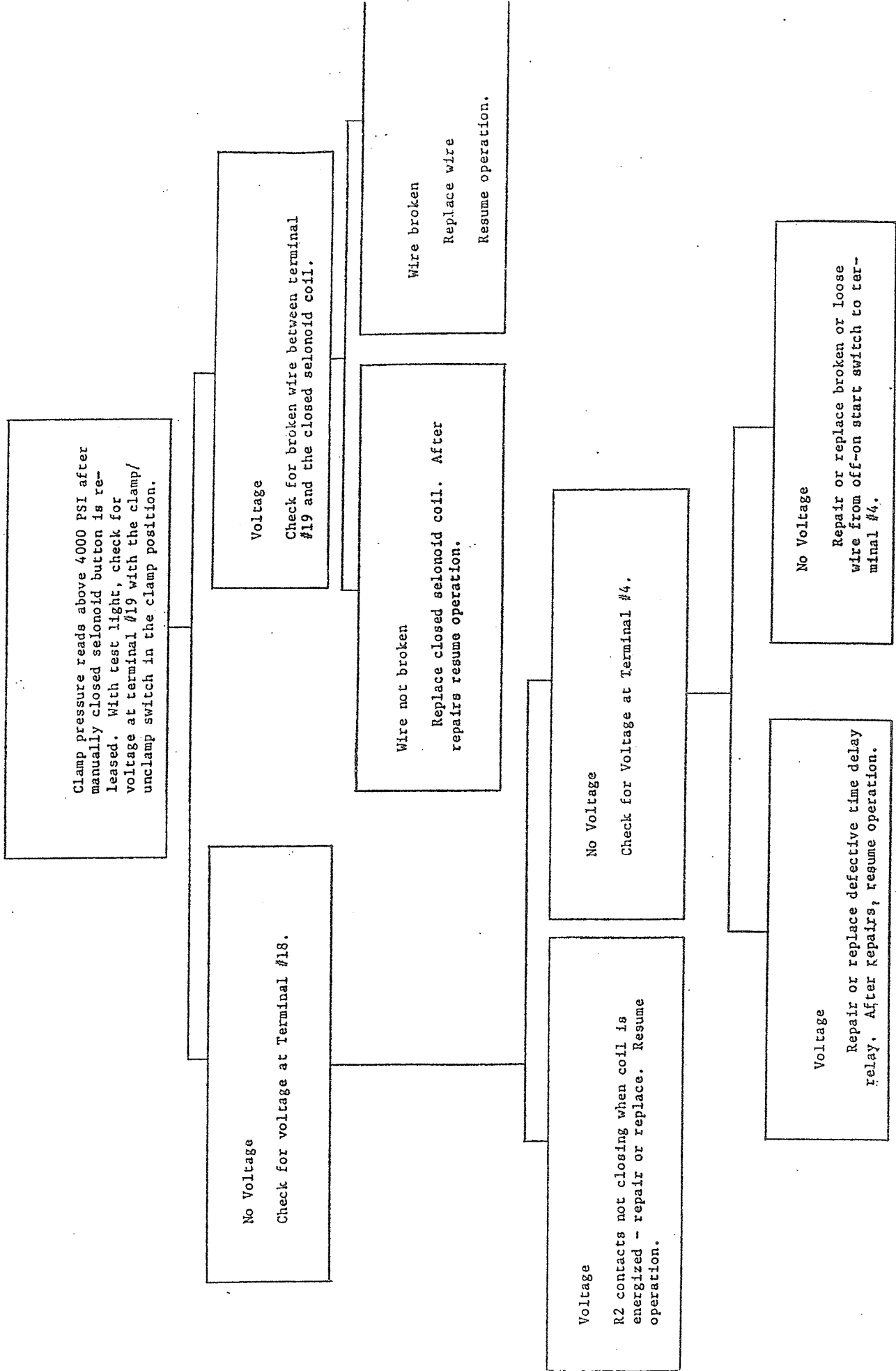


CHART D

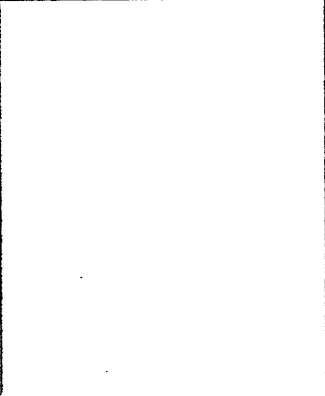
Difficulty: Clamp Light in Pendant does not come on when clamp closes.

Observe pressure reading on Clamp Pressure Gauge.



Pressure is above 4000 PSI Check for voltage at terminal 15 in Power Pack.

Pressure is between 0 and 4000 PSI Go to Point A on Chart C.



Voltage
Wire broken or loose in pendant or pendant cable, or clamp bulb burned out. Repair or replace as required. Resume operation.

No voltage
Readjust or replace and readjust pressure switch. Resume operation.

CHART E

Difficulty: Clamp light in Pendant comes on but clamp pressure is below 3500 PSI.

Adjust pressure switch or replace if defective. Resume operation.

CHART F

Difficulty: Clamp light on Pendant blinks off and on.

Clamp pressure gage oscillates rapidly.

Turn clamp/unclamp switch to the un-clamp position, wait 10 seconds, stop Diesel Engine. Disconnect clamp hydraulic line from the power pack. Start Diesel. Turn clamp switch to clamp. Observe if clamp light and clamp pressure gauge are operating normally.

Clamp Light and Clamp Pressure gauge operate normally.

Clamp line leaking or hydraulic clamp cylinder is leaking internally.
Repair or replace.
Resume operation.

Clamp Light still blinks on and off.
Replace clamp check valve. (Item J8).
Resume operation.

Chart G

Difficulty: Clamp will not open when clamp switch is turned to the unclamp position.

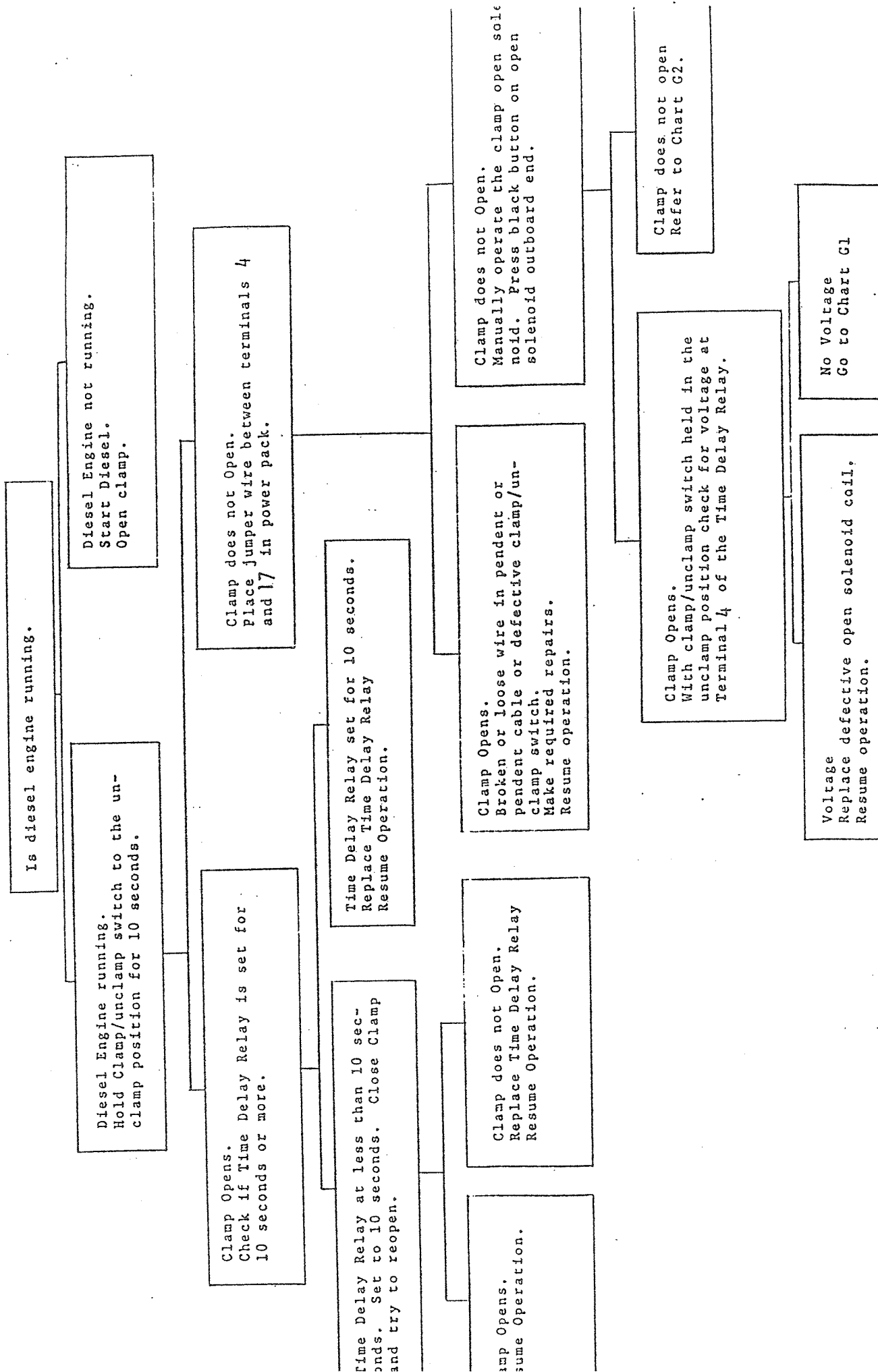
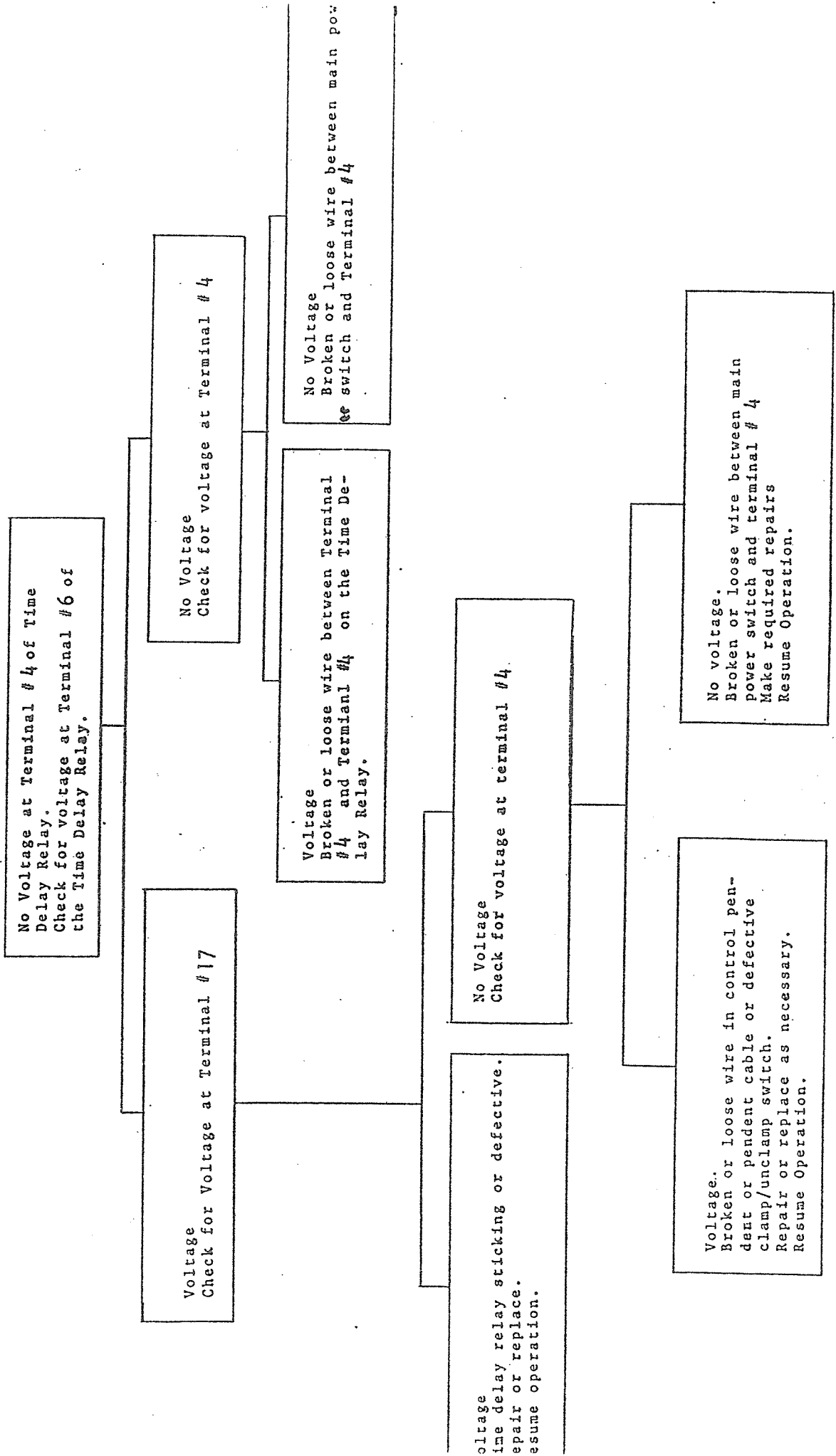


CHART C1



No Voltage at Terminal #4 of Time Delay Relay.
Check for voltage at Terminal #6 of the Time Delay Relay.

Voltage at Terminal #17
Check for Voltage at Terminal #17

No Voltage
Check for voltage at Terminal #4

Voltage
Broken or loose wire between Terminal #4 and Terminal #4 on the Time Delay Relay.

No Voltage
Broken or loose wire between main power switch and Terminal #4

Voltage
Broken or loose wire in control pendant or pendant cable or defective clamp/unclamp switch.
Repair or replace as necessary.
Resume Operation.

No Voltage
Check for voltage at terminal #4.

Voltage.
Broken or loose wire in control pendant or pendant cable or defective clamp/unclamp switch.
Repair or replace as necessary.
Resume Operation.

No Voltage.
Broken or loose wire between main power switch and terminal #4.
Make required repairs
Resume Operation.

CHART G2

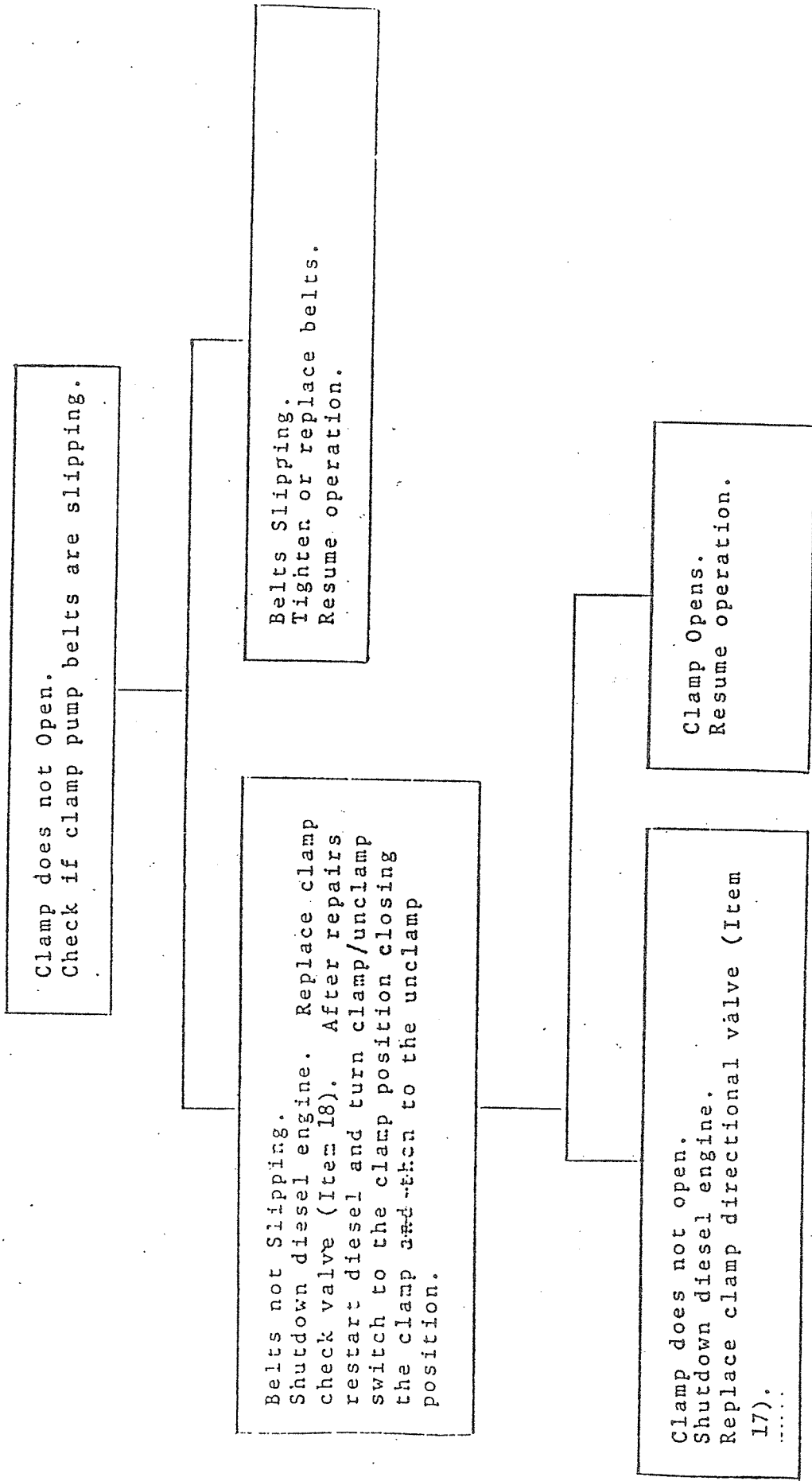


Chart H

Difficulty: Vibrator will not vibrate when speed control is rotated clockwise.

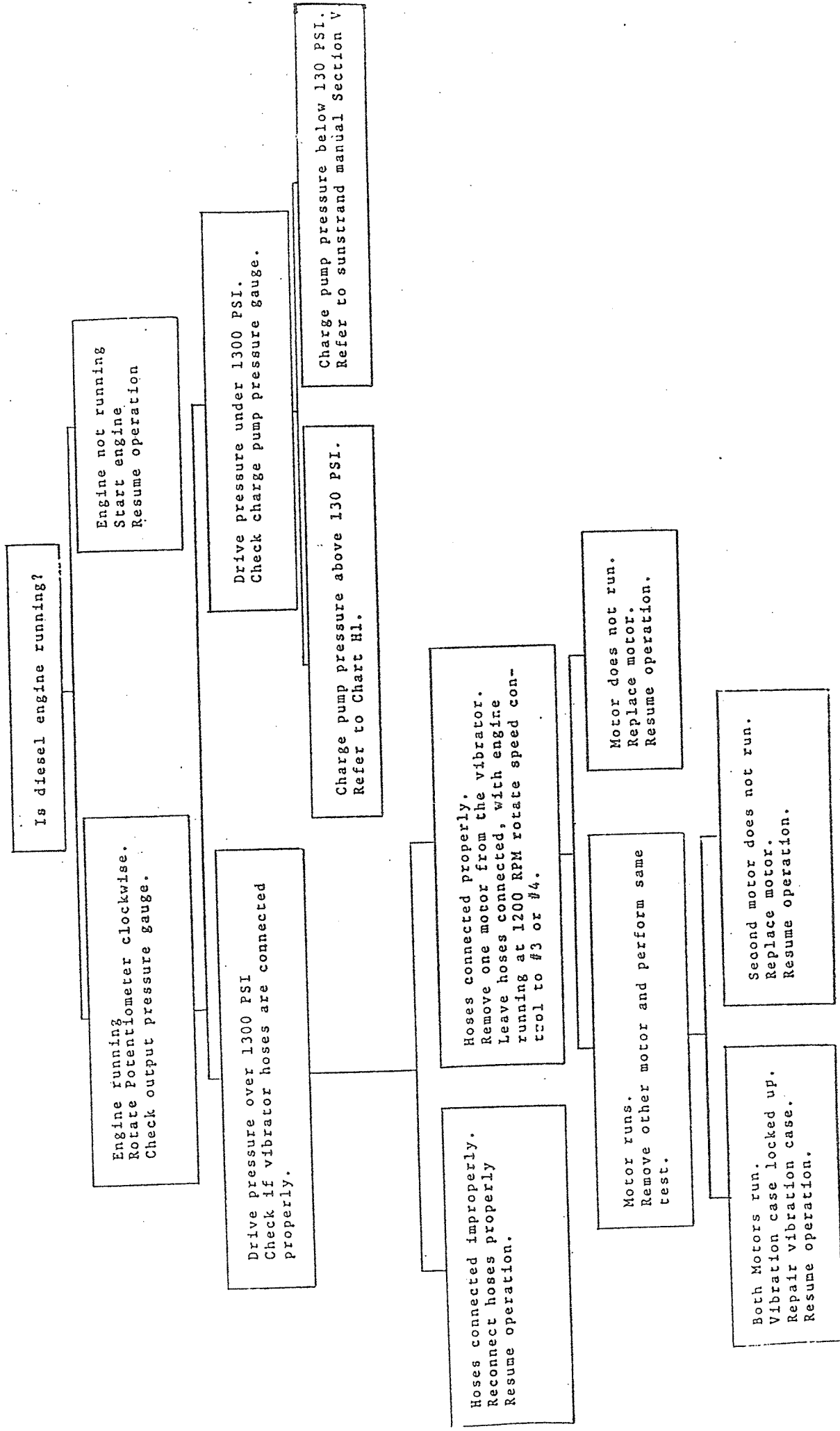


CHART HI

Rotate speed potentiometer fully clockwise.
Check Voltage at Terminal #37.

No Voltage.
Check Voltage at Terminal #31.

Voltage should range between .35 VDC when control speed potentiometer is fully counter clockwise to 1.40 VDC when control speed potentiometer is fully clockwise.
Problem lies in Honeywell controller or main pump refer to Honeywell controller and Sundstrand manuals.

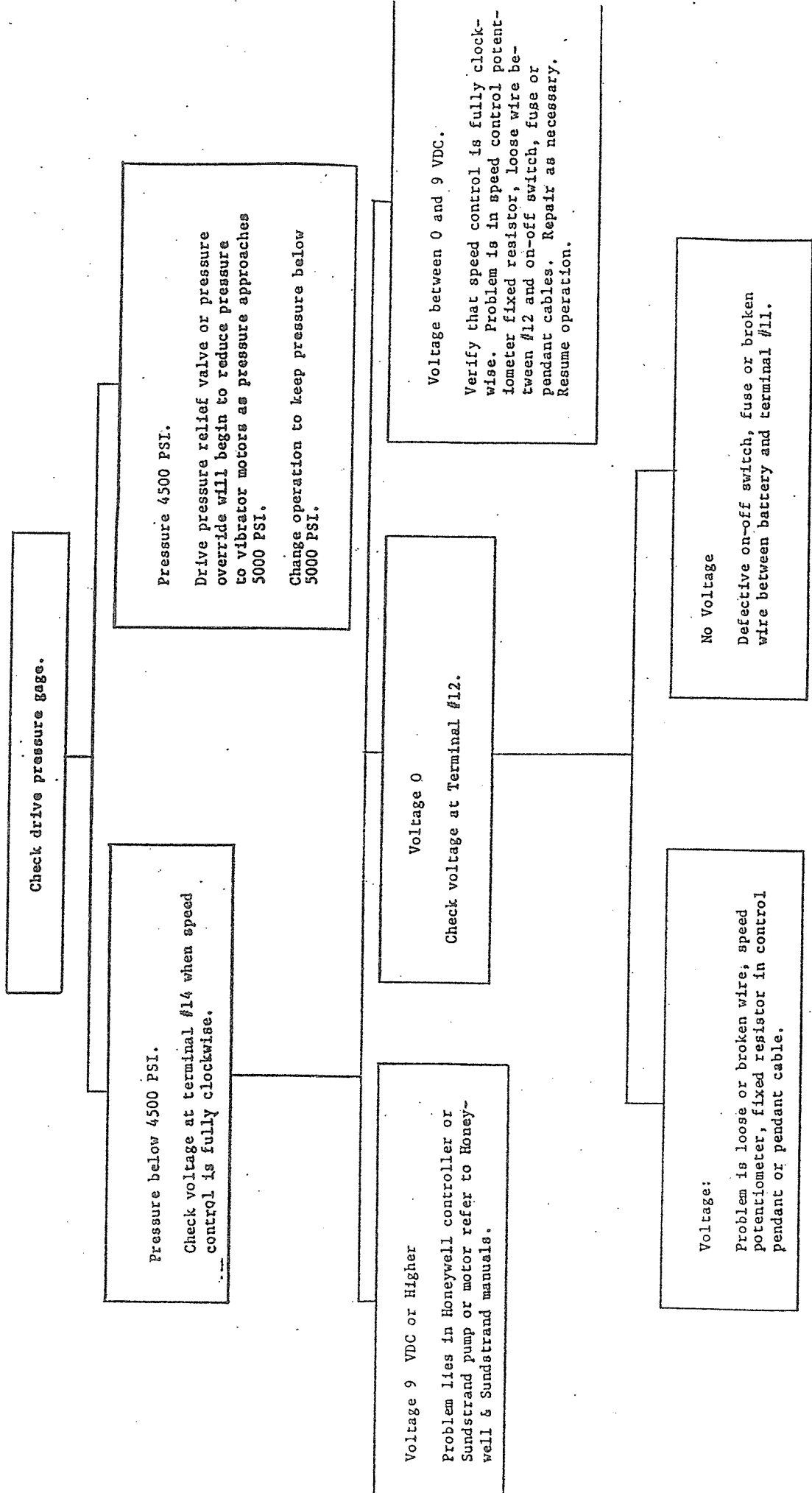
No Voltage

Broken or loose wire in control pendent cable or defective potentiometer or fixed resistor. Repair as necessary.
Resume operation.

Broken or loose wire between main power switch and Terminal #31.
Repair or replace.
Resume operation.

Chart I.

Difficulty: Vibrator won't come up to expected speed.



Check drive pressure gage.

Pressure below 4500 PSI.

Check voltage at terminal #14 when speed control is fully clockwise.

Pressure 4500 PSI.

Drive pressure relief valve or pressure override will begin to reduce pressure to vibrator motors as pressure approaches 5000 PSI.

Change operation to keep pressure below 5000 PSI.

Voltage 9 VDC or Higher

Problem lies in Honeywell controller or Sundstrand pump or motor refer to Honeywell & Sundstrand manuals.

Voltage 0

Check voltage at Terminal #12.

Voltage between 0 and 9 VDC.

Verify that speed control is fully clockwise. Problem is in speed control potentiometer fixed resistor, loose wire between #12 and on-off switch, fuse or pendant cables. Repair as necessary. Resume operation.

Voltage:

Problem is loose or broken wire; speed potentiometer, fixed resistor in control pendant or pendant cable.

No Voltage

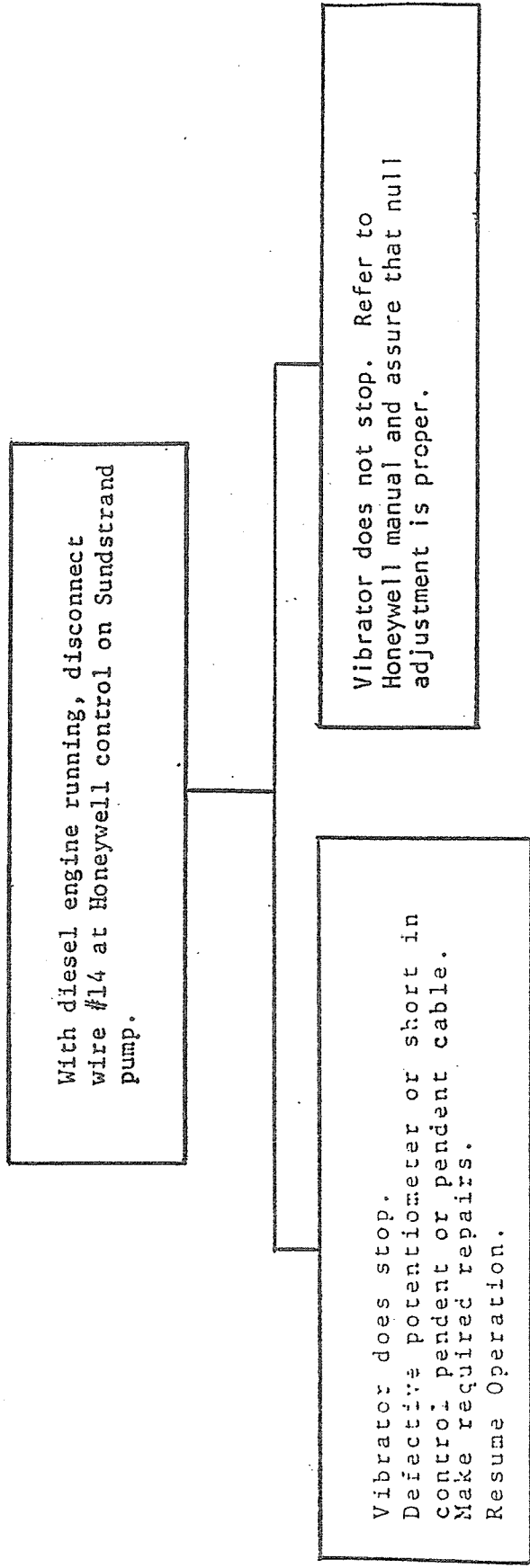
Defective on-off switch, fuse or broken wire between battery and terminal #11.

CHART J

Difficulty: Vibrator won't stop when speed control is rotated fully counter-clockwise.

NOTE: Shutting down diesel engine will stop vibrator.

CAUTION: Unless difficulty is corrected vibrator will start when diesel engine is started.





L.B.FOSTER COMPANY

4000 CASTEEL DRIVE, R. D. #1
CORAOPOLIS, PENNSYLVANIA 15108
PHONE 412-787-5500 • TWX 510-697-4018

S T A R T U P I N S T R U C T I O N S

IMPORTANT: Insure speed control potentiometer in control pendant is fully counter-clockwise before start-up.

- 1). Perform all maintenance prior to start-up as outlined in the operating and maintenance manual.
- 2). Pull engine throttle about 1/4 of the total distance from the closed position. Pushing in center button on control and pulling throttle is rapid adjustment, turning throttle is for fine adjustment. Push the stop knob in.
- 3). Turn off/on switch to the on position, green light should light, if not check speed potentiometer for full counter-clockwise position.
- 4). Depress and hold engine Murphy relay reset button. Simultaneously press and turn the engine start knob to the start position. Release the start knob on engine start-up but, continue to hold the reset button until 30 psi of oil pressure is attained.
- 5). Adjust throttle to 1500 RPM and allow engine to warm up. Once operating temperature is attained - increase speed to operating speed of 2000 RPM.

CONTROL PENDANT

- 1). Place vibro on sheet to be driven. Move the clamp/unclamp switch to the clamp position. When clamp pressure of 4500 psi is achieved the clamp light in the control pendant will come on.
- 2). To start vibration rotate the speed potentiometer clockwise from 0 until pile attains the fastest penetration.
- 3). To stop vibration rotate speed potentiometer fully counter clockwise to 0.
- 4). After vibration has stopped, release the clamp by turning the clamp/unclamp switch to unclamp position.

REPEAT STEPS 1 THROUGH 4 FOR CONTINUED OPERATION

SHUTDOWN INSTRUCTIONS:

- 1). Rotate speed potentiometer fully counter-clockwise to 0.
- 2). Throttle engine RPM slowly to idle.
- 3). Pull engine stop knob.
- 4). Turn engine start switch off.
- 5). Turn off/on switch to off.

NORMAL PRESSURE & CONDITIONS:

| | |
|---------------------|---|
| Drive | 0 - 5000 psi while driving |
| Clamp | 4000 - 4500 psi when clamped |
| Charge | 140 - 300 psi while operating |
| Suction | 0 - 5 inches of mercury while operating |
| Oil Temperature | 60° - 160°F. |
| Filter Clog Buttons | - In |

general purpose relays CR120 TYPE J

Whether you use General Electric's CR120 Type J 300-volt General Purpose Relay as a separately mounted device, or in multi-relay panels, you'll discover that it offers many advantages:

• You get multi-circuit flexibility — The relay, rated 10 amperes, 300 volts maximum, is available in 16 different forms for both AC and DC applications. You can select from one through four poles, in different combinations of normally open and normally closed contacts.

• You save space — All CR120 Type J open relays are only 2 $\frac{3}{4}$ inches high, 1 $\frac{1}{4}$ inches wide, and 2 $\frac{3}{4}$ inches deep. You can meet up to 4-pole applications in a minimum amount of space.

• You reduce installation, inspection time — All CR120 Type J relay forms are two-hole mounted. Large, screw-type terminals make wiring fast and easy. Relay contacts can be inspected from the front without disturbing wiring or removing relay from panel or enclosure.

Typical applications for this versatile relay include control of heating and cooling loads — fans, blowers, and heat-cool throw-over panels; starting inherently protected fhp motors; control of conveyors, packing and wrapping machinery; control of light commercial machines such as paper collators and copying machines; and for use with electronic control outputs.

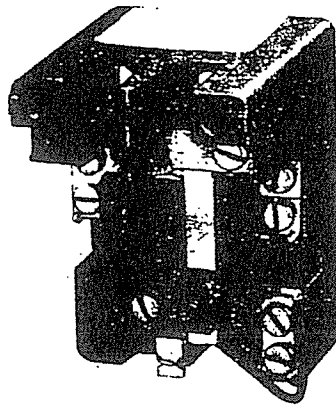
GE CR120 TYPE J RELAY SIMPLIFIES LAYOUT, CUTS INSTALLATION TIME

• All open relays have common mounting dimensions — panel can be laid out around one basic outline. This permits changing from one form to another in the same compact space.

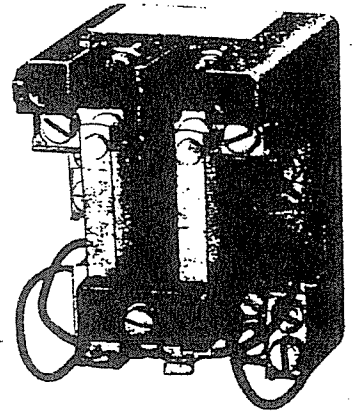
• All terminals are out-in-front, easy to wire.

• Large pan-head screws accept stranded wire, ring or spade terminals.

• Enclosed forms have wrap-around cover . . . provides maximum accessibility during installation and hookup.

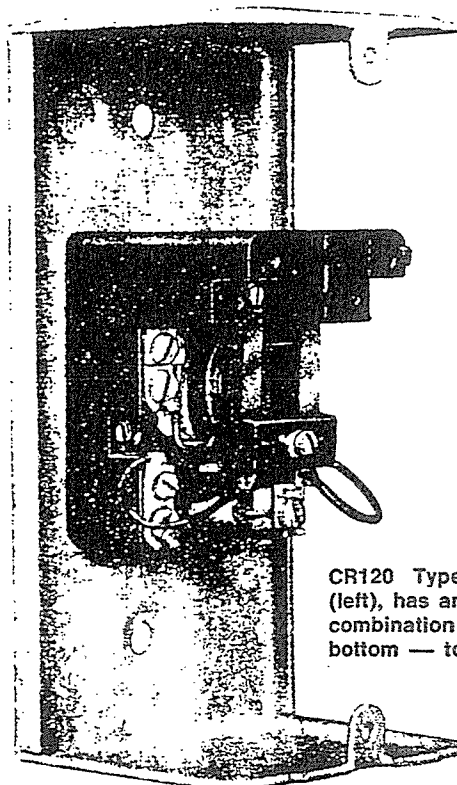


Open single-pole form



Open 4-pole form

You can choose from a total of 16 CR120 Type J forms in different combinations of normally open, normally closed contacts to match your application requirements.



CR120 Type J relay enclosure (left), has ample wiring room and combination knockouts at top and bottom — to speed wiring.

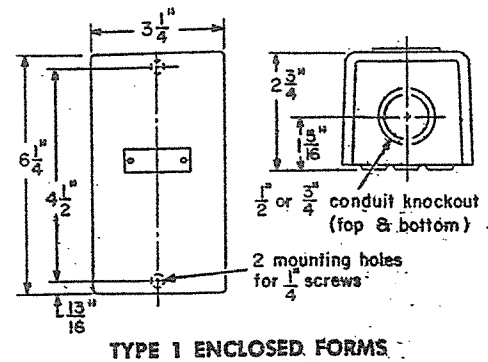
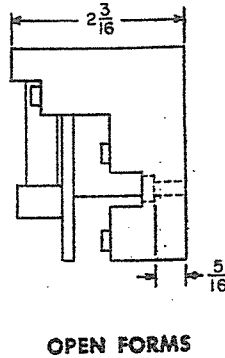
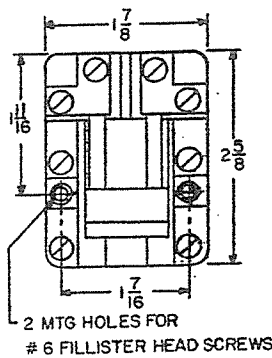


control

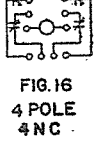
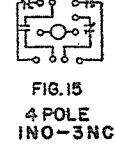
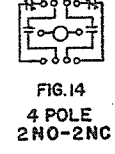
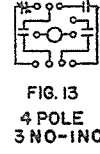
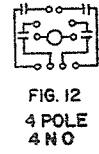
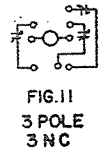
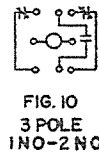
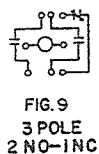
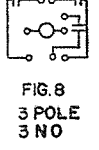
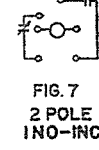
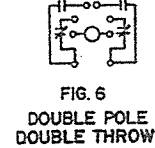
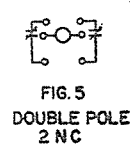
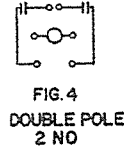
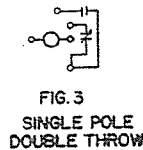
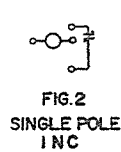
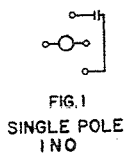
CR120 TYPE J 300-VOLT GENERAL PURPOSE RELAYS

engineering data and ordering information

DIMENSIONS (for estimating only)



CONNECTION DIAGRAMS



ORDERING INFORMATION

DEVICE NOMENCLATURE

| Number of Poles | Contact Arrangement | AC Nomenclature | | DC Nomenclature | | Connection Diagram Figure No. |
|-----------------|---------------------|-----------------|----------------------|-----------------|----------------------|-------------------------------|
| | | Open Forms | NEMA Type 1 Enclosed | Open Forms | NEMA Type 1 Enclosed | |
| One | 1NO | CR120 J100** | CR120 J1100** | CR120 J3100†† | CR120 J2100†† | 1 |
| | 1NC | CR120 J010** | CR120 J1010** | CR120 J3010†† | CR120 J2010†† | 2 |
| | SPDT | CR120 J001** | CR120 J1001** | CR120 J3001†† | CR120 J2001†† | 3 |
| Two | 2NO | CR120 J200** | CR120 J1200** | CR120 J3200†† | CR120 J2200†† | 4 |
| | 2NC | CR120 J020** | CR120 J1020** | CR120 J3020†† | CR120 J2020†† | 5 |
| | DPDT | CR120 J002** | CR120 J1002** | CR120 J3002†† | CR120 J2002†† | 6 |
| | 1NO-1NC† | CR120 J110** | CR120 J1110** | CR120 J3110†† | CR120 J2110†† | 7 |
| Three | 3NO | CR120 J300** | CR120 J1300** | CR120 J3300†† | CR120 J2300†† | 8 |
| | 2NO-1NC | CR120 J210** | CR120 J1210** | CR120 J3210†† | CR120 J2210†† | 9 |
| | 1NO-2NC | CR120 J120** | CR120 J1120** | CR120 J3120†† | CR120 J2120†† | 10 |
| | 3NC | CR120 J030** | CR120 J1030** | CR120 J3030†† | CR120 J2030†† | 11 |
| Four | 4NO | CR120 J400** | CR120 J1400** | CR120 J3400†† | CR120 J2400†† | 12 |
| | 3NO-1NC | CR120 J310** | CR120 J1310** | CR120 J3310†† | CR120 J2310†† | 13 |
| | 2NO-2NC | CR120 J220** | CR120 J1220** | CR120 J3220†† | CR120 J2220†† | 14 |
| | 1NO-3NC | CR120 J130** | CR120 J1130** | CR120 J3130†† | CR120 J2130†† | 15 |
| | 4NC | CR120 J040** | CR120 J1040** | CR120 J3040†† | CR120 J2040†† | 16 |

† Isolated contacts.

†† Add coil number from coil suffix table for DC forms.

** Add coil number from coil suffix table for AC forms.

COIL SUFFIX TABLES

Use where ** appear in nomenclature (For AC forms)

| Frequency | **AC Suffix No. | | |
|-----------|-----------------|-------|-------|
| | 24 V | 115 V | 230 V |
| 60 Hz | 12 | 02 | 03 |
| | 24 V | 110 V | 220 V |
| 50 Hz | 17 | 04 | 05 |

AC coils: Coil Inrush — 12 va; Holding — 7 va; Sealed Watts — 4.5 max.

Use where †† appear in nomenclature (For DC forms)

| DC Voltage | Suffix No. | DC Voltage | Suffix No. |
|------------|------------|------------|------------|
| 250 V | 31 | 24 V | 38 |
| 125 V | 30 | 12 V | 35 |
| 32 V | 40 | 6 V | 32 |

CONTACT RATINGS

| Contact Arrangement | One Pole | Two Poles in Series |
|--------------------------------|----------|---------------------|
| Max AC Voltage | 300 | 300 |
| Continuous Carry Current | 10 | 10 |
| AC Volt-Amps Rating 50/60 Hz ‡ | Make | 7200 |
| | Break | 720 |
| Hp Rating-60 Hz | 115 V | 1/2 |
| | 230 V | 1/2 |
| DC Rating-Amps | 125 V | 0.5 |
| | 250 V | 0.3 |

‡ Maximum make and break currents are 30 and 3 amps respectively for AC voltages below 115.

20-SERIES

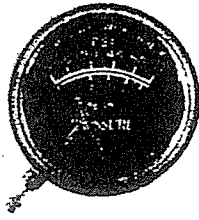
MURPHY
 swichgages®
 murphymatic® controlled
 selectronic® control systems

HOW TO SERVICE MURPHY SAFETY SWICHGAGES®

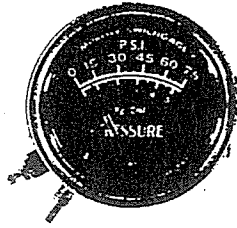
BULLETIN S-7041

REVISED 3-1-72

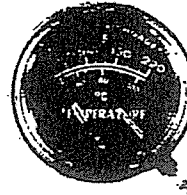
The Swichgages®, Magnetic Switches, and fuel valves shown below are usually standard equipment on industrial engines, irrigation and contractor pumps and on many air compressors and tractors. Write for complete installation and service bulletins on any individual installation.



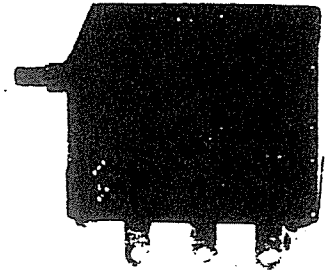
20-P-75
 PRESSURE



20-P-27
 PRESSURE

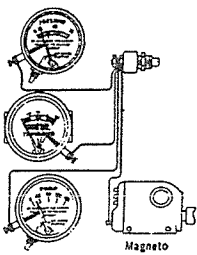


20-T-21
 TEMPERATURE
 (water or oil)

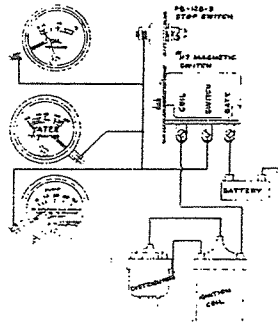


117
 MAGNETIC SWITCH
 (Circuit Breaker)

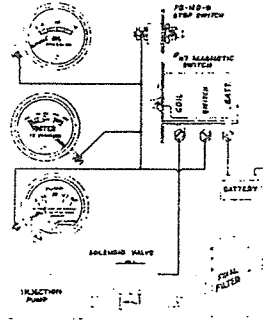
All MURPHY safety Swichgages® are built on the simple "one wire to ground" principle; the same basic instruments are used for magneto ignition, battery ignition or Diesel shut-down or alarm. See diagrams below.



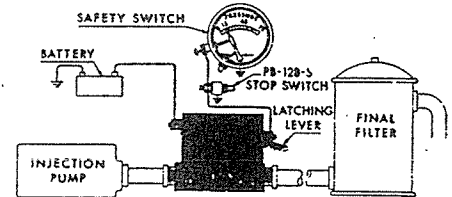
SINGLE MAGNETO



BATTERY IGNITION



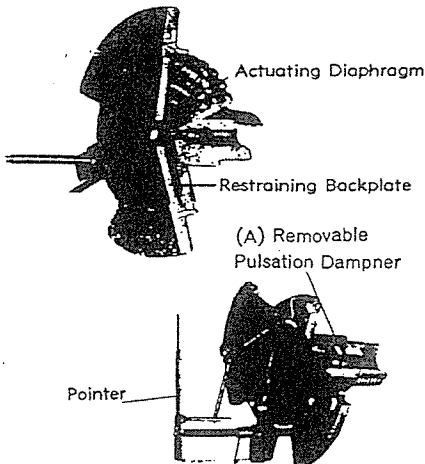
DIESEL
 using SV Valve
 (continuously energized)



DIESEL
 (momentarily energized)

VISIBLE-ADJUSTABLE CONTACTS

On all safety Swichgages® the visible contacts may be adjusted by turning contact carrier screw in or out to compensate for different operating pressure or altitude variations which affect boiling point of water.



OIL PRESSURE SWICHGAGES® 20-P-75 AND 20-P-27

(Also water pressure on irrigation units)

Available in pressure ranges of 0-15 psi up to 0-300 psi. Be sure you are using correct range. Cutaway at left shows how pressure enters through dampener and depresses diaphragm to actuate pointer-contact. If pointer registers higher than normally expected pressure or if it does not return to contact point.

1. Be sure instrument is in center of mounting hole and that nuts on U clamp are not drawn up in a strain as this will loosen studs.
2. If pipe dope is used to make up pressure connection, this can foul inlet and pulsation dampener. Unless applied properly, unit may not zero or may not ever register. (Also gums, varnish and dirt in lubricating oil.) Remove dampener (A) if it becomes clogged.

SEE LATER BULLETIN FOR 101, 101-D, 307 AND OTHER MAGNETIC SWITCHES

After Service Checks

With engine running short across from contact screw to panel to be sure connections from magneto or circuit breaker are good. Engine should stop. If it doesn't, check inside connection on magneto primary. If 117 circuit breaker it may be defective. (See below). If switches can't be field adjusted, replace from dealer stock. Units under warranty should be returned to factory for repair.

OIL PRESSURE SWITCHGAGES® (Continued)

If Engine Won't Run or "Misses" . . .

1. Check carburetion and ignition system. If engine runs okay with switches disconnected, it indicates a short circuit in switches. If it runs but won't shut down with switch "shorted" to panel, it indicates an open circuit in switch.
2. Check wire on switch-gauge and through panel to be sure it isn't grounding to bare metal.
3. Do not run magneto ground wires thru loom with spark plug wires as they will pick up high tension current and break down insulators.

TEMPERATURE SAFETY SWITCHGAGES® 20-T-21 Water and 20-TO-21 Oil Temperature

These units are actuated in same way as pressure switch-gauges except that liquid in heat responsive bulb and capillary tube expand on temperature rise to actuate pointer-contact. Each time cooling jacket is filled with coolant, loosen temperature bulb swivel nut and bleed all air that may be trapped. Failure to bleed trapped air will cause erratic reading. With engine running and switch-gauge operating normally, pointer should be in "RUN" zone. If pointer doesn't show any temperature it should be replaced as it cannot give protection. Checking Murphy Switchgages with a thermometer in radiator or other location IS NOT AN ACCURATE CHECK, as temperature will vary up to 20°F. If test is made, remove Switchgauge and check in same container of agitated water—constantly moving temperature bulbs. Most common cause of unit failure is damage to capillary tube lets charging element leak out. Always tape excess capillary tube out of way so vibration or accident won't damage it.

EXTREMELY HIGH TEMPERATURE READING, CHECK FOR:

1. Bulb in restricted "hot spot". Relocate in circulating area of average temperature. If capillary tube runs along exhaust manifold, extreme heat will cause it to read high. Relocate tube away from exhaust heat.
2. Heat responsive bulb may be forced into opening with obstruction causing compression or rupture.

MAGNETIC SWITCHES and for Periodic Service Checks

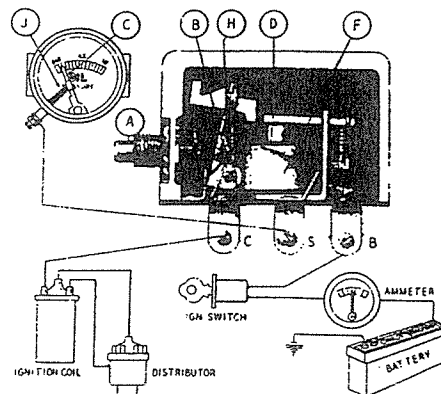
Used with all units for distributor (battery) ignition and with SV Series solenoid fuel valves.

1. Check wiring. Incorrect wiring is most common cause of trouble with battery ignition and solenoid valve control.

BE SURE TO DISCONNECT BATTERY DURING INSTALLATION TO AVOID ACCIDENTAL SHORTS BURNING POINTER-CONTACTS. Be sure location does not allow vibration to loosen fastenings and terminals.

2. Check contact screws, terminals and wiring. Short against panel will unlatch switch and stop engine.
3. Check pressure and temperature units and replace if erratic readings are noticed.
4. Test magnetic switch by depressing pushbutton "IN". Ammeter should show discharge when IN and none when released. **CAUTION:** When manually holding pushbutton "IN", depress fully or 117 coil will be damaged.
5. If, with engine running, and after normal oil pressure has separated contacts the magnetic switch will not stay latched, trouble may be isolated by removing switch-gauge leads from '(S)' terminal, starting engine, and touching one lead at a time to '(S)' terminal until faulty circuit is located. Should it be necessary to adjust 117 magnetic switch, proceed as follows:

Always mount magnetic switches in upright position or moisture will collect inside case and cause corrosion and short circuit.



Adjustments

Diagram shows how switch operates. Push button (A) to complete ignition circuit thru silver contacts (B) and (H). Arm carrying contact (B) latches over center on armature (D). Snap action break is provided when current is fed to coil (F) thru terminal (S) from contact—pointer on gauge as it reaches pre-set point. When correctly wired gauge pointer draws current for only fraction of second.

If case is opened for cleaning contacts, be sure to re-adjust, if necessary, contacts B and H so they make firmly when latched and break with an air gap when unlatched.

FUEL VALVES

Always mount fuel valves in upright position, if not, valve will not seat properly and moisture will collect.

SV Series—Solenoid valve: See instruction sheet packed with switches.

MV-7199 magnetic trip Diesel fuel valve: Be sure all valves are mounted with FLOW arrow pointing toward injector pump

MV-7199 for "hotshot" or lantern battery operation is stamped "6 volts". MV valves stamped "12 or 24 volts" may be used with batteries up to 32v.

Switchgages®, magnetic switches, valves and other control devices described in this bulletin are covered by one or more U. S. and foreign patents issued or pending.

FRANK W. MURPHY MANUFACTURER, INC.

3131 S. SHERIDAN P. O. BOX 45248 TULSA, OKLA. 74145 918, 627-3550

TULSA TELEX 49-2332

HOUSTON TELEX 76-2629

Cable address
"MURSWITCH-TULSA"

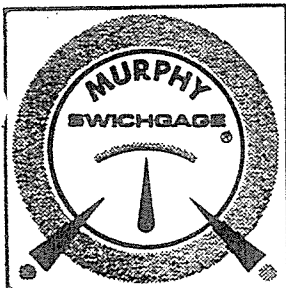
Write for a list of other Murphy representatives through-out the Free World.

MURPHY safety switch of California

38270 N. 10TH ST., E. PALMDALE, CALIF. 905-947-7100

FRANK W. **MURPHY** southern div.

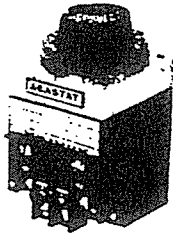
5301 ELM, HOUSTON, TEXAS 713, 626-4360



AGASTAT®

7000 Series timing relay

INSTALLATION AND OPERATION



Every AGASTAT timing relay is a precise timing instrument which balances pneumatic, electrical and mechanical forces in a unique design using a minimum of moving parts. Its accuracy and performance to specifications have been carefully tested before shipment. Properly applied, it offers exceptional life expectancy. A few minutes spent in familiarizing yourself with these instructions will help you get the best possible service from this unit in your application.

Because of the skilled calibration and adjustment required on certain components prior to final assembly, we recommend that field servicing be limited to the replacement of the switch-block and coil assemblies, listed below. These have been designed to insure factory-built performance after field servicing without elaborate calibration. In cases where damage or abuse make it impossible to restore satisfactory performance by replacing these assemblies, the unit should be returned to the factory for repair or replacement.

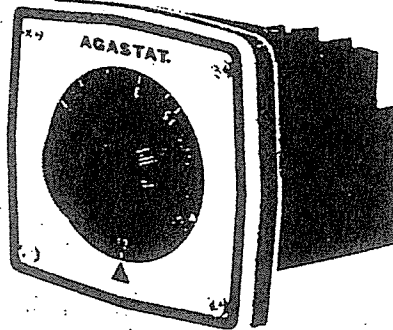
MOUNTING INSTRUCTIONS

A. VERTICAL

Normal mounting for the basic 7000 Series unit is in a vertical position, from the back of the panel. Four 8-32 tapped holes are provided in the back plate, making it interchangeable with earlier models. Mounting screws should not project more than 5/32" into the back of the unit, to prevent internal damage.

A bracket for mounting the unit from the front, and the screws required to attach it to the relay are also supplied with each unit. The bracket extends approximately 3/8" from each side of the unit.

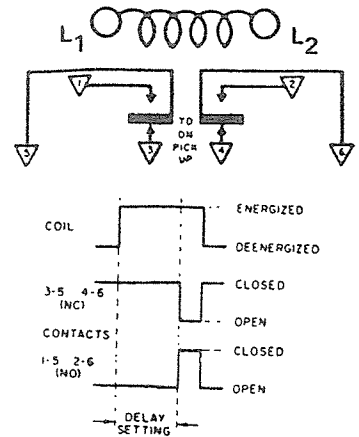
B. HORIZONTAL/PANELMOUNT



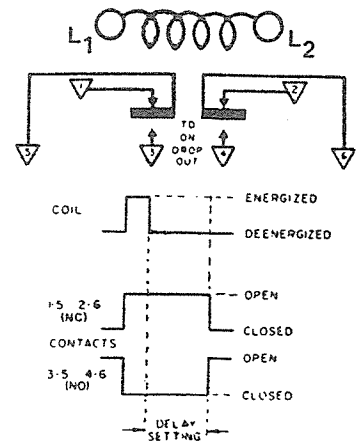
All basic 7000 Series units may be mounted horizontally. However, a dial calibration error (as much as 32% in some units) will result unless the timer is factory equipped with horizontal operation option X or Y1. A unit factory equipped with vertical-horizontal operation option Y2 will require the removal of the Position Compensation Spring in order to maintain accurate calibration. This spring may be removed after the removal of the plastic dust cover, which is fastened to the bottom of the timer with two screws. The dust cover must be replaced after removing the spring.

If the Panel Mounting Kit (option X) is added in the field to units not factory equipped with options Y1 or Y2, an error in dial calibration will result.

7012 SERIES



7022 SERIES



AUXILIARY SWITCH ADJUSTMENT

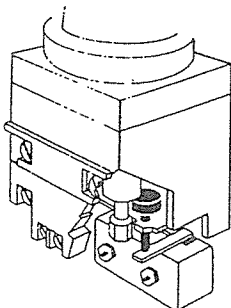
MODEL 7012

INSTANT TRANSFER AUX. SWITCH (CODE L)

Aux. switch should transfer immediately when relay coil is energized, and should reset shortly before solenoid core returns to its normal position, following deenergization. If it fails to reset before end of core's downward stroke, loosen screw in slotted hole of mounting bracket and move switch closer to terminal block.

TWO STEP AUX. SWITCH (CODE T)

Aux. switch contacts should transfer following first delay period after coil energization, and should reset shortly before core returns to its normal position, following coil deenergization. To increase first delay period, increase the distance between actuator screw head and arm by turning it clockwise, using 1/4" open end wrench.*



CODE L

MODEL 7022

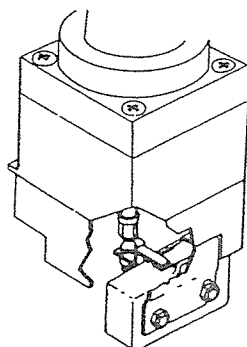
INSTANT TRANSFER AUX. SWITCH (CODE T)

Aux. switch should transfer immediately when relay coil is energized, and should reset shortly before spindle returns to its normal position, following deenergization. To increase aux. switch delay period, increase the distance between actuator screw head and arm by turning it clockwise, using 1/4" open end wrench.

TWO STEP AUX. SWITCH (CODE T)

Check operation as for Instant Transfer, above. Increase first delay period by turning actuator screw clockwise until the desired delay before aux. switch transfer is reached.*

* First delay is independently adjustable, but must be no more than 30% of overall delay. (Recommended max. 100 sec.)



CODE T

Coil Data

| Coil Part Number | Code Letter | Rated Voltage | Operating Voltage Range | | Rated Voltage | Operating Voltage Range | |
|------------------|-------------|------------------------------------|-------------------------|-----|---------------|-------------------------|--|
| | | | @ 60 Hz | | | @ 50 Hz | |
| 7000- | A | 120 | 102-132 | 110 | 93.5-121 | | |
| | B | 240 | 204-264 | 220 | 187-242 | | |
| | C | 480 | 408-528 | | | | |
| | D | 550 | 468-605 | | | | |
| | E | 24 | 20.5-26.5 | | | | |
| | F | | | | 127 | 108-140 | |
| | G | | | | 240 | 204-264 | |
| | H | 12 | 10.2-13.2 | | | | |
| | I | 6 | 5.1-6.6 | | | | |
| | J | 208 | 178-229 | | | | |
| | K | DUAL VOLTAGE COIL (COMBINES A & B) | | | | | |

AC SPECIALS L1, L2, etc.

A C Coils (Part No.=7000 followed by dash and code letter above)

| Coil Part Number | Code Letter | Rated Voltage | Operating Voltage Range | |
|------------------|-------------|---------------|-------------------------|--|
| | | | D C | |
| 7010- | M | 28 | 22.5-33.5 | |
| | N | 48 | 38.5-57.5 | |
| | O | 24 | 19.2-28.8 | |
| | P | 120 | 96-144 | |
| | Q | 12 | 9.6-14.4 | |
| | R | 60 | 48-74 | |
| | S | 250 | 200-300 | |
| | T | 550 | 440-660 | |
| | U | 16 | 12.8-19.2 | |
| | V | 32 | 25.6-38.4 | |
| | W | 96 | 76.8-115 | |
| | Y | 6 | 4.8-7.2 | |
| | Z | 220 | 176-264 | |

DC SPECIALS X1, X2, etc.

D C Coils (Part No.=7010 followed by dash and code letter above)

All units draw approximately 8 watts power at rated voltage. Minimum operating voltages are based on vertically mounted 7012 (on-delay) units. 7012 horizontally mounted or 7022 (off-delay) vertically or horizontally mounted units will operate satisfactorily at minimum voltages approximately 5% lower than those listed.

A C units drop out at approximately 50% of rated voltage. D C units drop out at approximately 10% of rated voltage.

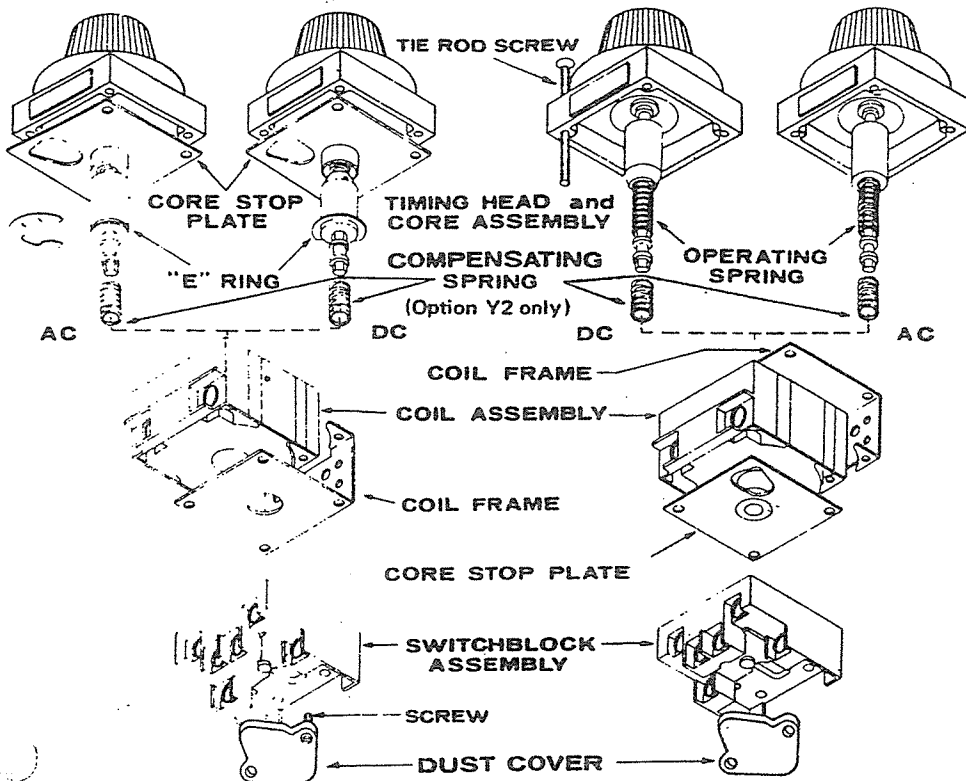
All units may be operated on intermittent duty cycle at voltages 10% above the listed maximums. (Intermittent duty—maximum 50% duty cycle and 30 minutes "on" time.)

REPLACING SWITCHBLOCK AND COIL ASSEMBLIES - MODEL 7012 AND 7022

Switchblock assemblies are universally interchangeable between all standard 7000 Series units. The same assembly is used for A C and D C models for delay on pull-in or delay on dropout service. Neither timing head/core assembly nor coil assembly is interchangeable between A C and D C models.

7012 SERIES

7022 SERIES

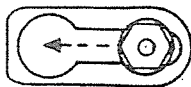


REMOVING SWITCHBLOCK

7012 models require removal of "E" ring from core to permit removing core from coil.

1. Remove four tie rod screws.
2. Hold timing head and coil assembly in one hand, switchblock in the other.
3. Slide switchblock 1/2" forward of coil assembly to center spindle in large end of keyhole slot in switch blade. (See diagram A).
4. Slowly lift timing head and coil assembly off switchblock, being careful to keep spindle collar away from switchblade while withdrawing it.

REVERSE THIS PROCEDURE TO INSTALL NEW SWITCHBLOCK.

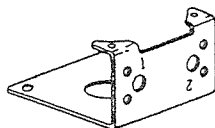


A

6. Slide off coil frame.

When installing new coil, be sure to replace coil frame with proper side up. Number "1" on back of frame should be up on 7012 (Delay on Pull-in) Models, Number "2" should be up on 7022 (Delay on Drop-out) Models. See Diagram B.

On 7012 models, replace "E" ring in core slot after assembling coil frame to coil.



B

REMOVING COIL

- Follow steps 1 to 4 above, then:
1. Remove timing head and core assembly. (On Model 7022 units the core stop plate and operating spring are loose pieces, located below the core rather than attached to the timing head and core assembly, as on the Model 7012 units. These two pieces should be removed before removing the coil frame, to prevent loss of the loose spring.)

REPLACEMENT ASSEMBLIES

| | Part No. |
|-------------------------------|----------|
| AC Coil Assembly | 7000-* |
| DC Coil Assembly | 7010-* |
| Switchblock Assembly | 2412-30 |
| Auxiliary Switch Kit (Code L) | 7000-47 |
| Auxiliary Switch Kit (Code T) | 2412-121 |

* Specify voltage with code letter

LINEAR TIMING RANGES

| Time Range Code | Models 7011, 7012, 7021, 7022, 7024 | Models 7014, 7031, 7032 |
|-----------------|-------------------------------------|-------------------------|
| A | .1 to 1 Sec. | .2 to 2 Sec. |
| B | .5 to 5 Sec. | .7 to 7 Sec. |
| C | 1.5 to 15 Sec. | 2 to 20 Sec. |
| D | 5 to 50 Sec. | 10 to 100 Sec. |
| E | 20 to 200 Sec. | 30 to 300 Sec. |
| F | 1 to 10 Min. | 1.5 to 15 Min. |
| H | 3 to 30 Min. | 3 to 30 Min. |
| I | 6 to 60 Min. | Not avail. |
| J | 3 to 120 Cyc. | Not avail. |
| K | 1 to 300 Sec. | Not avail. |

Basic models are furnished with dials calibrated in linear increments covering the range selected. In addition, time-calibrated ranges B through K provide non-linear adjustment from .2 second to the beginning of the linear zone. For easiest adjustment and lowest cost, the shortest time range suitable for the application should be selected.

* Models 7014, 7031 and 7032 are available with letter calibrated dials only. The upper end of the time ranges in these models may be twice the values shown.

CONTACT RATINGS

Contact Capacity in Amperes (Resistive Loads)

| Contact Voltage | Min. 100,000 Operations | Min. 1,000,000 Operations |
|-----------------|-------------------------|---------------------------|
| 30 vdc | 15.0 | 7.0 |
| 110 vdc | 1.0 | 0.5 |
| 120 v 60 Hz | 20.0 | 15.0 |
| 240 v 60 Hz | 20.0 | 15.0 |
| 480 v 60 Hz | 12.0 | 10.0 |

Inductive and capacitive loads should not have inrush currents that exceed five times normal operating load.

Contact Ratings as listed under the UL Component Recognition Program for 100,000 operations:

- 10 Amps Resistive, 240 VAC
 - 1/4 Horsepower, 120 VAC/240 VAC
 - 15 Amps, 30 VDC
 - 5 Amps., General Purpose, 600 VAC
- } Per P

WARRANTY

The AGASTAT timing relay is warranted against mechanical and electrical defects for a period of one year from date of shipment from factory if it has been installed and used in accordance with factory recommendations. New parts will be furnished free of charge in exchange for parts which have proven defective. The furnishing of these parts shall constitute fulfillment of the Company's obligations and liabilities.

FOR REPAIR SERVICE

Return defective units to:

CONTROL PRODUCTS DIVISION
AMERACE CORPORATION
 1000 Hickory Street
 Grafton, Wisconsin 53024

ATTENTION: Product Service Department



CONTROL PRODUCTS DIVISION

Amerace Corporation
 Control Products Division
 2330 Vauxhall Road
 Union, New Jersey 07083

70-2

(Supersedes 9/75)

Printed in U.S.A.

FOR

PALL

9660/9661 SERIES ULTIPOR® FILTER ASSEMBLIES

The 9660 (bypass) and 9661 (non-bypass) series 6000 PSIG (413.8 BARg) fluid filter assemblies are illustrated in the Pall Filtration Guide IHD-1 and are described in detail in Data Sheets D966-R (short element), D966-S (double-length element), D966-T (triple-length element), and D966-U (quadruple-length element). Internal bypass valves in 9660 units allow bypass flow to exit without passing over the contaminants trapped on the surface of the filter element. In 9661 non-bypass units, 3000 PSID (207 BARd) collapse rating of the filter element (industry's first "dirt fuse") eliminates all possibility of dirty fluid bypassing the filter. Optional reverse flow valves in these units also permit free flow in the reverse direction. Reference should be made to the Data Sheets for dimensions, operating parameters, assembly and element part numbering and ordering information, and notes and specifications. These Service Instructions are intended to be used in conjunction with the appropriate Data Sheet for your filter assembly. The filters are also shown in cross-section on assembly drawing HE9660-G; dirty element warning devices and accessories are shown on drawing HD9000-8G. These documents are all available through your local Industrial Hydraulics Division distributor or directly from Industrial Hydraulics Division, Pall Trinity Micro Corporation, 30 Sea Cliff Avenue, Glen Cove, New York 11542 (U.S.A.).

1 INSTALLATION - Prior to mounting, check that the fluid, pressure, and flow are compatible with data shown on the applicable Data Sheet and the nameplate on the filter head; maximum surge flow should not exceed 1-1/3 times normal flow.

1.1 The filter can be installed in any position but, for ease of servicing, it is recommended that it be installed with the bowl [3 in Exploded View] down. Allow 2-1/2" (63.5mm) clearance for element removal. If visual warning device [26] is used, locate filter so that red button can be easily seen.

NOTE - Head has a port machined for a dirty element warning device; this may be sealed with an AN814-8 bleed plug [30] and an internal plug [31]. Internal plugs can be pulled out with a 1/4-20 bolt. Never replace a bleed plug in this port without first installing the internal plug and uniform size -014 O-ring [28] or a small bypass flow will result, allowing contaminant to enter downstream of the filter element.

1.2 Mount units with four 7/16-14UNC x 1" bolts [34] to provide 3/4" (12.7mm) minimum thread engagement. Optional mounting bracket kits [33] are available and may be used singly or in pairs.

1.3 Use check valve on outlet if there is a possibility of unwanted reverse flow (or use Pall reverse flow valve).

1.4 Connect lines or hoses to ports.

CAUTION - Be sure to use fittings or adaptors compatible with ports furnished as shown by part number on nameplate and noted in Data Sheets; use of incorrect fittings or adaptors can cause head failure, resulting in loss of pressure and possible system failure or personal injury. Refer to SAE J518 for 4-bolt split flange hydraulic tube pipe and hose connections. Information on adapting other fittings is available from your Pall distributor.

1.5 If filter is fitted with electrical differential pressure switch [26], connect signal light or other warning device. Mating connectors for Option "S" switches are the Cannon CA3106R10SL-3S, Amphenol 97-3106R10SL-3S, Bendix 10-190610SL-3S, or commercially available equivalents. Pall stocks a limited supply of the mating straight plug; order by part number MS3106-ASSY. Use of both positive indication of circuit integrity (green light) and negative indication of a dirty element (red light) is recommended to monitor both filter and circuit.

1.6 Bleed filter. Open bleed plug [24 if head is up or 1 if bowl is up] at top of filter one and one-half turns. Jog system and fill filter until all air bleeds through plug, then tighten plug. Pressurize system fully and check for leaks; if leaks occur, refer to Paragraph 2.1.

2 ROUTINE MAINTENANCE - Pall filters do not normally require special attention except for periodic monitoring of the dirty element warning device. Schedule replacement of filter element for at least twice a year and have ample supply of spare elements available.

PALL

INDUSTRIAL HYDRAULICS DIVISION

PALL TRINITY MICRO CORPORATION

GLEN COVE, L.I., NEW YORK • (516) 671-4000 • TELEX: 1-26329

2.1 If external leakage is noted, replace O-ring at leak. For bowl seal leaks, replace O-ring [9] and backup ring [8], locating backup ring as shown in illustration (away from fluid, toward bowl [3], and the atmosphere). If leakage persists, check sealing surfaces for scratches or cracks; replace any defective parts.

2.2 Differential pressure indicators and switches [26] act as dirty element warning devices and actuate when differential pressure across element becomes excessive because of plugging by contaminant or because of high fluid viscosity under cold start conditions. If visual indicator actuates (red button extends 3/16" or 4.8 mm), reset by pushing button back after system reaches normal operating temperature at normal flow. If button stays in, element is still usable; if button will not stay in, change element [6]. If electrical switch actuates (red light comes on) during cold start, continue operating until red light goes out as system warms to normal operating temperature (this feature can be used as "warm up" indication in operating procedures). If warning signal (red light) remains or appears when system is warm, change element.

NOTE - Continued operation of 9660 bypass filters with differential pressure device actuated can allow unfiltered flow downstream. Refer to element change instructions in Paragraphs 3 through 3.5.

2.3 A dirty system can quickly plug a new filter element, especially with Pall silt removal grade medium UP. It may require one or two initial element changes to stabilize element life, which should be at least six months for normal conditions with a closed reservoir and properly filtered air vent. Contact your Pall distributor for appropriate vent filters. If element life is short or differential pressure excessive, filter may be undersized; refer to flow rate selector on Data Sheet. Retrofitting short-bodied Option "R" units with "S", "T", or "U" length elements and bowls will more than double, triple, or quadruple life (respectively), as will adding a second, third, or fourth filter assembly in parallel. If short element life persists, contact Pall Corporation's Scientific and Laboratory Services Department in Glen Cove, New York, with full particulars of fluid and application.

2.4 Element change labels [5] are attached to bowls [3]; there are different labels for bypass filters and for nonbypass filters. Always be sure that the labels are clean and undamaged. Replace illegible labels with the appropriate new labels.

3 CHANGING FILTER ELEMENTS - Remove and replace elements and restart as follows:

3.1 Turn off and depressurize system. Open bleed plug [1 or 24] at top of filter one and one-half turns. Remove plug [24 or 1] at bottom of filter and drain fluid into suitable container. Reinstall drain plug and tighten both plugs.

WARNING! - Failure to depressurize system before proceeding could result in explosive loss of fluid, damage to equipment, or possible personal injury.

3.2 Remove bowl [3]. Remove element [6] and carefully inspect the surface for significant visible contamination. Normally, no dirt should show but visible dirt can be an early warning of system component breakdown and can indicate potential failure. Discard both the element and its O-ring. The filter element is **NOT CLEANABLE!** Any attempt to clean the filter element can cause degradation of the filter medium and allow contaminated fluid to pass through the filter.

DO NOT ATTEMPT TO CLEAN OR REUSE ELEMENT.

3.3 Inspect filter housing for possible damage and remove any accumulated dirt, being careful to prevent contaminant from entering the outlet and washing downstream. Check that bowl seals (-239 size O-ring [9] and backup ring [8]) in head are not damaged. Use replacement filter element part number called for on assembly nameplate. Wet threads and sealing surfaces on bowl [3] and the -131 size O-ring [7] in element with clean system fluid.

3.4 Push open end of filter element straight onto nipple in head. Screw bowl to head until bottomed. O-ring sealing is not improved by over-tightening; do not exceed 15 ft-lbs (20 N-m) torque. Bleed system per Paragraph 1.6. Re-set visual warning device by pushing in the red button; electrical switch is re-set automatically.

3.5 Pressurize system fully and check for external leaks; if leaks occur, refer to Paragraph 2.1. After system reaches normal operating temperature, check that electrical switch has not actuated or that visual warning button remains down. Refer to Paragraphs 2.2 and 2.3.

4 FLUID SAMPLING - One good test of filter effectiveness is sampling and analysis of the fluid before and after it passes through the filter. Analysis is a laboratory procedure and beyond the scope of these instructions. Cleanliness of the sampling bottle and sampling procedure is critical. Optimum sampling to verify filter performance can be achieved by the use of dual port adaptor [36] installed in place of the differential pressure device [26]. This provides up and downstream SAE -4 straight thread ports to be used for sampling. For more information, ask your local Pall distributor for a copy of Sampling Procedure Bulletin IHD-4. Also, obtain ANSI/B93.19-1972 for sampling from system lines or dual port adaptor, and NFPA/T2.9.9-1976 for reservoir sampling. If automatic particle counter is used, calibrate it in accordance with ANSI/B93.28-1973. These standards are available from the National Fluid Power Association, 3333 N. Mayfair Road, Milwaukee, Wisconsin 53222 (U.S.A.).

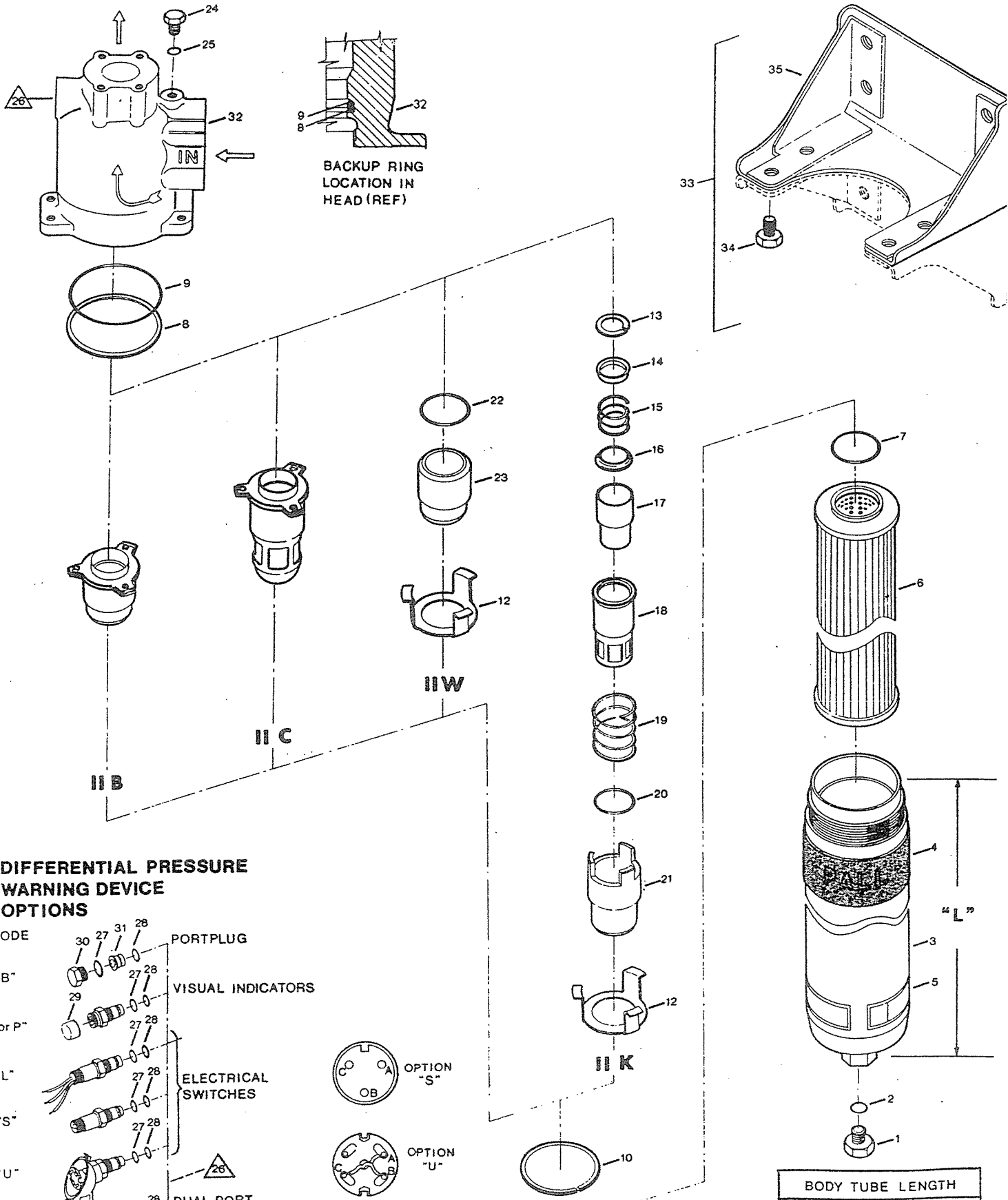
WARRANTY

Pall products are rigidly inspected during manufacture, and on completion, by a modern Quality Control Department, and are warranted for a period of one year from date of shipment or 3,000 hours use, whichever occurs first, against defective materials and workmanship when properly installed and operated at design conditions. All parts proven to be defective within this period will be replaced free of charge, FOB Cortland, New York, or original FOB point as applicable. However, claims for damage or labor will not be allowed; nor can the Seller's equipment be warranted against misapplication by the Purchaser or warranted for corrosion or similar sources of failure where the operating conditions are beyond the control of the Seller. All claims must be accompanied by full particulars including system conditions, if applicable.

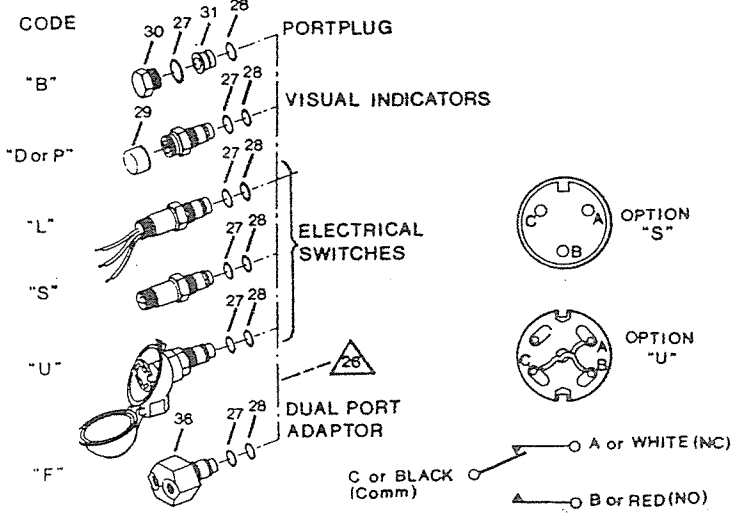
The warranty does not apply to filter element life (time between filter element changes) as this is beyond the control of the Seller. Filter elements are provided by the Seller to meet a specific requirement of grams of dirt capacity when tested to a particular standard, or to have an expected reasonable life based on the Seller's experience with similar systems. Depending upon the conditions of the system into which the filter is installed by the Purchaser the actual life can vary from minutes to years.

No other warranty is extended unless expressly given in writing and signed by an officer of the Seller.

EXPLODED VIEW



DIFFERENTIAL PRESSURE WARNING DEVICE OPTIONS



ELECTRICAL SWITCH WIRING

| BODY TUBE LENGTH | | |
|------------------|--------|-----|
| CODE | INCHES | MM. |
| R | 6 | 152 |
| S | 9 5/8 | 244 |
| T | 14 1/4 | 362 |
| U | 18 1/4 | 464 |

SERVICE INSTRUCTIONS IHD-SI-966

PARTS LIST

| INDEX | PART NUMBER (see Data Sheet) | PART NAME | QUANTITY |
|-------|---------------------------------|---|----------|
| | | FILTER ASSEMBLY | - |
| 1 | AN814-6 | BLEED PLUG | 1 |
| 2 | OR-906 or ORH-906 | O-RING, BUNA N or VITON A | 1* |
| 3 | H() 9660SBOWLR | BOWL ("R" Length) | 1*@ |
| | H() 9660SBOWLS | BOWL ("S" Length) | 1*@ |
| | H() 9660SBOWLT | BOWL ("T" Length) | 1*@ |
| | H() 9660SBOWLU | BOWL ("U" Length) | 1*@ |
| 4 | HB9600-8D1 | .SAFETY GRIP | 1 |
| 5 | HC9000-LB | .LABEL, ELEMENT CHANGE (bypass Options B,C) | 2*# |
| | HC9000-LW | .LABEL, ELEMENT CHANGE (non-bypass Opt. K,W) | 2*# |
| 6 | (see Data Sheet) | FILTER ELEMENT | 1 |
| 7 | OR-131 or ORH-131 | .O-RING, BUNA N or VITON A | 1* |
| 8 | MS27595-239 | BACKUP RING | 1 |
| 9 | OR-239 or ORH-239 | O-RING, BUNA N or VITON A | 1* |
| 10 | RR-312S | RETAINING RING (Spirolox) | 1! |
| 11B | HC9660-24RV | BYPASS VALVE ASSEMBLY (Option "B") | 1*! |
| 11C | HC9660-24RFV | REVERSE FLOW VALVE ASSEMBLY (Opt. "C", bypass) | 1*! |
| 11K | HC9661-RFV | REVERSE FLOW VALVE, HIGH PRESSURE (Option "K", non-bypass) | 1*! |
| 12 | HC9661-6D4 | .COLLAR, VALVE RETAINING | 1(K,W)! |
| 13 | RR-125 | .RETAINING RING (Spirolox) | 1(K)! |
| 14 | HA9600-2D81 | .SPRING GUIDE | 1(K)! |
| 15 | HA9600-8D3S | .SPRING, COMPRESSION | 1(K)! |
| 16 | HA9660-1D4RV | .SPRING GUIDE - C/V | 1(K)! |
| 17 | HB9600-3D5 | .POPPET, VALVE | 1(K)! |
| 18 | HB9661-6A3 | .POPPET/SEAT ASSEMBLY | 1(K)! |
| 19 | HA9661-1D6S | .SPRING, COMPRESSION | 1(K)! |
| 20 | ORH-129 | .O-RING, VITON A | 1(K)! |
| 21 | HC9661-6D3 | .NIPPLE, REVERSE FLOW, HIGH PRESSURE | 1(K)! |
| 11W | HB9661-NBP | NIPPLE SET (Option "W", non-bypass) | 1*! |
| 12 | HC9661-6D4 | .COLLAR, VALVE RETAINING | 1(K,W)! |
| 22 | ORH-223 | .O-RING, VITON A | 1(W)! |
| 23 | HB9661-1D12 | .NIPPLE | 1(W)! |
| 24 | AN814-4 | BLEED PLUG | 1 |
| 25 | OR-904 or ORH-904 | O-RING, BUNA N or VITON A | 1* |
| 26 | (see Dwg HD9000-8G) | DIFFERENTIAL PRESSURE DEVICE | 1 |
| 27 | OR-908 or ORH-908 | .O-RING, BUNA N or VITON A | 1* |
| 28 | OR-014 or ORH-014 | .O-RING, BUNA N or VITON A | 1* |
| 29 | 22345 | .DUST COVER (Mectron, Option "P" only) | 1 |
| 30 | AN814-8 | BLEED PLUG (Option "B" only) | 1 |
| 31 | AA9020-12D3 | INTERNAL PLUG (Option "B" only) | 1 |
| 32 | H() 9660A16SHD | HEAD (SAE 1" Straight Thread) | 1**@ |
| | H() 9660A20SHD | HEAD (SAE 1-1/4" Straight Thread) | 1**@ |
| | H() 9660A24SHD | HEAD (SAE 1-1/2" Straight Thread) | 1**@ |
| | H() 9660B16SHD | HEAD (1" NPT) | 1**@ |
| | H() 9660B20SHD | HEAD (1-1/4" NPT) | 1**@ |
| | H() 9660B24SHD | HEAD (1-1/2" NPT) | 1**@ |
| | H() 9660C16SHD | HEAD (1" BSPF) | 1**@ |
| | H() 9660C20SHD | HEAD (1-1/4" BSPF) | 1**@ |
| | H() 9660C24SHD | HEAD (1-1/2" BSPF) | 1**@ |
| | H() 9660D16SHD | HEAD (SAE 1" Split Flange, Medium Pressure) | 1**@ |
| | H() 9660D24SHD | HEAD (SAE 1-1/2" Split Flange, Med. Press.) | 1**@ |
| | H() 9660E16SHD | HEAD (SAE 1" Split Flange, High Pressure) | 1**@ |
| | H() 9660E20SHD | HEAD (SAE 1-1/4" Split Flange, High Press.) | 1**@ |

ACCESSORY ITEMS

| | | | |
|----|---------------------|--|-----------|
| 33 | HA9660-BRKT-1 or -2 | BRACKET KIT, SINGLE or DOUBLE | 1*! |
| 34 | Commercial | .BOLT, HEX HEAD, 7/16-14UNC x 1" long | 4 |
| 35 | HD9660-1D40 | .MOUNTING BRACKET | 1 or 2 |
| 36 | HC9380-DS | DUAL PORT ADAPTOR (for sampling and use of differential pressure gauge) | 1(F) |
| -- | H9600-SEALKIT-H | SEAL KIT, BUNA N (full set) | As Req'd* |
| -- | H9600-SEALKIT-Z | SEAL KIT, VITON A (full set) | As Req'd* |
| -- | HA9000PKIT-H or -Z | PLUGPORT KIT, BUNA N or VITON A (for "B" Opt., includes Items 16,17,19,20) | As Req'd* |

- NOTES:**
- * = Optional alternates, determine applicable item for each asterisked index number. O-rings and backup rings have uniform dash number sizes in accordance with SAE ARP-568.
 - When ordering spare parts, give name and part number of part required and complete filter assembly part number per nameplate on filter head.
 - # = Replacement filter heads include filter assembly nameplate, O-ring [9], backup ring [8], and bleed plug [24] and O-ring [25], installed. Head is also available with valve [11] and differential pressure device [26]; contact factory for head part number. Bowls include safety grip [4] and appropriate element change labels [5]. Bowls and heads are proof tested. SAE pressure ratings are noted as applicable.
 - ! = Valve parts available only in kits (Items 11B, 11C, 11K, or 11W); retaining ring [10] is included with all valve kits. High pressure reverse flow valve [11, Option "K"] is a matched assembly; do NOT interchange parts taken from other valves. Bracket kits [33] include items 34 and 35.
 - @ = Seal codes "H" (Buna N) and "Z" (VITON A) are indicated in the second digit of the filter assembly part number and the eleventh digit of the element part number on nameplate. Insert appropriate code letter as second letter of part number of bowl [3] and head [32].



INDUSTRIAL HYDRAULICS DIVISION

PALL TRINITY MICRO CORPORATION

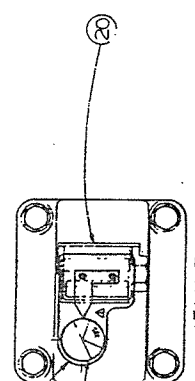
GLEN COVE, L.I., NEW YORK • (516) 671-4000 • TELEX: 1-26329

| REVISIONS | | DATE APPROVED |
|-----------|-------------|---------------|
| 1 | DESCRIPTION | 11-11-71 |
| 2 | DESCRIPTION | 11-10-71 |
| 3 | DESCRIPTION | 11-9-71 |
| 4 | DESCRIPTION | 11-9-71 |
| 5 | DESCRIPTION | 11-9-71 |
| 6 | DESCRIPTION | 11-9-71 |
| 7 | DESCRIPTION | 11-9-71 |
| 8 | DESCRIPTION | 11-9-71 |

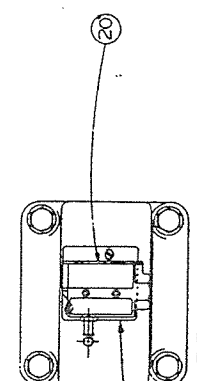
| ITEM QUAN. | DESCRIPTION | PART NO. |
|------------|---|------------|
| 1 | DIRT ALARM FILTER HEAD ASSEMBLY (INCLUDES ITEM 15) | A-1F-532 |
| 2 | WITH SAE STRAIGHT O-RING THREAD PORTS | A-1F-430 |
| 3 | WITH SAE 4 BOLT BOSS | A-1F-497 |
| 4 | FILTER HEAD ASSEMBLY (INCLUDES ITEM 14) | A-1F-533 |
| 5 | WITH WELDED PORTS | A-1F-799 |
| 6 | WITH SAE STRAIGHT O-RING THREAD PORTS | A-1F-600 |
| 7 | WITH SAE 4 BOLT BOSS | IF-589 |
| 8 | RETAINING RING | IF-537B |
| 9 | CAP SCREW AND WASHER (NOT SHOWN) | IF-493C |
| 10 | HOUSING (SINGLE ELEMENT) | IF-374 |
| 11 | HOUSING (DOUBLE ELEMENT) | IF-381 |
| 12 | HOUSING (TRIPLE ELEMENT) | IF-382 |
| 13 | ELEMENT (SEE NAMEPLATE) | XOR 25/32 |
| 14 | (INCLUDES 2 OF ITEM 26 PER ELEMENT) | IF-571 |
| 15 | ELEMENT BUSHING | IF-572P |
| 16 | COMPRESSION SPRING | IF-649 |
| 17 | MAGNET ASSEMBLY (ONE ELEMENT) | IF-502A1 |
| 18 | MAGNET ASSEMBLY (TWO ELEMENT) | A-1F-601H |
| 19 | MAGNET ASSEMBLY (THREE ELEMENT) | A-1F-602H |
| 20 | MAGNET SUCTION SEPARATOR KIT | A-1F-603H |
| 21 | DISH AND SPIDER ASSEMBLY | A-1F-422 |
| 22 | DIRT ALARM KIT (INCLUDES ITEM 18) | A-1F-421P |
| 23 | CAM AND ELECTRIC SWITCH MOUNTING PLATE KIT (INCLUDES ITEM 17) | A-1F-011P |
| 24 | CONSTANT RISE CAM ASSEMBLY | A-1F-784 |
| 25 | POINTER ASSEMBLY | A-1F-243A1 |
| 26 | ELECTRIC SWITCH MOUNTING PLATE KIT | IF-376 |
| 27 | ELECTRIC SWITCH | IF-376 |
| 28 | MODEL NO. NAMEPLATE WITH STUDS | IF-242K |
| 29 | DIRT ALARM NAMEPLATE WITH STUDS | IF-435E1 |

| ITEM QUAN. | SEAL SECTION DESCRIPTION | ALBRG. NO. | PART NO. |
|------------|-----------------------------|------------|----------|
| 23 | O-RING (FOR HYDR. OIL) | 56A-427 | IF-370 |
| 23 | O-RING (FOR HYDR. OIL) | 56A-427 | IF-370 |
| 24 | O-RING (FOR VITON) | -427 | IF-389 |
| 24 | O-RING (FOR VITON) | -427 | IF-389 |
| 24 | O-RING (FOR HYDR. OIL) | -908 | HS-104 |
| 24 | O-RING (FOR PHOSPH. ESTERS) | -908 | HS-104B |
| 24 | O-RING (FOR VITON) | -908 | HS-106A |
| 25 | O-RING (FOR HYDR. OIL) | -008 | IF-242PA |
| 25 | O-RING (FOR PHOSPH. ESTERS) | -008 | IF-242PB |
| 26 | O-RING (FOR VITON) | -008 | IF-242PC |
| 26 | O-RING (FOR HYDR. OIL) | NONE | IF-636-1 |
| 26 | O-RING (FOR PHOSPH. ESTERS) | NONE | IF-636-1 |
| 26 | O-RING (FOR VITON) | NONE | IF-636-1 |

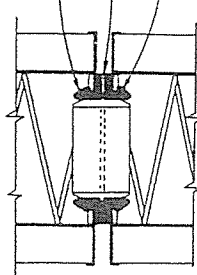
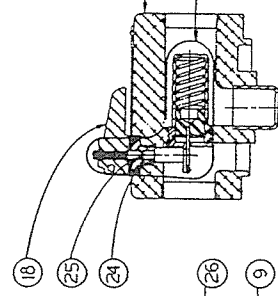
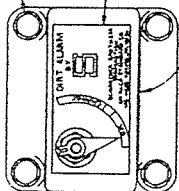
PARTS LIST



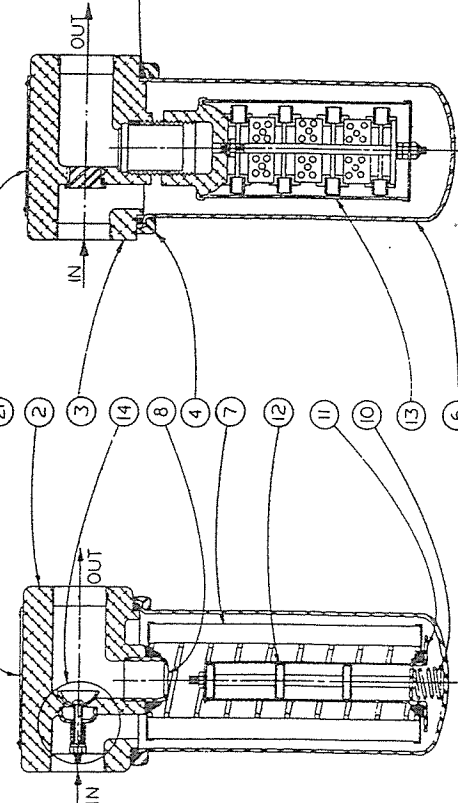
CAM AND ELECTRICAL SWITCH INTRODUCED NOV. 1, 1971



ELECTRIC SWITCH MOUNTING PREVIOUS TO NOV. 1, 1971



WHEN MORE THAN ONE ELEMENT IS USED IN A FILTER HOUSING AN ELEMENT CONNECTOR MUST BE USED.



LINE TYPE MAGNETIC SEPARATOR

| | | | |
|---------------|--|----------|--|
| CONTRACT NO. | | 11-11-71 | |
| DATE APPROVED | | 11-10-71 | |
| CHECKED | | D/J/M | |
| DRAWN | | S/M | |
| DATE | | 11-9-71 | |
| PROJECT | | S-283 | |
| DRAWING NO. | | D-2525 | |
| SCALE | | NONE | |
| SHEET | | OF 1 | |

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. FRACTIONS DECIMALS ANGLES MATERIAL

SCHROEDER BROTHERS CORP.
MCKEES ROCKS, PA. 15136

PARTS LIST FOR
IF-1 SERIES FILTERS

MODEL NUMBER DATA:
 ST-1K25 (0 OR 3) * SINGLE ELEMENT FILTER (25 10 OR 3 MICRON)
 ST-2K25 (0 OR 3) * DOUBLE ELEMENT FILTER (25 10 OR 3 MICRON)

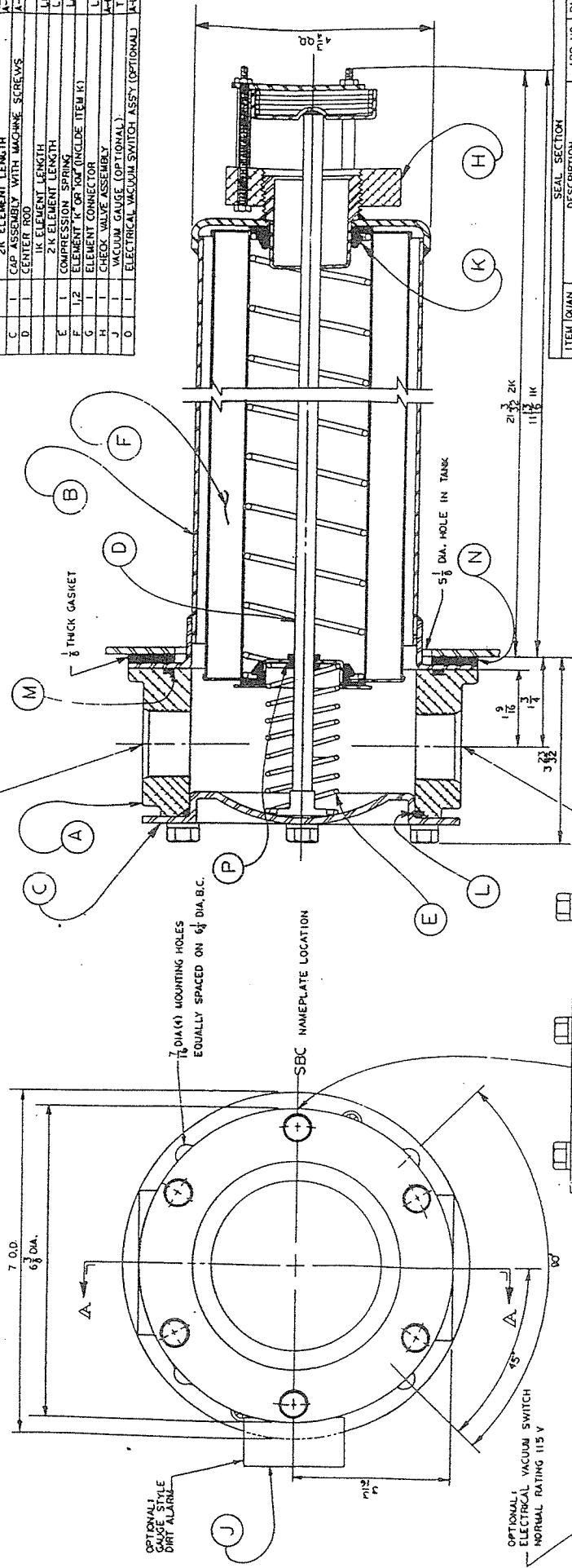
REVISIONS

| NO. | DESCRIPTION | DATE | APPROVED |
|-----|----------------|------|----------|
| 1 | INITIAL DESIGN | | |

PARTS LIST

| ITEM QUAN | DESCRIPTION | PART NO. |
|-----------|-------------------------------------|-----------|
| A | HEAD | |
| 1 | 1. NPTF ONE PORT | LFT-252 |
| 1 | 1. NPTF TWO PORTS | LFT-260 |
| 1 | 1. UNF ONE PORT | LFT-261 |
| 1 | 1. UNF TWO PORTS | LFT-262 |
| B | ENCLOSURE ASSEMBLY | |
| 1 | 1K ELEMENT LENGTH | A-LF-184 |
| 2 | 2K ELEMENT LENGTH | A-LF-185 |
| C | CAP ASSEMBLY WITH MACHINE SCREWS | A-LF-186 |
| D | CENTER ROD | A-LF-187 |
| E | 1K ELEMENT LENGTH | LFT-275 |
| 2 | 2K ELEMENT LENGTH | LFT-276 |
| F | 1.2 ELEMENT SPRING | LFT-277 |
| G | 1. ELEMENT CONNECTOR | LFT-572P |
| H | CHECK VALVE ASSEMBLY | A-LF-188 |
| J | VACUUM GAUGE (OPTIONAL) | 18-187 |
| O | ELECTRICAL VACUUM SWITCH (OPTIONAL) | A-LF-189S |

AVAILABLE PORTING: (SEE PORTING SYMBOLS)
 1. NPTF
 2. SAE STRAIGHT THREAD
 3. 1" NPTF
 4. 1/2" UNF



SECTION A-A

SEAL SECTION

| ITEM QUAN | DESCRIPTION | PART NO. |
|-----------|---------------------------------|----------|
| P | GROMMET | |
| 1 | 1. GROMMET (FOR HYDR. OIL) | LF-728P |
| 2 | 2. GROMMET (FOR PHOSPH. ESTER) | LF-636 |
| K | 2.4 GROMMET (FOR PHOSPH. ESTER) | LF-636B |
| K | 2.4 GROMMET (OF VITON) | LF-636V |
| L | O-RING (FOR HYDR. OIL) | 568-246 |
| L | O-RING (FOR PHOSPH. ESTER) | 568-246 |
| M | O-RING (OF VITON) | 568-252 |
| M | O-RING (FOR HYDR. OIL) | 568-252 |
| N | O-RING (FOR PHOSPH. ESTER) | 568-252 |
| N | O-RING (OF VITON) | 568-252 |
| N | GASKET (FOR HYDR. OIL) | LFT-512 |
| N | GASKET (FOR PHOSPH. ESTER) | LFT-512 |

APPROVED

DATE: 7-10-73

DESIGNED BY: NK

DRAWN BY: NK

DATE: 9-2-73

W.O. NO.:

PROJ. NO.:

REV. NO.:

SCALE: 1" = 1"

DATE APPROVED:

DATE: 7-10-73

APPROVED BY: NK

DATE: 9-2-73

W.O. NO.:

PROJ. NO.:

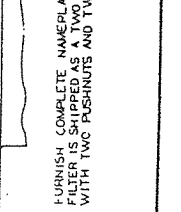
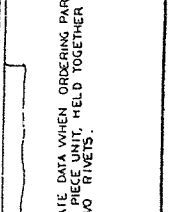
REV. NO.:

SCALE: 1" = 1"

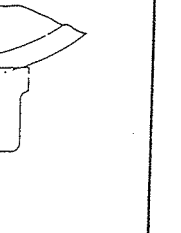
REV. VALUES OF DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS (DECIMALS IN INCHES) MATERIAL

1. FURNISH COMPLETE NAMEPLATE DATA WHEN ORDERING PARTS
 2. FILTER IS SHIPPED AS A TWO PIECE UNIT, HELD TOGETHER WITH TWO NUTS AND TWO RIVETS.

WHEN MORE THAN ONE ELEMENT IS USED IN A FILTER HOUSING A ELEMENT CONNECTOR MUST BE USED.



NOTES



APPLICATION

The V7058A Hydrotransmission Valve is designed to be used on Sundstrand variable displacement pumps and variable displacement motors. When used on the variable displacement pump, the valve varies the swashplate angle to control the output flow. On the variable displacement motor, the valve varies the swashplate angle to control the motor speed. The output flow of the pump determines the output rpm of a fixed displacement motor. If a variable displacement pump is used with a variable displacement motor, the output speed is determined by the swashplate angle of both the pump and motor. A motor and pump combination makes up the hydrotransmission.

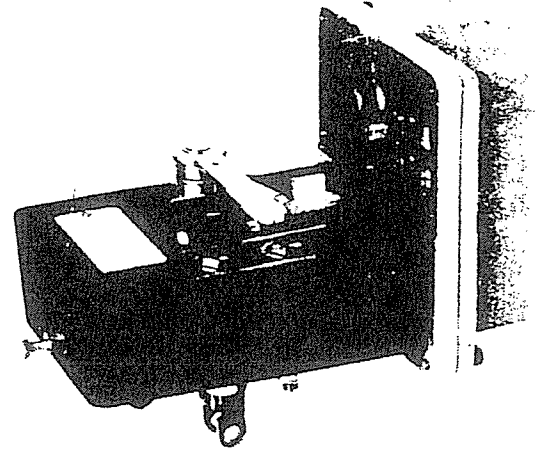
The valve-pump-motor combinations are used on mobile or stationary equipment for such functions as remotely or automatically regulating forward speed of mobile equipment, auger feed rate, vibratory screed rate on an asphalt paver, remote control of rpm on a drill rig, etc.

FEATURES

The V7058A Hydrotransmission Valve operates directly from a d-c voltage source having a power output capability of at least 5 watts and 10 volts. Upon loss of power, the valve returns to the null deadband. At null, the swashplate angle of the variable displacement pump is zero; the swashplate angle of the variable displacement motor is at its maximum. Hydraulic flow at null is essentially zero. A manual operator is provided.

The V7058A fits the same mounting surface as the Sundstrand manual valve. Simplicity of installation makes the valve field replaceable. Because operation is electrical, no operating linkage is needed. The manual operator of the valve may require linkage, if it is used. Only two electrical conductors are needed for hookup to a remote command potentiometer or automatic control amplifier (for either unidirectional or bidirectional control). The hydraulic source for the servo control valve is the internal charge pump of the transmission.

The capability for proportional remote or automatic control of the swashplate angle of any Sundstrand Series 20 through 27 variable displacement pump or motor is provided by the V7058A Valve. The V7058A is just one of the many Honeywell building block components for servo control.



SPECIFICATIONS

ELECTRICAL

MAXIMUM VOLTAGE RATING—
14 volts dc.

FULL DRIVE CURRENT—
 225 ± 25 mA dc.

FULL DRIVE VOLTAGE—
9 volts dc at 125°F.

FULL DRIVE POWER—
2.0 watts.

INPUT RESISTANCE—
DC: 33 ohms @ 76°F.
AC: $\frac{(35 + j\omega .37) (470)}{(505 + j\omega .37)}$

The input resistance consists of a 35-ohm, 0.37 henry coil with a 470-ohm parallel resistor.

TOTAL ELECTRICAL DEADBAND—
10 to 40 mA dc (.3 to 1.2 volts Ref.).

TEMPERATURE

OPERATING RANGE—
70°F to 180°F and down to -40°F for low viscosity fluids. The V7058A Valve can be used throughout the recommended temperature range as shown in the *Sundstrand Engineering Application Manual*, obtainable from Sundstrand Hydrotransmission, Ames, Iowa.

HYDRAULIC

NORMAL OPERATING SUPPLY PRESSURE—
300 psi (21 kg/cm²).

CASE PRESSURE RATING—
200 psi (14 kg/cm²).

CASE BURST PRESSURE RATING—
500 psi (35 kg/cm²).

FLUID—

The V7058A Valve can be used with the fluids recommended in the *Sundstrand Engineering Application Manual*. For special applications, or fire resistant fluid types, contact Sundstrand Hydrotransmission, or Honeywell.

REQUIRED HYDRAULIC SYSTEM FILTRATION—
10 micron.

PERFORMANCE DATA

1. V7058A VALVE (INDEPENDENT OF TRANSMISSION)

A. FREQUENCY RESPONSE—

90° phase lag @ 26 Hz for voltage drive. The mechanical response is flat to greater than 100 Hz with reference to driving function *current*.

B. ELECTRICAL CHARACTERISTICS—

Torque motor coil impedance is 35 ohms with 0.37 henry inductance. Therefore the electrical time constant is:

$$\frac{L}{R} = \frac{0.37}{35} \cong .010 \text{ second.}$$

This is the time required for the coil current to build to 63% of a step change in *voltage* imposed on it. There is a 470-ohm resistor in parallel with the coil to limit inductive spikes when the coil current is interrupted.

The coil resistance is 33 ohms at 76°F. Following normal copper resistance change proportional to absolute temperature, the coil resistance is calculated as follows:

$$R_c = 33 \left[\frac{459 + ^\circ F}{459 + 76} \right]$$

Example: For a 100°F rise in temperature from 76°F, the coil resistance is 39 ohms. The resulting current then drops by 10% for a given applied voltage.

Because the torque motor responds to current (not voltage), the temperature effects must be considered. If, for example, a 100-ohm fixed resistor is placed in series with the V7058A coil, the temperature effect will be about 1/4 the original effect. The full-drive currents of up to 0.25 ampere then would demand a source voltage up to 35 Vdc. If the control circuit is a true current source, the coil temperature has little effect.

C. HYDRAULIC CHARACTERISTICS—

With 200 psi pressure drop:

Flow gain: 12 cim/mA.

Flow rating: 1.7 gpm @ 60 mA.

Quiescent flow: 30 cim maximum (unless otherwise specified).

2. V7058A VALVE AND SERIES 22 TRANSMISSION

A. FREQUENCY RESPONSE—

With a sinusoidal drive function of ± 10% of rated *current*, the corner frequency (for 90° lag) is 2.0 cycles per second; about 13 radians per second. The pump will move to 63% of the input step in 1/13 second in response to step changes in current.

B. TYPICAL SWASHPLATE SHIFTING TIMES—

With no orifice, a full-to-full displacement step will occur in a time dependent on pump size. If a zero-to-full step is imposed, the shifting time is 60% of the full-to-full time. If a zero to half-speed step is imposed, the shifting time is 35% of the full-to-full time. Return to zero times are about the same.

The following are *approximate* full-to-full shifting times (in seconds) of pumps versus orifice:

| Pump Size | Orifice | | No Orifice |
|-----------|---------|------|------------|
| | .041 | .062 | |
| 20 | 2.3 | 1.0 | 0.8 |
| 21 | 2.5 | 1.1 | 0.9 |
| 22 | 3.6 | 1.6 | 1.2 |
| 23 | 3.8 | 1.7 | 1.25 |
| 24 | 6.2 | 2.8 | 2.1 |
| 25 | 7.0 | 3.1 | 2.4 |
| 26 | 14.0 | 6.2 | 4.8 |
| 27 | 19.0 | 8.3 | 6.3 |

C. HYDRAULIC CHARACTERISTICS—

Refer to Figure 1.

Symmetry—

20%.

Independent Linearity—

5% of rated current, except within 10 mA of the start current.

Sensitivity—

The valve will respond to a current change of 2% of rated current between the deadband and rated current.

Hysteresis—

5% of rated current beyond 10 mA of the start current.

Null Shift With Temperature—

12 mA/100°F.

D. LOAD DEPENDENT FACTORS—

Whether the standard manual input control or the electric V7058A is used, overhauling loads have certain effects on the pump. When the hydrostatic pump is exposed to an "overhauling load", some of the reaction forces within the pump reverse; that is, the normal "self-centering" forces for pumping action become "drive away from center" forces when motoring. To establish equilibrium conditions, the servo piston differential pressures must reverse. The valve spool then must shift to the opposite side of hydraulic null to establish the proper pressure. This is accomplished by the swashplate moving to a larger than normal angle as the feedback spring forces move the spool through null. Thus, when the system pressure varies from +5000 psi to -5000 psi, the swashplate will vary less than 4° of angle.

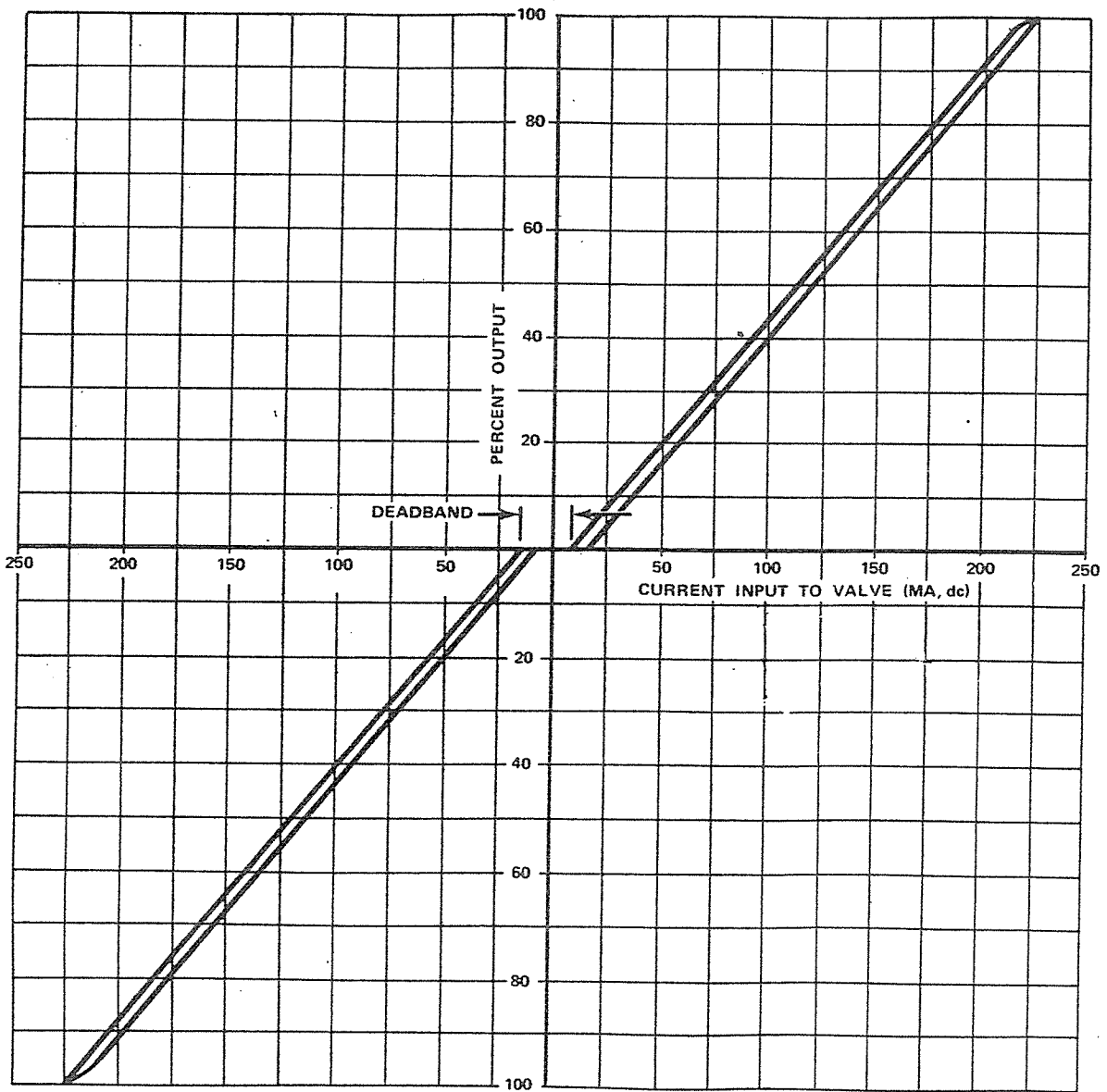


Figure 1—Percent Output of Sundstrand Pump Versus DC Current Input to Valve (Typical).

DIMENSIONS

Refer to Figure 2. Request DR12964 for installation drawing.

THEORY OF OPERATION

See Figure 3.

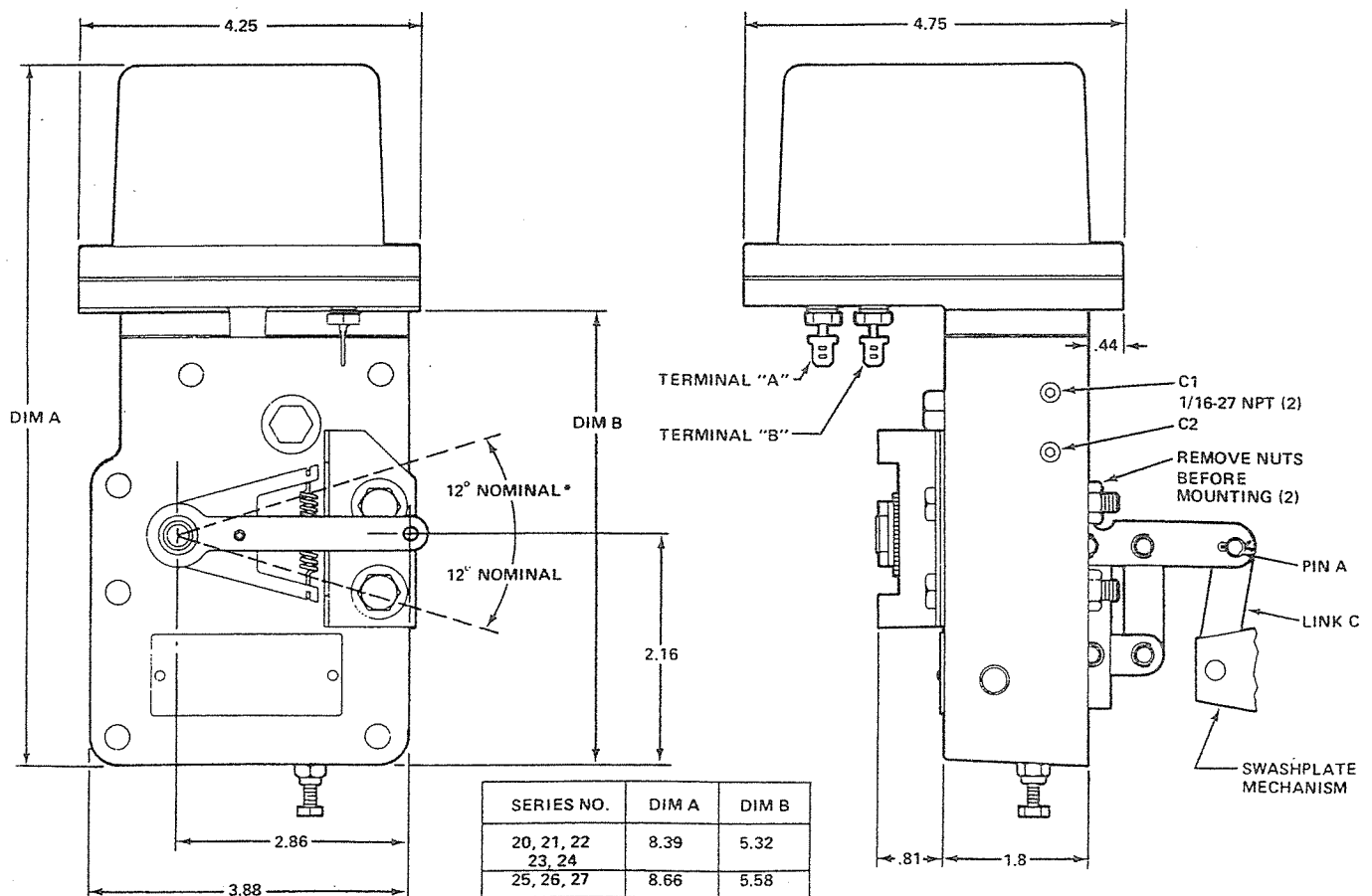
In normal operation, a force from the "torque motor" or manual operator is applied to the valve spool. It causes the valve to open and port oil to the servo pistons which move the swashplate.

As the swashplate moves, the feedback linkage follows and generates a force to drive the valve spool toward hydraulic center. An equilibrium valve spool position is reached when the pressure applied to the servo pistons is just adequate to

hold against the reaction forces at that moment. The resulting swashplate position is quite linearly proportional to the torque motor current.

The direct operation of the V7058A actuator enhances its fail-safe performance. In case of electric power failure, the valve will return to neutral, which in turn will return the pump to neutral. If there is no electric drive current, no electro-magnetic forces are generated. If the pump is not at neutral, the swashplate position feedback forces will move the spool to hydraulically drive the swashplate toward neutral. Near neutral, the valve "open-centers" to allow servo piston springs to complete the centering action.

The manual operator can exert a force on the spool to operate the transmission with or without electrical power. When under electrical control only, the manual operator remains in a neutral position.



NOTE: TERMINALS FIT AMP FASTON "250" SERIES CONNECTORS.

* FOR 90% MINIMUM OF FULL DRIVE. MANUAL OPERATOR TORQUE FOR FULL DISPLACEMENT: 18 ± 2 IN. LB.

48C

Figure 2—Approximate Dimensions of the V7058A (Inches).

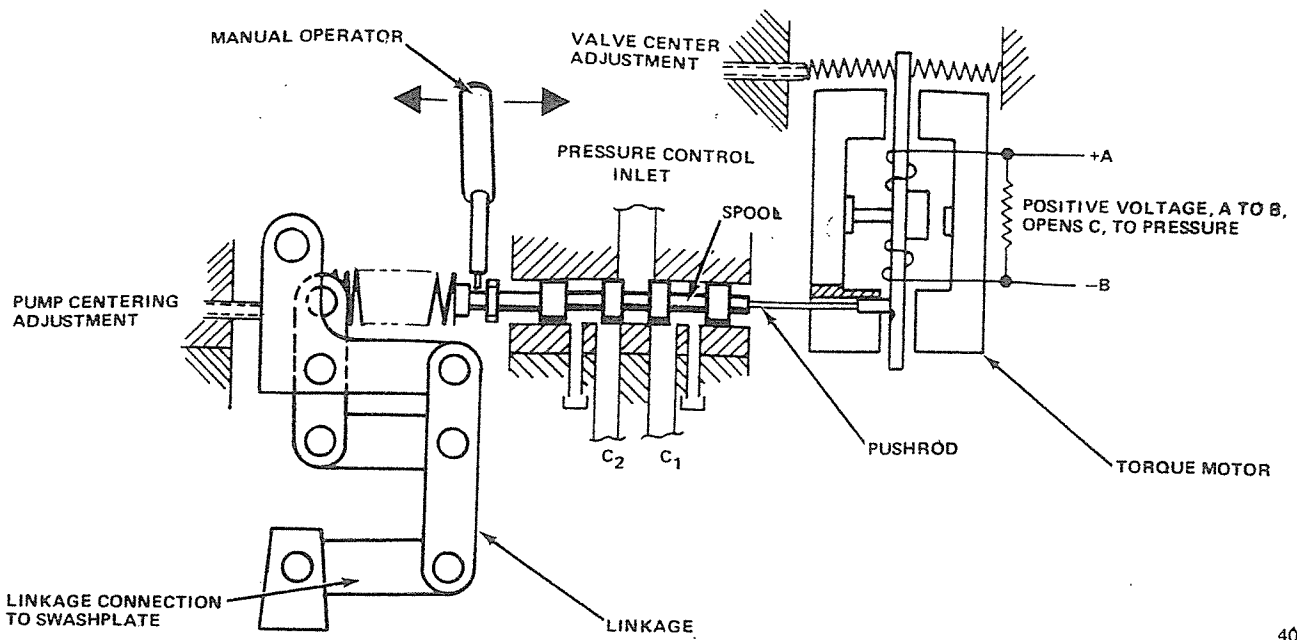


Figure 3—V7058A Schematic.

406-a

INSTALLATION

The feedback linkage of the V7058A Hydrotransmission Valve varies with the series number of the pump or motor. Two models of the V7058A are available without a feedback linkage. These two models can be adapted to a Series 20 through 24, or Series 25 through 27 pump or motor by means of the appropriate linkage assembly (see Table B, ORDERING INFORMATION). Use the following procedure to install the linkage assembly. *Read all instructions prior to assembly.*

1. Figure 4 identifies the components of the feedback linkage. Note that the links are identified by a number. The corresponding series numbers are tabulated in Table A. Loosen the locknut of the pump centering adjust bolt (shown in Figure 4), and back out the bolt until there is clearance for removal of shaft D (Figure 4).

2. Remove the clip from the end of shaft D, and remove shaft D.

| Series Number | Linkage Identification Numbers | |
|---------------|--------------------------------|--------|
| | Link A | Link B |
| 20 | 137077 | 136697 |
| 21, 22 | 137437 | 136702 |
| 23 | 137437 | 136701 |
| 24 | 135356 | 136700 |
| 25, 26 | 135357 | 136698 |
| 27 | 135359 | 136699 |

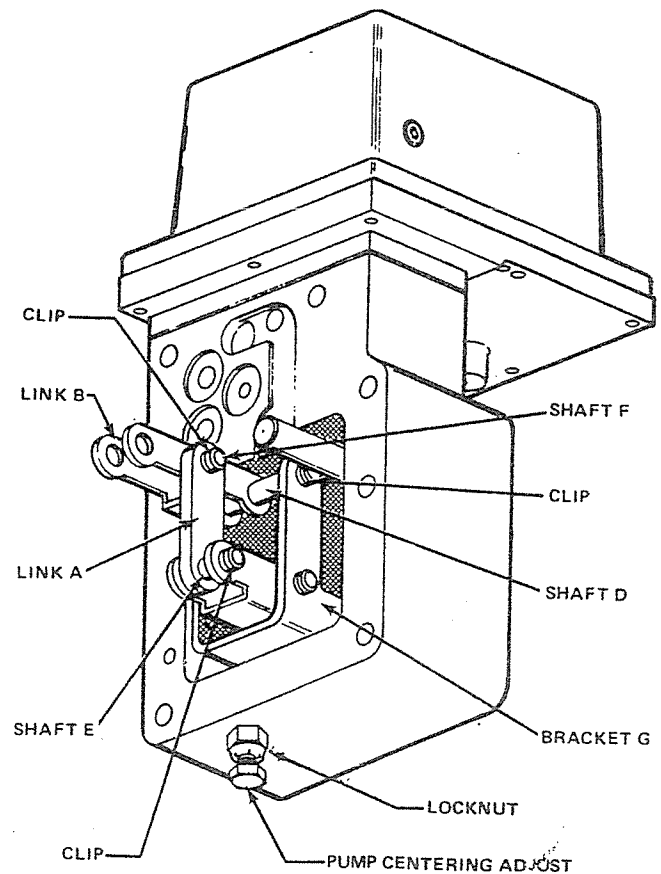


Figure 4—Assembly of Feedback Linkage.

405C

3. Replace shaft D in the same location, placing link B on the shaft between the legs of bracket G. (see Figure 4). Replace the retaining clip. **(CAUTION:** If clip is accidentally pressed over the shaft rather than in the groove, discard and use new "C" ring.)
4. Remove the clip from the end of shaft E, and remove shaft E.
5. Place link A on shaft E, and replace shaft E in the same location. Replace the retaining clip.
6. Install shaft F (supplied with the linkage assembly) through the middle holes of link B, capturing link A outside the legs of link B (see Figure 4). Install retaining clips on the ends of shaft F.
7. Return the pump centering adjust bolt to its original position, and tighten the locknut. (The lower surface of bracket G should be approximately parallel to the valve body surface.) Refer to the ADJUSTING section of this form.

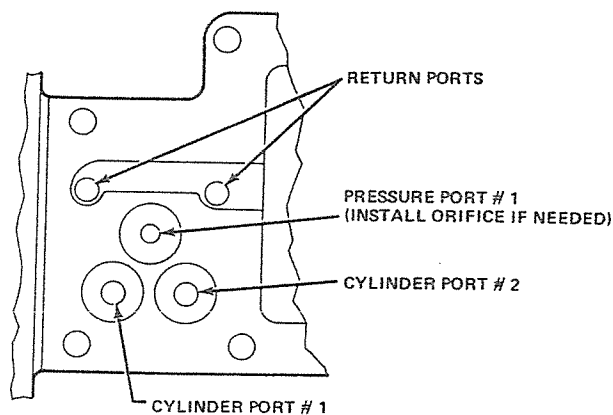
MOUNTING

The V7058A is mounted directly on the pump or motor of the hydrotransmission, and may be mounted in any orientation.

1. Remove the manual valve and gasket from the Sundstrand transmission. Use extra care when removing the valve to prevent any of the linkage parts, "O" rings or orifice if used, from falling into the transmission. Use precautionary measures to assure that dirt does not enter transmission or valve parts.
2. Clean mating surfaces thoroughly before mounting the new valve. Place the new gasket supplied with the valve on the mounting block surface of the hydrotransmission pump or motor.
3. If required, insert orifice of desired diameter in pressure port #1, and place "O" ring around the orifice to retain it. A 0.041-inch diameter orifice is supplied with the valve. Place "O" rings at cylinder ports #1 and #2. (Hold "O" rings in place with a small amount of petroleum jelly, if necessary. An excess amount may plug the filter.) Figure 5 shows the respective location of these ports on the valve.
4. Attach linkage of hydrotransmission valve to link C of the pump or motor. Refer to Figure 2 for linkage iden-

tification. While inserting the shaft and cotter pin, use extra care to assure that nothing falls into the transmission. Check that "O" rings and orifice are in place.

5. Secure the valve to the pump with the set of bolts supplied with the V7058A Valve.
6. When using the V7058A on the variable displacement motor, charge pressure must be plumbed externally to the control pressure port in the variable motor. Charge pressure can be obtained from the charge pressure gauge ports on the motor or pump. (Refer to the *Sundstrand Engineering Application Manual* for the location of these ports.) Should the charge pressure be obtained from the variable motor, it is important to note that the charge pressure is available only when the system pressure is sufficient to shift the shuttle valve in the motor manifold.



"O" RING SIZE: 0.489" I. D., 0.070" CROSS SECTION

50-a

Figure 5—Cylinder and Pressure Port Locations (Viewed From Underside of Valve).

7. Connect input leads to the valve. Typical hookups are shown in Figures 6 and 7. A positive voltage on terminal "A" will open cylinder port #1 to produce flow out of port "A" of the pump.

An emergency stop switch is to be supplied and installed by the customer to remove machine power in the event of a valve or system malfunction. As the correct application of the stop switch will vary with the machine to which it is applied, the responsibility of supplying this function rests with the person, persons, or company applying the valve or system.

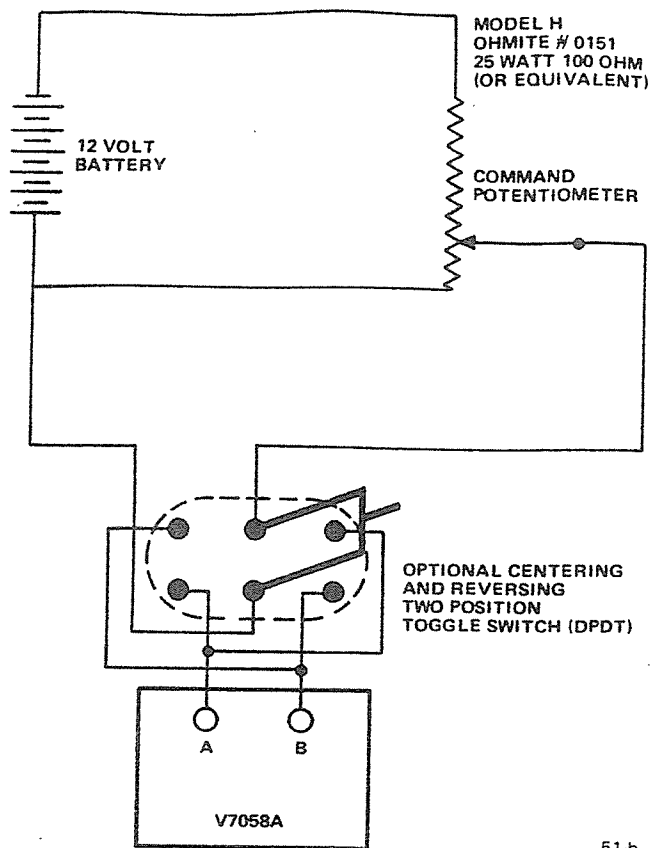


Figure 6—Typical Hookup for Unidirectional Control, 12-Volt Source.

51-b

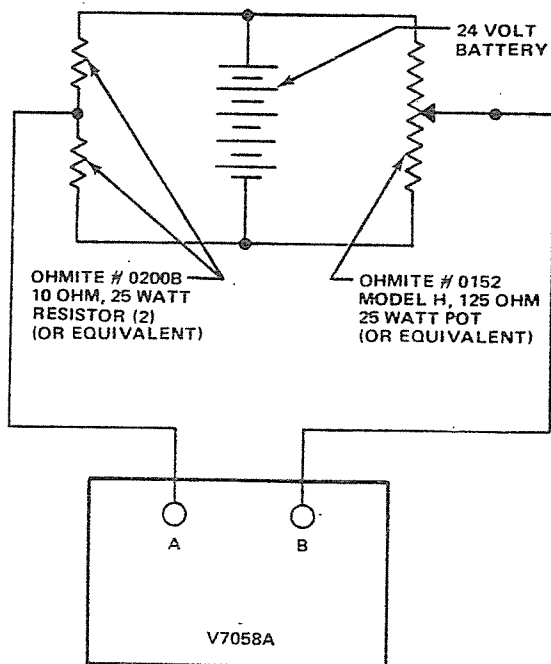


Figure 7—Typical Hookup for Bidirectional Control, 24-Volt System.

52-a

ADJUSTING

CENTERING THE PUMP—

Adjust centering by means of the *pump centering adjust bolt* provided (shown in Figures 2, 4, and 8). **DO NOT use the valve centering adjust for pump centering.** With the pump running, loosen the locknut and turn the pump centering adjust bolt clockwise until the output shaft of the transmission just starts rotating. If the output shaft of the transmission is already rotating and clockwise adjustment of the bolt increases the speed of the shaft, turn the bolt counterclockwise until the output shaft just starts rotating in the opposite direction. Mark or note the relative position of the pump centering adjust bolt, and turn the bolt in the opposite direction until the output shaft of the transmission just starts rotating in the opposite direction. Split the difference between the two points. The centering should now be adjusted.

CENTERING THE MOTOR—

To properly adjust the valve for motor operation, it is necessary to install a 250 psi pressure gauge in the C2 port of the valve. (The C2 port is farthest from the torque motor housing, and is shown in Figure 2.) Access is by means of a 1/16-27 NPT pipe tap; or, more convenient is a 1/8-27 NPT pipe tap available on the Sundstrand housing directly below the side of the V7058A Valve. The function of the pressure gauge is to determine when the swashplate is against the stops, and held in position.

The *valve centering adjust screw* is located on the torque motor housing (refer to Figure 8), and is sealed with ambroid. Break the seal to rotate the screw. To adjust the valve, rotate the valve centering adjust screw one turn clockwise. This should shift the null of the valve so that the swashplate will move to approximately the 18° position. The pressure gauge will read near the case pressure (from 5 to 40 psi) as the valve spool is displaced, until such time as the swashplate hits the 18° stop. At that time, the gauge pressure will rise to approximately charge pressure (150 psi). Continue turning the adjust screw clockwise until charge pressure is attained in port C2. In no case should this adjusting screw be rotated more than two turns from its original position.

DO NOT attempt to adjust by means of the pump centering adjust bolt.

To check the valve adjustment, apply positive voltage to terminal "A" of the torque motor housing. As the voltage is increased, the swashplate will begin to move off the 18° stops at approximately 1.5 to 2 volts. The swashplate will hit the limiting 7° stop at approximately 7.5 volts.

TROUBLESHOOTING

When a system malfunction occurs, it is not always obvious which system component is causing a problem. The following guide is provided for assistance in determining which system component is responsible for the malfunction.

All tests should be performed with machine in neutral if possible. Specific parts of the valve are identified in Figure 8.

MOTOR WILL NOT OPERATE—

A few types of transmission failures appear to be valve failures because the motor will not run. In these cases, the shuttle or relief valve of the hydrostatic transmission motor may be stuck. Another symptom might be a lack of charge pressure in the pump. Check to see if these conditions exist before replacing the valve.

One cause of transmission failure may be a loss of electrical power, such as a broken leadwire. Check voltage across the valve terminals. If none exists, check wiring to the valve. If a voltmeter is not available, a small spark can usually be drawn at the valve terminal. **(Do not short to ground!)** With voltage at the valve terminals, a lead to the valve coil may be broken, or the coil may have an internally broken wire.

This type of failure may be checked with a volt-ohm-meter (VOM) by checking coil resistance. Be sure to disconnect the valve from the power leads. The ohmmeter should read approximately 33 ohms. If a VOM is not available, attach the +12 volt d-c lead to one of the valve terminals. Intermittent grounding of the other terminal through a leadwire should draw a spark, which indicates a good coil. It should be possible to hear the torque motor operate at 12 volts, dc (hits stop).

If the coil and power source check out correctly, the valve spool could be stuck or jammed. This problem could be the result of an uneven mounting surface, causing binding of the spool. Check by reducing the mounting bolt torque.

If spool cannot be freed by manual or electrical operation of the valve, or if coil is open, the valve must be replaced.

MOTOR ROTATES IN ONE DIRECTION ONLY—

Vary voltage to valve by varying the command potentiometer or other command source. Reverse polarity of excitation to valve terminals, and repeat polarity reversals. If valve does not respond, operate with manual operator if so equipped. If valve does not respond to manual operator, check flow to motor. The spool of the V7058A may be jammed.

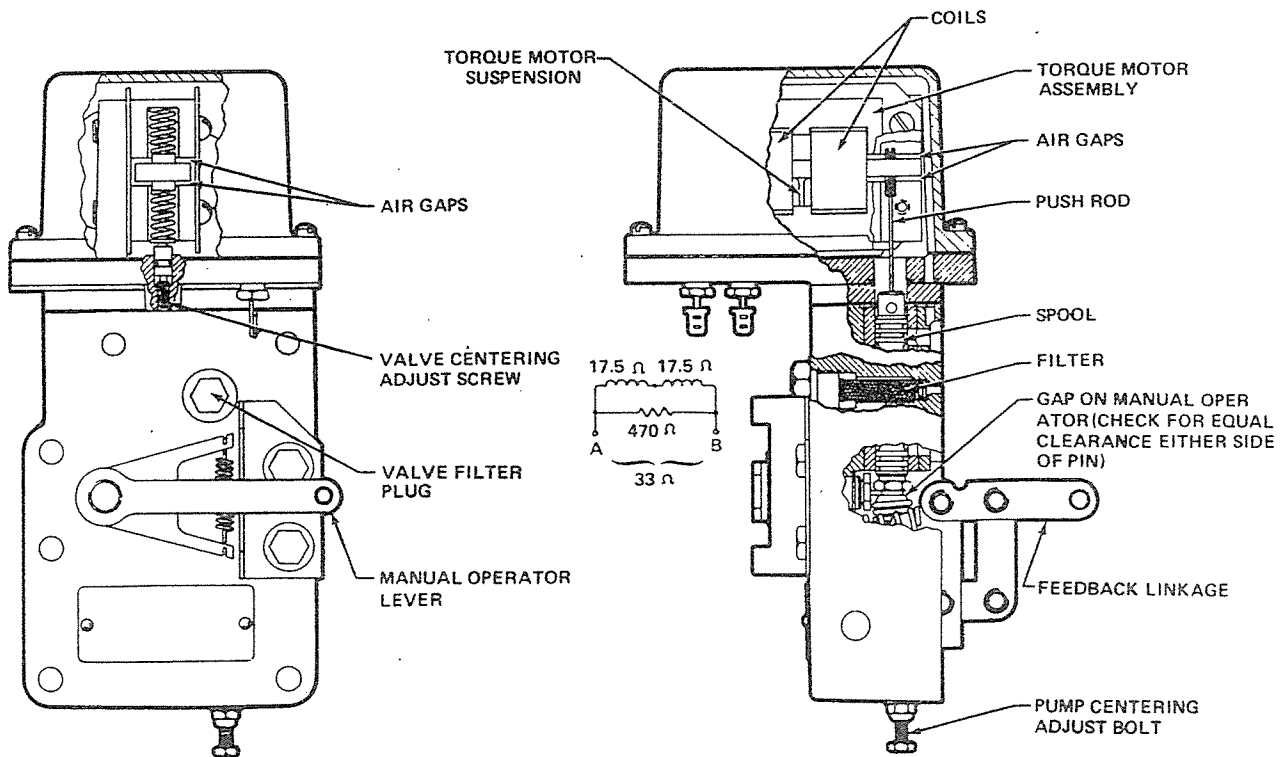


Figure 8—V7058A Cutaway View.

MOTOR RESPONDS SLOWLY TO CHANGES OF INPUT IN EITHER DIRECTION—

Remove the valve filter and check for cleanliness. If dirty, replace with a new filter (Kit No. 136567A). *Change system oil and replace the 10 micron system filter.* (The internal filter of the valve will not clog under normal operating conditions with a 10-micron filter in the system.)

Check the orifice to be sure that it is free of obstructions. If the orifice is clean and the valve continues to respond slowly, the air gaps may be clogged and the valve will require replacement. If these checks do not reveal the trouble source, the problem may be in the transmission.

MOTOR RUNS CONTINUOUSLY, AND TOGGLES TO OPPOSITE DIRECTION WHEN VOLTAGE IS APPLIED—

In this case, the motor may snap from one direction to the other when voltage is applied. Such a condition may be caused by a broken torque motor suspension or worn torque motor stops and will require replacement of the valve.

INCOMPLETE DRIVE IN ONE DIRECTION—

Check the valve centering adjust screw, spool, and valve linkage to see that each is properly adjusted, allowing equal travel in both directions. Also check to be sure that the proper valve and/or linkages are being used.

TRANSMISSION CANNOT BE CONTROLLED—

A broken pushrod can cause the valve to function as though the command source was inoperative. The pushrod may be checked by moving the manual operator and observing spool movement. If the spool moves back and forth freely, and does not appear to be restrained or centered by the torque motor, then the pushrod is broken. If operation of the valve is jerky and unpredictable, check to see that the manual operator has clearance to the spool and is centered in the gap. Also examine the feedback linkage between valve and transmission, making sure it is not bent or binding. Linkage can be replaced if bent. Replace valve if one of the other problems is found.

MOTOR CREEPS IN EITHER DIRECTION; VALVE CENTERING DIFFICULT—

If the valve is not easily centered for full stop after operating in both directions, the spool may have worn porting edges and will require replacement. Dirty oil will cause abnormally rapid wear. A 10-micron filter or better is recommended for system filtration.

ORDERING INFORMATION

SPECIFY—

1. Model number (V7058A).
2. Pump or motor series number.
3. Accessories needed.

ORDER FROM—

1. Your usual source, or
2. Honeywell
1885 Douglas Drive North
Minneapolis, Minnesota 55422
(In Canada—Honeywell Controls Limited
740 Ellesmere Road
Scarborough, Ontario).
International sales and service offices
in all principal cities of the world.

ACCESSORIES AVAILABLE—

1. Valve filter replacement kit. Order Part No. 136567A.
2. Linkage assemblies. For valves obtained without a feedback linkage assembly, order the corresponding linkage according to the pump or motor series number from Table B.

TABLE B
VALVE—LINKAGE ASSEMBLIES

| Sundstrand Pump or Motor Series Number | Linkage Assembly Number |
|--|-------------------------|
| 20 | 7617ADB |
| 21, 22 | 7617ADC |
| 23 | 7617ADD |
| 24 | 7617ADE |
| 25, 26 | 7617ADF |
| 27 | 7617ADG |

3. Junction box, part number 24400006-001, provides a means of connecting electrical conduit to the valve for wiring protection as well as code regulations.

DEVICE REPAIR

For devices in need of repair, attach tag to device describing malfunction and any other pertinent information. Return to—

Honeywell, Mobile Controls Center
Return Goods Department
Columbia Heights Plant
550 39th Avenue N.E.
Minneapolis, Minnesota 55421

REXROTH
Bethlehem, Pa. 18018
215/865-6110

Direct Oper. Pressure Relief Valve Type DBD

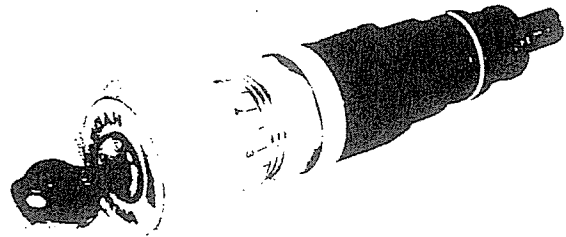
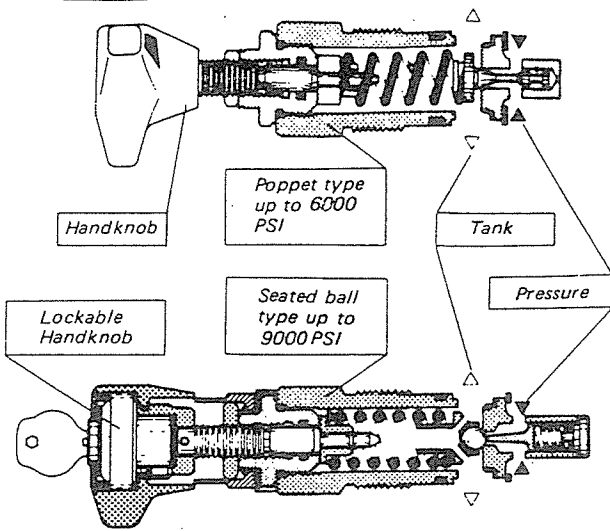
Size 6 (1/4") up to 30 (1 1/2") up to 9000 PSI up to 87 GPM

RA
25400

Description

Cartridge Type
Set Screw, Handknob or Handwheel Adjustment

Issue: 4.74



The DBD pressure relief valves are directly operated. They are available in 7 pressure ranges, variable up to 375, 750, 1500, 3000, 4500, 6000 and 9000 PSI.

Pressure adjustment can be performed by a set screw (with protective cap), a handknob, or a lockable handknob (with scale for repeat settings).

The DBD pressure relief valves are designed as cartridge inserts, subplate or manifold mounted units and as valves with threaded connections.

Ordering Code

(subplate and mounting screws to be ordered separately)

MODEL NUMBER

DBD

10/ / 5* *

Set Screw with Protective Cap = S
Handwheel = H
Lockable Handwheel with calibrated scale = A
(Sizes 6, 8, 10 only)

Adjustment

Options

Further details to be added in clear text

| | Size 10 (1 1/2") | Size 6 up to 20 (1/4" up to 1") | Size 25 and 30 (1 1/4" a. 1 1/2") |
|-------|------------------|---------------------------------|-----------------------------------|
| 25 = | 375 PSI | 375 PSI | 375 PSI |
| 50 = | 750 PSI | 750 PSI | 750 PSI |
| 100 = | 1500 PSI | 1500 PSI | 1500 PSI |
| 200 = | 3000 PSI | 3000 PSI | 3000 PSI |
| 315 = | 4500 PSI | 4500 PSI | 4500 PSI |
| 400 = | 6000 PSI | 6000 PSI | |
| 630 = | 9000 PSI | | (max. pressure setting) |

(Specified by factory)
Series

10 = Series 10 (10 to 19 ≅ Installation and Port Dimensions remain the same)

| Pipe Connections | G | K | P |
|------------------|----|----|----|
| 1/4" (NPT) ≅ | 6 | 6 | 6 |
| 3/8" (NPT) ≅ | 8 | - | - |
| 1/2" (NPT) ≅ | 10 | 10 | 10 |
| 3/4" (NPT) ≅ | 15 | - | - |
| 1" (NPT) ≅ | 20 | 20 | 20 |
| 1 1/4" (NPT) ≅ | 25 | - | - |
| 1 1/2" (NPT) ≅ | 30 | 30 | 30 |

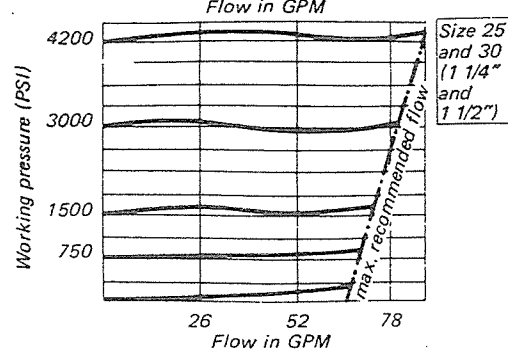
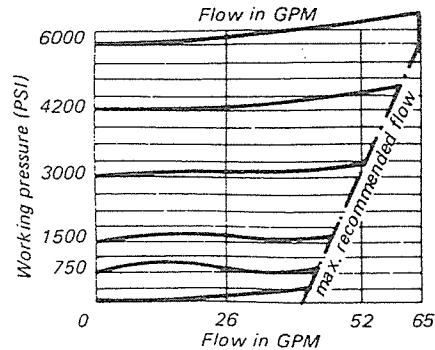
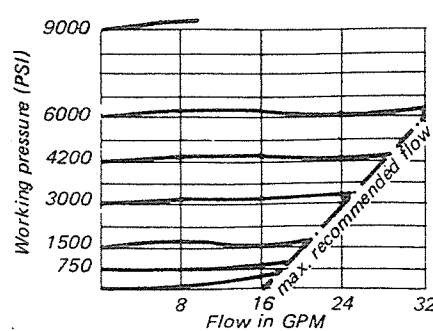
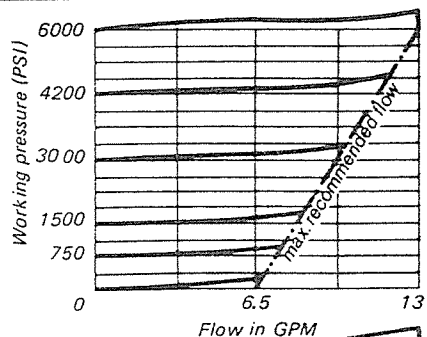
Size

Connection Method

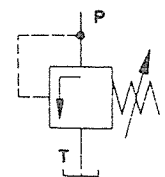
K = Cartridge Type
G = Threaded Connections
P = Subplate Mounting

*Omit on "K" (cartridge type) unless ordered with UNF threads (see note on page 2)

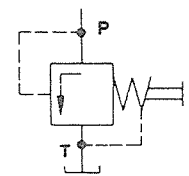
Performance Curves



Symbols



Simplified



Detailed

Technical Data

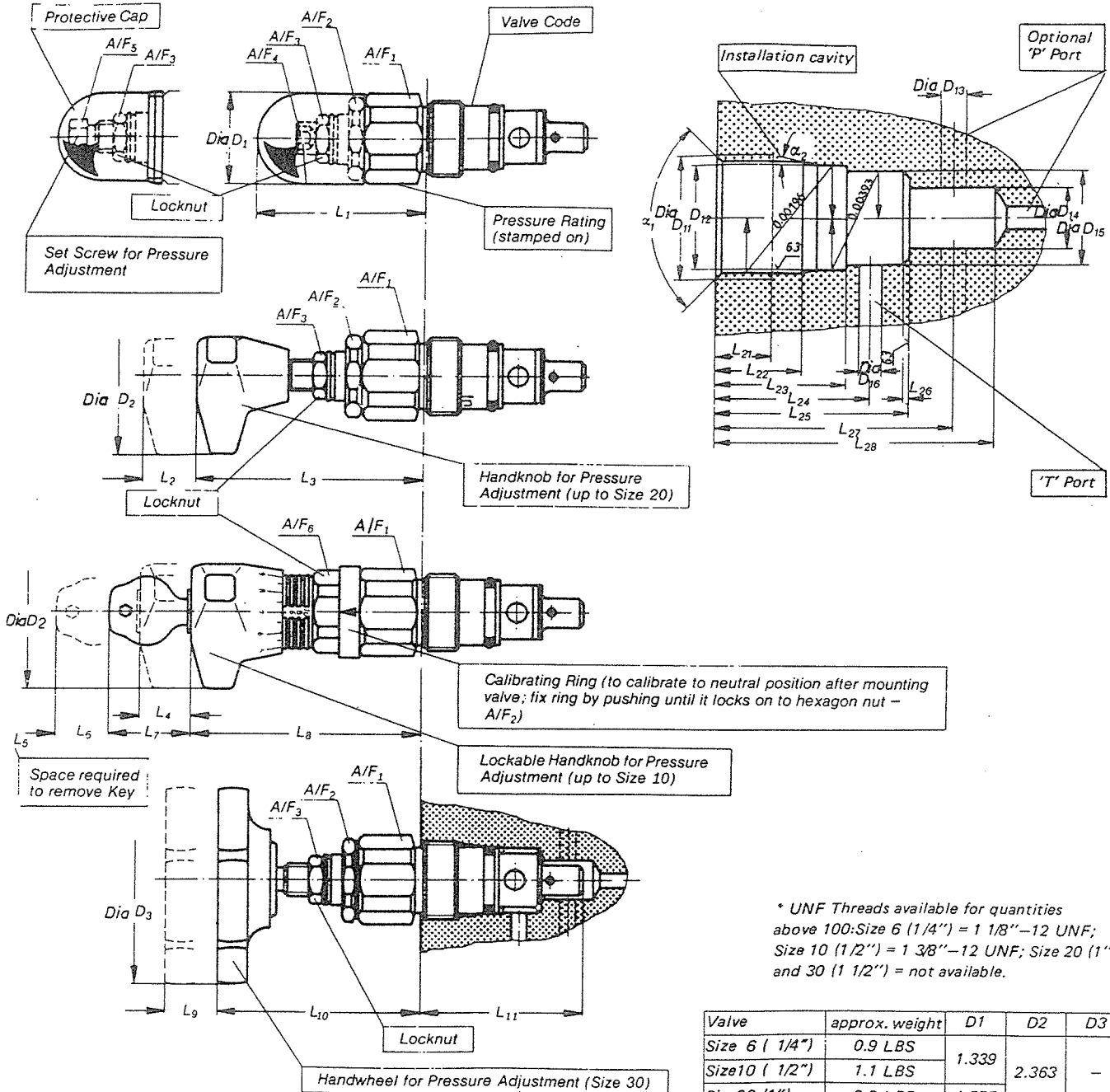
| | |
|-------------------------|-------------------|
| Design | Poppet Valve Type |
| Hydraulic Medium | Mineral Oil |
| Fluid Temperature Range | -4.0 to +160°F |

| | | | |
|-----------------------|----------------|---------------------------|------------------|
| Viscosity Range | 35 to 1750 SSU | | |
| Max. Working Pressure | Size 10 (1/2") | Size 6 to 20 (1/4" to 1") | Size 30 (1 1/2") |
| | 9000 PSI | 6000 PSI | 4500 PSI |
| - inlet side | | | |
| - outlet side | to 4500 PSI | | |

For applications to other specifications please consult us

Unit Dimensions (in inches)

Cartridge type (K)

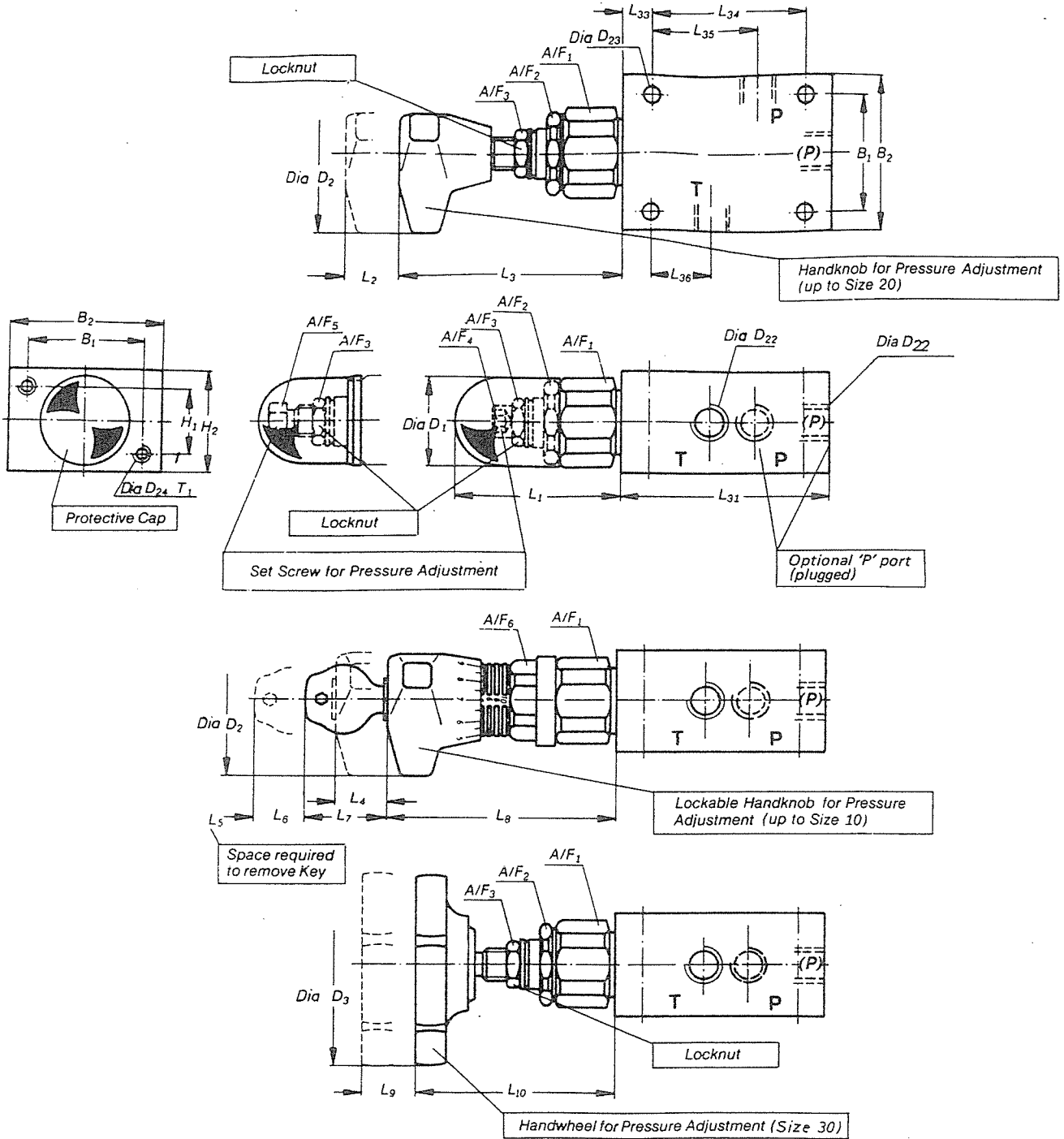


* UNF Threads available for quantities above 100: Size 6 (1/4") = 1 1/8"-12 UNF; Size 10 (1/2") = 1 3/8"-12 UNF; Size 20 (1") and 30 (1 1/2") = not available.

| Valve | approx. weight | D1 | D2 | D3 |
|------------------|----------------|-------|-------|-------|
| Size 6 (1/4") | 0.9 LBS | 1.339 | 2.363 | - |
| Size 10 (1/2") | 1.1 LBS | | | |
| Size 20 (1") | 2.2 LBS | 1.575 | | |
| Size 30 (1 1/2") | 4.8 LBS | 1.969 | - | 3.150 |

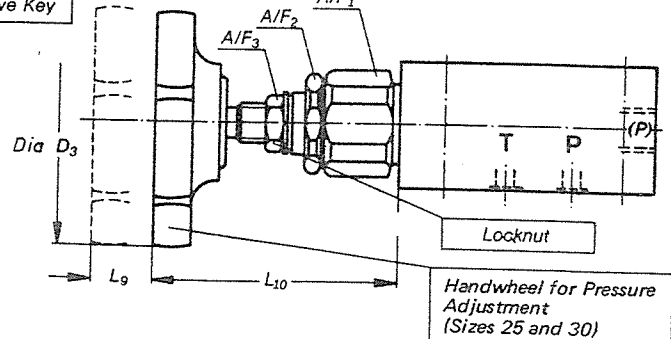
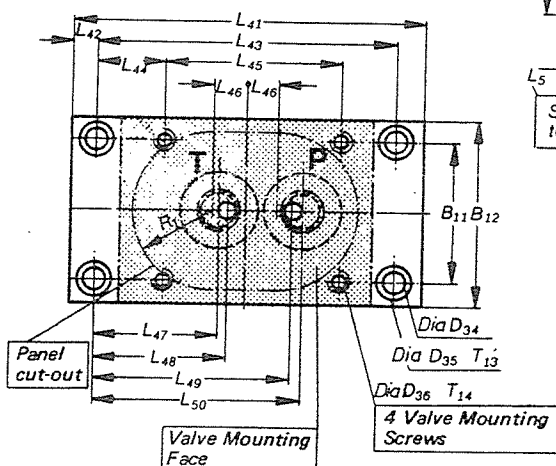
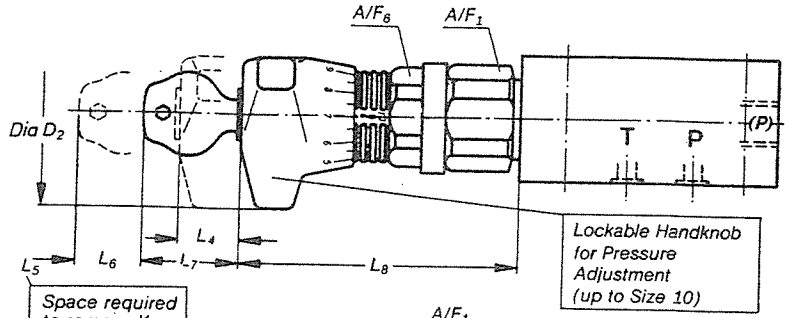
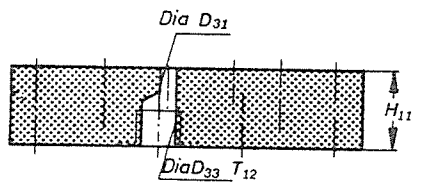
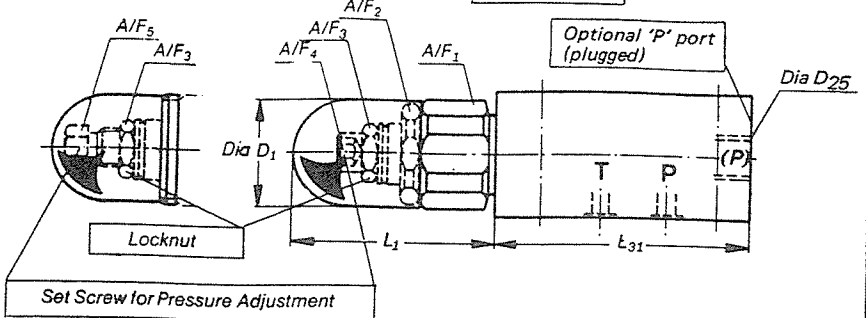
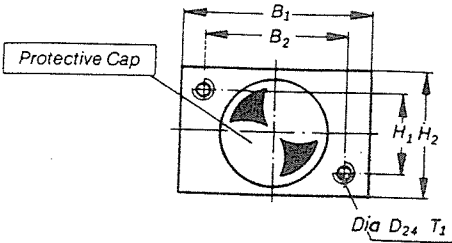
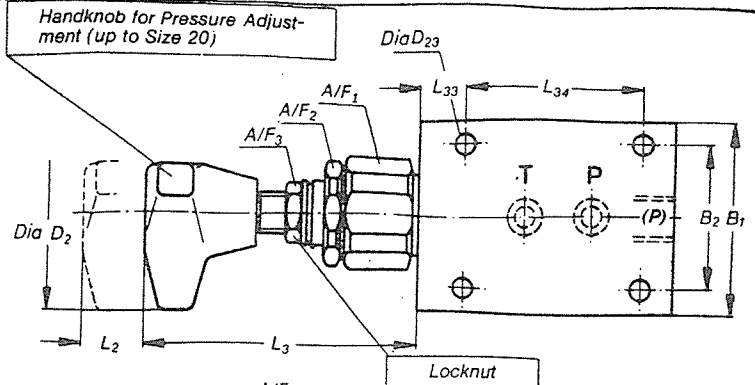
| Valve | L1 | L2 | L3 | L4 | L5 | L6 | L7 | L8 | L9 | L10 | L11 | A/F1 | Tight. Torque | A/F2 | A/F3 | A/F4 | A/F5 | A/F6 |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------------|-------|-------|-------|-------|-------|
| Size 6 (1/4") | 2.835 | | 3.701 | 0.433 | 0.785 | 0.433 | 1.181 | 3.701 | | | 2.520 | 1.260 | 87 ft-lb | 1.181 | | | | 1.181 |
| Size 10 (1/2") | 2.678 | 0.433 | 3.544 | | | | | 3.544 | - | - | 2.953 | 1.418 | 102 ft-lb | | 0.748 | 0.237 | - | |
| Size 20 (1") | 2.560 | | 3.465 | | | | | | | | 4.174 | 1.811 | 124 ft-lb | 1.418 | | | | |
| Size 30 (1 1/2") | 3.268 | | | | | | | | 0.433 | 2.638 | 5.158 | 2.363 | 145 ft-lb | 1.811 | | - | 0.519 | |

| Installation cavity | D11* | D12 | D13 | D14 | D15 | D16 | L21 | L22 | L23 | L24 | L25 | L26 | L27 | L8 | 1 | 2 |
|---------------------|------------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|-------------|-------|----|----|
| Size 6 (1/4") | M 28 x 1.5 | 0.98629 0.98425 | 0.237 | 0.591 | 0.981 | 0.237 | 0.591 | 0.748 | 1.181 | 1.378 | 1.772 | 0.020 x 45° | 2.225±0.217 | 2.560 | 90 | 15 |
| Size 10 (1/2") | M 35 x 1.5 | 1.26228 1.25984 | 0.394 | 0.729 | 1.256 | 0.394 | 0.709 | 0.906 | 1.378 | 1.614 | 2.048 | | 2.658±0.296 | 3.150 | | |
| Size 20 (1") | M 45 x 1.5 | 1.57724 1.57440 | 0.789 | 0.945 | 1.571 | 0.788 | 0.827 | 1.063 | 1.772 | 2.126 | 2.756 | | 3.603±0.335 | 4.331 | | |
| Size 30 (1 1/2") | M 60 x 2 | 2.16826 2.16533 | 1.181 | 1.526 | 2.162 | 1.181 | 0.906 | 1.142 | | 2.362 | 3.307 | | 4.469±0.453 | 5.512 | | |



| Valve | appr. Weight | B1 | B2 | D1 | D2 | D3 | D22 | D23 | D24 | H1 | H2 | L1 | L2 | L3 | L4 | L5 | | |
|-------------------------------|--------------|-------|-------|------------------|-------|-------|----------------------|-------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Size 6(1/4") | 3.3 LBS | 1.772 | 2.363 | 1.339 | 2.363 | - | 1/4"NPT | 0.260 | 1/4"-20/NC | 0.985 | 1.575 | 2.835 | 0.433 | 3.701 | 0.433 | 0.785 | | |
| Size 8(3/8") a. 10(1/2") | 8.2 LBS | 2.363 | 3.150 | [3/8"NPT]1/2"NPT | | | 0.355 | 5/16"-18/NC | 1.575 | 2.362 | 2.677 | 3.544 | | | | | | |
| Size 15(3/4") a. 20(1") | 14.1 LBS | 2.756 | 3.937 | 1.575 | | | [3/4"NPT]1"NPT | 1.969 | 2.756 | 2.560 | 3.465 | | | | | | | |
| Size 25(1 1/4") a. 30(1 1/2") | 30.6 LBS | 3.937 | 5.118 | 1.969 | - | 3.150 | (1 1/4"NPT)1 1/2"NPT | 0.433 | 3/8"-16/NC | 2.362 | 3.543 | 3.268 | - | - | - | - | | |
| Valve | L6 | L7 | L8 | L9 | L10 | L31 | L32 | L33 | L34 | L35 | L36 | A/F1 | A/F2 | A/F3 | A/F4 | A/F5 | A/F6 | T1 |
| Size 6(1/4") | 0.433 | 1.181 | 3.701 | - | - | 3.150 | - | 0.591 | 2.166 | 1.596 | 1.378 | 1.260 | 1.181 | 0.748 | 0.236 | - | 1.181 | 0.394 |
| Size 8(3/8") a. 10(1/2") | | | 3.544 | | | 3.937 | | 0.788 | 2.756 | 1.930 | 0.866 | 1.418 | | | | | | 0.785 |
| Size 15(3/4") a. 20(1") | | - | - | 5.350 | 3.937 | 2.560 | 1.339 | 1.811 | 1.418 | - | - | - | 0.785 | | | | | |
| Size 25(1 1/4") a. 30(1 1/2") | | - | 0.433 | 2.634 | 7.087 | 0.985 | 5.118 | 3.347 | 1.378 | 2.362 | 1.811 | - | 0.512 | | | | | 0.985 |

| Valve mounting screws | Tight Torque |
|-----------------------------|--------------|
| Size 6 (1/4") 1/4"-20 NC | 7.3 (ft-lb) |
| Size 10 (1/2") 5/16"-18 NC | 18.2 (ft-lb) |
| Size 20 (1") 5/16"-18 NC | 36.4 (ft-lb) |
| Size 30 (1 1/2") 3/8"-16 NC | |



| Valve | appr. Weight | B1 | B2 | D1 | D2 | D3 | D23 | D24 | H1 | H2 | L1 | L2 | L3 | L4 | L5 | L6 | L7 | L8 | |
|----------------|--------------|-------|-------|-------|-------|-------|-------|-------------|-------|-------|-------|-------|-------|-------|-------|----|-------|-------|---|
| Size 6 (1/4") | 3.3 LBS | 2.363 | 1.772 | 1.339 | 2.363 | - | 0.260 | 1/4"-20/NC | 0.985 | 1.575 | 2.835 | - | 3.701 | - | - | - | - | - | - |
| Size 8 (3/8") | 8.2 LBS | 3.150 | 2.363 | - | - | - | 0.355 | 5/16"-18/NC | 1.575 | 2.362 | 2.677 | 0.433 | 3.544 | 0.433 | 0.785 | - | 1.181 | 3.701 | |
| Size 10 (1/2") | 14.1 LBS | 3.937 | 2.756 | 1.575 | - | - | 1.969 | 2.756 | 2.560 | - | - | - | 3.465 | - | 0.433 | - | - | 3.544 | |
| Size 20 (1") | 30.6 LBS | 5.118 | 3.937 | 1.969 | - | 3.150 | 0.433 | 3/8"-16/NC | 2.362 | 3.543 | 3.268 | - | - | - | - | - | - | - | |

| L9 | L10 | L31 | D25 | L33 | L34 | A/F1 | A/F2 | A/F3 | A/F4 | A/F5 | A/F6 | T1 |
|-------|-------|-------|----------|-------|-------|-------|-------|-------|-------|------|-------|-------|
| - | - | 3.150 | 1/4" NPT | 0.591 | 2.166 | 1.260 | 1.181 | - | 0.236 | - | 1.181 | 0.394 |
| - | - | 3.937 | 3/8" NPT | 0.788 | 2.756 | 1.418 | - | 0.748 | - | - | - | 0.785 |
| - | - | 5.360 | 1/2" NPT | - | 3.937 | 1.811 | 1.418 | - | - | - | - | 0.985 |
| 0.433 | 2.634 | 7.087 | 3/4" NPT | 0.985 | 5.118 | 2.362 | 1.811 | - | 0.512 | - | - | 0.985 |

| Subplate | Type | appr. Weight | B11 | B12 | D31 |
|------------------|---------|--------------|-------|-------|-------|
| Size 6 (1/4") | G 300/5 | 3.3 LBS | 1.771 | 2.362 | 0.237 |
| Size 10 (1/2") | G 302/5 | 4.4 LBS | 2.362 | 3.150 | 0.394 |
| Size 20 (1") | G 304/5 | 12.1 LBS | 2.756 | 3.937 | 0.788 |
| Size 30 (1 1/2") | G 306/5 | 17.6 LBS | 3.937 | 5.118 | 1.181 |

| D33 | D34 | D35 | D 36(NC) | H11 | L41 | L42 | L43 | L44 | L45 | L46 | L47 | L48 | L49 | L50 | T12 | T13 | T14 | R1 |
|------------|-------|-------|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| 1/4" NPT | 0.276 | 0.433 | 1/4"-20 | 0.985 | 4.331 | 0.315 | 3.701 | 0.866 | 2.166 | 0.394 | 1.536 | 1.654 | 2.441 | 2.560 | 0.591 | 0.355 | 0.591 | 0.273 |
| 1/2" NPT | - | - | 5/16"-18 | 1.575 | 5.315 | 0.394 | 4.528 | 1.083 | 2.756 | - | 1.595 | 1.910 | 2.855 | 3.170 | 0.630 | 0.355 | 0.591 | 0.0985 |
| 1" NPT | 0.453 | 0.689 | 3/8"-16 | 1.575 | 6.693 | 0.591 | 5.512 | 0.785 | 3.937 | 0.788 | 1.654 | 2.126 | 3.347 | 3.819 | 0.788 | 0.512 | 0.866 | 1.575 |
| 1 1/2" NPT | - | - | - | - | 7.481 | 0.492 | 6.230 | 0.689 | 5.118 | 0.886 | 1.654 | 2.067 | 4.036 | 4.607 | 0.945 | 0.453 | 0.866 | 2.166 |

THE REXROTH CORPORATION/BETHLEHEM, PA. 18018
2315 City Line Road, L. V. I. P.

Telex: 84-7498

Phone: 215/865-6110



Bethlehem, Pa. 18018
215/865-6110

4/3-, 4/2- and 3/2-Way Directional Control Valves Type WE10

Size 10 (1/2")

up to 4500 PSI

**RA
23 299**

Description

Direct Solenoid Operated Valve and Subplate

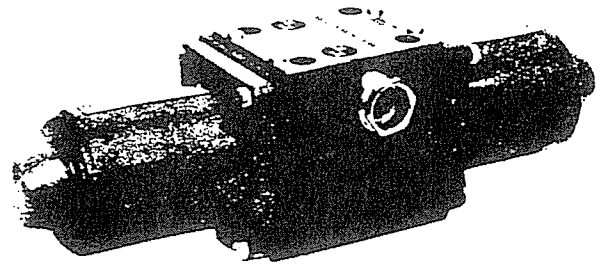
Issue: 6.74

Model with Air Gap DC Solenoids

The main spool is spring returned to the center or end positions (except impulse valve). Spool operation is by means of air gap solenoids. Manual override button allows operation of the spool without solenoid energization.

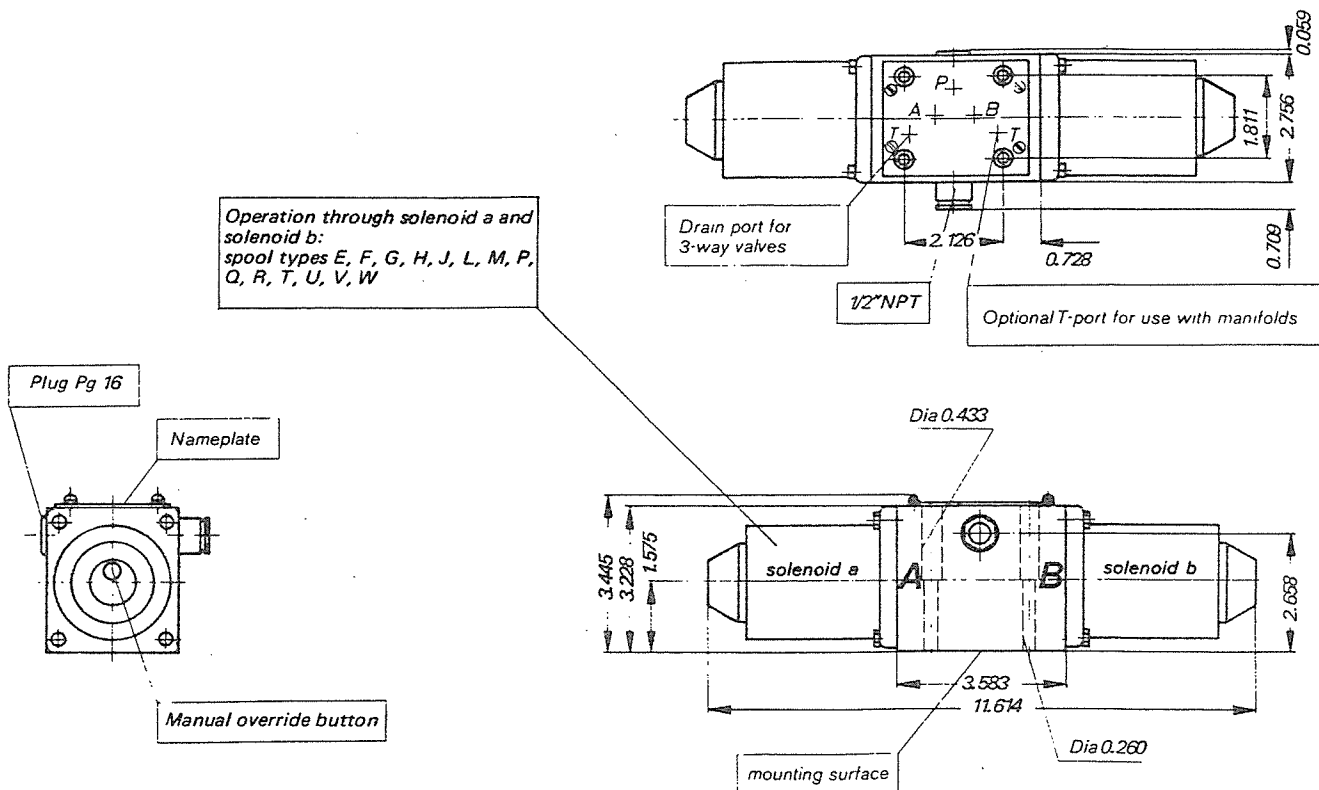
The air gap solenoid is of simple design, and fully encapsulated.

The DC model is extremely reliable, gives smooth operation and is suitable for high shifting frequencies. It is not affected by voltage fluctuations in either direction.



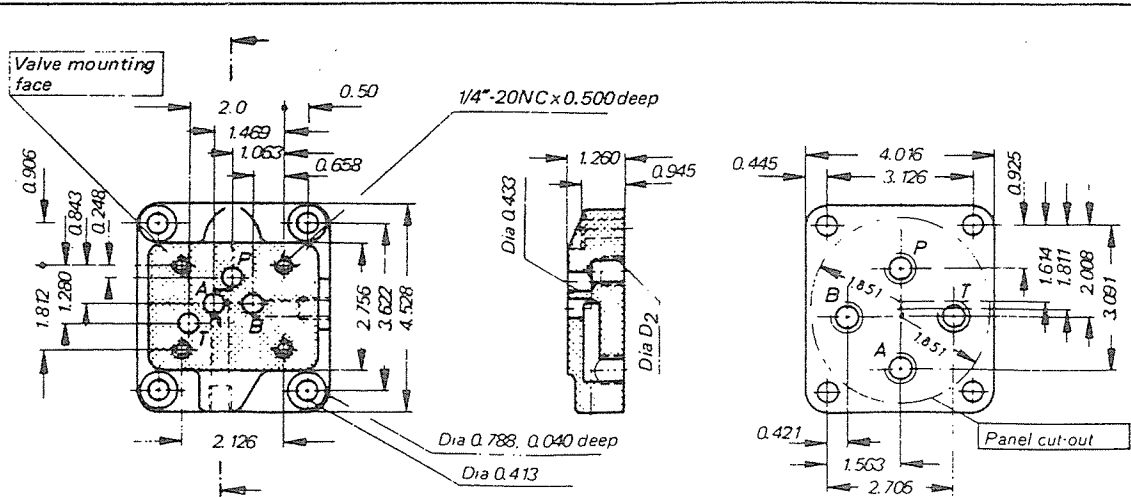
Pictured is valve with cable connection

Unit Dimensions: 3-position valve (Dimensions in inches)

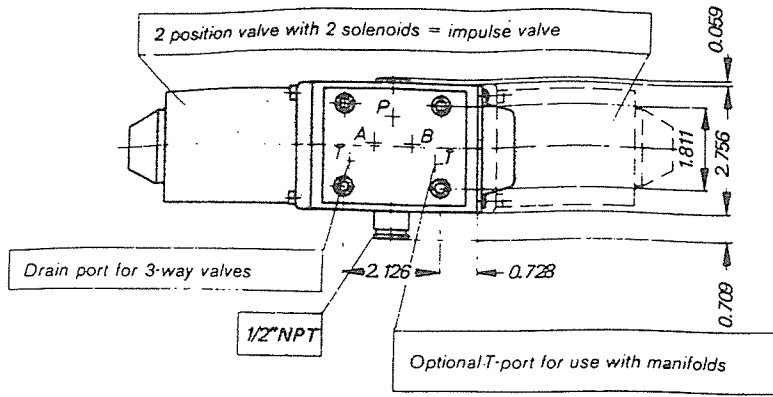


Unit Dimensions: Subplate (Dimensions in inches)

| Subplate Type | D ₂ |
|---------------------------------|----------------|
| G 89/5 | 1/4" NPT |
| G 66/5 | 3/8" NPT |
| G 67/5 | 1/2" NPT |
| Weight: 5 LBS | |
| Mounting screws 1/4"-20NC x 2" | |
| Tightening torque Md = 13 ft-lb | |



Unit Dimensions: 2-position valve (Dimensions in inches)

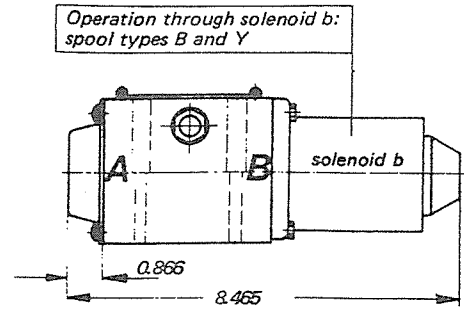
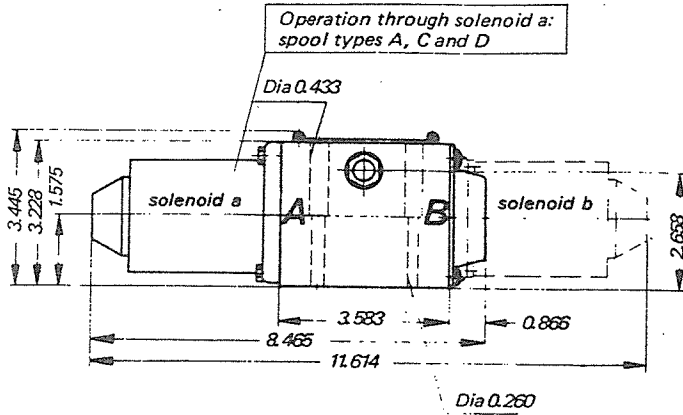


Terminal connections for central connection:

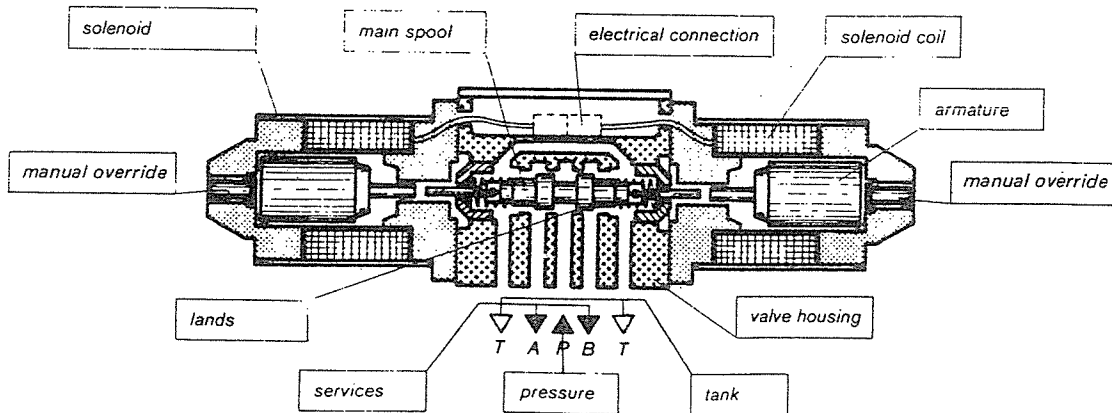
with 2 solenoids:
Solenoid a to terminals 1 and 2
Solenoid b to terminals 3 and 4
Ground to terminal 5

with 1 solenoid:
Solenoid always to terminals 1 and 2
Ground to terminal 5

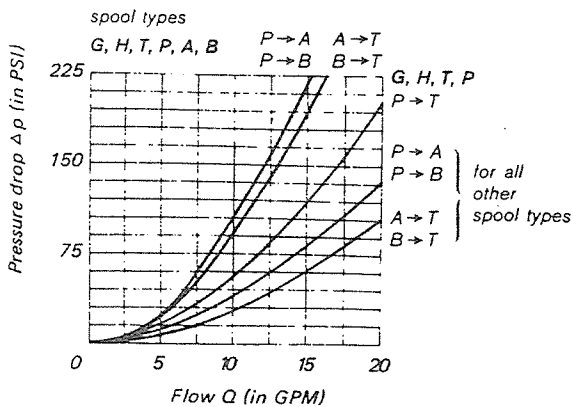
Operation through solenoid a and solenoid b:
spool types C .../O, D .../O, C .../OF and D .../OF



Sectional Diagram



Performance Data (pressure drop Δp related to flow Q at 172 SSU)



Due to tilting the function of the valves is dependent on the filtration. In order to obtain the maximum flow values shown, main flow filtration of 25 μ m is recommended. The internal flow forces in the valve also affect the flow, and therefore the flow details shown for 4-way valves apply for normal application with two flow directions (e.g. from P to A and simultaneously return flow from B to T). (See table).

If there is only one flow direction, e.g. when a 4-way valve with port A or B plugged is used as a 3-way valve, in extreme cases the maximum flow could be considerably lower.

| Flow (GPM) for spool types | Max. Performance Data at pressure (PSI) of | | | | |
|-------------------------------|---|------|------|------|------|
| | 750 | 1500 | 3000 | 3750 | 4500 |
| E, C/O, D/O | 21 | 21 | 19.8 | 15.8 | 15.8 |
| J, H, M, C, L, Q, W, U, V | 21 | 21 | 19.8 | 13.2 | 11.9 |
| G, D, R, F, Y, P, T | 19.8 | 18.5 | 15.8 | 13.2 | 11.9 |
| A, B | 13.2 | 11.9 | 9.3 | 7.9 | 6.6 |

Model Number

WE 10

4.0/

3 service ports = 3
4 service ports = 4

Options Further details to be added in clear text

| Symbol with spool crossover position | Valve Symbol (spool type) |
|--------------------------------------|---------------------------|
| | |
| | = A |
| | = C |
| | = D |
| | = B |
| | = Y |
| | b.../O |
| | b.../OF |
| | = C.../.. |
| | = D.../.. |
| | |
| | = E |
| | = F |
| | = G |
| | = H |
| | = J |
| | = L |
| | = M |
| | = P |
| | = Q |
| | = R |
| | = T |
| | = U |
| | = V |
| | = W |

With 3-way-valves port T must be used as drain port when operating pressure exceeds 2100 PSI.

seals no desig. = Buna-N seals
V = Viton seals

Electrical connections (see page 4)

| | | |
|--------------------|--|--|
| no desig. = nation | | side cable entry |
| D | | top cable entry |
| L | | with indicator light(s) side cable entry |
| Z | | side plug-in connector |
| DL | | with indicator light(s) top cable entry |
| DZ | | top plug-in connector |
| ZL | | side plug-in connector with indicator light(s) |
| DZL | | top plug-in connector with indicator light(s) |

N = with manual override
no designation = without man. override

G 24 = 24 V DC
(see technical data for further voltages)

W 22CR* = DC solenoid with built-in rectifier for 220 V AC **

W 110R* = DC solenoid with built-in rectifier for 110 V AC **

* for single connection with Z 1(L), Z 2(L), Z 5 only
** independent of frequency

Solenoid details

O = without spring return
OF = without spring return, with detent

Spool positioning

(2 position valves and 2 solenoids only)

4.0 = Series 4.0
(4.0 to 4.9 = installation and connection dimensions remain the same)

Design no. (specified by factory)

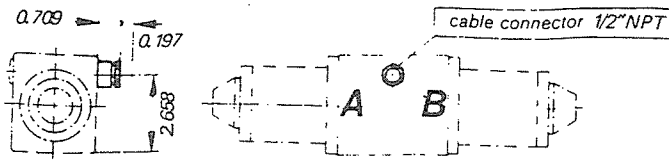
Technical Data

| | | |
|---------------------------------------|--|-----------------------|
| Weight (valve) | with 2solenoids 13LBS; with 1solenoid 9.7LBS | |
| Hydraulic medium | Mineral oil | |
| Fluid temperature range | -20 to +160°F | |
| Viscosity range | 35 to 1750 SSU | |
| Max operating pressure | Ports | |
| | A · B · P | T |
| Throttling section in center position | spool type W | spool type O |
| | 3" of nominal section | 6" of nominal section |
| DC voltage | 12 V, 24 V, 42 V, 60 V, 110 V, 180 V, 195 V, 220 V | |

| | |
|--------------------------|-------------|
| Power requirement | 43W |
| Duty cycle | 100% |
| Response time (on) | 60 ms |
| Response time (off) | 40 ms |
| Max. ambient temperature | +120°F |
| Max. coil temperature | +300°F |
| Max. shifting frequency | 15 000/hour |
| Insulation | IP 65 |

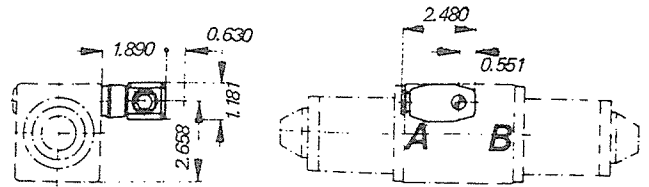
No Designation

Central connection on tank connection side



Z

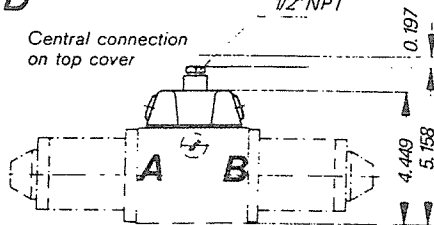
Central connection with plug-in connector on tank connection side



D

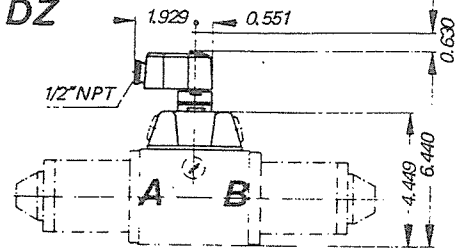
Central connection on top cover

1/2" NPT



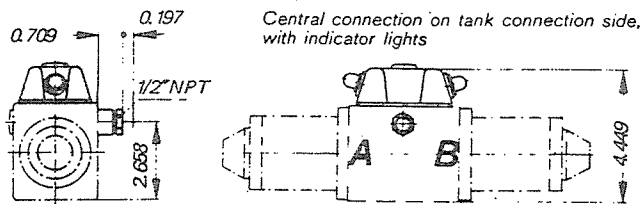
DZ

Central connection with plug-in connector on top cover with 1/2" NPT.



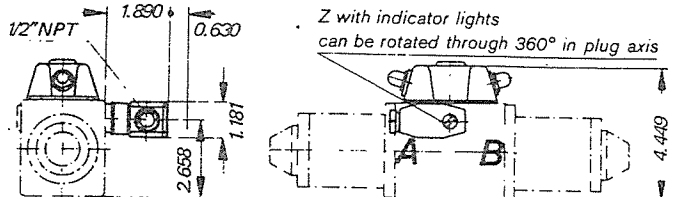
L

Central connection on tank connection side, with indicator lights



ZL

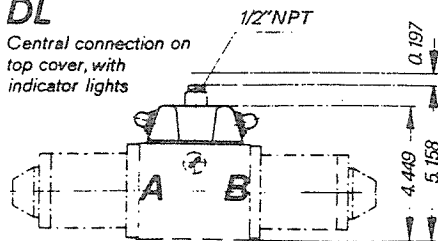
Z with indicator lights can be rotated through 360° in plug axis



DL

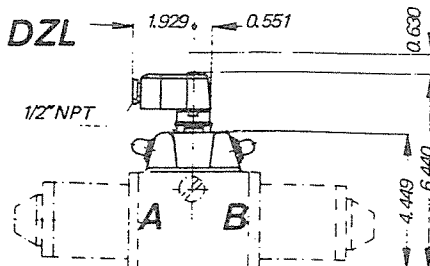
Central connection on top cover, with indicator lights

1/2" NPT



DZL

DZ with indicator lights



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THE REXROTH CORPORATION/BETHLEHEM, PA. 18018
2315 City Line Road, L. V. I. P.



REXROTH
Bethlehem, Pa. 18018
215/865-6110

Double Check Valve Type Z2S10

Size 10 (1/2")

up to 4500 PSI

RA
21551

Description

Manifold Block Type

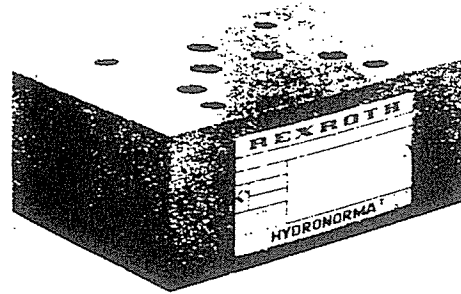
Issue: 6 .74

The double check valves type Z2S10 comprise two pilot operated check valves for two independent flows.

They are designed for use in conjunction with directional control valves and subplates of sizes 8(3/8") and 10(1/2")

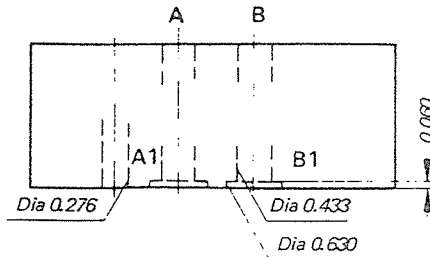
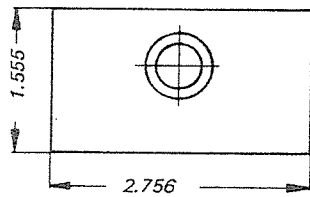
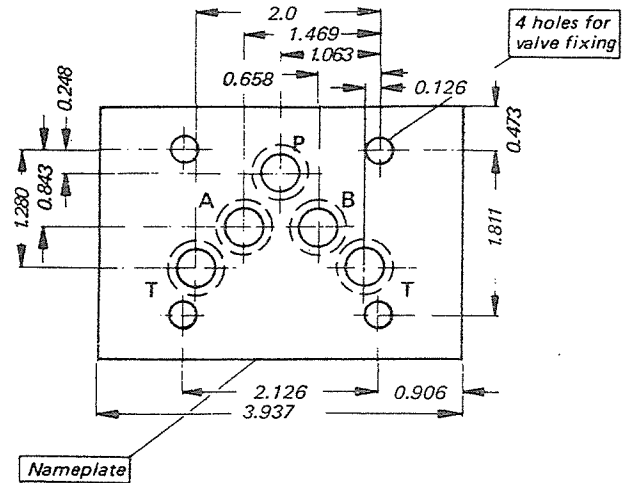
The hydraulic operation is effected internally from the pressurized opposite side in the flow direction A to A1. Free flow in the direction B1 to B is therefore given.

To ensure proper closure of both valve poppets, both user connections should be unloaded when the control valve is in the neutral position by connecting with the return line.



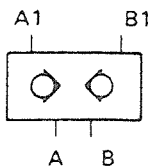
Unit Dimensions (in inches)

Weight: approx. 4.9 LBS

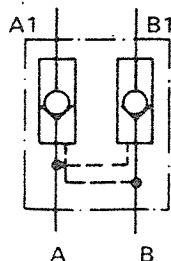


Symbols

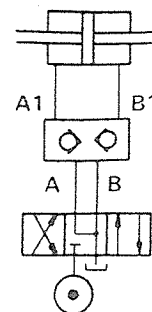
Example of Application



simplified



detailed



G

Ordering Code

Model Number

Z 2 S 10 - 1 . 2 / *

Size 10 (1/2") = 10

Size

Options

further details to be added in clear text

Series 1.2 = 1.2
(1.0 to 1.9 installation and correction dimensions remain the same)

(Specified by factory)

Series no.

Seal material

no designation = Buna-N
V = Viton

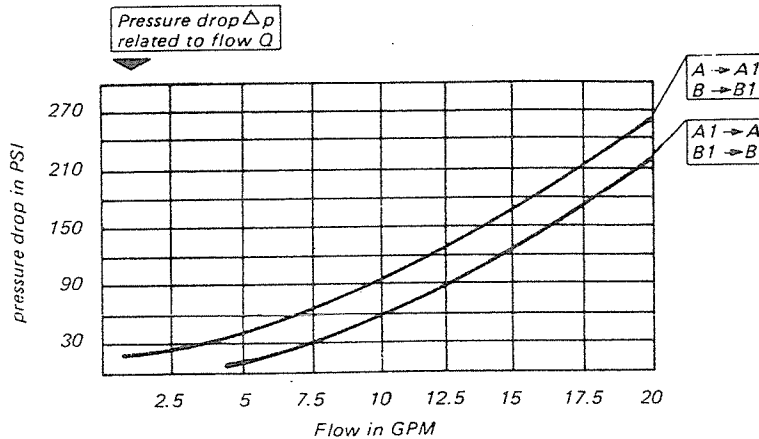
Technical Data

| | |
|-------------------------|---|
| Direction of flow | From A to A1 or B to B1 free flow over check valve; controlled flow from B1 to B or A1 to A |
| Hydraulic medium | Mineral oil |
| Fluid temperature range | -4 to +160°F |
| Viscosity range | 35 to 1750 SSU |

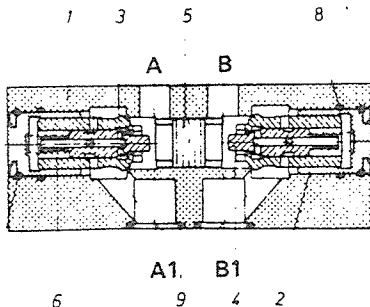
| | |
|--|--|
| Operating pressure range | up to 4500 PSI |
| Cracking pressure in free flow direction | 7 PSI |
| Area Ratio | Pilot Poppet = 1 Control Spool = 4.75 |

For applications to other specifications please consult us.

Performance Curves



Spares



| Item | Description | Part No. | Qty. |
|------|----------------------------------|----------|------|
| 1 | Housing | 120 509 | 1 |
| 2 | Cover | 120 502 | 2 |
| 3 | Main Poppet | 120 501 | 2 |
| 4 | Pilot Poppet | 120 500 | 2 |
| 5 | Spool | 107 927 | 1 |
| 6 | Spring | 007 194 | 2 |
| 7 | Retaining-Ring 18 mm | 003 896 | 2 |
| 8 | O-Ring 18 x 2.5 mm | 004 276 | 2 |
| 9 | O-Ring 12 x 2 mm | 004 255 | 5 |
| 10 | Nameplate (not illustrated) | 005 631 | 1 |
| 11 | Rivet 2 x 6 mm (not illustrated) | 005 106 | 2 |

Ordering Example: Type Z 2 S 10 - 1.2: (2) O-Ring 18 x 2.5 mm, Item 8, Part no. 004 276
(when ordering always state complete valve code)

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THE REXROTH CORPORATION/BETHLEHEM, PA. 18018

2315 City Line Road, L. V. I. P.

Telex: 84-7498

Phone: 215/865-6110

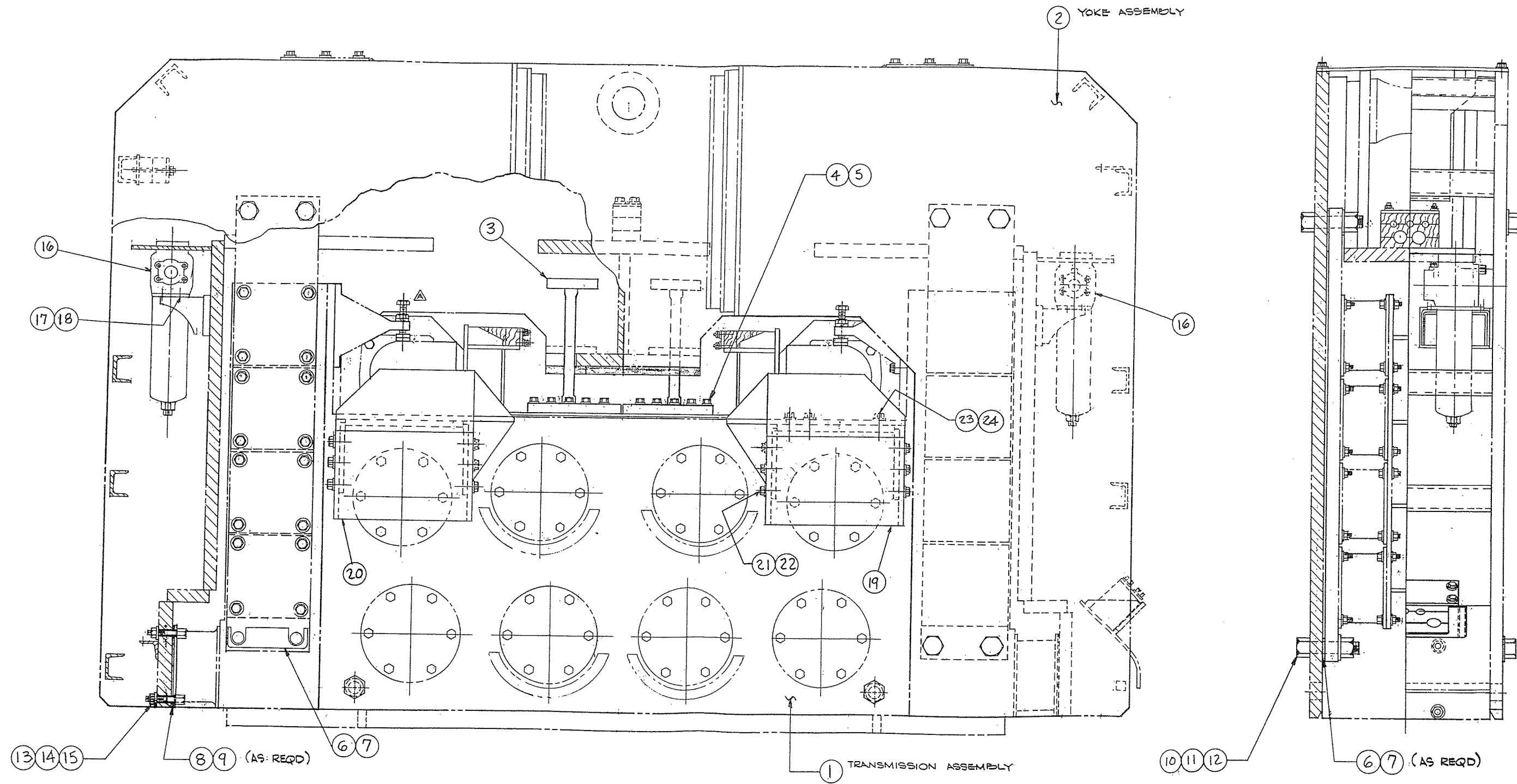
4000 VIBRO DRIVER

PARTS MANUAL

4000 VIBRO DRIVER

| | |
|----------------------------------|----------|
| GENERAL ARRANGEMENT - MECHANICAL | E-7D-459 |
| TRANSMISSION ASSEMBLY | E-7D-457 |
| YOKE ASSEMBLY | E-7D-458 |
| GENERAL ARRANGEMENT - HYDRAULIC | E-6D-634 |
| DRIVE PRESSURE LINE | E-6A-608 |
| RETURN PRESSURE LINE | E-6A-607 |
| CASE DRAIN LINE | E-6A-606 |
| A CLAMP CURCUIT | E-6A-612 |
| B CLAMP CURCUIT | E-6A-612 |

| | |
|------------|----------------------------|
| AD | ADAPTOR |
| AM STD | AMERICAN STANDARD |
| ASS 'Y | ASSEMBLY |
| BULKHD | BULKHEAD |
| ENCL | ENCLOSURE |
| EXT | EXTERNAL |
| FL | FLARE |
| FP | FEMALE PIPE THREAD |
| GR | GRADE |
| H.H.C.S. | HEX HEAD CAP SCREW |
| H.P. | HIGH PRESSURE |
| H.S.H.C.S. | HEX SOCKET HEAD CAP SCREW |
| H.S.L.W. | HELICAL SPRING LOCK WASHER |
| INT | INTERNAL |
| INSP | INSPECTION |
| LG | LONG |
| L.H. | LEFT HAND |
| MP | MALE PIPE THREAD |
| NPT | NATIONAL PIPE THREAD |
| PRESS | PRESSURE |
| PTL | PLATE |
| Q.D. | QUICK DISCONNECT |
| RD. HD. | ROUND HEAD |
| R.H. | RIGHT HAND |
| SFL | SPLIT FLANGE |
| SQ. HD. | SQUARE HEAD |



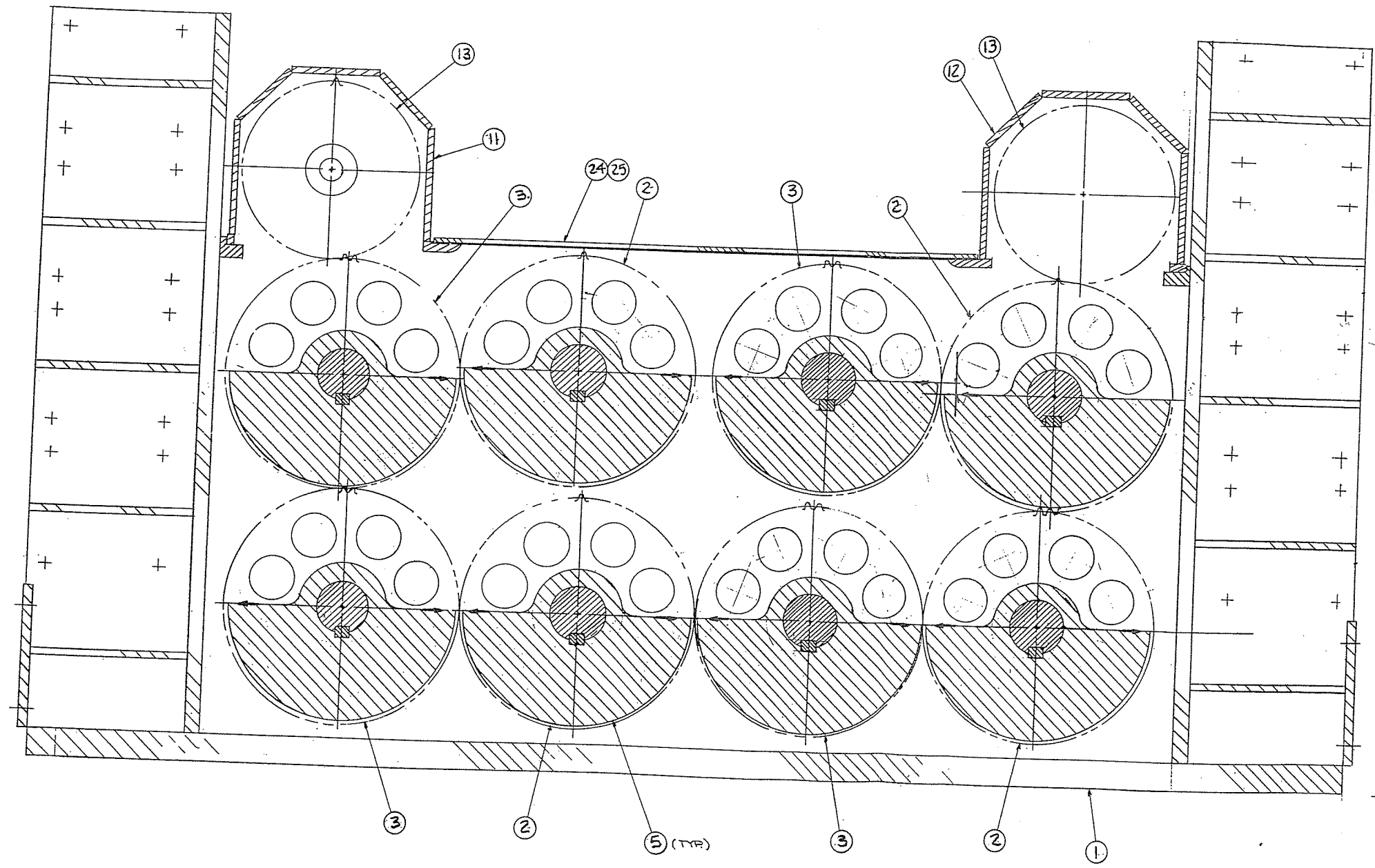
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| GENERAL ARRANGEMENT - MECHANICAL | | | |
| 4000 VIBRO | | 01400003 | |
| DRAWN RD | DATE 3/30/77 | | |
| CHECK | DATE | DRAWING No. E-7D-459 | |

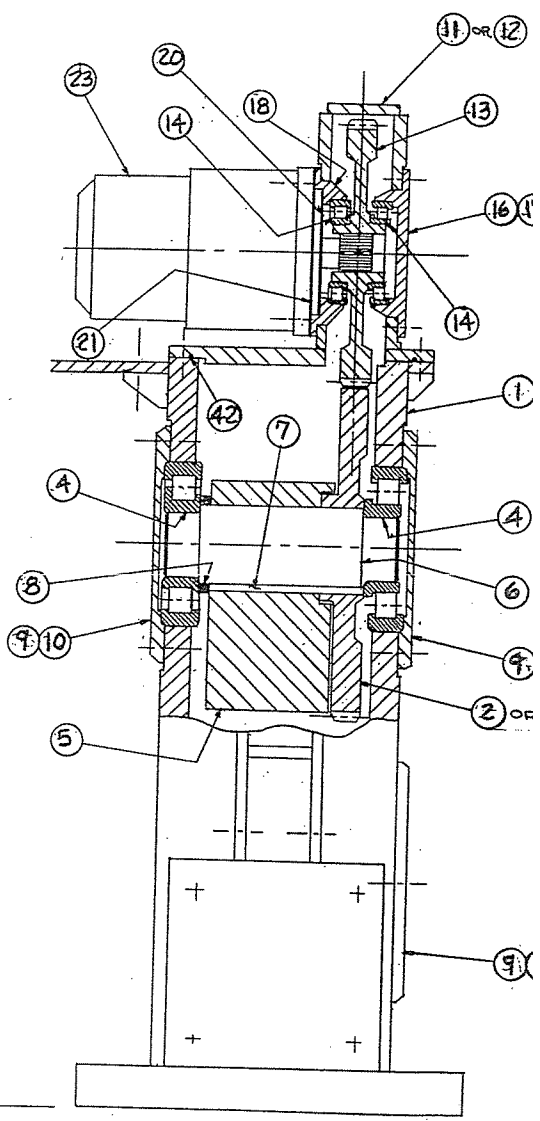
GENERAL ARRANGEMENT MECHANICAL

E-7D-459

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|--|
| 1 | 1 | 03400003 | TRANSMISSION ASS'Y |
| 2 | 1 | 04400003 | YOKE ASS'Y |
| 3 | 2 | 15004742 | SAFETY STOP |
| 4 | 20 | 48004771 | SAFETY STOP BOLTS |
| 5 | 20 | 47061600 | M16 RIB WASHER VS17 |
| 6 | 8 | 10904671 | SHIM 1/8" THK |
| 7 | 8 | 10904841 | SHIM 3/16 THK |
| 8 | 4 | 10904931 | SHIM 1/8" THK |
| 9 | 4 | 10904921 | SHIM 3/16"THK |
| 10 | 16 | 40012401 | 1 1/2" - 6 H.H.C.S. x 5" GR 8 |
| 11 | 16 | 41012400 | 1 1/2" - 6 HEX NUT GR 8 |
| 12 | 16 | 42072401 | 1 1/2" BELLEVILLE WASHER |
| 13 | 8 | 40011208 | 3/4" - 10 H.H.C.S. x 3" GR 8 |
| 14 | 8 | 42081201 | 3/4" RIB WASHER |
| 15 | 8 | 41011200 | 3/4" O 10 HEX NUT GR 8 |
| 16 | 2 | 20300032 | FILTER ASS'Y |
| | 0 | <u>23000032</u> | (ELEMENT REORDER) |
| 17 | 8 | 40010701 | 7/16" - 14 H.H. C.S. x 1" GR 8 |
| 18 | 8 | 42030700 | 7/16" H.S.L.W. |
| 19 | 1 | 11950651 | MOTOR GUARD (R.H.) |
| 20 | 1 | 11950661 | MOTOR GUARD (L.H.) |
| 21 | 12 | 45011606 | M16 x 2.00 H.H.C.S. 50 m/m LG DIN933 GR 8.8 |
| 22 | 12 | 47061600 | M16 RIB WASHER VS17 |
| 23 | 6 | 45011608 | M16 x 2.00 H.H.C.S. x 60 m/m DIN 933 GR 8.8 |
| 24 | 6 | 47061600 | M16 RIB WASHER VS17 |



SECTION A-A

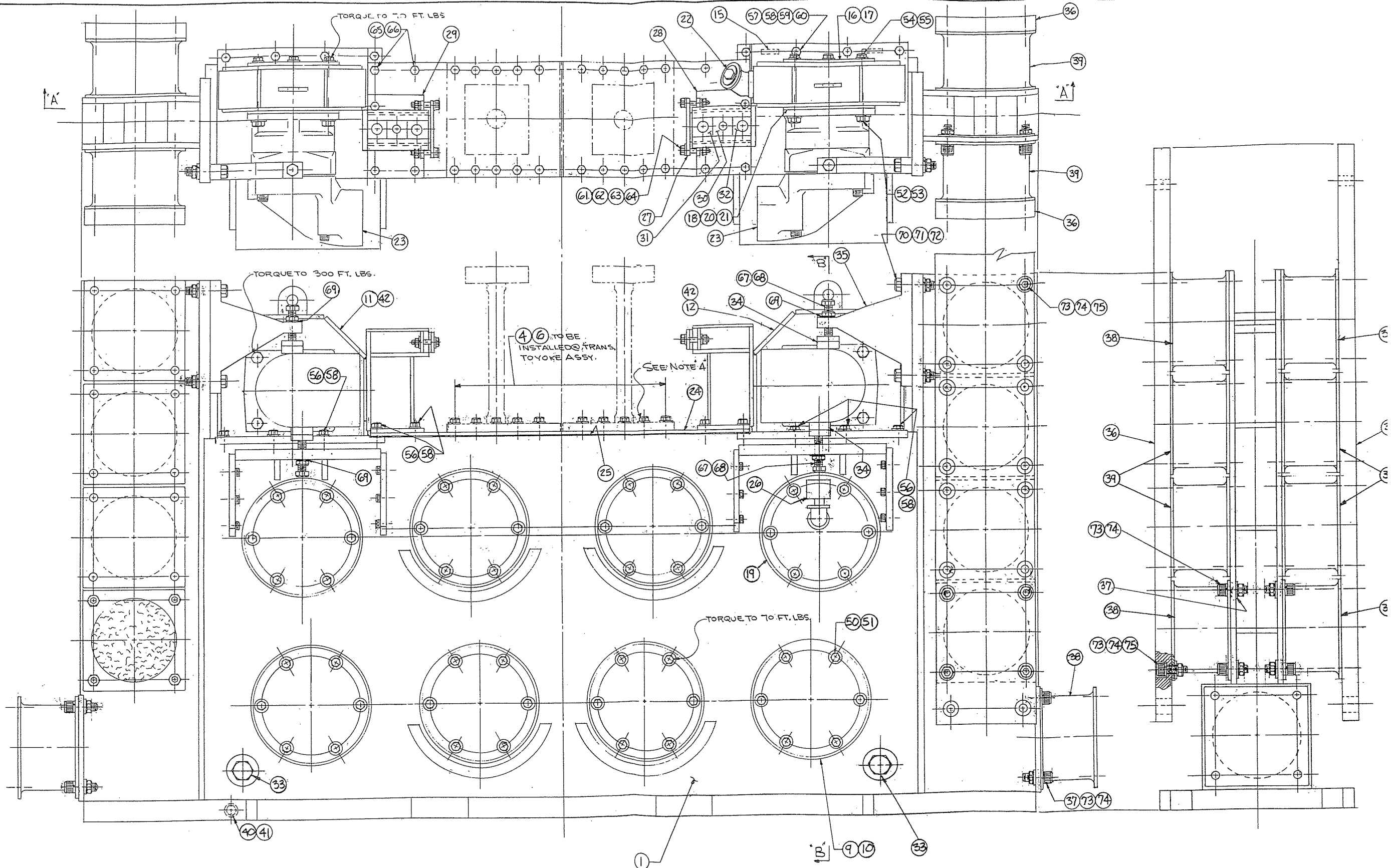


SECTION B-B

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| | | | |
|-------------------------------------|----------------------|--|-------------------------|
| FOSTER EQUIPMENT DIVISION | | L.B. FOSTER COMI 4000 CASTLE DRIVE, P. O. #1 CORAOPOLIS, PENNSYLVANIA 16108 | |
| TRANSMISSION ASSEMBLY | | | |
| Drawn: VRD | Date: 3-30-77 | PT # 03 | |
| Check: _____ | Date: _____ | SHEET 3 | |
| No. | DATE | REVISION | DRAWING No. E-11 |

C. DETZLER CO. 7-28864-1



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| | | | |
|-------------------------------------|--|---|--|
| FOSTER EQUIPMENT DIVISION | | L.B. FOSTER COMPANY 4900 CASTLE DRIVE, R. D. #1 CORAOPOLIS, PENNSYLVANIA 15108 | |
| TRANSMISSION ASSEMBLY | | | |
| DRAWING NO. <u>RD</u> | | DATE <u>3-25-77</u> | |
| CHECK _____ | | DATE _____ | |
| | | Pt. # 03400003 SHT 1 OF 2 DRAWING E-1D-457 | |

TRANSMISSION ASSEMBLY

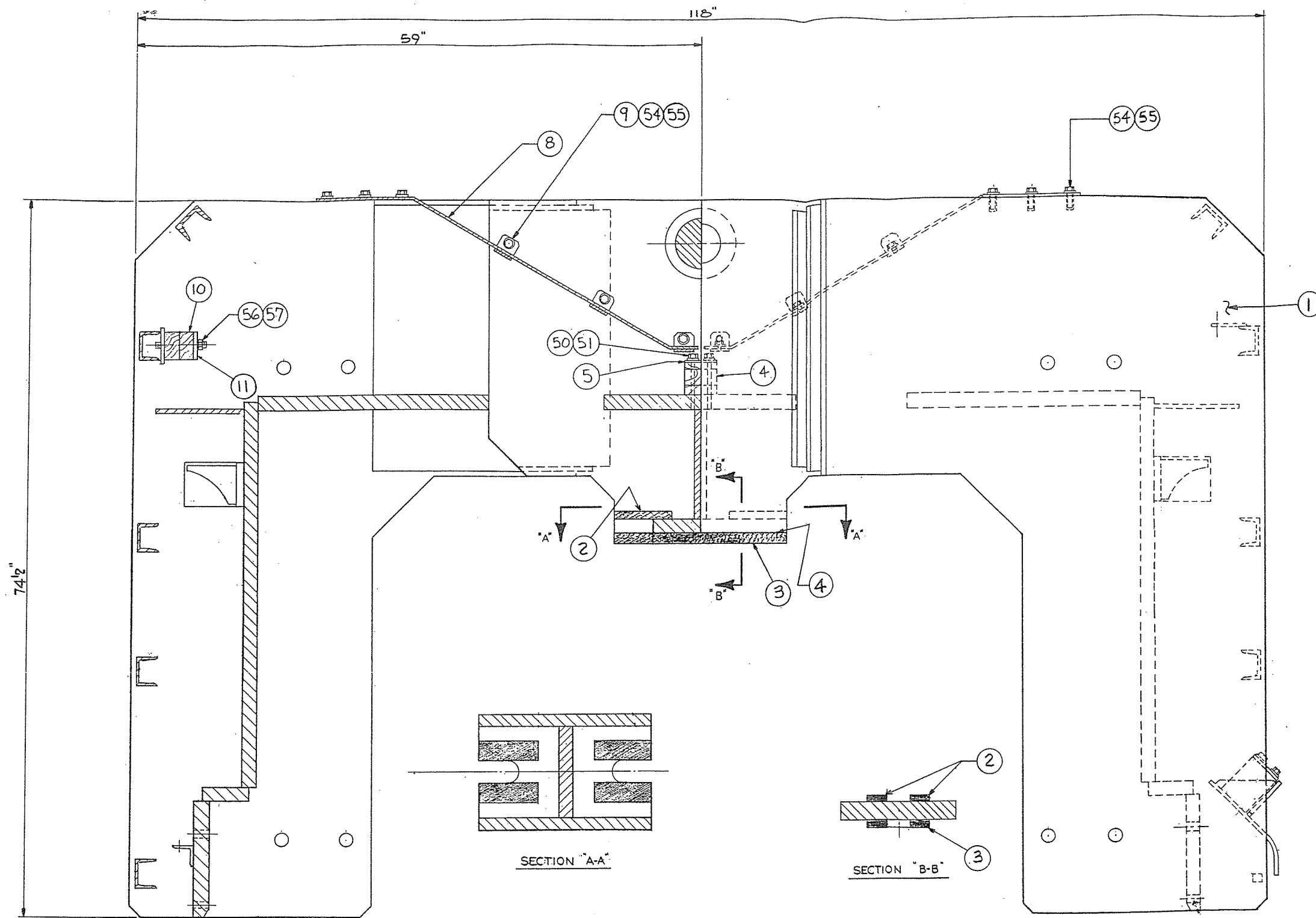
E-7D-457

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|----------------------------|
| 1 | 1 | 12804673 | TRANSMISSION CASE |
| 2 | 4 | 10504432 | GEAR (MALE) |
| 3 | 4 | 10504442 | GEAR (FEMALE) |
| 4 | 16 | 10403415 | BEARING |
| 5 | 8 | 10604572 | ECCENTRIC |
| 6 | 8 | 11004588 | SHAFT |
| 7 | 8 | 10704592 | KEY |
| 8 | 8 | 10804561 | SPACER |
| 9 | 16 | 22804661 | GASKET (COVER PLT) |
| 10 | 15 | 11804551 | COVER PLATE |
| 11 | 1 | 12804683 | PINION HOUSING (L.H.) |
| 12 | 1 | 12804693 | PINION HOUSING (R.H.) |
| 13 | 2 | 10504452 | MOTOR PINION |
| 14 | 4 | 10401214 | PINION BEARING |
| 15 | 4 | 10704721 | PINION HOUSING KEY |
| 16 | 2 | 11804481 | COVER PLT (MOTOR ACCESS) |
| 17 | 2 | 22804491 | GASKET (MOTOR ACCESS) |
| 18 | 2 | 12204601 | MOTOR MOUNT |
| 19 | 1 | 11804541 | COVER PLT (BREATHER) |
| 20 | 2 | 22804611 | GASKET (MOTOR MOUNT INNER) |
| 21 | 2 | 22804621 | GASKET (MOTOR MOUNT OUTER) |
| 22 | 1 | 20424021 | 1/2" SQ. HD. PIPE PLUG |
| 23 | 2 | 22507011 | MOTOR |
| 24 | 1 | 11804702 | INSPECTION COVER PLT |
| 25 | 1 | 22804711 | GASKET (INSP. COVER PLT) |
| 26 | 1 | 20200011 | BREATHER |
| 27 | 2 | 12100031 | CLAMP PLATE |
| 28 | 1 | 12200101 | HOSE BLOCK MOUNT (R.H.) |
| 29 | 1 | 12200111 | HOSE BLOCK MOUNT (L.H.) |
| 30 | 2 | 12100011 | PIPE CLAMP (3/4" TUBE) |
| 31 | 2 | 12100021 | PIPE CLAMP 1" TUBE) |
| 32 | 2 | 12100000 | PIPE CLAMP (1" TUBE) |
| 33 | 4 | 93000204 | LEVEL SIGHT GAGE |
| 34 | 4 | 15005051 | MOTOR RESTRAINT PAD ASS'Y |
| | | 14004011 | (4) PAD |
| | | 11305001 | (4) FABREEKA PAD |
| 35 | 2 | 15004991 | MOTOR RESTRAINT |
| 36 | 4 | 12204852 | MOUNT PLATE |
| 37 | 36 | 43004891 | NUT BAR |
| 38 | 10 | 11300031 | ELASTOMERIC MOUNT |
| 39 | 8 | 11300021 | ELASTOMERIC MOUNT |

TRANSMISSION ASSEMBLY

E-7D-457

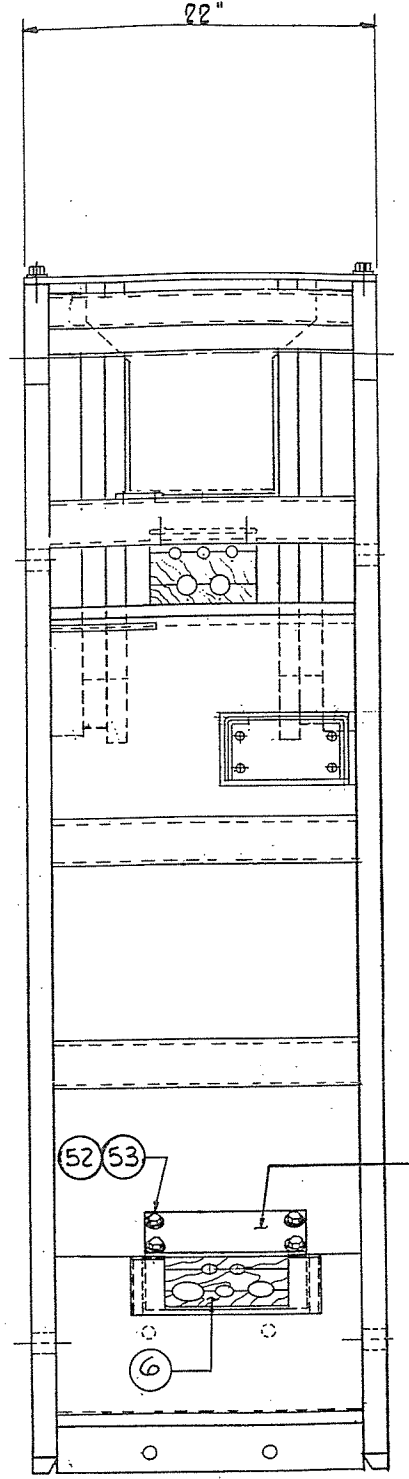
| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|--|
| 40 | 1 | 45032002 | M20 x 2.50 H.S.H.C.S. x 35 M/M DIN 912 GR 8.9 |
| 41 | 1 | 22800002 | COPPER SEAL RING 20 x 24 DIN 7603 |
| 42 | 2 | 22800011 | "O" RING STRIP .070 Sq x 4' LG |
| 50 | 96 | 45011202 | M12 x 1.75 H.H.C.S. x 25 M/M DIN 933 GR 8.9 |
| 51 | 96 | 47061200 | M12 RIB WASHER VS13 |
| 52 | 8 | 45022001 | M20 x 2.50 H.H.C.S x 50 M/M DIN 931 GR 8.8 |
| 53 | 8 | 47062000 | M20 RIB WASHER VS21 |
| 54 | 12 | 45011202 | M12 x 1.75 H.H.C.S. x 25 M/M DIN 933 GR 8.8 |
| 55 | 12 | 47061200 | M12 RIB WASHER VS13 |
| 56 | 16 | 45011606 | M16 x 2.00 H.H.C.S. x 50 M/M DIN 933 GR 8.8 |
| 57 | 8 | 45021601 | M16 x 2.00 H.H.C.S. 55 M/M DIN 931 GR 8.8 |
| 58 | 24 | 47061600 | M16 RIB WASHER VS17 |
| 59 | 8 | 47011600 | M16 FLATWASHER DIN 125 |
| 60 | 8 | 46011600 | M16 x 2.00 HEX NUT DIN 934 GR 8 |
| 61 | 4 | 40010617 | 3/8" - 16 H.H.C.S. GR 8 x 2" |
| 62 | 4 | 41010600 | 3/8" FLATWASHER |
| 63 | 4 | 42070601 | 3/8" BELLEVILLE WASHER |
| 64 | 4 | 41010600 | 3/8" - 16 HEX NUT GR 8 |
| 65 | 4 | 45011604 | M16 x 2.00 H.H.C.S. x 40 M/M DIN 933 GR 8.8 |
| 66 | 4 | 47061600 | M16 RIB WASHER VS17 |
| 67 | 4 | 45012003 | M20 x 2.50 H.H.C.S. x 80 M/M DIN 933 GR 8.8 |
| 68 | 4 | 46012000 | M20 x 2.50 HEX NUT DIN 934 GR 8 |
| 69 | 4 | 47062000 | M20 RIBWASHER VS21 |
| 70 | 4 | 45012003 | M20 x 2.50 H.H.C.S. x 80 M/M DIN 933 GR 8.8 |
| 71 | 4 | 46012000 | M20 x 2.50 HEX NUT DIN 934 GR 8 |
| 72 | 4 | 47062000 | M20 RIB WASHER VS21 |
| 73 | 136 | 40031202 | 3/4" - 10 H.S.H.C.S. x 2" GR 8 |
| 74 | 72 | 41011200 | 3/4" - 10 HEX NUT GR 8 |
| 75 | 136 | 42081201 | 3/4" RIB WASHER |
| 76 | 12 | 45021201 | M12 x 1.75 H.H.C.S. x 55 M/M DIN 931 GR 8.8 |



SECTION "A-A"

SECTION "B-B"

SIDE ELEVATION

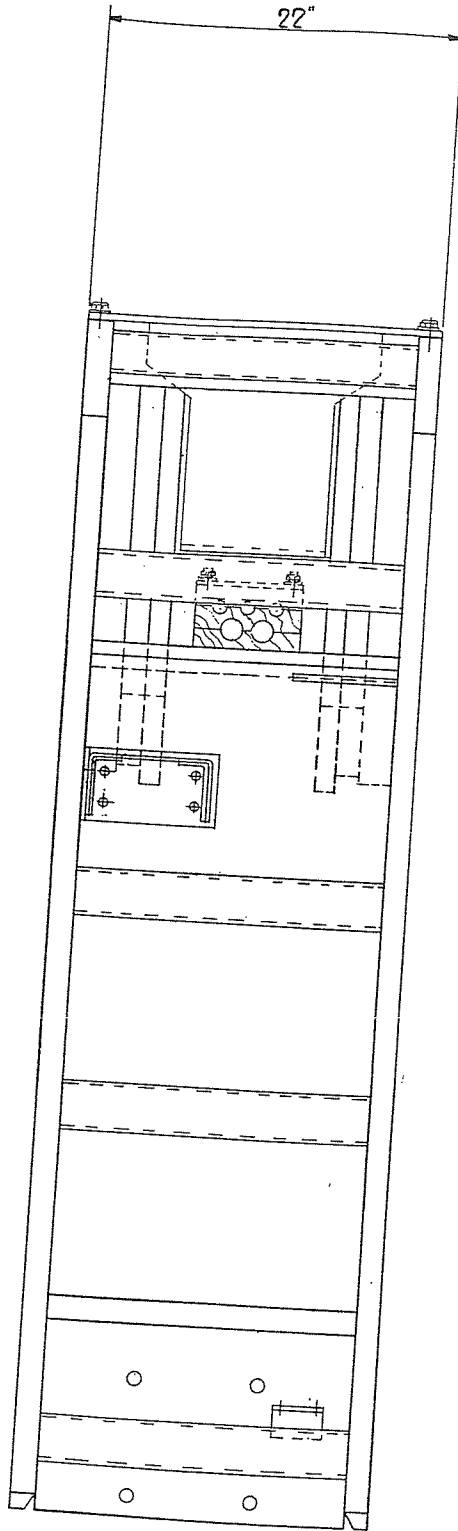


END VIEW - RIGHT

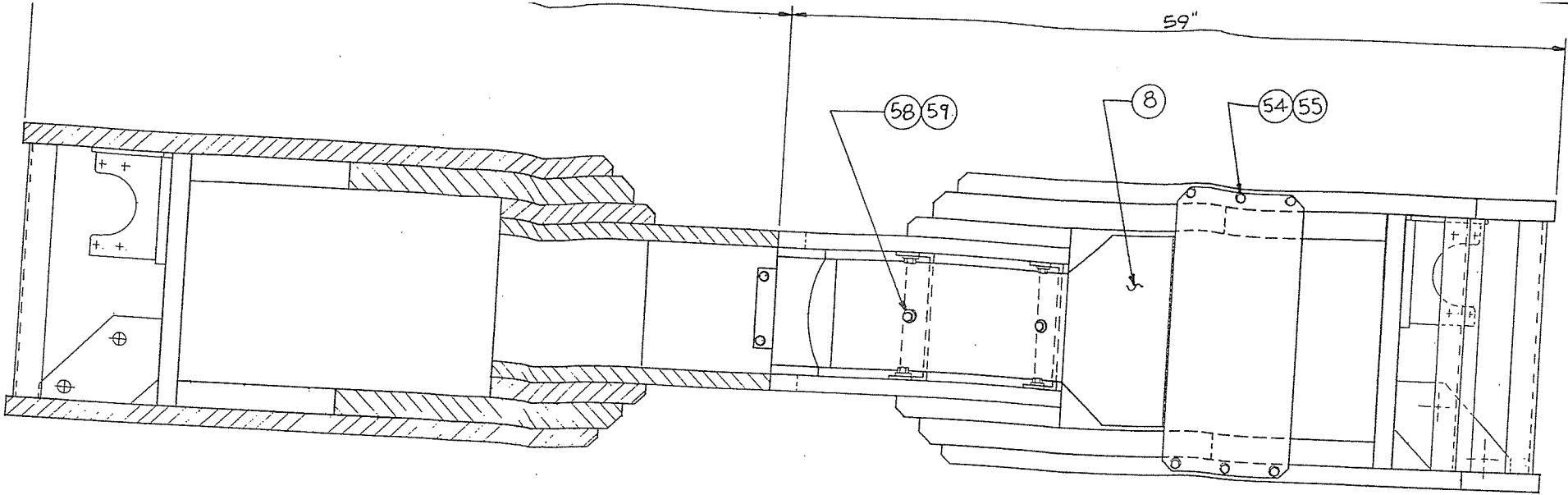
• FOR TOP VIEW & END VIEW (LEFT) SEE SHEET 2 OF 2

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| | | | | |
|-----|---------|------------------------|---|--|
| E | 1/3/78 | SEE ECN #53 | FOSTER EQUIPMENT DIVISION L.B.FOSTER COMPANY 4000 CASTLE DRIVE, R. D. #1 CORAOPOLIS, PENNSYLVANIA 15106 | PT. NO 04A00C SHEET 1 OF 2 DRAWING E-7D-4E |
| D | 5-15-78 | CORRECT FABRICATION | | |
| C | 3-13-78 | SEE ECN 030 | YOKE ASSEMBLY | DRAWN RD DATE 3/24/77 CHECK DATE |
| B | 1-27-78 | SEE ECN 024 | | |
| A | 6-20-77 | REVISED WERE INDICATED | | |
| No. | DATE | REVISION | | |



END VIEW-LEFT



HALF SECTION - TOP VIEW

L. B. FOSTER CO. P-3384-44

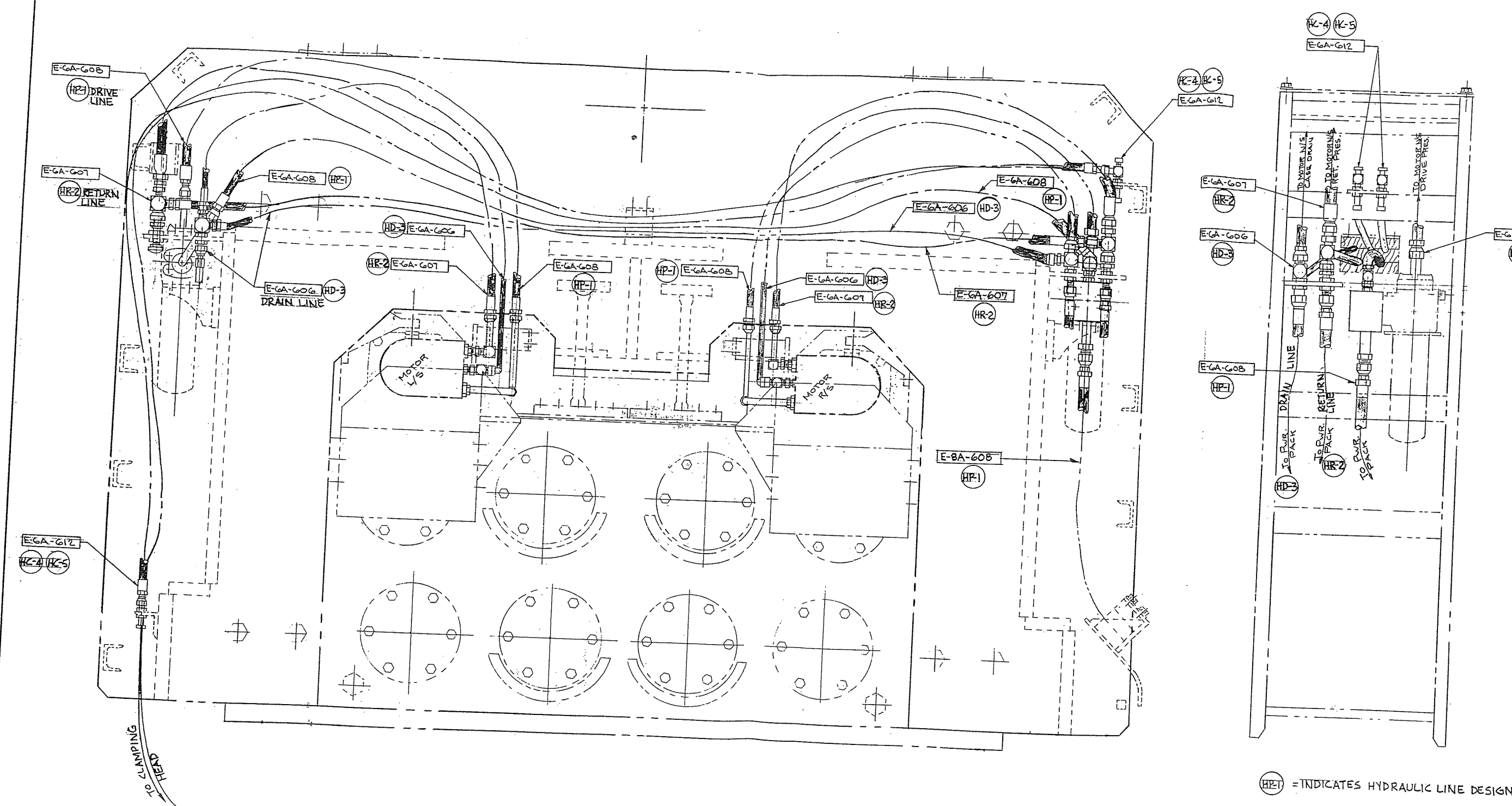
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| | | | |
|-------------------------------------|---------------------|--|--|
| FOSTER EQUIPMENT DIVISION | | L.B.FOSTER COMPANY 4000 CASTLE DRIVE, R. D. #1 CORAOPOLIS, PENNSYLVANIA 15108 | |
| YOKE ASSEMBLY | | | |
| DRAWN <u>ED</u> | DATE <u>3/25/77</u> | PT. NO <u>04400003</u> | |
| CHECK _____ | DATE _____ | SHEET <u>2</u> OF <u>2</u> | |
| | | DRAWING NO. <u>E-7D-458</u> | |

YOKE ASSEMBLY

E-7D-457

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|--|
| 1 | 1 | 12904652 | YOKE WELDMENT |
| | | 15004781 | (1) LIFTING SPINDLE |
| | | 15005071 | (1) HOSE GUIDE PLATE |
| | | 12200021 | (2) FILTER MTG BRACKET PALL |
| 2 | 4 | 11304751 | FABREEKA BUMPER |
| 3 | 1 | 11305091 | FABREEKA BUMPER |
| 4 | 1 | 12104881 | HOSE BLOCK,WOOD |
| 5 | 1 | 12103481 | CLAMP PLATE |
| 6 | 1 | 12104863 | HOSE BLOCK,WOOD |
| 7 | 1 | 12104871 | CLAMP PLATE |
| 8 | 2 | 12005081 | HOSE TROUGH COVER |
| 9 | 6 | 12004911 | HOSE TROUGH HANGER |
| 10 | 1 | 12103491 | HOSE BLOCK,WOOD |
| 11 | 1 | 12103501 | CLAMP PLATE |
| 50 | 4 | 46011200 | M12 x 1.75 HEX NUT DIN 934 GR 8 |
| 51 | 4 | 47021200 | M12 H.S.L.W. DIN 127 |
| 52 | 4 | 46011200 | M12 x 1.75 HEX NUT DIN 934 GR 8 |
| 53 | 4 | 47021200 | M12 H.S.L.W. DIN 127 |
| 54 | 24 | 45011004 | M10 x 1.50 H.H.C.S. x 30 M/M DIN 933 GR 8.8 |
| 55 | 24 | 47021000 | M10 H.S.L.W. DIN 127 |
| 56 | 2 | 46011000 | M10 x 1.50 HEX NUT DIN 934 GR 8 |
| 57 | 2 | 47021000 | M10 H.S.L.W. DIN 127 |
| 58 | 6 | 45011001 | M10 x 1.5 H.H.C.S. x 20 M/M DIN 933 GR 8.8 |
| 59 | 6 | 47021000 | M10 H.S.L.W. DIN 127 |



(HR-1) = INDICATES HYDRAULIC LINE DESIGNATION,

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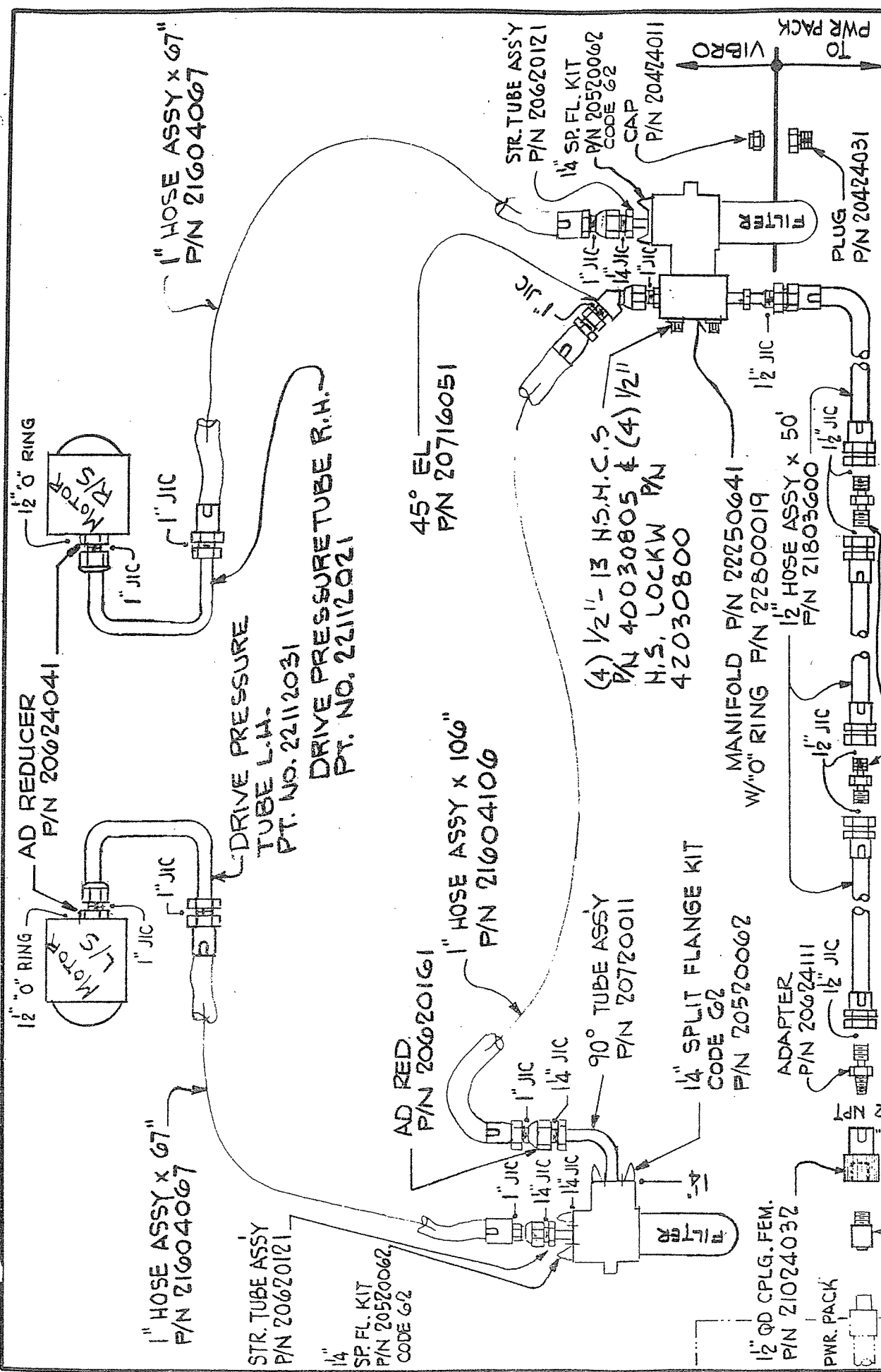
| | | |
|---|----------|--------------|
| A | 10/21/78 | SEE ECN # 52 |
| | DATE | REVISION |

FOSTER EQUIPMENT DIVISION
L.B. FOSTER COMPANY
 4000 CASTLE DRIVE, P.O. #1
 CORAOPOLIS, PENNSYLVANIA 16106

HYDRAULIC GENERAL ARRANGEMENT
4000 VIBRO

DRAWN: JRD DATE: 9-9-77
 CHECK: _____ DATE: _____

DRAWING No. **E-6D-634** A



L.B. FOSTER CO.
EQUIPMENT DIVISION
CORAOAPOLIS, PENNA. 15108

HP-1
DRIVE PRESSURE LINE
4000 VIBRO

DRAWN: [Signature] DATE: 9/15/77
CHECKED: [Signature]

DWG. NO. F-400812

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RETURNABLE UPON DEMAND

| | |
|----------|--------------------|
| 10/18/78 | ADD EXTN TO PWR PK |
| A 2 14 | GEN. REV. |

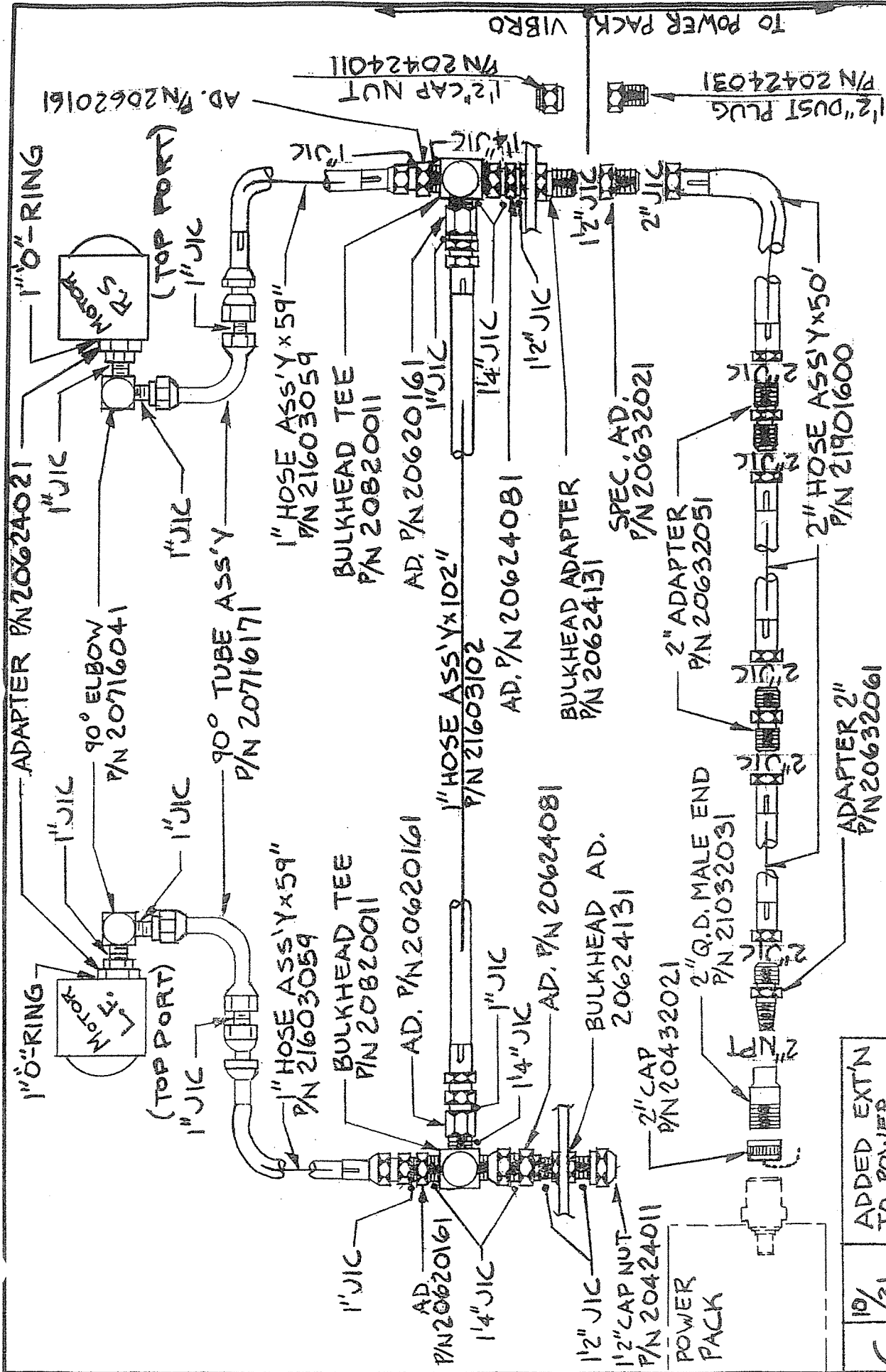
GENERAL ARRANGEMENT HYDRAULIC

E-6D-634A

DRIVE PRESSURE LINE

E-6A-608

| <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-----------------|-----------------|---------------------------------|
| 1 | 22112021 | DRIVE PRESS TUBE R.H. |
| 1 | 22112031 | DRIVE PRESS TUBE L.H. |
| 2 | 20624041 | ADAPTER REDUCER 37° FL/"O" RING |
| 2 | 21604067 | 1 " HOSE ASS'Y |
| 2 | 20620121 | ADAPTER STRAIGHT FL/37° FL |
| 3 | 20520062 | SPLIT FLANGE KIT CODE 62 |
| 1 | 20720011 | 90° ADAPTER FL/37° FL |
| 1 | 21604106 | 1" HOSE ASS'Y |
| 1 | 20716051 | 45° ELBOW 37° FL. SW/37° FL |
| 1 | 22250641 | MANIFOLD |
| 1 | 22800019 | 1 1/4" "O" RING |
| 4 | 40030805 | 1/2" - 13 H.S.H.C.S. x 4" GR 8 |
| 4 | 42030800 | 1/2" H.S.L.W. |
| 1 | 20424011 | 1 1/2" CAP 37° FL |
| 1 | 20424031 | 1 1/2" PLUG 37° FL |
| 3 | 21803600 | 1 1/2" HOSE ASS'Y |
| 2 | 20624121 | ADAPTER 37° FL/37° FL |
| 1 | 20624111 | ADAPTER MP/37° FL |
| 1 | 21024032 | 1 1/2" QD FEMALE |
| 1 | 21024042 | 1 1/2" DUST PLUG W/CHAIN |
| 1 | 20620161 | ADAPTER REDUCER 37° FL/ 37° FL |



EQUIPMENT DIVISION
 CORAOPOLIS, PENNA. 15108

L.B. FOSTER CO.
 RETURN PRESSURE LINE HR-2
 4000 VIBRO

| | | | |
|--------------|-----------------|--------------|------------------------|
| DRAWN JRD | DATE 8/28/77 | CHECKED V | DWG. NO. E-6A-607 C |
|--------------|-----------------|--------------|------------------------|

PROPRIETARY INFORMATION
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 LIMITED USAGE
 RETURNABLE UPON DEMAND

| | | |
|---|----------|----------------------------|
| C | 10/31/78 | ADDED EXT'N TO POWER PACK. |
| B | 8/17/78 | 20624021 WAS 20624041 |
| A | 2/24/77 | GEN. REV. |

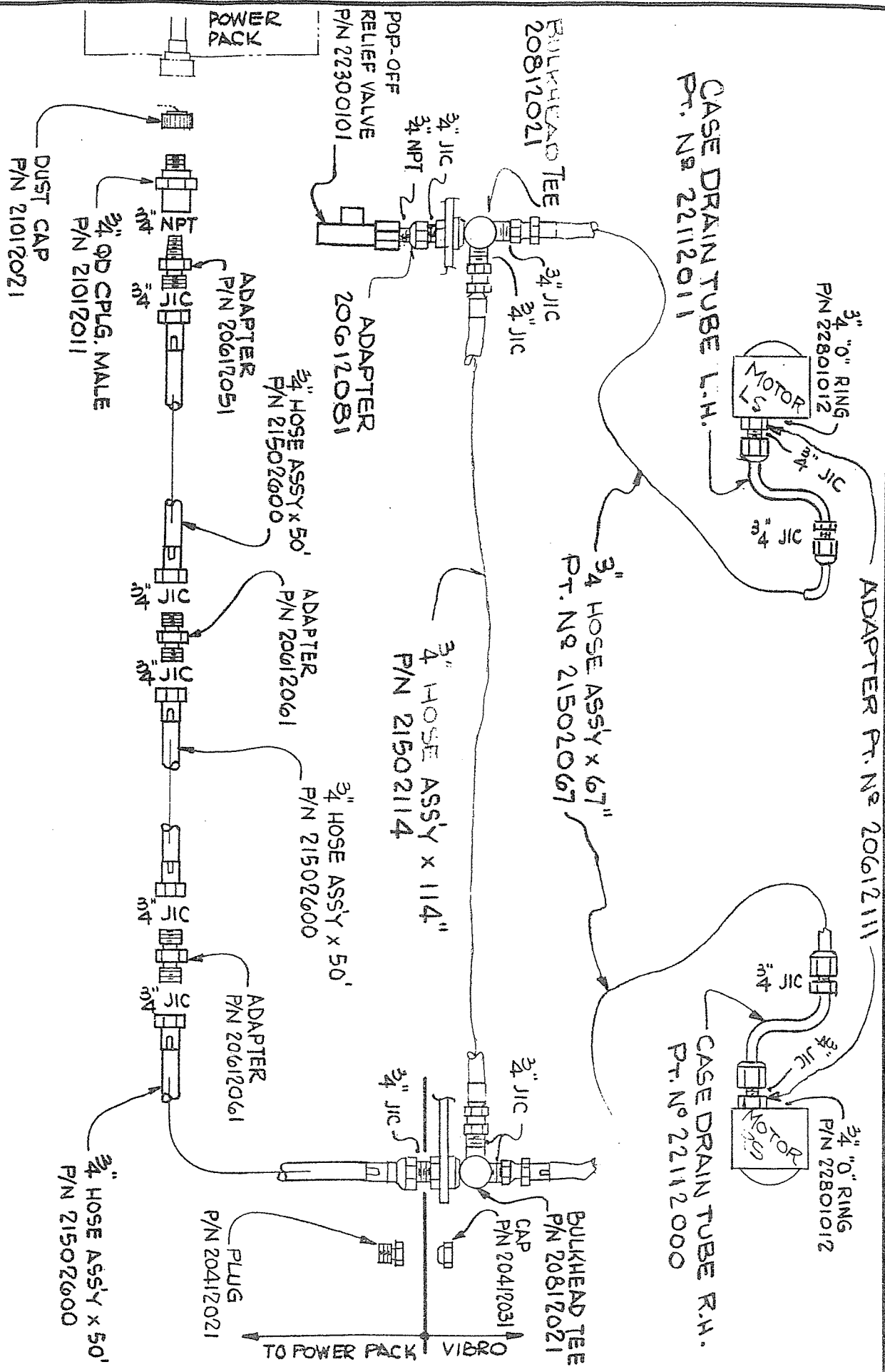
GENERAL ARRANGEMENT HUDRAULIC :

E-6D-634A

RETURN PRESSURE LINE

E-6A-607

| | | |
|---|----------|----------------------------------|
| 2 | 20624021 | ADAPTER 37° FL/37° FL |
| 2 | 20716041 | 90° ELBOW 37° FL/37° FL |
| 2 | 20716171 | 90° ADAPTER 37° FL/37° FL |
| 2 | 21603059 | 1" HOSE ASS'Y |
| 4 | 20620161 | ADAPTER RED. 37° FL/37° FL |
| 2 | 20820011 | 1 1/4" BULKHD. TEE 37° FL/37° FL |
| 1 | 21603102 | 1" HOSE ASS'Y |
| 2 | 20624081 | ADAPTER REDUCER 37° FL/37° FL |
| 2 | 20624131 | 1 1/2" BULKHEAD AD 37° /37° FL |
| 2 | 20424011 | 1 1/2" CAP NUT 37° FL |
| 1 | 20424031 | 1 1/2" PLUG 37° FL |
| 1 | 20632021 | SPEC ADAPTER 37° FL |
| 3 | 21901600 | 2" HOSE ASS'Y |
| 2 | 20632051 | ADAPTER 2" JIC 37° FL/37° FL |
| 1 | 20632061 | ADAPTER MP/37° fl |
| 1 | 21032031 | 2" Q.D. MALE END |
| 1 | 21032041 | 2" DUST CAP |



| | | |
|---|----------|-------------------|
| A | 2 | GEN REV. |
| B | 10/18/78 | ADD EXT'N TO R.P. |

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| | | | |
|---|---------|---------|----------|
| L.B. FOSTER CO. | | | |
| EQUIPMENT DIVISION CORADOLIS, PENNA. 15108 | | | |
| CASE DRAIN LINE | | HD-3 | |
| 4000 VIBRO | | | |
| DRAWN | DATE | CHECKED | DWG. NO. |
| JRD | 8/18/77 | | E-6A-C |
| | | | B |

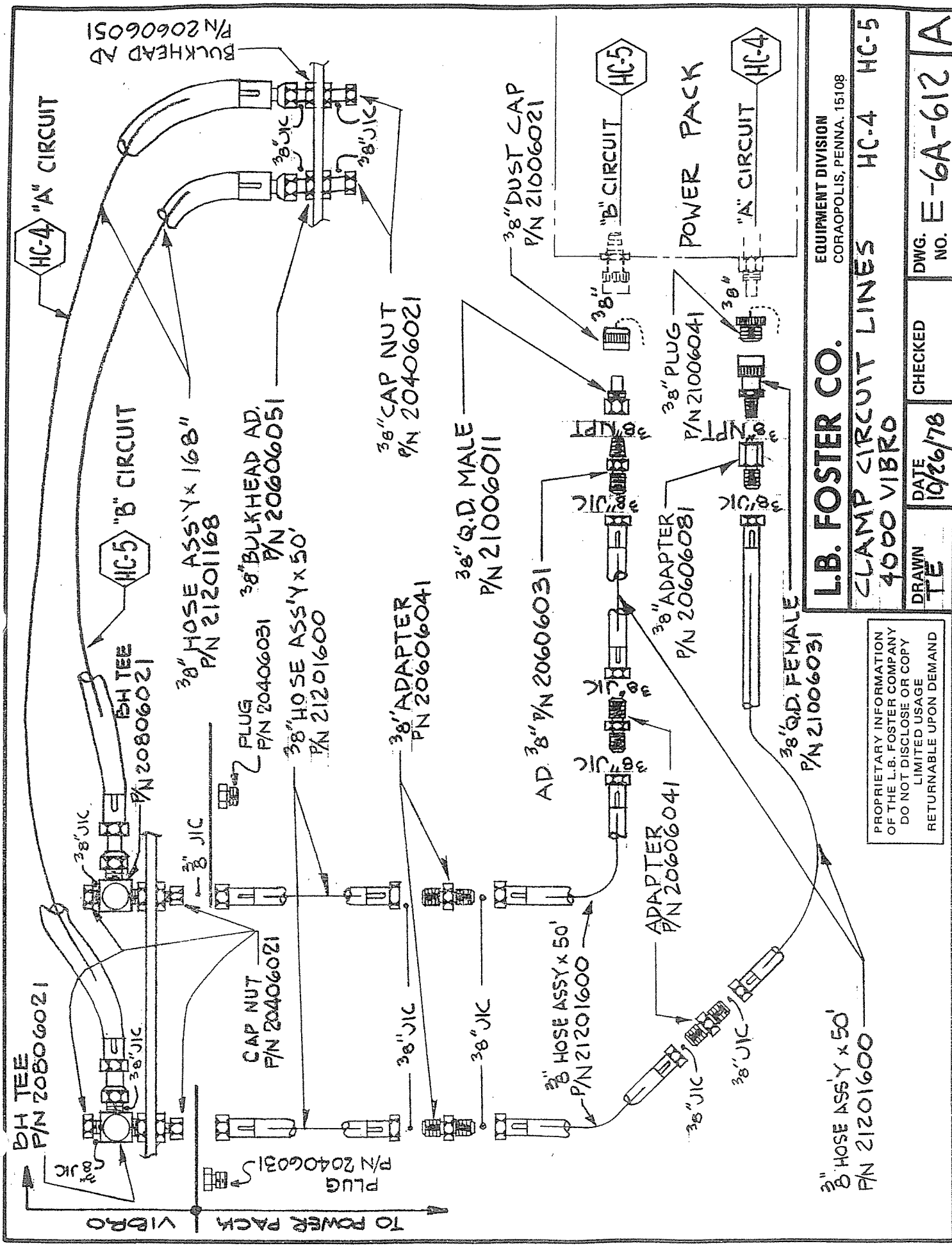
GENERAL ARRANGEMENT HYDRAULIC

E-6D-634A

CASE DRAIN LINE

E-6A-606

| <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-----------------|-----------------|-----------------------------------|
| 2 | 22801012 | 3/4" "O" RING |
| 2 | 20612111 | ADAPTER 37° FL/"O" RING |
| 1 | 22112011 | CASE DRAIN TUBE L.H. |
| 1 | 22112000 | CASE DRAIN TUBE R.H. |
| 2 | 21502067 | 3/4" HOSE ASS'Y |
| 2 | 20812021 | BULKHEAD TEE 37° FL/37° FL/37° FL |
| 1 | 21502114 | 3/4" HOSE ASS'Y |
| 1 | 20612081 | ADAPTER 37° FL/"O" RING |
| 1 | 22300101 | POPOFF RELIEF VALVE |
| 1 | 20412031 | 3/4" CAP 37° FL |
| 1 | 20412021 | 3/4" PLUG 37° FL |
| 3 | 21502600 | 3/4" HOSE ASS'Y |
| 2 | 20612061 | ADAPTER 37° FL/37° FL |
| 1 | 20612051 | ADAPTER MP/37° FL |
| 1 | 21012011 | 3/4" QD MALE |
| 1 | 21012021 | 3/4" DUST CAP |



L.B. FOSTER CO.
 EQUIPMENT DIVISION
 CORAOPOLIS, PENNA. 15108
CLAMP CIRCUIT LINES HC-4 HC-5
4000 VIBRO

DRAWN **TE** DATE **10/26/78** CHECKED DWG. NO. **E-6A-612 A**

PROPRIETARY INFORMATION
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BULKHEAD AD P/N 20606051

HC-4 "A" CIRCUIT

HC-5 "B" CIRCUIT

HC-5

HC-4

3/8" DUST CAP P/N 21006021

POWER PACK

3/8" CAP NUT P/N 20406021

3/8" HOSE ASS'Y x 168" P/N 21201168

3/8" BULKHEAD AD. P/N 20606051

3/8" HOSE ASS'Y x 50' P/N 21201600

PLUG P/N 20406031

3/8" ADAPTER P/N 20606041

3/8" Q.D. MALE P/N 21006011

AD. 3/8" P/N 20606031

3/8" ADAPTER P/N 20606031

ADAPTER P/N 20606041

3/8" Q.D. FEMALE P/N 21006031

3/8" HOSE ASS'Y x 50' P/N 21201600

TO POWER PACK

3/8" JIC

3/8" JIC

3/8" JIC

3/8" JIC

3/8" JIC

3/8" JIC

3/8" JIC

3/8" HOSE ASS'Y x 50' P/N 21201600

3/8" JIC

3/8" JIC

3/8" JIC

3/8" PLUG P/N 21006041

3/8" PLUG P/N 21006041

3/8" JIC

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3/8" JIC

GENERAL ARRANGEMENT HYDRAULIC

E-6D-634A

A CLAMP CIRCUIT

E-6A-612

| <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-----------------|-----------------|--|
| 3 | 20406021 | 3/8" CAP NUT 37°FL |
| 1 | 20606051 | BULKHEAD ADAPTER 37°FL/37° FL |
| 1 | 21201168 | 3/8" HOSE ASS'Y |
| 1 | 20806021 | 3/8" BULKHEAD TEE 37° FL/37° FL/37° FL |
| 1 | 20406031 | 3/8" PLUG 37° FL |
| 3 | 21201600 | 3/8" HOSE ASS'Y |
| 2 | 20606041 | ADAPTER 37° FL/37° FL |
| 1 | 20606081 | ADAPTER 37° FL/37° FL |
| 1 | 21006031 | 3/8" Q.D. FEMALE |
| 1 | 21006041 | 3/8" DUST PLUG |

GENERAL ARRANGEMENT HYDRAULIC

E-6D-634A

B CLAMP CIRCUIT

E-6A-612

| <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-----------------|-----------------|--|
| 3 | 20406021 | 3/8" CAP NUT 37° FL |
| 1 | 20606051 | BULKHEAD ADAPTOR 37° FL/37° FL |
| 1 | 21201168 | 3/8" HOSE ASS'Y |
| 1 | 20706021 | 3/8" BULKHEAD TEE 37° FL/37° FL/37° FL |
| 1 | 20406031 | 3/8" PLUG 37° FL |
| 3 | 21201600 | 3/8" HOSE ASS'Y |
| 2 | 20606041 | ADAPTER 37° FL/37° FL |
| 1 | 20606031 | ADAPTER MP/37° FL |
| 1 | 21006011 | 3/8" Q.D. MALE |
| 1 | 21006021 | 3/8" DUST CAP |

1205 - C POWER PACK

PARTS MANUAL

1205 - C POWER PACK

| | |
|---|----------|
| GENERAL ARRANGEMENT MECHANICAL | E-7D-536 |
| GENERAL ARRANGEMENT HYDRAULIC | E-6D-537 |
| CLAMP CIRCUIT & CHARGE PUMP TO RESERVOIR | E-6A-158 |
| CLAMP CIRCUIT MANIFOLD, GAGE & Q.D. | E-6A-159 |
| FUEL LINE ARRANGEMENT | E-6A-190 |
| CASE DRAIN Q.D. TO TANK | E-6A-436 |
| PRESSURE COMPENSATOR LINES | E-6A-535 |
| CHARGE PUMP LINES | E-6A-551 |
| CASE DRAIN TELL-TALE INDICATOR | E-6A-587 |
| RETURN FILTER TELL-TALE INDICATOR | E-6A-588 |
| CLAMP PRESSURE LINE | E-6A-611 |
| OIL COOLER BY-PASS LINE | E-6A-652 |
| HYDRAULIC FILL PUMP LINES | E-6A-700 |
| HEAT EXCHANGE BY-PASS | E-6A-703 |
| RETURN, DRIVE & GAGE LINES | E-6A-721 |

| | |
|------------|----------------------------|
| AD | ADAPTOR |
| AM STD | AMERICAN STANDARD |
| ASS'Y | ASSEMBLY |
| BULKHD | BULKHEAD |
| ENCL | ENCLOSURE |
| EXT | EXTERNAL |
| FL | FLARE |
| FP | FEMALE PIPE THREAD |
| GR | GRADE |
| H.H.C.S. | HEX HEAD CAP SCREW |
| H.P. | HIGH PRESSURE |
| H.S.H.C.S. | HEX SOCKET HEAD CAP SCREW |
| H.S.L.W. | HELICAL SPRING LOCK WASHER |
| INT | INTERNAL |
| INSP | INSPECTION |
| LG | LONG |
| L.H. | LEFT HAND |
| MP | MALE PIPE THREAD |
| NPT | NATIONAL PIPE THREAD |
| PRESS | PRESSURE |
| PTL | PLATE |
| Q.D. | QUICK DISCONNECT |
| RD. HD. | ROUND HEAD |
| R.H. | RIGHT HAND |
| SFL | SPLIT FLANGE |
| SQ. HD. | SQUARE HEAD |

GENERAL ARRANGEMENT MECHANICAL

E-7D-536

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|----------------------------------|
| 1 | 1 | 12700031 | FRAME/FUEL TANK |
| | | 12600301 | (1) TOOL & ACCESS. CONT. |
| 2 | 1 | 20448011 | 3" STD PIPE CAP (VENTED) |
| 3 | 1 | 12200051 | OIL COOLER MOUNTING FRAME |
| 4 | 1 | 22900011 | OIL COOLER |
| 5 | 2 | 12203381 | LIFTING BALE TIE-DOWN BAR |
| 6 | 1 | 43003421 | 1/2" ϕ THREADED BATTERY ROD |
| 7 | 1 | 14003431 | BATTERY HOLDING PLATE |
| 8 | 1 | 15051211 | BATTERY BOX LINER (WOOD) |
| 10 | 1 | 12500011 | ENGINE |
| 11 | 1 | 15000061 | THROTTLE CABLE CONN. PLATE |
| 12 | 1 | 14501741 | THROTTLE LEVER ASS'Y |
| 13 | 1 | 93000601 | TACH SENDING KIT |
| 14 | 1 | 12500052 | EXHAUST STACK |
| 15 | 1 | 12500072 | EXHAUST RAIN CAP |
| 16 | 1 | 12500062 | EXHAUST STACK "U" CLAMP |
| 17 | 1 | 12203762 | MOUNTING BRKT. FOR TERM. STRIPS |
| 18 | 1 | 10200011 | SHEAVE |
| 19 | 1 Set | 10100011 | V-BELTS, NOTCHED |
| 20 | 1 | 30600011 | OIL PRESSURE SWITCH |
| 21 | 1 | 30600021 | WATER TEMP. SWITCH |
| 22 | 1 | 12200071 | PUMP MFG. BRACKET |
| 23 | 1 | 11100013 | THROTTLE CABLE |
| 24 | 1 | 11100031 | EMERGENCY STOP W/CABLE |
| 25 | 1 | 12200082 | CLP. PUMP INLET FILT. BRACKET |
| 26 | 1 | 11100081 | CABLE END CLEVIS KIT |
| 27 | 1 | 12600021 | SHEET METAL ENCLOSURE |
| 28 | 1 | 12650571 | SHEET METAL PANEL ENCLOSURE |
| 29 | 1 | 12603301 | ENCL. CONTR. PANEL |
| 30 | 1 | 12603312 | ENCL. CONTR. PANEL |
| 31 | 1 | 12651401 | SHEET METAL ENCL. SKIRT |
| 32 | 1 | 12251381 | GAGE MOUNTING PLATE |
| 33 | 1 | 12251431 | CONTROL PEND. BRACKET |
| 34 | 1 | 15004031 | 1 1/4" SHACKLE 12 TON CAP |
| 35 | 10 | 12251202 | CLIP ANGLE |
| 36 | 1 | 22614013 | VAR. DISPL'MENT PUMP |
| | | 22604021 | (1) 4.0 CU. IN. CHARGE PUMP |
| | | 22300141 | (1) PUMP CONTROLLER |
| | | | (1) INTERNAL PORT PLUG |
| 37 | 1 | 12300031 | DRIVE COUPLING |
| 38 | 1 | 22300161 | SOLENOID VALVE |
| 39 | 1 | 12200251 | SOLENOID VALVE BRACKET |

GENERAL ARRANGEMENT MECHANICAL

E-7D-536

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|---|
| 40 | 1 | 20300041 | H.P. RETURN FILTER |
| | 0 | 23000132 | ELEMENT REORDER |
| 41 | 1 | 20300021 | CASE DRAIN FILTER |
| | 0 | 23000010 | ELEMENT REORDER |
| 42 | 1 | 22601011 | CLAMP PUMP |
| 43 | 2 | 20300012 | INTAKE FILTER |
| | 0 | 23000010 | ELEMENT REORDER |
| 44 | 1 | 20300022 | CLAMP PUMP INLET FILTER |
| | 0 | 23000010 | ELEMENT REORDER |
| 45 | 1 | 20100342 | HYDRAULIC FLUID RESERVOIR |
| 46 | 1 | 22850371 | GASKET, HYDR. RESERVOIR |
| 47 | 1 | 20100351 | RESERVOIR SUPPORT L |
| 48 | 1 | 22850391 | GASKET, RESERVOIR COVER PLATE |
| 49 | 1 | 20200021 | AIR BREATHER FILTER |
| 50 | 2 | 12251391 | MTG. RING FOR INTAKE FILTER |
| 51 | 1 | 12251181 | MANIFOLD MOUNTING BRACKET |
| 52 | 2 | 12100112 | PIPE CLAMP ASS'Y W/CUSHION |
| 53 | 2 | 22300041 | 1" BRASS STOP COCK |
| 54 | 1 | 12250152 | TERMINAL MANIFOLD BASE |
| 55 | 1 | 22204851 | TERMINAL MANIFOLD |
| 56 | 1 | 12250141 | QD MOUNTING BRACKET (1) LOWER BRACKET STAY |
| 57 | 1 | 12251191 | UPPER BRACKET STAY |
| 57a | 2 | 40010607 | 3/8" 16 H.H.C.S. x 3" GR 8 |
| 57b | 2 | 42030600 | 3/8" H.S. LOCKWASHER |
| 58 | 1 | 12251332 | SWITCH MOUNTING PLATE |
| 59 | 1 | 22204981 | VALVE MANIFOLD BLOCK |
| 60 | 1 | 22200172 | CLAMP CIRCUIT MANIFOLD ASSEMBLY |
| | | 22300011 | (1) CLAMP P.O. CHECK VALVE |
| | | 22300021 | (1) CLAMP DIRECTIONAL VALVE |
| | | 22300031 | (1) CLAMP PUMP RELIEF VALVE |
| 61 | 1 | 12203541 | "TELL TALE" MTG BRACKET |
| 62 | 2 | 25000011 | "TELL TALE" INDICATOR BLOCKS |
| 63 | 1 | 25000021 | "TELL TALE" INDICATOR BUTTON |
| 64 | 3 | 30700031 | 1" STRAIN RELIEF CONNECTOR |
| 65 | 3 | 30700030 | 1/2" STRAIN RELIEF CONNECTOR |
| 66 | 2 | 30700121 | HOLE GROMMET |
| 67 | 1 Kit | 92001521 | INDICATOR NAME PLATES |
| 68 | 2 | 91000011 | SELF-SEAL PLASTIC SHEETS 10" x 12" |
| 69 | 2 | 12100332 | HOSE/WIRE CLAMP |
| 70 | 1 | 92000031 | "WARNING" LABELS |
| 71 | 2 | 92000030 | "WARNING" LABELS |
| 72 | 2 | 20616111 | 1" STD PIPE COUPLING |
| 73 | 1 | 14900001 | TEMPERATURE BULB WELL |

GENERAL ARRANGEMENT MECHANICAL

E-7D-536

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|-----------------------------|
| 74 | 1 | 93000301 | DRIVE PRESS GAGE 5000PSI |
| 75 | 1 | 93000301 | CLAMP PRESS GAGE 5000PSI |
| 76 | 1 | 93000305 | CHARGE PRESS. GAGE 0-800PSI |
| 77 | 1 | 93000304 | SUCTION PRESS. GAGE 0-30 HG |
| 78 | 1 | 93000401 | TEMPERATURE GAGE |
| 79 | 1 | 93000306 | OIL PRESSURE GAGE |
| | 1 | 30400031 | RESISTOR |
| | 1 | 93000307 | SENDER, PRESSURE |
| 80 | 1 | 93000402 | WATER TEMP. GAGE |
| | 1 | 30400031 | RESISTOR |
| | 1 | 93000403 | SENDER, TEMPERATURE |
| 81 | 1 | 93000501 | AMMETER |
| 82 | 1 | 93000602 | TACHOMETER |
| 83 | 1 | 30600031 | RESET SWITCH |
| 84 | 1 | 93000701 | HOUR METER |
| 85 | 1 | 93000101 | OIL LEVEL GAGE |
| 86 | 1 | 30600071 | CHARGE PRESSURE SWITCH |
| 87 | 1 | 30500011 | RELAY 24V R2 |
| 88 | 1 | 30500031 | RELAY 12V R1 |
| 89 | 1 | 30500021 | TIMING RELAY TDR |
| 90 | 1 | 30600042 | CLAMP PRESSURE SWITCH |
| 91 | 1 | 30600111 | TEMP. CONTROLLER SWITCH |
| 92 | 1 | 30600061 | OFF/ON POWER SWITCH |
| 93 | 1 | 30300031 | START LIGHT |
| 94 | 1 | 30300041 | LENS |
| 95 | 1 | 30200051 | 60 A FUSE HOLDER SAE |
| 96 | 1 | 30200061 | 40 A FUSE TYPE K-5 |
| 97 | 1 | 30200041 | 30 A FUSE HOLDER SAE |
| 98 | 1 | 30200011 | 10A FUSE TYPE K-5 |
| 99 | 1 | 30200031 | 1 A FUSE |
| 100 | 1 | 30200021 | FUSE HOLDER |
| 101 | 4 | 30700041 | 8 POST TERMINAL BOARDS |
| 102 | 1 | 30700081 | TERMINAL MFG. TRACK |
| 103 | 15 | 30700101 | TERMINAL STRIPS |
| 104 | 1 | 30700111 | MOUNTING KIT |
| 105 | 1 | 30600081 | START SWITCH |
| 106 | 1 | 92000025 | START SWITCH PLATE |
| 107 | 1 | 30600091 | CWS TOGGLE SWITCH D.P.D.T. |
| 108 | 2 | 30100011 | 12 VOLT BATTERIES |
| 109 | 4 | 30700061 | BATTERY CLAMPS |
| 110 | 2 | 30700071 | BATTERY CABLE LUGS |
| 111 | 4 | 30700052 | NEOPRENE BATTERY CABLE |
| | | | (2) BATTERY CABLE x 18" LG |
| | | | (1) BATTERY CABLE x 12" LG |

GENERAL ARRANGEMENT MECHANICAL

E-7D-536

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|-------------------------------------|
| 112 | AS REQD | 30700151 | #8 STRANDED ELECTRIC WIRE |
| 113 | AS REQD | 30700161 | #10 STRANDED ELECTRIC WIRE |
| 114 | AS REQD | 30700181 | #14 STRANDED ELECTRIC WIRE |
| 115 | AS REQD | 30700130 | WIRE MARKERS |
| 116 | AS REQD | 30700140 | WIRE MARKERS |
| 117 | 20' | 30700300 | PLASTIC SPIRAL WRAP |
| 118 | 1 | 12600011 | PENDANT CONTROL BOX |
| 119 | 1 | 30300031 | CLAMP LITE |
| 120 | 1 | 30300041 | LENS, GREEN |
| 121 | 1 | 30600051 | CLAMP/UNCLAMP SWITCH |
| 122 | 1 | 30900001 | LENS GUARD RING |
| 123 | 3 | 30700021 | WIRE CLAMP (SMALL) |
| 124 | 1 | 30400011 | POTENTIOMETER |
| 125 | 1 | 30400021 | RESISTOR |
| 126 | 1 | 92000024 | RHEOSTAT DIAL |
| 127 | 1 | 11200011 | RHEOSTAT KNOB |
| 128 | 2 | 12203521 | PENDANT MOUNTING BAR |
| 129 | 50' | 30700011 | 12/16 ELECTRIC CABLE |
| 130 | 1 | 22640011 | HAND PUMP |
| 201 | 12 | 40031201 | 3/4" - 10 H.S.H.C.S. 1960 SERIES GR |
| 202 | 12 | 42030600 | 3/4" H.S.L.W. |
| 203 | 4 | 40011202 | 3/4" - 10 H.H.C.S. GR 8 2" |
| 204 | 4 | 41041200 | 3/4" - 10 HEAVY HEX NUT GR 8 |
| 205 | 4 | 42030600 | 3/4" H.S.L.W. |
| 206 | 4 | 40011204 | 3/4" - 10 H.H.C.S GR 8 2 1/2" |
| 207 | 4 | 42021200 | 3/4" HVY FLATWASHER |
| 208 | 4 | 42030600 | 3/4" H.S.L.W. |
| 209 | 2 | 40011001 | 5/8" - 11 HEX HD BOLT GR 8 1" |
| 210 | 2 | 42031000 | 5/8" H.S.L.W. |
| 211 | 8 | 40010801 | 1/2" - 13 H.H.C.S. GR 8 1" |
| 212 | 8 | 42030800 | 1/2" H.S.O.W. |
| 213 | 4 | 40010804 | 1/2" - 13 H.H.C.S GR 8 2" |
| 214 | 4 | 41010800 | 1/2" - 13 HEX NUT GR 8 |
| 215 | 4 | 52010800 | 1/2" FLATWASHER |
| 216 | 4 | 42030800 | 1/2" H.S.L.W. |
| 217 | 12 | 40010702 | 7/16" - 14 H.H.C.S. GR 8 1 1/4" |
| 218 | 12 | 42030700 | 7/16" H.S.L.W. |
| 219 | 4 | 40010801 | 1/2" - 13 H.H.C.S. GR 8 1" |
| 220 | 4 | 42030800 | 1/2" H.S.L.W. |
| 221 | 2 | 40010802 | 1/2" 13 H.H.C.S. GR 8 1 1/4" |
| 222 | 2 | 41010800 | 1/2" - 13 HEX NUTS GR 8 |
| 223 | 2 | 42010800 | 1/2" FLATWASHER |
| 224 | 2 | 42030800 | 1/2" H.S.L.W. |

GENERAL ARRANGEMENT MECHANICAL

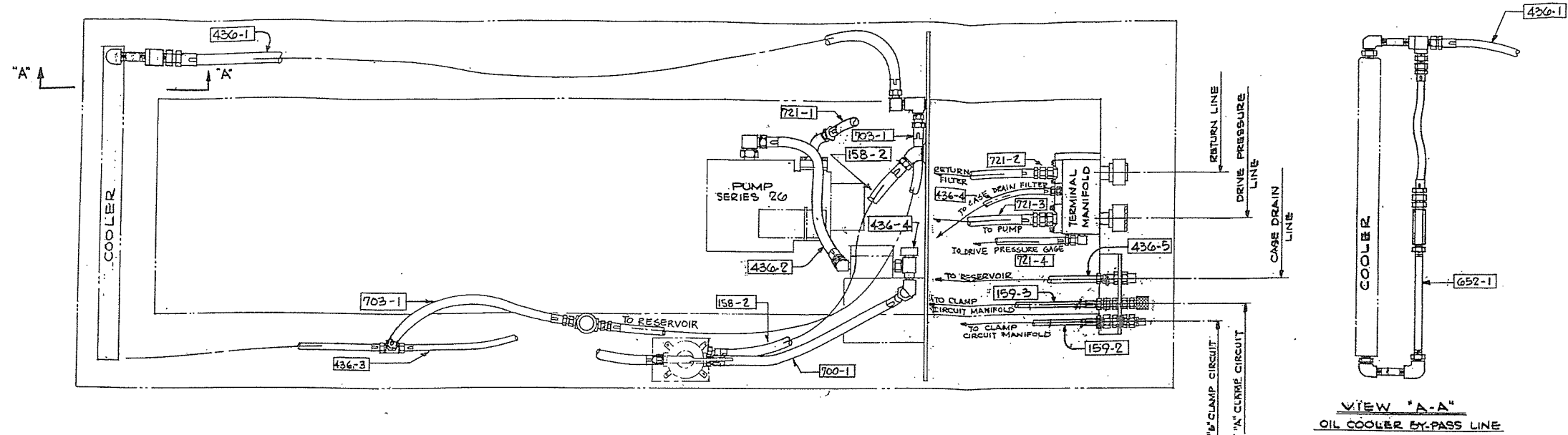
E-7D-536

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|-----------------------------------|
| 225 | 10 | 40010603 | 3/8" - 16 H.H.C.S. GR 8 1" |
| 226 | 10 | 42010600 | 3/8" FLATWASHER |
| 227 | 10 | 42030600 | 3/8" H.S.L.W. |
| 228 | 8 | 40010604 | 3/8" - 16 H.H.C.S. Gr 8 1-1/4" |
| 229 | 8 | 42010600 | 3/8" FLATWASHER |
| 230 | 8 | 42030600 | 3/8" H.S.L.W. |
| 231 | 7 | 40010603 | 3/8" - 16 H.H.C.S. Gr 8 1" |
| 232 | 7 | 42010600 | 3/8" FLATWASHER |
| 233 | 7 | 42030600 | 3/8" H.S.L.W. |
| 234 | 4 | 40010603 | 3/8" - 16 H.H.C.S. gr 8 1" |
| 235 | 4 | 42010600 | 3/8" FLATWASHER |
| 236 | 4 | 42030600 | 3/8" H.S.L.W. |
| 237 | 18 | 40010603 | 3/8" - 16 H.H.C.S. GR 8 1" |
| 238 | 18 | 42010600 | 3/8" FLATWASHER |
| 239 | 18 | 42030600 | 3/8" H.S.L.W. |
| 240 | 1 | 40010603 | 3/8" - 16 H.H.C.S. GR 8 1" |
| 241 | 1 | 41010600 | 3/8" - 16 HEX NUT GR 8 |
| 242 | 2 | 42010600 | 3/8" FLATWASHER |
| 243 | 1 | 42030600 | 3/8" H.S.L.W. |
| 244 | 7 | 40010603 | 3/8" - 16 H.H.C.S. GR 8 1" |
| 245 | 4 | 41010600 | 3/8" - 16 HEX NUT GR 8 |
| 246 | 7 | 42010600 | 3/8" FLATWASHER |
| 247 | 7 | 42030600 | 3/8" H.S.L.W. |
| 248 | 20 | 40010604 | 3/8" - 16 H.H.C.S. GR 8 1-1/4" |
| 249 | 20 | 42010600 | 3/8" FLATWASHER |
| 250 | 20 | 42070601 | 3/8" BELLEVILLE WASHER |
| 251 | 10 | 41040600 | 3/8" - 16 1-NY. HEX NUT (STRUCT.) |
| 252 | 4 | 40010601 | 3/8" - 16 H.H.C.S. GR 8 5/3" |
| 253 | 4 | 42030600 | 3/8" H.S.L.W. |
| 254 | 4 | 40010508 | 5/16" - 18 H.H.C.S. GR 8 1'4" |
| 255 | 4 | 42030500 | 5/16" H.S.L.W. |
| 256 | 4 | 41010500 | 5/16" - 18 HEX NUT GR 8 |
| 257 | 4 | 42030500 | 5/16" H.S.L.W. |
| 258 | 4 | 40030501 | 5/16" - 18 H.S.H.C.S. GR 8 2-1/2" |
| 259 | 4 | 41010500 | 5/16" - 18 HEX NUT GR 8 |
| 260 | 4 | 42010500 | 5/16" FLATWASHER |
| 261 | 4 | 42030500 | 5/16" H.S.L.W. |
| 262 | 12 | 40010402 | 1/4" - 20 H.H.C.S. GR 8 1" |
| 263 | 12 | 42010400 | 1/4" FLATWASHER |
| 264 | 12 | 42030400 | 1/4" H.S.L.W. |
| 265 | 1 | 40010502 | 5/16" - 18 H.H.C.S. GR 8 1" |
| 266 | 1 | 41010500 | 5/16" - 18 HEX NUT GR 8 |

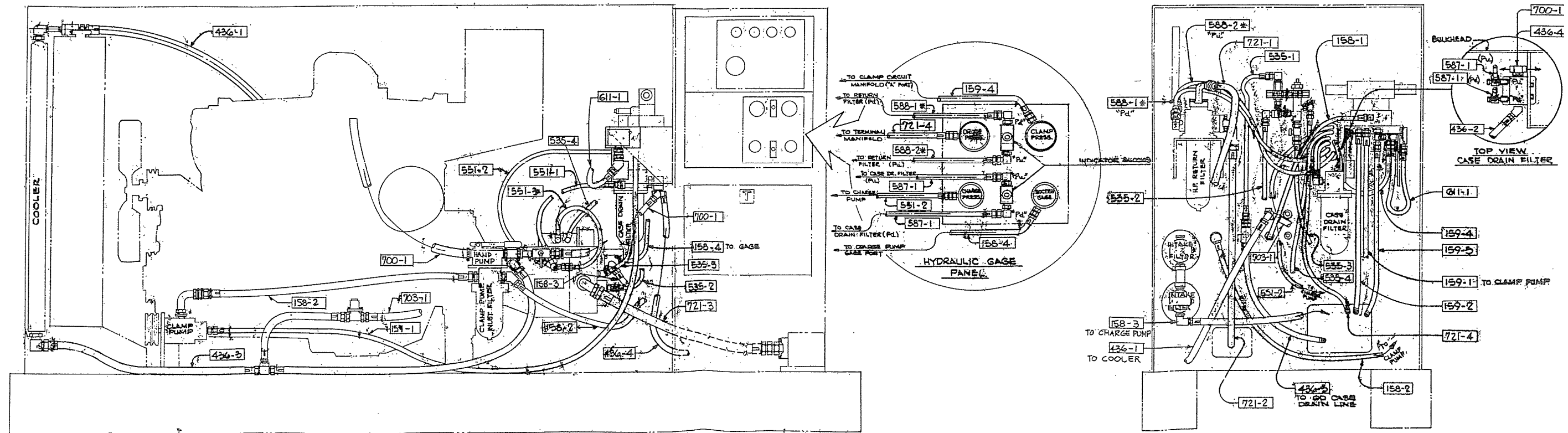
GENERAL ARRANGEMENT MECHANICAL

E-7D-536

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|--|
| 267 | 1 | 42010500 | 5/16" FLATWASHER |
| 268 | 1 | 42030500 | 5/16" H.S.L.W. |
| 269 | 2 | 40040401 | 1/4" - 20 R.H. MACH. SCREWS 2" |
| 270 | 2 | 41010400 | 1/4" - 20 HEX NUT GR 8 |
| 271 | 2 | 42030400 | 1/4" H.S.L.W. |
| 272 | 2 | 42010400 | 1/4" FLATWASHER |
| 273 | 2 | 40010404 | 1/4" - 20 H.H.C.S. 1-1/2" |
| 274 | 2 | 41010400 | 1/4" - 20 HEX NUT |
| 275 | 2 | 42010400 | 1/4" FLATWASHER |
| 276 | 2 | 42030400 | 1/4" H.S.L.W. |
| 277 | 2 | 40010403 | 1/4" - 20 H.H.C.S. GR 8 1-1/4" |
| 278 | 2 | 41010400 | 1/4" - 20 HEX NUT |
| 279 | 2 | 42030400 | 1/4" H.S.L.W. |
| 280 | 3 | 40010402 | 1/4" - 20 H.H.C.S. GR 8 1" |
| 281 | 3 | 41010400 | 1/4" - 20 HEX NUT |
| 282 | 6 | 42010400 | 1/4" FLATWASHER |
| 283 | 3 | 42030400 | 1/4" H.S.L.W. |
| 284 | 9 | 40040302 | #10-24 RD.HD. MACH. SCREW 3/4" |
| 285 | 9 | 41010300 | #10-24 HEX NUT |
| 286 | 9 | 42060300 | #10 EXT. TOOTH LOCKWASH |
| 287 | 4 | 40050301 | #10-32 RD.HD. MACH SCREW 1" |
| 288 | 4 | 41020300 | #10-32 HEX NUT |
| 289 | 8 | 42010300 | #10 FLATWASHER |
| 290 | 4 | 42030300 | #10 H.S.L.W. |
| 291 | 2 | 40040303 | #10-24 RD.HD. MACH SCREW 1-1/4" |
| 292 | 2 | 41010300 | #10-24 HEX NUT |
| 293 | 2 | 42010300 | #10 FLATWASHER |
| 294 | 2 | 42030300 | #10 H.S.L.W. |
| 295 | 3 | 40040201 | #8-32 RD.HD. MACH SCREW 1/2" |
| 296 | 3 | 41010200 | #8-32 HEX NUT |
| 297 | 3 | 42010200 | #8 FLATWASHER |
| 298 | 3 | 42030200 | #8 H.S.L.W. |
| 299 | 6 | 40110201 | #8-32 SLOTTED PANHD. SELF TAP SCREW 1/2" |
| 300 | 6 | 42050200 | #8 INTERNAL TOOTH LOCKWASHER |
| 301 | 4 | 40070401 | 1/4" - 20 HEX WSH"RHD SELF TAP SCREW 1/2" |



| HYDRAULIC LINE LISTING | | | |
|------------------------|------|---|-------------|
| LINE MK. NO. | QTY. | DESCRIPTION | DRAWING NO. |
| 158-1 | 1 | CLAMP MANIFOLD TO RESERVOIR | E-6A-158 |
| 158-2 | 1 | RESERVOIR TO CLAMP PUMP | E-6A-158 |
| 158-3 | 1 | INTAKE FILTER TO CHARGE PUMP | E-6A-158 |
| 158-4 | 1 | SUCTION LINE AT CHARGE PUMP TO GAGE | E-6A-158 |
| 159-1 | 1 | CLAMP PUMP HI PRESSURE TO MANIFOLD (PORT) | E-6A-159 |
| 159-2 | 1 | CLAMP CIRCUIT MANIFOLD (PORT) TO QD | E-6A-159 |
| 159-3 | 1 | CLAMP CIRCUIT MANIFOLD (PORT) TO QD | E-6A-159 |
| 159-4 | 1 | CLAMP SYSTEM LINE TO CLAMP PRESS. GAGE | E-6A-159 |
| 436-1 | 1 | CASE DRAIN COOLER TO RESERVOIR | E-6A-436 |
| 436-2 | 1 | CASE DRAIN FILTER TO PUMP | E-6A-436 |
| 436-3 | 1 | CASE DRAIN PUMP TO COOLER | E-6A-436 |
| 436-4 | 1 | CASE DRAIN FILTER TO TERMINAL MANIFOLD | E-6A-436 |
| 436-5 | 1 | CASE DRAIN LINE, RESERVOIR TO QD | E-6A-436 |
| 721-1 | 1 | RETURN LINE FILTER TO PUMP | E-6A-721 |
| 721-2 | 1 | RETURN LINE FILTER TO QD | E-6A-721 |
| 721-3 | 1 | PUMP HIGH PRESS. DRIVE LINE TO MAN. QD | E-6A-721 |
| 721-4 | 1 | HIGH PRESS. LINE TO DRIVE PRESS. GAGE | E-6A-721 |
| 555-1 | 1 | PRESSURE COMPENSATOR TO RESERVOIR | E-6A-555 |
| 555-2 | 1 | PRESSURE COMPENSATOR TO SERVO | E-6A-555 |
| 555-3 | 1 | PRESSURE COMP. TO H.P. PUMP OUTLET (PORT) | E-6A-555 |
| 555-4 | 1 | PRESSURE COMPENSATOR TO PUMP CONTROL | E-6A-555 |
| 551-1 | 1 | CHARGE PRESSURE SWITCH TO PUMP | E-6A-551 |
| 551-2 | 1 | CHARGE PUMP TO CHARGE PRESSURE GAGE | E-6A-551 |
| 551-3 | 1 | CHARGE PUMP LINE TO PUMP CONTROLLER | E-6A-551 |
| 587-1 | 2 | CASE DRAIN FILTER TO TELL TALE INDICATOR | E-6A-587 |
| 588-1 | 1 | RETURN FILTER TO TELL TALE INDICATOR (PL) * | E-6A-588 |
| 588-2 | 1 | RETURN FILTER TO TELL TALE INDICATOR (PL) * | E-6A-588 |
| 611-1 | 1 | CLAMP PRESSURE SWITCH LINE | E-6A-611 |
| 652-1 | 1 | OIL COOLER BY-PASS | E-6A-652 |
| 700-1 | 1 | HYDRAULIC FILLER LINE THRU CASE DRAIN | E-6A-700 |
| 703-1 | 1 | HEAT EXCHANGER BY-PASS | E-6A-703 |

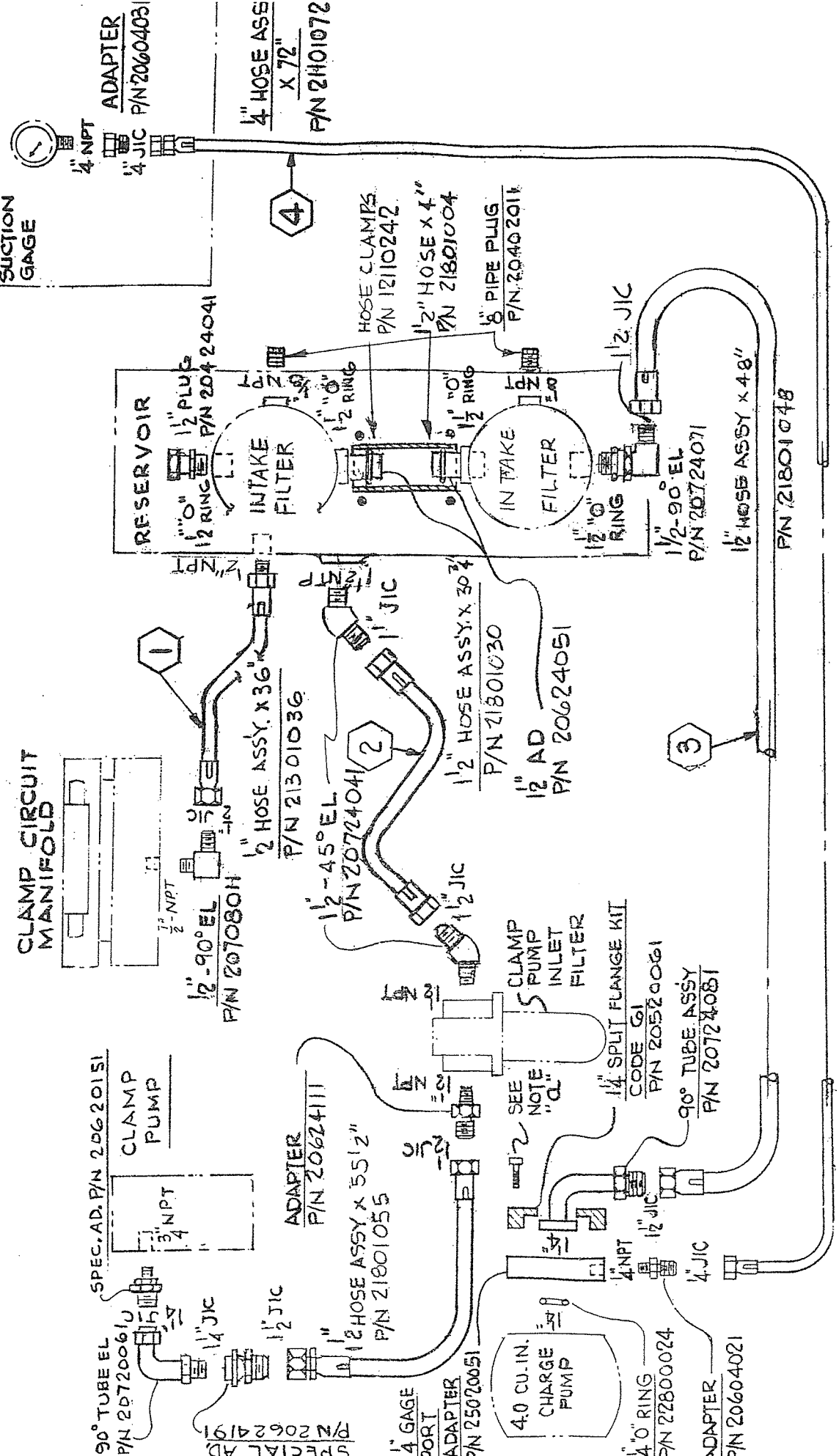


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FOSTER EQUIPMENT DIVISION
L.B. FOSTER COMPANY
 4000 CASTLE DRIVE, P. O. #1
 CORAOPOLIS, PENNSYLVANIA 16104

GENERAL ARRANGEMENT - HYDRAULIC
 POWER PACK
 MODEL 1205-C P/N 01120505

DRAWN RD DATE 8-2-77
 CHECK DATE
 DRAWING No. E-6D-537 D



NOTE A
 DISCARD 7/16" x 1 1/2" LG BOLTS
 THAT COME WITH KIT AND
 REPLACE WITH 2 1/2" LG
 BOLTS AS PER B/M.

| | | |
|---|---------|-----------------------|
| H | 5/23/78 | SEE ECN# 42 |
| G | 3/27/78 | SEE ECN# 34 |
| F | 3/15/78 | PER ECN # 30 |
| E | 8/19/77 | ADD SUCTION GAGE LINE |
| D | 6/12/77 | SEE ECN #10 |

① = INDICATES LINE NUMBER

L.B. FOSTER CO.
 EQUIPMENT DIVISION
 CORAOPOLIS, PENNA. 15108

HOSE & FITTING ARRANGEMENT
 CLAMP CIRCUIT & CHARGE PUMP TO RESERVOIR

1205C

DRAWN SHEKBY
 DATE 5-17-76

DWG. NO. E-6A-158

PROPRIETARY INFORMATION
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GENERAL ARRANGEMENT HYDRAULIC

E-6A-158

MANIFOLD RETURN TO RESERVOIR

E-6A-158

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|--------------------|
| 158-1 | 1 | 20708011 | 90° ELBOW MP/37°FL |
| | 1 | 21301036 | 1/2" HOSE MP/37°FL |

RESERVOIR TO CLAMP PUMP

E-6A-158

| | | | |
|-------|---|----------|---------------------------|
| 158-2 | 2 | 20724041 | 45° ELBOW MP/37° FL |
| | 1 | 21801030 | 1-1/2" HOSE 37°FL/37°FL |
| | 1 | 20624111 | ADAPTOR MP/37°FL |
| | 1 | 21801055 | 1-1/2" HOSE 37°FL/37°FL |
| | 1 | 20624191 | SPEC. ADAPTOR 37°FL/37°FL |
| | 1 | 20720061 | 90° ELBOW 37°FL/37°FL |
| | 1 | 20620151 | SPEC. AD. 37°FL/MP |

INTAKE FILTER TO SUCTION GAGE

E-6A-158

| | | | |
|-------|---|----------|-----------------------|
| 158-4 | 1 | 20604021 | ADAPTOR MP/37°FL |
| | 1 | 21101072 | 1/4" HOSE 37°FL/37°FL |
| | 1 | 20604031 | ADAPTOR FP/37°FL |

INTAKE FILTER TO CHARGE PUMP

E-6A-158

| | | | |
|-------|---|----------|------------------------------------|
| 158-3 | 2 | 20402011 | 1/8" PIPE PLUG - SQ. HD. NPT |
| | 1 | 20424041 | 1-1/2" PLUG "O" RING |
| | 2 | 20624051 | 1-1/2" ADAPTOR "O" RING/HOSE BIB |
| | 3 | 21801004 | 1-1/2" HOSE |
| | 2 | 12110242 | LOW PRESSURE 1-1/2" HOSE CLAMP |
| | 1 | 20724071 | 1-1/2" - 90° ELBOW "O" RING/37°FL |
| | 1 | 21801048 | 1-1/2" HOSE 37°FL/37°FL |
| | 1 | 20724081 | 90° ELBOW FL/37°FL |
| | 1 | 20520061 | 1-1/4" SPLIT FLANGE KIT |
| | 1 | 25020051 | 1-1/4" GAGE PORT ADAPTOR |
| | 4 | 40010704 | 7/16" -14 H.H.C.S. x 2-1/2"LG GR 8 |
| | 1 | 22800024 | 1-1/4" "O" RING |

GENERAL ARRANGEMENT HYDRAULIC

E-6.D-537

CLAMP PUMP TO HIGH PRESSURE TO MANIFOLD

E-6A-159

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|-----------------------|
| 159-1 | 2 | 20608071 | ADAPTOR MP/37°FL |
| | 1 | 21302108 | 1/2" HOSE 37°FL/37°FL |

CLAMP CIRCUIT MANIFOLD TO QUICK DISCONNECT

E-6A-159

| | | | |
|-------|---|----------|-----------------------------|
| 159-2 | 1 | 20608021 | ADAPTOR MP/37°FL |
| | 1 | 21201060 | 3/8" HOSE 37°FL/37°FL |
| | 1 | 20608031 | ADAPTOR REDUCER 37°FL/37°FL |
| | 1 | 20608051 | BULKHEAD ADAPTOR MP/37°FL |
| | 1 | 21006011 | 3/8" Q.D. MALE |
| | 1 | 21006021 | 3/8" DUST CAP Q.D. |

CLAMP CIRCUIT MANIFOLD TO QUICK DISCONNECT

E-6A-159

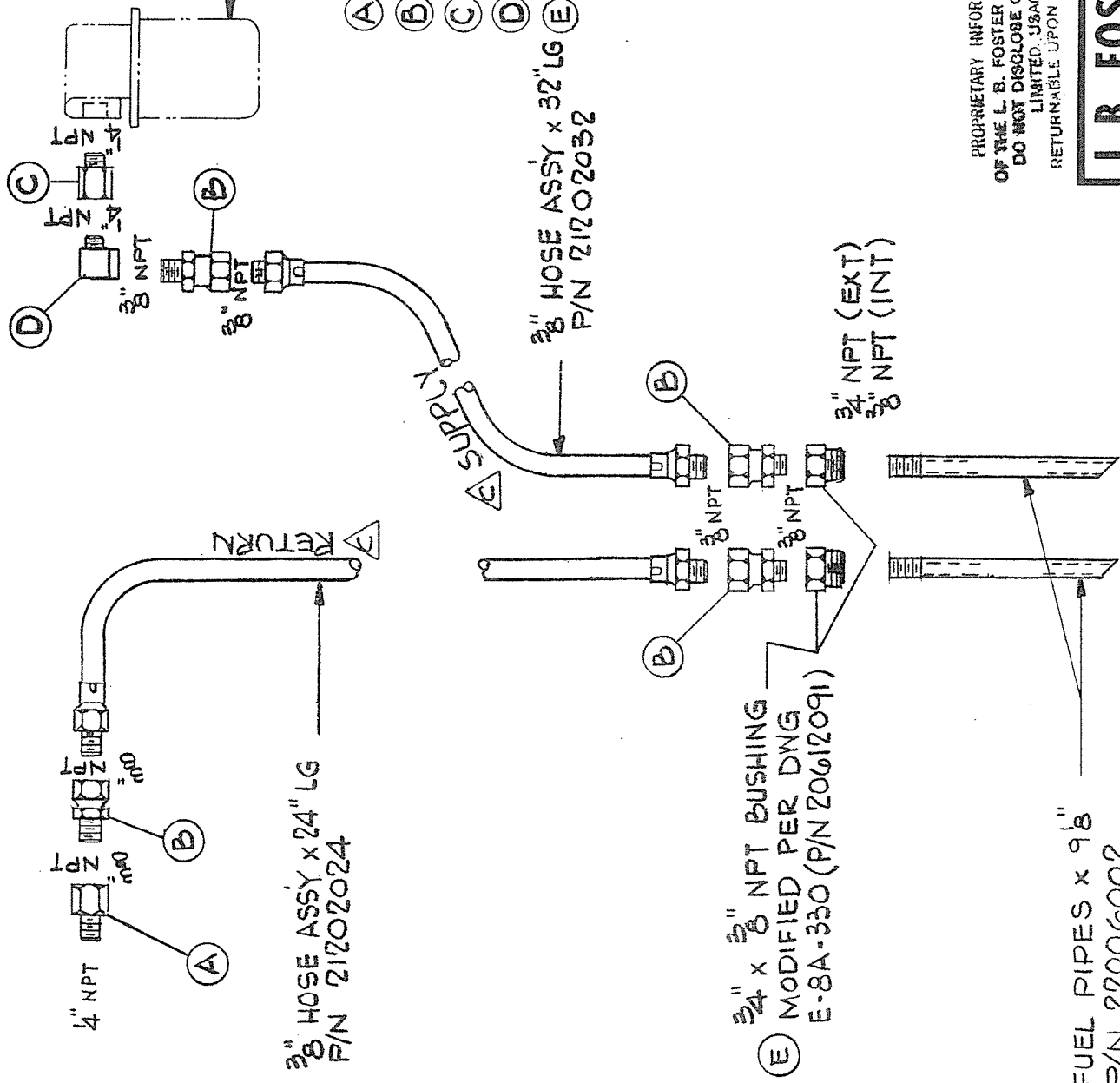
| | | | |
|-------|---|----------|-----------------------------|
| 159-3 | 1 | 20608101 | ADAPTOR MP/FP |
| | 1 | 20806011 | TEE MP/FP/FP |
| | 1 | 20606031 | ADAPTOR MP/37°FL |
| | 1 | 21201060 | 3/8" HOSE 37°FL/37°FL |
| | 1 | 20608031 | ADAPTOR REDUCER 37°FL/37°FL |
| | 1 | 20608041 | BULKHEAD ADAPTOR FP/37°FL |
| | 1 | 21006031 | 3/8" Q.D. FEMALE |
| | 1 | 21006041 | 3/8" DUST CAP Q.D. |

CLAMP SYSTEM LINE TO GAGE

E-6A-159

| | | | |
|-------|---|----------|-----------------------|
| 159-4 | 1 | 20606021 | ADAPTOR REDUCER MP/FP |
| | 1 | 20804021 | TEE MP/37°FL/37°FL |
| | 1 | 21101072 | 1/4" HOSE 37°FL/37°FL |
| | 1 | 20604031 | ADAPTOR FP/37°FL |

PRIMARY FUEL OIL FILTER
AC 25000 MK II ENGINE



- (A) ADAPTER RED. P/N 20606011
- (B) ADAPTER P/N 20606061
- (C) ADAPTER P/N 20604041
- (D) 90° EL P/N 20706021
- (E) 3/4" x 3/8" NPT BUSHING P/N 20612091 (MOD)

3/8" HOSE ASSY x 24" LG
P/N 21202024

3/4" x 3/8" NPT BUSHING
MODIFIED PER DWG
E-8A-330 (P/N 20612091)

FUEL PIPES x 9/8"
P/N 22006002
DWG E-8A-675

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L. B. FOSTER CO.

EQUIPMENT DIVISION
CORAOOLIS, PENNA. 15108

FUEL LINE ARRANGEMENT
AC 25000 MK II 205C

| | |
|---------------|--------------|
| SWITCHED | 9/18/78 |
| SUPPLY & RET. | |
| REVISIONS | PER ECN # 30 |

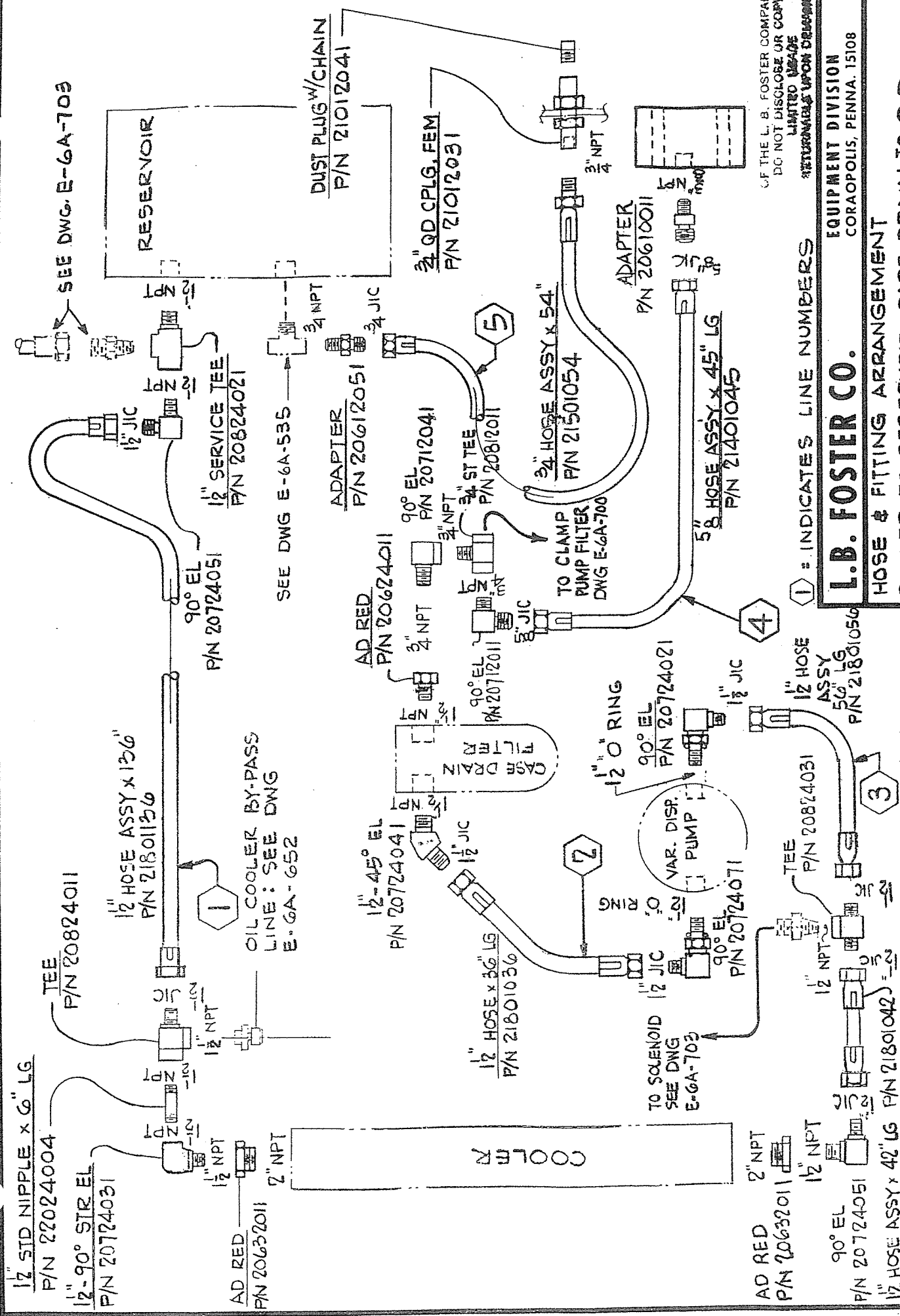
DRAWN RD DATE 8-2-76

DWG. NO. E-6A-190 C

FUEL HOSE ARRANGEMENT

E-6A-190

| <u>ITEM</u> | <u>NO. REQ'D</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|------------------|-----------------|--------------------|
| 1 | 1 | 20606011 | AD RED MP/FP |
| 2 | 4 | 20606061 | AD MP/FP |
| 3 | 1 | 20604041 | AD MP/FP |
| 4 | 1 | 20706021 | 90° EL MP/FP |
| 5 | 1 | 21202024 | 3/8" HOSE ASS'Y |
| 6 | 1 | 21202032 | 3/8" HOSE ASS'Y |
| 7 | 2 | 20612091 | NPT BUSHING |
| 8 | 2 | 22006002 | FUEL PIPE |



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① = INDICATES LINE NUMBERS

L.B. FOSTER CO.
EQUIPMENT DIVISION
CORAOOLIS, PENNA. 15108

HOSE & FITTING ARRANGEMENT
COOLER TO RESERVOIR, CASE DRAIN TO Q.D.

| | | | |
|-------------|-----------------|----------------------|---|
| DRAWN RD | DATE 3-17-77 | DWG. NO. E-6A-436 | F |
|-------------|-----------------|----------------------|---|

| | | | | | |
|---|---------|----------------------|---|---------|----------------------------------|
| F | 9/24/78 | ECN # 43 | D | 8-11-77 | 36" LG HOSE W/33" |
| E | 3/28/78 | ADDED TEE, LINE 1 | C | 7-1-77 | DELETE 90° EL ADD ADAPTER 4 T |
| | | SEE 3/17/78 | | | |
| | | SEE 10/31/77 | | | |

GENERAL ARRANGEMENT HYDRAULIC

E-6D-537

CASE DRAIN COOLER TO RESERVOIR

E-6A-436

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|-------------------------------|
| 436-1 | 1 | 20632011 | ADAPTOR REDUCER MP/FP |
| | 1 | 20724031 | 1-1/2" - 90° STREET ELBOW NPT |
| | 1 | 22024004 | 1-1/2" STD NIPPLE |
| | 1 | 20824011 | TWV FP/FP/37°FL |
| | 1 | 21801136 | 1-1/2" HOSE 37°/FL/37°FL |
| | 1 | 20724051 | 90° ELBOW MP/37°FL |
| | 1 | 20824021 | 1-1/2" SERVICE TEE NPT |

CASE DRAIN FILTER TO PUMP

E-6A-436

| | | | |
|-------|---|----------|-----------------------------------|
| 436-2 | 1 | 20724041 | 1-1/2" - 45° ELBOW MP/37°FL |
| | 1 | 21801036 | 1-1/2" HOSE 37°FL/37°FL |
| | 1 | 20724071 | 1-1/2" - 90° ELBOW "O" RING/37°FL |

CASE DRAIN PUMP TO COOLER

E-6A-436

| | | | |
|-------|---|----------|---------------------------------|
| 436-3 | 1 | 20724021 | 1'2" - 90° ELBOW "O" RING/37°FL |
| | 1 | 21801056 | 1'2" HOSE 37°FL/37°FL |
| | 1 | 20824031 | TEE FP/37°FL/37°FL |
| | 1 | 21801042 | 1-1/2" HOSE 37°FL/37°FL |
| | 1 | 20724051 | 1-1/2" - 90° ELBOW MP/37°FL |
| | 1 | 20632011 | ADAPTOR REDUCER MP/FP |

CASE DRAIN FILTER TO TERMINAL MANIFOLD

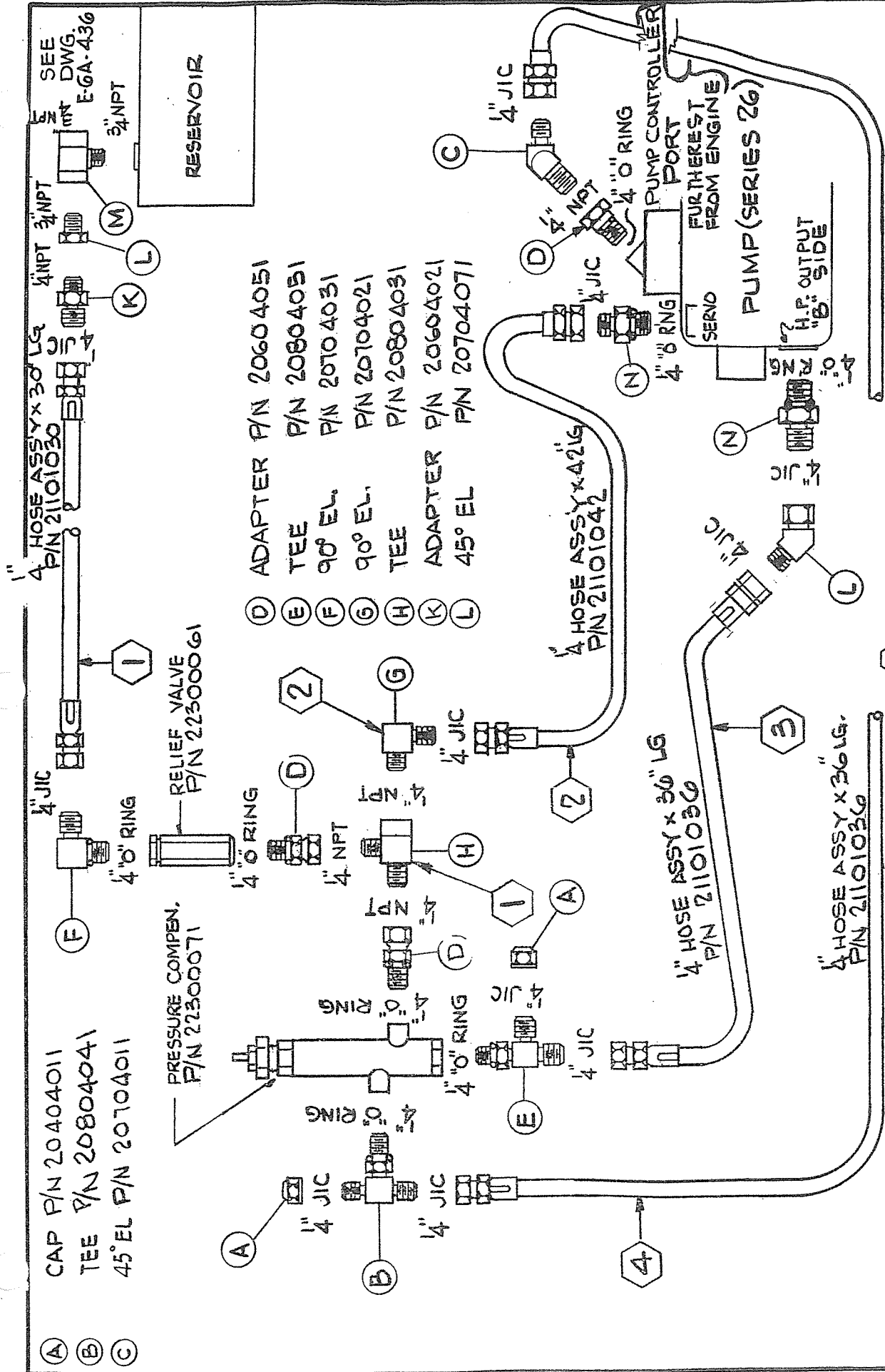
E-6A-436

| | | | |
|-------|---|----------|--------------------------|
| 436-4 | 1 | 20624011 | ADAPTOR MP/MP |
| | 1 | 20712041 | 90° ELBOW MP/FP |
| | 1 | 20812011 | 3/4" STREET TEE MP/FP/FP |
| | 1 | 20712011 | 90° ELBOW MP/FP |
| | 1 | 21401045 | 5/8" HOSE 37°FL/37°FL |
| | 1 | 20610011 | ADAPTOR MP/37°FL |

CASE DRAIN LINE RESERVOIR TO QUICK DISCONNECT

E-6A-436

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|------------------------|
| 436-5 | 1 | 20612051 | ADAPTOR MP/37°FL |
| | 1 | 21501054 | 3/4" HOSE MP/37°FL |
| | 1 | 21012031 | 3/4" Q.D. FEMALE |
| | 1 | 21012041 | 3/4" DUST PLUG W/CHAIN |



① = INDICATES LINE NUMBER

L.B. FOSTER CO.
 EQUIPMENT DIVISION
 CORAOPOLIS, PENNA. 15108

PRESSURE COMPENSATOR LINES - TO RELIEF VALVE & RESER., TO SERVO, TO H.P. PUMP OUTPUT & TO PUMP CONTROLLER

- (A) CAP P/N 20404011
- (B) TEE P/N 20804041
- (C) 45° EL P/N 20704011

- (D) ADAPTER P/N 20604051
- (E) TEE P/N 20804051
- (F) 90° EL. P/N 20704031
- (G) 90° EL. P/N 20704021
- (H) TEE P/N 20804031
- (K) ADAPTER P/N 20604021
- (L) 45° EL P/N 20704071

- (L) AD. RED P/N 20612011
- (M) TEE P/N 20812011
- (N) ADAPTER P/N 20604071

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| | | |
|---|---------|-----------------|
| B | 3-31-78 | ADD EL., LINE 3 |
| A | 3-21-78 | SEE ECN #30 |

| | | | | | |
|----------|----------|------|---------|---------|---|
| DRAWN | RD | DATE | G/13/77 | CHECKED | |
| DWG. NO. | E-6A-535 | | | | B |

GENERAL ARRANGEMENT HYDRAULIC

E-6D-537

PRESSURE COMPENSATOR LINE TO RESERVOIR

E-6A-535

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|--------------------------|
| 535-1 | 2 | 20604051 | ADAPTOR FP/"O" RING SW |
| | 1 | 20804031 | TEE MP/MP/FP |
| | 1 | 22300061 | RELIEF VALVE |
| | 1 | 20704031 | 90° ELBOW "O" RING/37°FL |
| | 1 | 21101030 | 1/4" HOSE 37°FL/37°FL |
| | 1 | 20604021 | ADAPTOR MP/37°FL |
| | 1 | 20612011 | ADAPTOR REDUCER MP/FP |
| | 1 | 20812011 | TEE MP/FP/FP |

PRESSURE COMPENSATOR LINE TO SERVO

E-6A-535

| | | | |
|-------|---|----------|------------------------|
| 535-2 | 1 | 20704021 | 90° ELBOW MP/37°FL |
| | 1 | 21101042 | 1/4" HOSE 37°FL/37°FL |
| | 1 | 20604071 | ADAPTOR "O" RING/37°FL |

PRESSURE COMPENSATOR TO HIGH PRESSURE PUMP OUTPUT

E-6A-535

| | | | |
|-------|---|----------|--------------------------|
| 535-3 | 1 | 22300071 | PRESSURE COMPENSATOR |
| | 1 | 20804051 | TEE "O" RING/37°FL/37°FL |
| | 1 | 20404011 | CAP 37°FL |
| | 1 | 21101036 | 1/4" HOSE 37°FL/37°FL |
| | 1 | 20604071 | ADAPTOR "O" RING/37°FL |
| | 1 | 20704071 | 45° ELBOW 37°FL/37°FL SW |

PRESSURE COMPENSATOR TO PUMP CONTROLLER

E-6A-535

| | | | |
|-------|---|----------|--------------------------|
| 535-4 | 1 | 20804041 | TEE "O" RING 37°FL/37°FL |
| | 1 | 20404011 | CAP 37°FL |
| | 1 | 21101036 | 1/4" HOSE 37°FL/37°FL |
| | 1 | 20704011 | 45° ELBOW MP/37°FL |
| | 1 | 20604051 | ADAPTOR FP/"O" RING SW |

GENERAL ARRANGEMENT HYDRAULIC

E-6D-537

CHARGE PRESSURE SWITCH TO PUMP

E-6A-551

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|-----------------------|
| 551-1 | 1 | 20704061 | 90° ELBOW MP/MP |
| | 1 | 22400011 | PRESSURE SNUBBER |
| | 1 | 20604031 | ADAPTOR FP/37°FL |
| | 1 | 21101030 | 1/4" HOSE 37°FL/37°FL |
| | 1 | 20604021 | ADAPTOR MP/37°FL |

CHARGE PUMP TO CHARGE PRESSURE GAGE

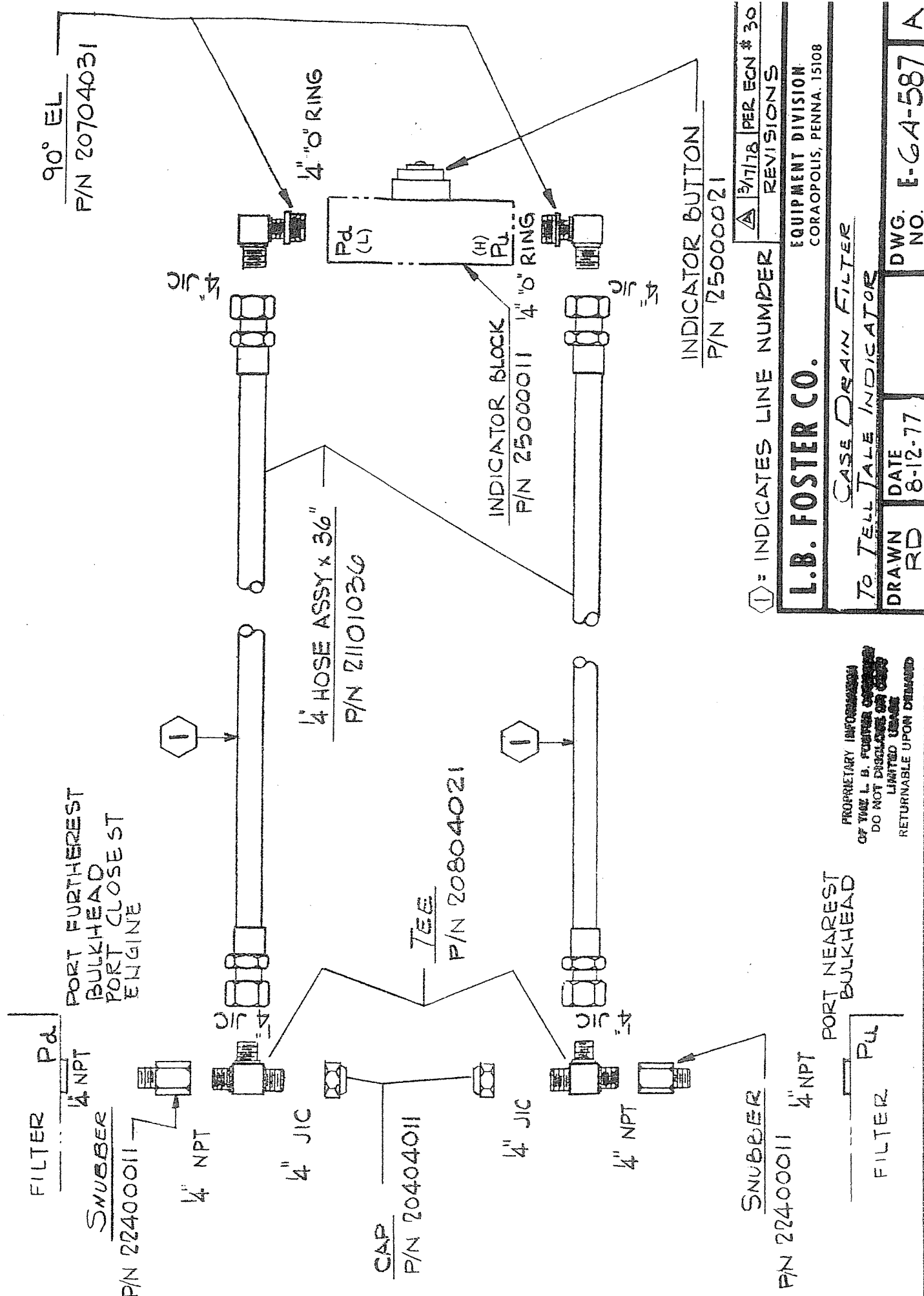
E-6A-551

| | | | |
|-------|---|----------|-----------------------|
| 551-2 | 1 | 20604011 | ADAPTOR "O" RING/FP |
| | 1 | 20904011 | CROSS MP/FP/FP/FP |
| | 1 | 20604021 | ADAPTOR MP/37°FL |
| | 1 | 21101066 | 1/4" HOSE 37°FL/37°FL |
| | 1 | 20604031 | ADAPTOR FP/37°FL |

CHARGE PUMP LINE TO PUMP CONTROLLER

E-6A-551

| | | | |
|-------|---|----------|--------------------------|
| 551-3 | 1 | 20604021 | ADAPTOR MP/37°FL |
| | 1 | 21101030 | 1/4" HOSE 37°FL/37°FL |
| | 1 | 22300051 | CHECK VALVE |
| | 1 | 20804051 | TEE "O" RING/37°FL/37°FL |
| | 1 | 20404011 | CAP 37°FL |



① = INDICATES LINE NUMBER
 3/17/78 PER ECN # 30 REVISIONS
L.B. FOSTER CO.
 EQUIPMENT DIVISION
 CORAOPOLIS, PENNA. 15108
 CASE DRAIN FILTER
 TO TELL TALE INDICATOR
 DRAWN RD DATE 8-12-77 DWG. NO. E-6A-587 A

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GENERAL ARRANGMENT HYDRAULIC

E-6D-537

CASE DRAIN FILTER TO TELL TALE INDICATOR

E-6A-587

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|--------------------------|
| 587-1 | 2 | 22400011 | PRESSURE SNUBBERS |
| | 2 | 20804021 | TEE MP/37°FL/37°FL |
| | 2 | 21101036 | 1/4" HOSE 37°FL/37°FL |
| | 2 | 20704031 | 90° ELBOW "O" RING/37°FL |
| | 2 | 20404011 | CAP 37°FL |

1/4" HOSE ASSY x 56" LG
P/N 21101056

90° EL
P/N 20704031

THIS INDICATOR
 BUTTON FURNISHED
 WITH RETURN FILTER
 REMOVE & RELOCATE
 IN INDICATOR BLOCK

INDICATOR
BLOCK
P/N 25000011

NOTE... THIS LINE
 IDENTICAL TO
 LINE ① (FAR SIDE).
 EXCEPT AS NOTED.

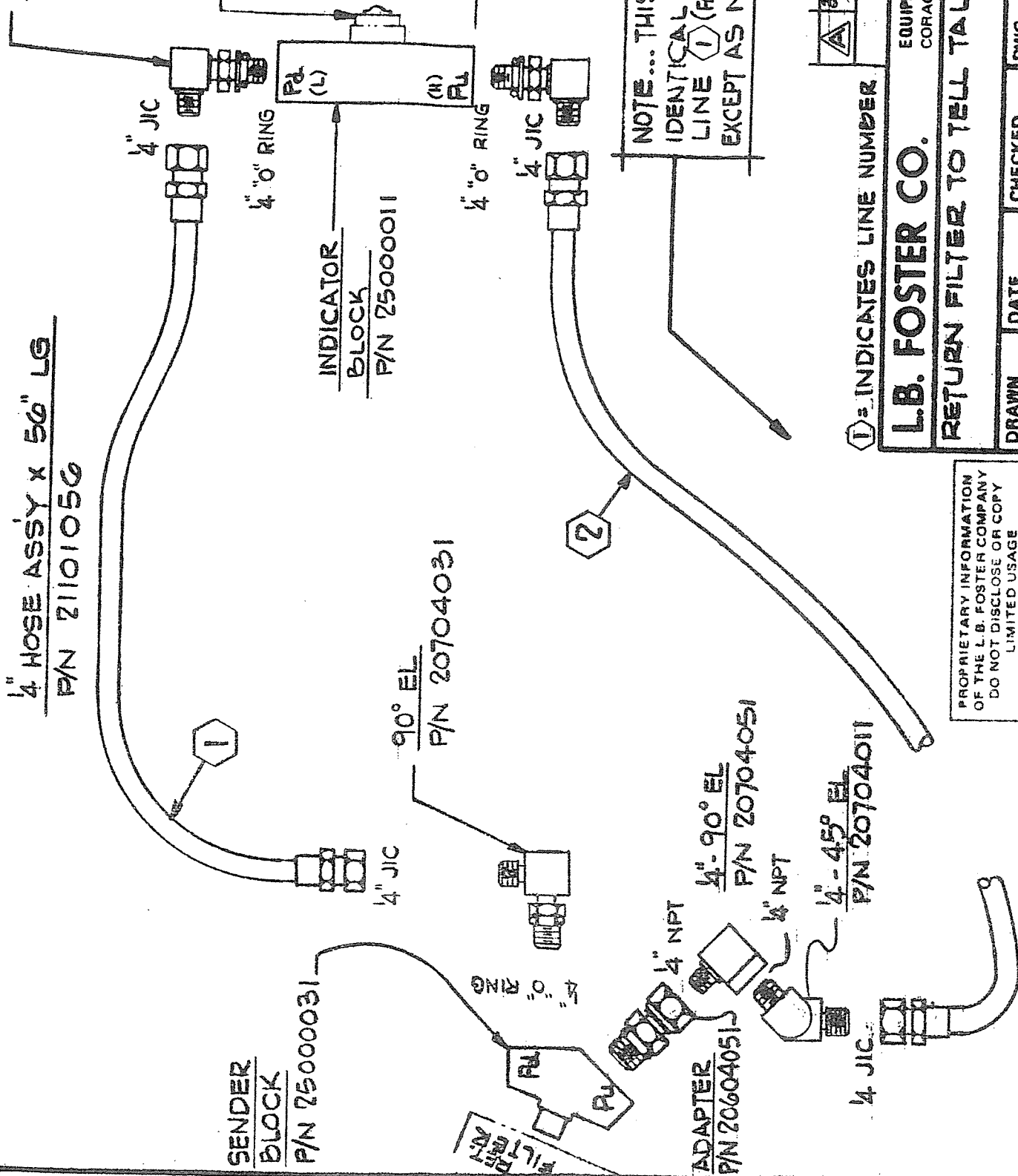
90° EL
P/N 20704031

SENDER
BLOCK
P/N 25000031

1/4" - 90° EL
P/N 20704051

1/4" - 45° EL
P/N 20704011

ADAPTER
P/N 20604051



| | |
|---|--|
| ⓐ 5/16/76 PER ECN # 30 REVISIONS | ⓐ INDICATES LINE NUMBER |
| | L.B. FOSTER CO. EQUIPMENT DIVISION CORAOPOLIS, PENNA. 15108 |
| RETURN FILTER TO TELL TALE INDICATOR | |
| DRAWN RD | DATE 8/12/77 |
| CHECKED | DWG. NO. E-6A-588A |

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GENERAL ARRANGEMENT HYDRAULIC

E-6D-537

RETURN FILTER TO TELL TALE INDICATOR

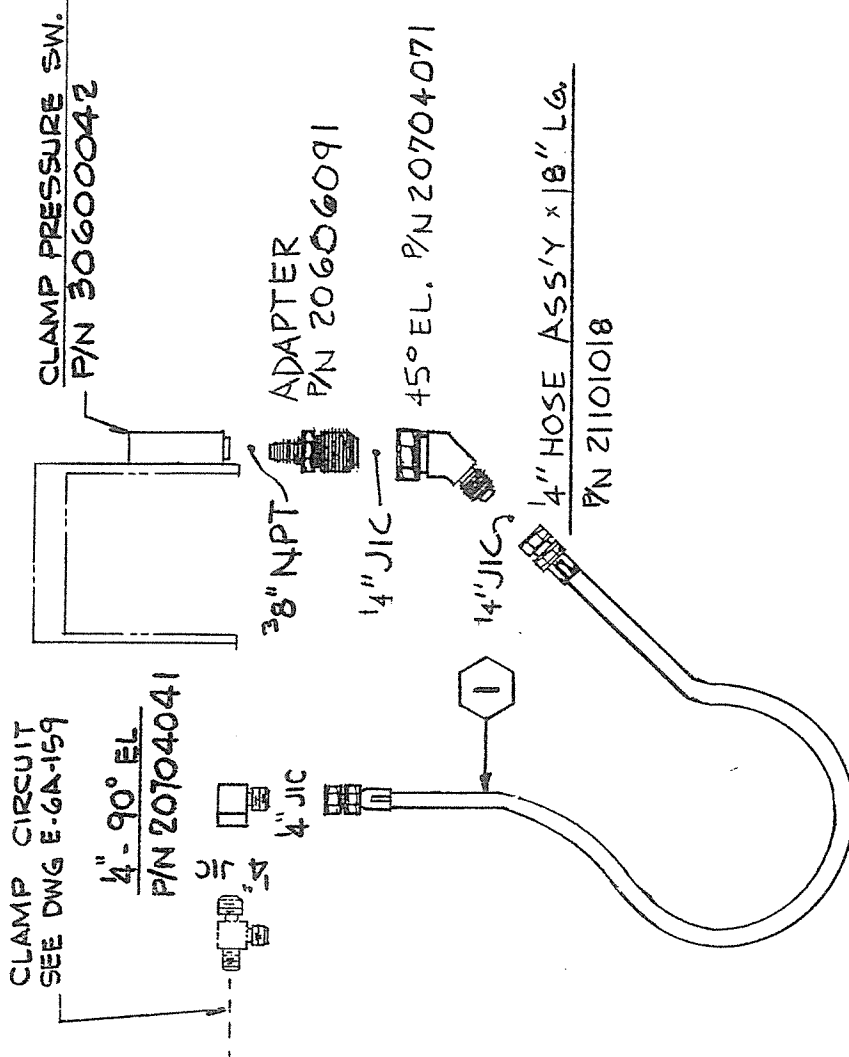
E-6A-588

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|--------------------------|
| 588-1 | 2 | 20704031 | 90° ELBOW "O" RING/37°FL |
| | 1 | 21101056 | 1/4" HOSE 37°FL/37°FL |

RETURN FILTER TO TELL TALE INDICATOR

E-6A-588

| | | | |
|-------|---|----------|--------------------------|
| 588-2 | 1 | 25000031 | SENDER BLOCK |
| | 1 | 20604051 | ADAPTOR FP/"O" RING |
| | 1 | 20704051 | 90° ELBOW MP/FP |
| | 1 | 20704011 | 45° ELBOW MP/37°FL |
| | 1 | 21101056 | 1/4" HOSE 37°FL/37°FL |
| | 1 | 20704031 | 90° ELBOW "O" RING/37°FL |



① = INDICATES LINE NUMBER

| | | | |
|-----------------------------------|------------------------|--|-----------------------------|
| L.B. FOSTER CO. | | EQUIPMENT DIVISION CORAOPOLIS, PENNA. 15108 | |
| CLAMP PRESSURE SWITCH LINE | | IZ05 C | |
| DRAWN RD | DATE 8-22-77 | CHECKED | DWG. NO. E-6A-611 |
| | | | B |

PROPRIETARY INFORMATION
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| | | |
|-----------|----------------|------------------------|
| B | 8/24/78 | PER ECN # 47 |
| A | 3/19/78 | PER ECN # 30 |
| REVISIONS | | |

GENERAL ARRANGEMENT HYDRAULIC

E-6D-537

CLAMP PRESSURE SWITCH LINE

E-6A-611

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|-----------------------|
| 611-1 | 1 | 20704041 | 90° ELBOW 37°FL/37°FL |
| | 1 | 21101018 | 1/4" HOSE 37°FL/37°FL |
| | 1 | 20704071 | 45° ELBOW 37°FL/37°FL |
| | 1 | 20606091 | ADAPTOR MP/37°FL |

GENERAL ARRANGEMENT HYDRAULIC

E-6D-537

OIL COOLER BY-PASS LINE

E-6A-652

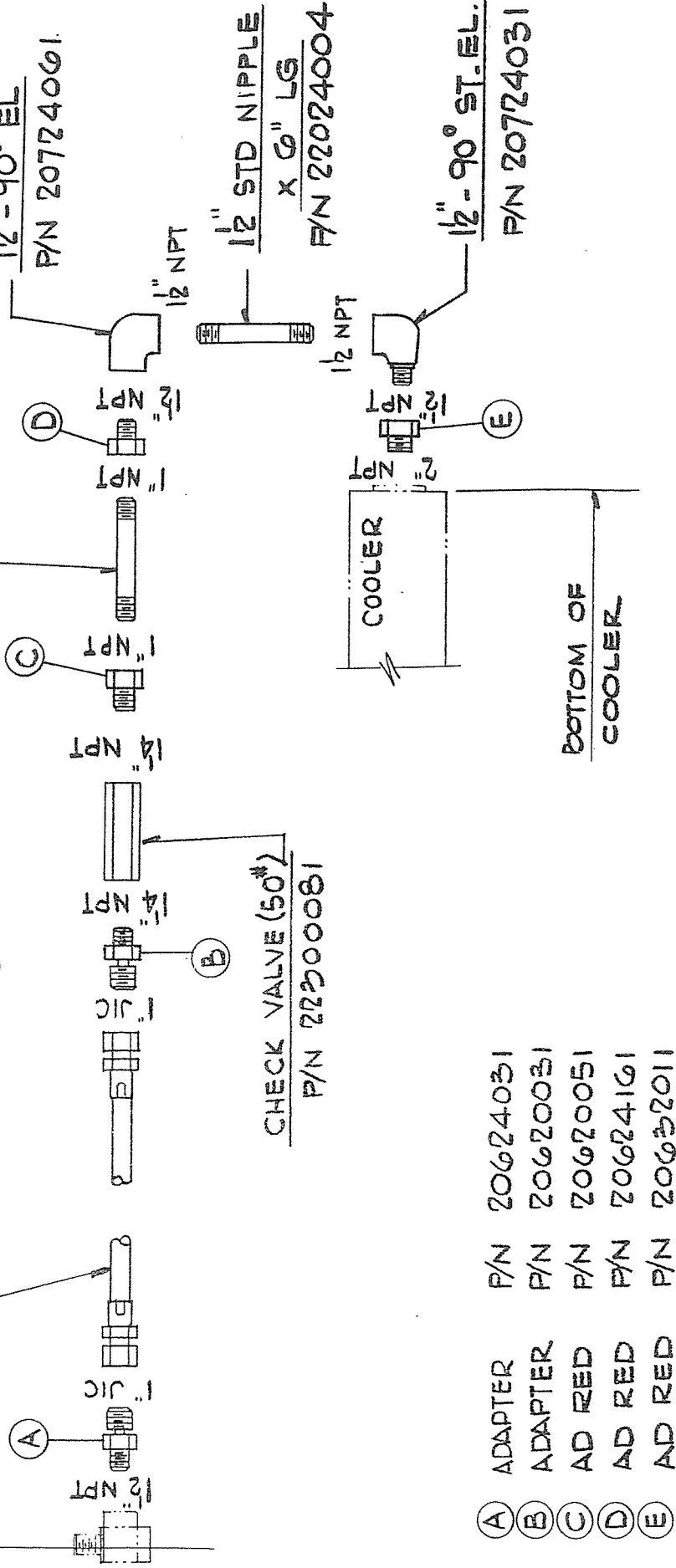
| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|-------------------------------|
| 652-1 | 1 | 20624031 | ADAPTOR REDUCER MP/37°FL |
| | 1 | 21602023 | 1" HOSE ASSY. |
| | 1 | 20620031 | ADAPTOR REDUCER |
| | 1 | 22300081 | CHECK VALVE 50# |
| | 1 | 20620051 | ADAPTOR REDUCER |
| | 1 | 22016026 | 1" STD. PIPE |
| | 1 | 20624161 | ADAPTOR REDUCER |
| | 1 | 20724061 | 1-1/2" - 90° ELBOW-NPT |
| | 1 | 22024004 | 1-1/2" STD NIPPLE |
| | 1 | 20724031 | 1-1/2" - 90° STREET ELBOW NPT |
| | 1 | 20632011 | ADAPTOR REDUCER |

CASE DRAIN COOLER TO
RESERVOIR LINE.

DWG E-6A-436

1" HOSE ASSY x 23" LG

P/N 21602023



- (A) ADAPTER P/N 20624031
- (B) ADAPTER P/N 20620031
- (C) AD RED P/N 20620051
- (D) AD RED P/N 20624161
- (E) AD RED P/N 2062011

① = INDICATES LINE NUMBER

L.B. FOSTER CO.

EQUIPMENT DIVISION
CORAPOLIS, PENNA. 15108

OIL COOLER BY-PASS LINE

PROPRIETARY INFORMATION
OF THE L.B. FOSTER COMPANY
DO NOT DISCLOSE OR COPY
LIMITED USAGE
RETURNABLE UPON DEMAND

| | | |
|---|-----------|-------------|
| A | 3-7-78 | PER ECN #30 |
| | REVISIONS | |

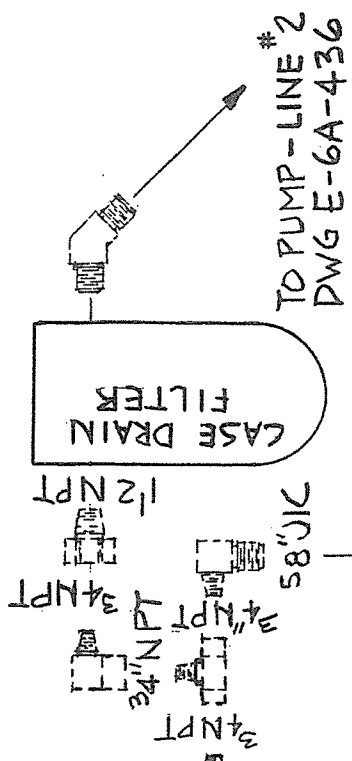
DRAWN RD DATE 11-1-77

CHECKED

DWG. NO. E-6A-652

A

45° EL
P/N 20712071



1" FLEX TUBING x 120" LG
P/N 21609011

ADJ HOSE CLAMP
P/N 12110201

1" HOSE x 2 1/2 LG
P/N 21609021

HAND PUMP

ADJ HOSE CLAMPS
P/N 12110101

TO PUMP - LINE #2
DWG E-6A-436

TO TERM. MANIFOLD -
LINE #4 DWG E-6A-436

3/4" BALL VALVE
P/N 22300171

3/4" STD PIPE x 2 1/4 LG
P/N 22012001

3/4" HOSE ASSY 20" LG
P/N 21504020

1

INDICATES LINE NUMBER

L.B. FOSTER CO.

EQUIPMENT DIVISION
CORAOOLIS, PENNA. 15108

HYDRAULIC FILLER LINE THRU CASE DRAIN
FILTER 1205C

DRAWN
T.E

DATE
9/1/78

CHECKED

DWG. NO.
E-6A-700

PROPRIETARY INFORMATION
OF THE L.B. FOSTER COMPANY
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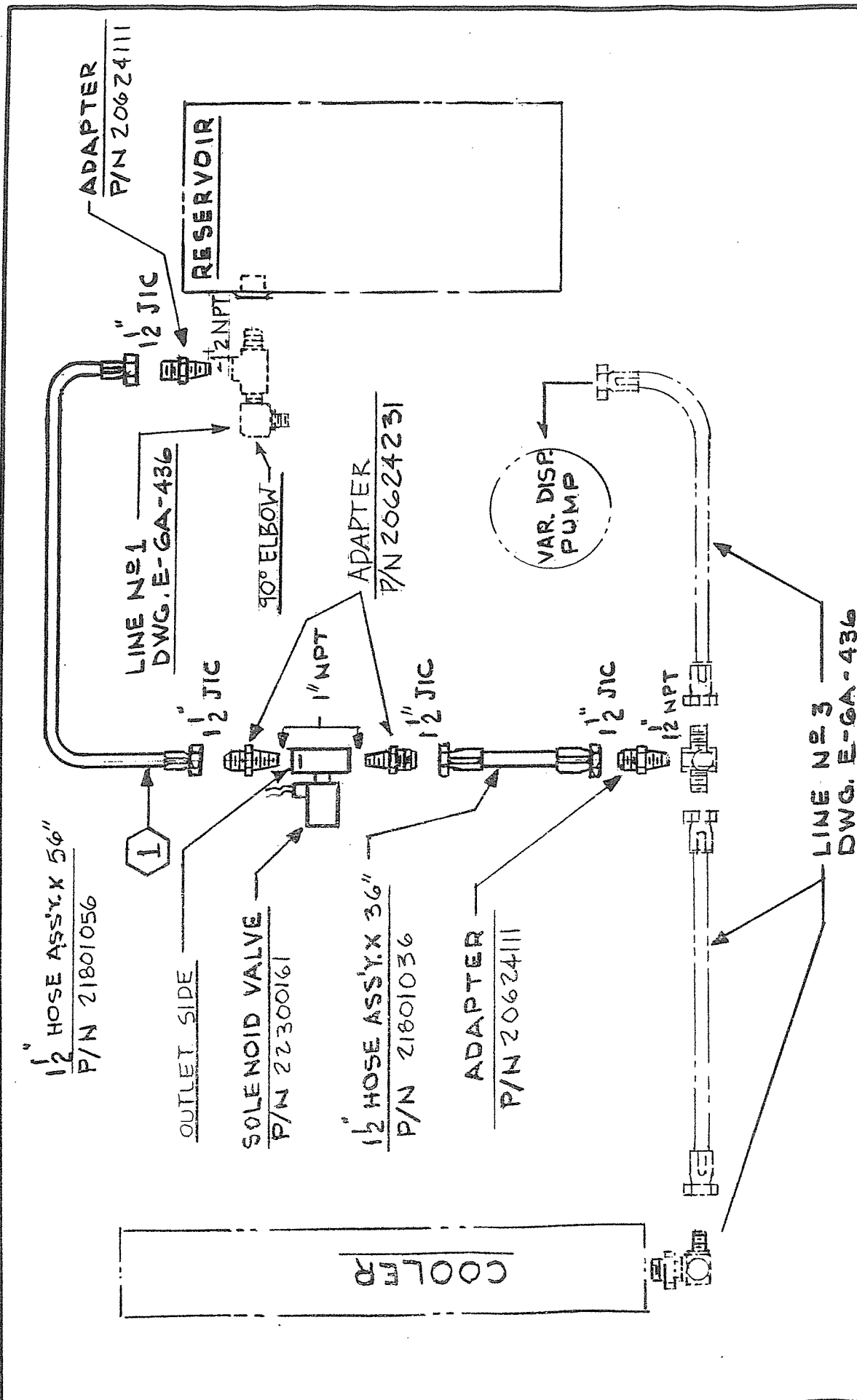
GENERAL ARRANGEMENT HYDRAULIC

E-6D-537

HYDRAULIC FILTER LINE THROUGH CASE DRAIN FILTER

E-6A-700

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|-----------------------|
| 700-1 | 1 | 20712071 | 45° ELBOW 37°FL/Mp |
| | 1 | 21504020 | 3/4" HOSE 37°FL/37°FL |
| | 1 | 20612051 | ADAPTOR MP/37°FL |
| | 1 | 22300171 | 3/4" BALL VALVE |
| | 1 | 22012001 | 3/4" PIPE |
| | 3 | 12110161 | ADJ. HOSE CLAMP |
| | 1 | 21609021 | 1" HOSE |
| | 1 | 21609011 | 1" CLEAR FLEX TUBING |



① = INDICATES LINE NUMBER

L.B. FOSTER CO.

EQUIPMENT DIVISION
CORAOPO LIS, PENNA. 15108

HEAT EXCHANGER BY-PASS

DRAWN
T. D.

DATE
6-27-78

CHECKED

DWG. NO.
E-6A-703

PROPRIETARY INFORMATION
OF THE L.B. FOSTER COMPANY
DO NOT DISCLOSE OR COPY
LIMITED USAGE
RETURNABLE UPON DEMAND

LINE N^o 3
DWG. E-6A-436

LINE N^o 1
DWG. E-6A-436

1 1/2" HOSE ASS'Y X 56"
P/N 21801056

1 1/2" HOSE ASS'Y X 36"
P/N 21801036

ADAPTER
P/N 20624111

ADAPTER
P/N 20624231

ADAPTER
P/N 20624111

RESERVOIR

COOLER

VAR. DISP.
PUMP

OUTLET SIDE

SOLENOID VALVE
P/N 22300161

90° ELBOW

1 1/2" JIC

1 1/2" JIC

1" NPT

1 1/2" JIC

1 1/2" JIC

1 1/2" JIC

1" NPT

GENERAL ARRANGEMENT HYDRAULIC

E-6D-537

HEAT EXCHANGER BY-PASS

E-6A-703

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|-------------------------|
| 703-1 | 2 | 20624111 | ADAPTOR MP/37°FL |
| | 1 | 21801036 | 1-1/2" HOSE 37°FL/37°FL |
| | 2 | 20624231 | ADAPTOR MP/37°FL |
| | 1 | 21801056 | 1-1/2" HOSE 37°FL/37°FL |

GENERAL ARRANGEMENT HYDRAULIC

E-6D-537

DRIVE LINE, FILTER TO PUMP

E-6A-721

| <u>ITEM</u> | <u>QUANTITY</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-----------------|-----------------|----------------------------------|
| 721-1 | 1 | 20532062 | 2" SPLIT FLANGE KIT |
| | 1 | 20732011 | 90° ELBOW FLANGE/37°FL |
| | 1 | 21901063 | 2" HOSE 37°FL/37°FL |
| | 1 | 20732021 | 90° ELBOW FLANGE/37°FL |
| | 1 | 20532061 | 2" SPLIT FLANGE KIT |
| | 1 | 25032011 | ADAPTOR BLOCK SET |
| | 2 | 22800020 | 1-1/2" "O" RING |
| | 4 | 40030802 | 1/2" - 13 H.S.H.C.S. x 1-1/2" LG |
| | 4 | 42040800 | 1/2" H.C.H.S.L.W. |
| | 4 | 40010807 | 1/2" - 13 H.H.C.S. x 1-3/4"LG |
| | 4 | 42030800 | 1/2" H.S.L.W. |

DRIVE LINE, PUMP TO TERMINAL MANIFOLD

E-6A-721

| | | | |
|-------|---|----------|-------------------------|
| 721-3 | 1 | 20724011 | 90° ELBOW FLANGE/37°FL |
| | 2 | 20524062 | 1-1/2" SPLIT FLANGE KIT |
| | 1 | 21803030 | 1-1/2" HOSE 37°FL/37°FL |
| | 1 | 20624211 | ADAPTOR |
| | 1 | 20624141 | ADAPTOR |
| | 1 | 21024012 | 1-1/2" Q.D. MALE |
| | 1 | 21024022 | 1-1/2" DUST CAP |

RETURN LINE FILTER TO TERMINAL MANIFOLD

E-6A-721

| | | | |
|-------|---|----------|------------------------|
| 721-2 | 1 | 20532062 | 2" SPLIT FLANGE KIT |
| | 1 | 20732011 | 90° ELBOW FLANGE/37°FL |
| | 1 | 21901058 | 2" HOSE 37°FL/37°FL |
| | 1 | 20632031 | ADAPTOR FLANGE/37°FL |
| | 1 | 20532061 | 2" SPLIT FLANGE KIT |
| | 1 | 20632041 | ADAPTOR MP/MP |
| | 1 | 21032011 | 2" Q.D. FEMALE |
| | 1 | 21032021 | 2" DUST PLUG |

HIGH PRESSURE LINE TO DRIVE PRESSURE GAGE

E-6A-721

| | | | |
|-------|---|----------|-----------------------|
| 721-4 | 1 | 20704021 | 90° ELBOW MP/JIC |
| | 1 | 21101072 | 1/4" HOSE 37°FL/37°FL |
| | 1 | 20604031 | ADAPTOR FP/JIC |

MISC.

| <u>ITEM</u> | <u>NO. REQ'D.</u> | <u>PART NO.</u> | <u>DESCRIPTION</u> |
|-------------|-------------------|-----------------|---------------------|
| | 125 GAL. | 51000021 | HYDRAULIC OIL |
| | 8 GAL. | 57000010 | COOLANT/ANTI-FREEZE |
| | AS REQ'D | 54000001 | RUBBER SEALANT |
| | 5 GAL. | 52000001 | FOSTER ORANGE PAINT |