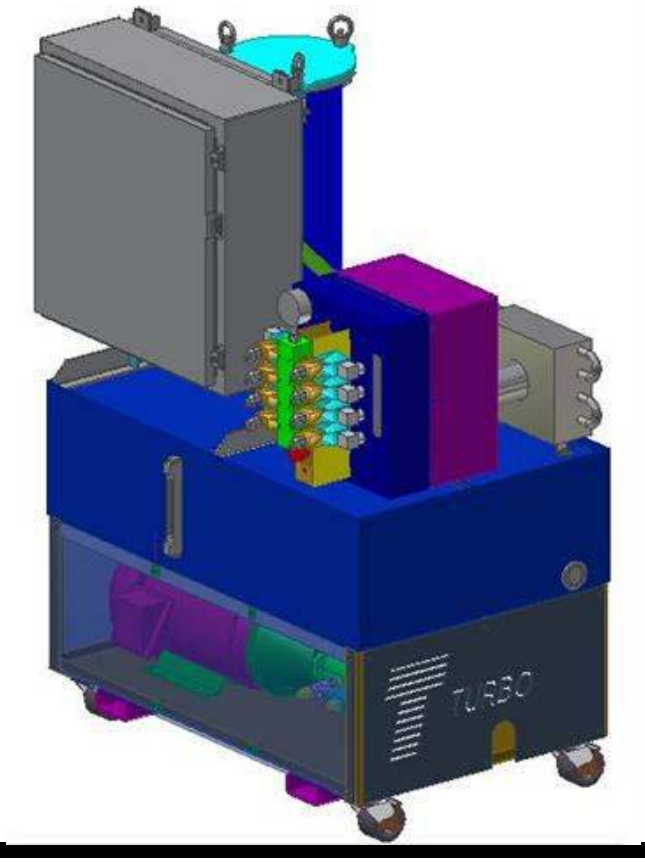
ST HIGH PRESSURE COOLANT SYSTEM PARTS AND SERVICE MANUAL



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TURBO SYSTEMS INCORPORATED

Thank you for choosing a TURBO SYSTEMS INC. Chip Conveyor. We are proud to have you among our Turbo Systems' Incorporated family of users.

TURBO SYSTEMS' Chip Conveyors simply and reliably remove waste from machining operations. Machine efficiency is increased and operator safety is improved since the conveyor work with little operator attention and without interrupting production time. TURBO Conveyors are available for many types of machine tools or other applications. They can be arranged to deliver wet or dry waste to containers or to conveyor or chute-type disposal systems. For further information, contact:

Sales Department
TURBO SYSTEMS INCORPORATED
203 Turbo Drive
Kings Mountains, NC 28086

This Service Manual is intended to assist with the normal maintenance that will assure long service life of your TURBO Chip Conveyor. It is in two parts – a Service Instruction Section, followed by a Parts Section, which includes drawings and parts lists for the basic elements of the conveyors.

NOTICE

ALL INFORMATION CONTAINED IN THIS MANUAL IS INTENDED TO BE CORRECT; HOWEVER INFORMATION AND DATA IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. TURBO CONVEYOR MAKES NO WARRANTY OF ANY KIND WITH REGARD TO THIS INFORMATION OR DATA. FURTHER, TURBO CONVEYOR IS NOT RESPONSIBLE FOR ANY OMISSIONS OR ERRORS OR CONSEQUENTIAL DAMAGE CAUSED BY THE USER OF THE PRODUCT. TURBO CONVEYOR RESERVES THE RIGHT TO MAKE MANUFACTURING CHANGES, WHICH MAY NOT BE INCLUDED IN THIS MANUAL.

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INSTRUCTIONS FOR ORDERING PARTS

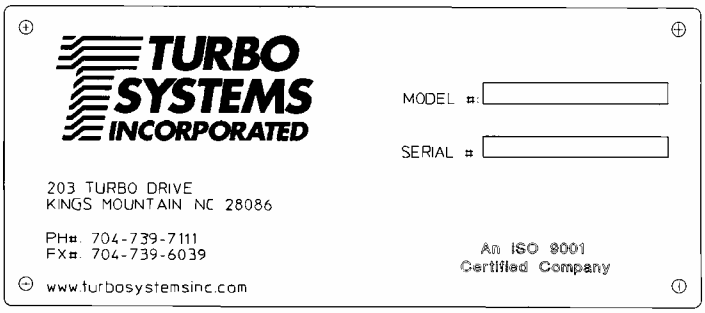
Furnish the following information on your order:

- Model and serial no. of machine
- Catalog number and name of part
- Quantity wanted
- Purchase order number
- Bill to address

Furnish exact shipping instructions:

- Complete shipping address
- Mode of delivery
- Parcel post, truck line, etc

How to find the model and serial number of your machine:
The machine model number and serial number is stamped on the machine nameplate located on the motor cover.



DIRECT YOUR ORDER TO:

TURBO SYSTEMS INCORPORATED
203 Turbo Drive
Kings Mountains, NC 28086 U.S.A.
Telephone: (704) 739-7111 Fax: (704) 739-6039

WARRANTY

Seller warrants that within 12 months from original shipment, if its products are operated by the original specified user: Seller will repair or replace, at its option, free of charge except freight, FOB shipping point, any parts it finds nonconforming on these conditions:

a. on request, user promptly allows seller to inspect, and user returns all requested parts to seller's plant, and
b. user has operated and maintained products in accordance with seller's maintenance and operational literature and good business practice; and
c. products have not been misused, abused, damaged by accident or altered without seller's written consent; and
d. user employs trained maintenance and operating personnel; and
e. buyer meets all payment obligations;

Seller warrants products manufactured by others to the extent warranted by their original manufacturers, on these conditions. Parts, which have expected life shorter than one year under normal usage, are excluded.
USED PRODUCTS ARE SOLD AS IS. SELLER MAKES NO WARRANTY FOR USED PRODUCTS EXCEPT AS TO TITLE. BUYER MAY INSPECT AND TEST BEFORE SHIPMENT AND ACCEPTS USED PRODUCTS ON THESE TERMS.

THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER WRITTEN, ORAL, OR IMPLIED, (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE.)

BENEFITS OF HIGH PRESSURE COOLANT

1. CYCLE TIME

The introduction of high pressure coolant at the tool to part interface allows the cutting fluid to do its job more effectively. With lower pressures, the coolant does not effectively cool the shear zone; rather most heat is dissipated via conduction to material around the shear zone. Higher pressures allow the coolant to dissipate heat at the cut more directly enabling higher metal removal rates and, therefore lower cycle times.

2. TOOL LIFE

Properly applied high pressure coolant helps to break chips and evacuate them from the cutting area. This minimizes re-cutting of chips. Along with more effective cooling, this not only reduces tool wear; it also makes tool life more predictable. Tooling wears, it doesn't fail from chip damage and heat.

3. PART FINISH

Elimination of chip re-cutting, higher metal removal rates, more effective cooling, predictable tool wear, along coolant filtration all contribute to a better surface finish.

4. OTHER

- Improved accuracy by the reduction of chips contaminating the tool holder to spindle taper interface.
- Improved chip evacuation from fixtures and the machining area.
- Improved machining capability / range (e.g. Larger L/D ratios, higher metal removal rates, etc.).
- Improved through-put by combining operations on a single machine / set-up (e.g. milling and deep drilling).
- Improved capabilities with 'exotic' material and tooling.

HIGH PRESSURE COOLANT REQUIREMENTS / CONSIDERATIONS

1. MACHINE CAPABILITY

The machine tool coolant path (spindle seals, rotary unions, hose, fittings, etc.) must be suitable for the pressure applied. The machine components must have a working pressure rating equal to or greater than the maximum coolant pressure supplied.

2. MACHINE ENCLOSURE

Higher pressure at the tool along with faster metal removal rates may produce more splash and coolant atomization (mist) depending on the machining process.

3. FILTRATION

Most spindle OEM's recommend that coolant should be filtered to between 10 and 30 microns for proper operation of their systems. This higher filtration also improves part finish and tool holder to spindle accuracy (less contamination).

Most machine tool manufacturers provide a 'police filter' in the coolant path, near the machine tool spindle. This filter functions as a back-up filter downstream of the main filters to insure against stray contamination from the coolant hoses, fitting sealant, improper filter media in the main filters and etc. Such a filter usually has a nominal filtration level significantly higher (less filtration) than the main

coolant filters. As such, it should not require attention except during periodic system cleaning. It is recommended to insure the machine is equipped with such a filter.

4. HEAT

Properly applied coolant absorbs much of the heat generated in the cutting zone. High pressure coolant enables more effective cooling which allows a higher metal removal rate which, in turn, results in more heat transferred to the coolant. A high-pressure pump may also introduce heat to the coolant. In some cases, the process dictates the use of an external cooling mechanism. Turbo's 'clean coolant' reservoir provides an effective heat dissipation mechanism. This eliminates the need for additional cooling equipment in many cases.

FEATURES OF TURBO POWERSTREAM HIGH PRESSURE COOLANT SYSTEMS

'SWISS TURN' MULTI-PORT POWERSTREAM SYSTEM

The Turbo PowerStream-ST coolant system uses a low pressure pump to transfer coolant from the main, machine tank through a filter system to a holding tank. A high pressure pump delivers filtered coolant from the holding tank to a bank of up to 8 individual solenoid valves. Each valve is independently controlled to supply the filtered high pressure coolant to each machine coolant circuit.

The optional coolant **transfer pump** is mounted integrally to the PowerStream-ST unit. It draws coolant from the machine tank and pumps it through a **canister filter**. As contamination collects in the filter element, resistance to flow causes the pressure differential across the filter to increase. The system incorporates a **pressure switch** to indicate that the filter requires service.

The filter canister is integral to a **holding tank** (no downstream plumbing). The large holding tank aids in heat dissipation. A **high-pressure pump** draws filtered coolant from the holding tank and delivers it to the machine via a bank of **independently controlled solenoid valves**. The coolant supply to the high pressure pump is supplied by an **'open system'**, i.e. it is not pressurized or fixed flow rate. The transfer pump is controlled by a hi/lo level switch to maintain the proper volume of filtered coolant in the holding tank. Consequently, the transfer pump flow rate is somewhat independent of the high pressure pump flow rate. That means the transfer pump does not have to be synchronized with the high pressure pump. This provides significant advantage over in-line filters or 'closed' systems in which one is forced to choose between lag time and transfer pump churning (dead-heading). The combination of a substantial holding tank and the elimination of transfer pump dead-heading **reduces heat** build up and power consumption.

The holding tank also incorporates a **level switch** to provide an alarm signal if the volume of filtered coolant in the tank drops to an unacceptable level. This could indicate a failure of the transfer pump or blockage of the canister filter system.

Additional sensors may be integrated for specific applications.

The PowerStream-ST system is a straight forward, stand-alone design which provides a high level of functionality with a low level of complexity.

STANDARD FEATURES

- □ Pressure up to 2000 psi (at 5 gpm).
- □ Flow up to 10 gpm (at 1000 psi).
- □ Other flow and pressure combinations available by request.
- □ Simple control interface.
- □ Accommodates from 1 to 8 independently controlled solenoid valves.
- □ Canister (bag) filter.
  - Open to / built into tank.
  - No external plumbing downstream of filters.
  - Less agitation.
  - No timing issues with transfer pump / starving HP pump.
  - Eliminates churning at transfer pump.
  - Readily available (standard sized) filter elements.
- □ System built and serviced by Turbo.
- □ Simple installation.
- □ Highly mobile - Quick disconnect couplings, JIC fittings and locking castors.
- □ Easily retro-fit to virtually any coolant system.

SIZE

STAND ALONE UNIT

Overall Size	L	41	in	1040	mm
	W	26	in	660	mm
	H	61	in	1550	mm
Nominal Volume	V	45	gal	170	l

PERFORMANCE CHARACTERISTICS (Standard System)

Filtration	10um standard. 5 to 200 optional.
Transfer / Filtration Flow	12-15 gpm
Transfer Pressure	< 25 psi
Maximum High Pressure Flow	10 gpm (at 1000 psi with cutting oil)
Maximum Pressure	2000 psi
Control Input	Machine tool m-codes to suit user
Control Output	24 VDC

Consult Factory For Other Pressures Flow Rates And Capacities.

OPTIONS

2000 psi / 5gpm pump (cutting oil)
1000 psi / 8 gpm pump suitable for oil or water based coolant
Heat Exchanger
Discharge Hose Assembly
Transfer Hose Assembly
Transfer Pump

Alternative Pressure and Flow	Consult Factory		
Filtration	5	um	98731130
	10	um	98731127 (Standard if not specified by customer)
	25	um	98731131
	50	um	98731132
	100	um	98731133
	200	um	98731134

POWERSTREAM INSTALLATION INSTRUCTIONS STANDARD UNITS

1) Inspect for shipping damage.

2) Position the unit and connect to the machine tool and main coolant tank.
The proper location for the PowerStream unit must accommodate the following connections to the machine tool and its main coolant tank.

a) High Pressure Outlet(s)
- Plumb the machine's high pressure line(s) to the PowerStream's high pressure outlet manifold.
- The PowerStream manifold terminates in female SAE-8 (1/2 inch) ports.

b) Overflow Discharge – Clean Coolant
- Connect the overflow 1.5 inch NPT female to the machine tank.
- The optional Discharge Hose Assembly provides all hardware to accomplish this connection.
- During normal operation, the PowerStream unit may filter more coolant than is used by the high pressure pump. This excess will flow back to the machine tank. Note that this is a gravity drain and the machine tank fluid level must be lower than the PowerStream fluid level for proper operation.

c) Transfer Pump – Dirty Coolant In
- Connect the Filter inlet (1 inch NPT female) to a suitable coolant supply.
- The optional Transfer Pump Assembly and Transfer Hose Assembly provide all hardware to accomplish the connection.
- If the Transfer Pump Assembly is not used, the customer must furnish a pump that supplies adequate flow for the selected high pressure pump at a head of 15 psi and develops a maximum pressure of no more than 35 psi.
- If the Transfer Hose Assembly is not used, it is recommended to install a check valve near the transfer pump to prevent drain back of fluid when the transfer pump is off.

d) Electrical / Control connections vary with control options. Control schematics specific to each model are shipped inside the PowerStream's electrical control cabinet. Make the necessary connections.

3) Prepare the canister filter(s).
Open filter canister(s), check for and remove any foreign material from shipping and insert the proper filter element(s). See 'Filter Maintenance Procedure'.

4) Fill the tank with filtered coolant.
Never add coolant directly to the PowerStream tank. All coolant must pass through the filter canister before introduction to the clean reservoir. The unit is equipped with a number of level sensors that interface with the machine tool control the fluid level in the PowerStream tank during normal operation. The recommentde method of coolant addition is to activate the Powerstream system and let the transfer pump pull coolant from the machnine tank and pump it throught he canister filter(s) into the clean reservoir. Unfiltered coolant should be added to the machine tank as necessary until the transfer pump stops (when the clean reservoir high level switch is reached).

Depending on the particular machine tool control, the tank may have to be filled manually at installation. Use the transfer pump or other means to pump coolant through a properly prepared canister filter until coolant starts to flow through the Powerstream discharge (overflow) line.

5) Machine tank coolant level

It is very important not to overfill the mavhine coolant tank. During normal operation, the Powerstream unit will transfer a volume of coolant, via the HP circuits, to the machine tool before the transfer pump is activated to move that volume of coolant back to the Powerstream system. Then the transfer pump will move an amount ov coolant back to the clean holding tank. During operation, some coolant will be captive in the machine system. This coolant amount varies with each machine type and pumbing arrangement. Upon machine or HPC system shut down, this 'captive' coolant will drain back to the machine tank.

6) Prepare the high pressure pump as necessary.

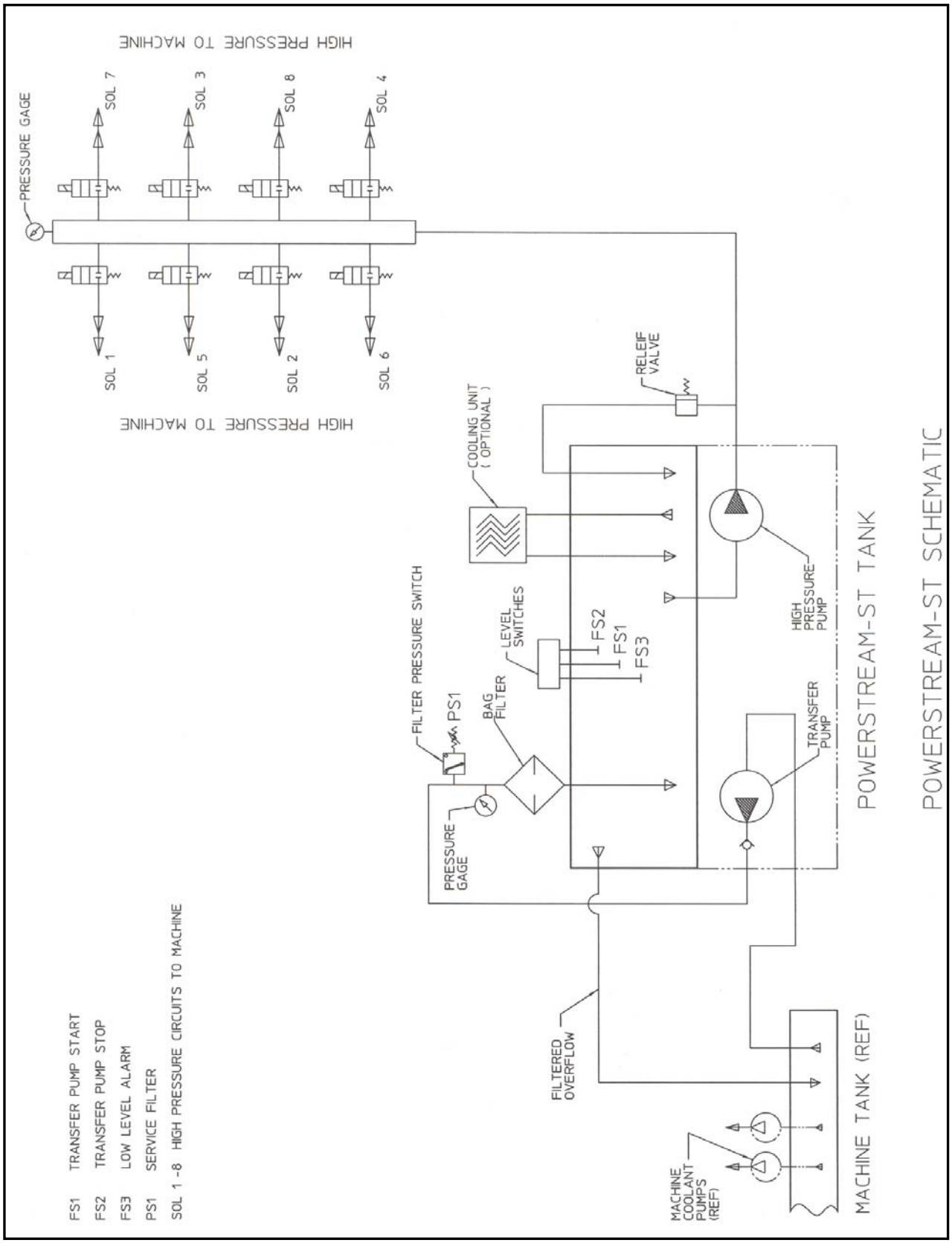
Gear Pumps – it is imperative that the gear pump operate in the correct rotational direction and have an adequate supply of fluid. See the detailed instructions in the 'Start-Up' section of this manual.

Balanced diaphragm piston pumps (Hydra-Cell) - Refer to the pump operation manual.

7) Relief Valve (not included on 200 psi units).
The relief valve is set at the factory for the maximum recommended system pressure. The valve is adjustable for cases that require less than the maximum pressure.

UNDER NO CIRCUMSTANCES SHOULD THE RELIEF VALVE BE ADJUSTED TO PRODUCE A PRESSURE HIGHER THAN THE SYSTEM DESIGN PRESSURE. SUCH ACTION MAY VOID THE SYSTEM WARRANTY, CAUSE PREMATURE FAILURE, AND / OR PERSONNEL HAZARDS.

HIGH PRESSURE SYSTEM SCHEMATIC



SERVICE SECTION
BEFORE INITIAL START-UP

HIGH PRESSURE PUMP

Before you start the pump, be sure that:

- All shut-off valves are open, and the pump has an adequate supply of fluid.
- All connections are tight.
- The coupler that connects the pump and motor has been sized and installed correctly.

IMPORTANT PRECAUTIONS

Adequate Fluid Supply. To avoid cavitation and premature pump failure, be sure that the pump will have an adequate fluid supply and that the inlet line will not be obstructed.

Shut-Off Valves. Never install shut-off valves between the pump outlet and discharge pressure regulator, or in the regulator bypass line.

Freezing Conditions. Protect the pump from freezing. See also the Maintenance Section.

- All guards and safety covers have been installed.
- All electrical wiring has been done correctly to electrical codes.

INITIAL START-UP PROCEDURE

HIGH PRESSURE PUMP

1) Ensure an adequate, unobstructed fluid supply to the pump as described above.
2) 'Jog' power to the high pressure and transfer pump motors. Observe that both motors turn in the direction of the arrows on the motor housings or fan guards.
3) Turn on power to the pump motor.
4) Listen for any erratic noise, and look for unsteady flow.

FILTER MAINTENANCE PROCEDURE

SYSTEM DESCRIPTION

The filter canister is integral to a holding tank (no downstream plumbing) and open to atmospheric pressure at its outlet. As contamination collects in the filter element, resistance to flow causes the pressure drop across the filter to increase. The system incorporates a pressure switch to indicate when the filter requires service. The pressure switch is set at the factory to approximately 15 psig. This setting may be adjusted in the field to tailor operation to a specific procedure, but the switch should always be set to activate at or below 20 psig. Furthermore, incoming flow should never exceed 40 psig.

MAINTENANCE PROCEDURE

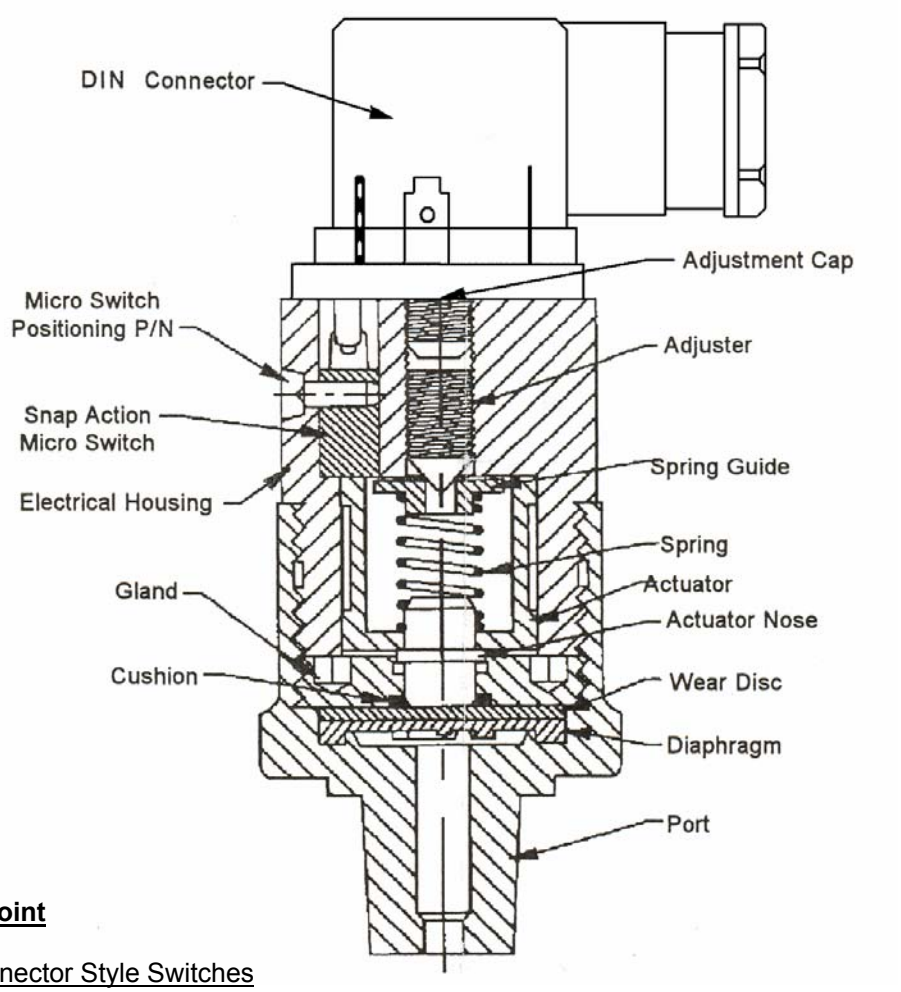
To replace the filter element in the canister:

1. Press the “Filter Reset” button on the PowerStream control panel if so equipped.
2. Open the bleed off valve to vent any residual pressure to tank. (NOTE 1)
3. Inspect the canister pressure gauge to ensure pressure has reached zero.
4. Loosen the eye nut on each of the 3 canister lid swing bolts
5. Swing the canister lid away from the canister body to expose the inside of the canister and filter element.
    - □ Take care not to damage the o-ring situated in the canister flange.
    - □ Take care to prevent contamination from the used filter element, coolant inlet area or external sources from entering the canister during the rest of this procedure.
6. Remove the used filter element from the filter basket in the canister and discard in an approved manner.
7. Place a new filter element in the filter basket. Ensure that the filter element ring is seated against the filter basket flange and canister walls.
8. Inspect the canister lid and canister flange. Ensure they are clean and undamaged.
9. Inspect the canister o-ring and ensure it is clean, undamaged, and properly seated. Lubricate with Viton compatible grease as needed.
10. Replace the canister lid.
11. Position canister lid swing bolts and tighten the eye nuts hand tight.
12. Close the bleed off valve. (NOTE 1)
13. The canister is now ready for service.

NOTE 1. This step applies only on units equipped with optional ‘bleed-off’ valves.

PRESSURE SWITCH INSTALLATION & ADJUSTMENT

To install the switches, use a suitable wrench on the port and plumb into place with the proper sealant. For electrical wiring, refer to wiring codes below and to the specification sheet for the switch ratings. For low DC loads (<50 mA, TTL logic) use switches with gold contacts. The switch installed on the high pressure unit is adjustable but has been preset at the factory to 15 +/- 2 PSIG prior to shipping the unit. In case a replacement is orderrd, follow the following procedures. All switches are maintenance-free.



Adjusting the Set point

For DIN Connector Style Switches

A) Remove DIN connector, then remove the top cover.
B) Remove center screw with female internal thread

Then follow the steps below.

1) All non-DIN models have an outer 1/8" Allen head cap that must be removed to allow access to the 1/8" Allen adjustment screw. Using a 1/8 inch Allen (Hex) wrench, adjust ***clockwise to increase*** the set point and ***counterclockwise to lower*** the set point, which is 15 PSIG (+/- 2 PSIG), while applying this pressure and monitoring the switch's state.)

2) After verifying the set point re-assemble the switch.

Wiring Code

Leads	DIN	
Black	#1	Common
Green	#2	Normally closed
Red	#3	Normally open

LIQUID LEVEL SWITCHES INSTALLATION AND MAINTENANCE

INSTALLATION

Operation is stated in the tank dry position.

NC OPERATION: Stainless Steel Floats: Witness mark (round circle) down.

NO OPERATION: Stainless Steel Floats: Witness mark (round circle) up.

MAINTENANCE

Maintenance should consist of inspection to see that the float is free to move and not coated with any substance, which would change its weight or volume significantly. If this occurs, the float should be removed for cleaning. This is easily accomplished without disturbing the installation. In addition, the stem may be wiped down to remove any build-up.

(Make sure float is replaced in the same orientation).

The only repair possible in the field is replacement of either the float or stem. Dents or nicks on the float are usually of no consequence to operation.

HIGH PRESSURE PUMP MAINTENANCE

Gear Pump Maintenance

The gear pumps used on PowerStream systems are maintenance free. The pumps will provide reliable service as long as the system upstream is maintained to provide adequate, filtered coolant.

Hydracell D12

DAILY

Check the oil level and the condition of the oil. When the pump is operating, the oil in the pump housing gets warm and expands, filling into the oil reservoir. Depending on the type of oil and the operating temperature of the system, the oil level will vary in the reservoir. If there is no oil in the reservoir when the system has reached operating temperature, add oil through the fill cap on the reservoir. Fill the reservoir about 25% full.

If the pump is too full of oil, it will overflow the reservoir and reach equilibrium. This is no cause for concern. When the unit is shut down and the oil has cooled, the oil will drain out of the reservoir and back into the pump housing.

Use the appropriate motor oil for the application (refer to the chart below).

Your unit was shipped from the factory with Hydra-Oil Standard Grade 10W30 weight oil. This oil is designed for lower temperatures and lighter loads. It maintains consistent viscosity over a wide temperature range and repeated cold start-ups.

If your high-pressure pump is going to run for continuous use at higher loads and temperatures, 40W oil is recommended, since it provides exceptional wear resistance and film thickness in extended high temperature applications. However, most machining operations do not require continuous high-pressure coolant requirements.

OIL RECOMMENDATION

PUMP MODEL:	**D-10**
OIL RESERVOIR CAPACITY:	**1.10 U.S. QUARTS (1.05 LITERS)**
STANDARD DUTY APPLICATIONS:	**10W30 OIL**
CONTINUOUS DUTY APPLICATIONS:	**40W OIL**
COLD TEMPERATURE/SEVERE DUTY:	**5W/30 SYNTHETIC OIL**
HIGH TEMPERATURE/SEVERE DUTY:	**15W/50 SYNTHETIC OIL**

OIL CHARACTERISTICS	Standard Grade		Synthetic Grade	
	10W30	40W	5W30	15W50
Gravity, API @ 60° F	31.1	28.7	30.4	30.2
Flash Point °F	400	430	445	470
Fire Point °F	440	470	N/A	N/A
Pour Point °F	-30	10	-65	-55
Viscosity: SUS @ 100°F	360	811	265	556
SUS @ 210°F	63	85	60	90
Viscosity Index	148	107	165	170

CAUTION: If you are losing oil but don't see any external leakage, or if the oil becomes discolored and contaminated, one of the diaphragms (90A-70) may be damaged. Refer to the Service Section. *Do no operate* the pump with a damaged diaphragm.

CAUTION: Do no leave contaminated oil in the pump housing or leave the housing empty. Remove contaminated oil as soon as discovered, and replace it with clean oil. This will help prevent corrosion of internal pump components.

PERIODICALLY

Change the oil after the first 100 hours of operation, and every 1000 operating hours thereafter. To change the oil:

1. Disconnect or lock out the electrical power to the pump motor.
2. Remove the access plate on the tank, so there is room to hinge the pump/motor to the horizontal position.
3. Remove the four bolts that hold the pump base to the tank.
4. Hinge the pump/motor to the horizontal position, and support it in that position.
5. Place a pan under the pump oil drain. Remove the drain plug (90A-80) and fill plug (90A-78) from the pump housing. The drain plug is magnetic – clean any metal from the magnet on the plug.

CAUTION: Do not turn the drive shaft while the oil reservoir is empty.

6. When the oil has drained, reinstall the drain plug (90A-80). Refill with the appropriate oil, and install the fill plug (90A-78). Tighten to 25 ft/lbs (30 N-m).
7. Hinge the pump/motor back to the vertical position. Reinstall the four bolts that held the pump base to the tank, and reinstall the access plate.
8. Restore the electrical power.
9. Follow the "Initial Startup Procedures," .

CAUTION: Protect the pump from freezing. Refer also the "Shutdown Procedure".

SHUTDOWN PROCEDURE
During Freezing Temperatures

1. Disconnect the inlet and outlet piping from the pump.
2. Remove the drain plug (90A-53) at the bottom center of the manifold.
3. Open any draincocks in the piping.
4. Start the pump, and allow it to run until all fluid is removed from the pump head.
5. Stop the pump, and reinstall the drain plug.
6. Fill the pump with antifreeze.

When you put the pump back into service, thoroughly flush the antifreeze.

SERVICE (FLUID END)

This section explains how to disassemble and inspect all easily-serviceable parts of the high pressure pump. Repair procedures for the hydraulic end (oil reservoir) of the pump are included in a later section of the manual.

CAUTION: Always disconnect power from the motor before doing maintenance on the pump or motor.

CAUTION: Do not disassemble the hydraulic end unless you are a skilled mechanic.

CAUTION: The two bolts (item # 38 shown on page 33 exploded view) that screw through the back of the housing into the cylinder casting hold the casting over the hydraulic end of the pump. *Do not remove* them except when repairing the hydraulic end.

1. Hinge Pump to Horizontal Position.

2. Disconnect all Electrical Connections (or lock out power to the unit).

3. Remove Manifold (90A-56), Valve Plate (90A-66).

a. Remove all nuts (90A-81), bolts (90A-54), and washers (90A-55) around the manifold. Do **not** remove the two bolts (item # 38 shown on page 33 exploded view) that are installed through the back of the pump housing.

b. Use a 10-mm hex Allen wrench to remove the pump centerbolt (90A-51) and its washer (90A-52) in the center of the manifold.

CAUTION: Do not turn the pump drive shaft while the manifold and valve plate are off the pump, except when removing diaphragms or repriming the hydraulic cells.

c. Remove the manifold (90A-56). The valve plate (90A-66) will remain on the cylinder housing (90A-74).

d. Inspect the manifold for warping or wear around the inlet and outlet ports. If wear is excessive, replace the manifold or return it to Wanner Engineering for resurfacing.

To check if the manifold is warped, remove the O-rings and place a straightedge across it. A warped manifold should be replaced.

4. Inspect Valves (90A-60 – 90A-65)

The three inlet and three outlet valve assemblies are identical (but face in opposite directions). Inspect each valve as follows:

a. Check the spring retainer (90A-65), and replace if worn.

b. Check the valve spring (90A-63). If it is shorter than a new spring, replace it (don't just stretch the old spring).

c. Check the valve poppet (90A-62). If worn excessively, replace it.

NOTE: If your pump has plastic spring retainers, there is a tetra seal (flat O-ring, (90A-64) between the retainer (90A-65) and valve seat (90A-61).

d. Remove the valve seat (90A-61). A seat remover is included in the Wanner Tool Kit. Inspect the valve seat for wear, and replace it if necessary.

e. Reinstall the valve assemblies:

- **Clean the valve ports and shoulders with emery cloth, and lubricate them with lubricating gel or petroleum jelly.**
- **Install the O-ring (90A-60) on the valve seat (90A-61).**
- Inlet (3 center valves). **Insert the spring retainer (15) into the valve plate, then insert the spring, valve, and valve seat (90A-61, 90A-62, 90A-63). If the pump has** plastic **spring retainers, install a flat O-ring (90A-64) between the retainer and seat. On** abrasive-duty **pumps, install a dampening washer (90A-88) on top of the seat.**
- Outlet (3 outer valves). **Insert the valve seat, valve, and spring, then the retainer. If the pump has** metal **spring retainers in the outlet valves, position them so a leg does** not **point toward the center of the pump (refer to the illustration). On** abrasive-duty **pumps, install a dampening washer (90A-88) into the valve plate before installing the other parts.**

5. **Inspect and Replace Diaphragms (90A-70)**

If it is necessary to service the diaphragms, use a 5-mm Allen wrench to remove the two Allen-head bolts (90A-73) that secure the valve plate (90A-66) to the cylinder housing (90A-74). Inspect the valve plate as you did the manifold.

a. Lift the diaphragm by one edge, and turn the pump shaft until the diaphragm pulls up. This will expose machined cross-holes in the plunger shaft behind the diaphragm.

To turn the pump over, turn the motor shaft over by turning the motor fan. The fan guard on the motor may have to be removed to allow you to turn the shaft. Reattach the fan guard to the motor when done with maintenance.

NOTE: ***Alternatively, remove the coupler access plate and rotate the coupler by hand.***

b. Insert an Allen wrench through one of the cross-holes in the plunger shaft, to hold the diaphragm up. The proper size tool is included in the Wanner A03-200-1101 Tool Kit.

c. Remove the screw (90A-67), O-ring (90A-68), and follower (90A-69) in the center of the diaphragm.

d. Remove the diaphragm, and inspect it carefully. A ruptured diaphragm generally indicates a pumping system problem, and replacing only the diaphragm will not solve the larger problem. Inspect the diaphragm for the following:

- Half-moon marks. **Usually caused by cavitation of the pump (refer to "Troubleshooting").**
- Concentric circular marks. **Usually caused by cavitation of the pump (refer to "Troubleshooting").**
- Small puncture. **Usually caused by a sharp foreign object in the fluid, or by an ice particle.**
- Diaphragm pulled away **from the center screw, or from the cylinder casting or casting sides. Usually caused by fluid being frozen in the pump, or by over pressurization of the pump.**
- Diaphragm becoming stiff **and losing flexibility. Usually caused by pumping a fluid that is incompatible with the diaphragm material.**
- Slice in ridge of diaphragm. **Occurs when a** Viton **diaphragm is operated at cold temperatures.**
- Diaphragm edge chewed away. **Usually caused by over pressurizing the system.**

e. Inspect the plunger (90A-71) for any rough surfaces or edges. **Do not** remove the plunger from the plunger shaft. Smooth the surfaces and edges as necessary with emery cloth or a fine file.

CAUTION: If a diaphragm has ruptured and foreign material or water has entered the oil reservoir, do not operate the pump. Check all diaphragms, then flush the reservoir

completely (as outlined below) and refill it with fresh oil. Never let the pump stand with foreign material or water in the reservoir, or with the reservoir empty.

f. Install a new diaphragm, ridge side out.

g. Clean the screw (90A-67) and remove any oil from it. Apply medium-strength threadlocker to the screw. Reinstall the screw and follower (90A-69), and a new O-ring (90A-68). Tighten to 18 in.-lbs (2.0 N-m).

h. Repeat the above inspection procedure (and replacement, if necessary) with the other two diaphragms.

6. Flush Contaminant from Hydraulic End (only if a diaphragm has ruptured)

a. Remove the oil drain cap (90A-80) and allow all oil and contaminant to drain out. Dispose of it properly.

b. Fill the reservoir with kerosene or solvent, manually turn the pump shaft to circulate the kerosene, and drain.

CAUTION: If you have EPDM diaphragms, or if food-grade oil is in the reservoir, do not use kerosene or solvents. Instead, flush with the same lubricant that is in the reservoir. Pumps with EPDM diaphragms have an "E" as the 7th digit of the Model No.

c. Repeat the flushing procedure (step b).

d. Fill the reservoir with fresh oil, manually turn the pump shaft to circulate the oil, and drain once again.

e. Refill the reservoir. If the oil appears milky, there is still contaminant in the reservoir. Repeat the flushing procedure until the oil appears clean.

7. Prime the Hydraulic Cells

a. With the pump **horizontal and the fluid-end head removed**, fill the reservoir with the appropriate Hydra-Oil brand motor oil for the application.

b. All air in the oil within the hydraulic cell (behind the diaphragms) must be forced out by turning the shaft (and thus pumping oil into the piston). If the motor is connected to the pump, rotate the shaft by rotating the motor fan blade. If the motor and coupler have been removed from the pump, use the shaft rotator that is included in the Wanner Tool Kit. Turn the shaft until a **bubble-free** flow of oil comes from behind all the diaphragms.

Watch the oil level in the reservoir: if it gets too low during priming, air will be drawn into the pistons (inside the hydraulic end) and will cause the pump to run rough.

c. Wipe excess oil from the cylinder casting and diaphragms.

8. Reinstall Valve Plate (90A-66), Manifold (90A-56)

a. Reinstall the valve plate (90A-66) with the valve assemblies installed as outlined above, onto the cylinder casting. Using a 5-mm hex Allen wrench, install the two socket-head cap screws (90A-73) and secure the valve plate to the cylinder housing.

b. Reinstall the O-rings (90A-57, 90A-58, 90A-59) on the rear side of the manifold. Use petroleum jelly or lubricating gel to hold them in place.

c. Reinstall the manifold onto the valve plate. Be sure the drain plug (90A-53) is at the bottom of the manifold.

d. Insert all six bolts (90A-54) around the edge of the manifold. Reinstall the pump centerbolt (90A-51) with its washer (90A-52).

e. Alternately tighten the perimeter bolts until all are secure. Torque to 45 ft-lbs (54 N-m).

f. Tighten the pump centerbolt. Torque to 45 ft-lbs (54 N-m).

g. Recheck all bolts for tightness.

9. Reconnect Electrical Power to Motor

(or remove lock-out from power source)

SERVICE (HYDRAULIC END)

CAUTION: Do not disassemble the hydraulic end of the pump unless you are ea skilled mechanic.

CAUTION: The two bolts (item # 38 shown on page 33 exploded view) that screw through the back of the pump housing (90A-89) into the cylinder casting (90A-74) hold the casting to the pump housing. Do not remove them except when repairing the hydraulic end.

NOTE: The following service procedures refer several times to the Wanner Took Kit. We strongly urge you not to try to repair the hydraulic end of the pump without using the tools in this kit, Part No. A03-200-1101.

1. Remove Motor and Coupler from Pump
2. Disconnect all Electrical Connections (or lock out power to the unit)

3. Remove Pump Housing

a. Remove the head of the pump, and the diaphragms, as outlined in the Fluid-End Service Section.

b. Drain the oil from the pump housing by removing the drain plug (90A-80).

c. Stand the hydraulic end of the pump face-down on the cylinder casting (90A-74).

d. Check the shaft for sharp burrs. Smooth any burrs to prevent scarring the housing seals (90A-104) when you disassemble the pump.

e. Remove the bolts (item #38 shown on page 33 exploded view) that secure the housing to the cylinder casting. The piston return springs (90A-90) will force the cylinder casting and housing apart.

f. Lift off the housing (90A-89).

g. Inspect the cam and bearings (90A-102), and the bearing race in the rear of the housing. If the bearings are pitted or binding, or if the housing race is worn, contact the factory.

4. Disassemble Pistons

a. With the pump housing removed (see above), turn the unit over and set it on a flat surface, piston side down.

b. With the diaphragms removed (see the Fluid-End Service Section), reinsert a follower screw (90A-67) into the hole in one of the valve plungers (90A-94). Tap the screw lightly with a hammer: the plunger (90A-71) should slip off the valve plunger (90A-94).

The hydraulic piston assembly (90A-90 – 90A-99) can now be disassembled. Inspect all parts, and replace all O-rings and any other parts, which are worn or damaged.

c. Repeat step b for the remaining pistons.

NOTE: When you reassemble the hydraulic piston, use new plungers (90A-71). They are press-fit onto the valve plungers (90A-94) and are not reusable.

5. Reassemble Pistons

   a. Drop a ball (90A-98) into each opening in the bottom of a piston assembly (90A-99).

   b. Insert a retaining washer (90A-97) and O-ring (90A-96) to hold the ball in place.

   c. Insert a valve plunger (90A-94) into a valve cylinder (90A-95). Slide a spring (90A-93) over the plunger, inside the valve cylinder.

   d. Insert an O-ring (90A-92) into a spring retainer (90A-91).

   e. Slide the assembled valve cylinder, plunger, and spring (90A-93 – 90A-95) into the spring retainer (90A-91).

   f. Slide the complete cylinder-and-retainer assembly (90A-91 – 90A-95) into the piston assembly (90A-99).

   g. Insert a return spring (90A-90) into the piston assembly, wide end first. This is a tight fit, and can best be done by "screwing" the spring in counterclockwise.

   h. Repeat the above procedure for the other two pistons.

6. Reassemble Housing and Casting

   NOTE: Inspect the shaft seals (90A-104) before continuing. If they look damaged in any way, replace them (remove by pounding them out from inside the pump housing). Both seals should be replaced at the same time. Be careful not to damage the seal bore.

   a. Place the cylinder casting (90A-74) face-down on a flat surface.

   b. Insert the assembled pistons (90A-90 – 90A-99) into the cylinder casting.

   c. Note the location of the outer **ring of holes in the cylinder casting and in the pump housing flange (in particular, the holes where bolts (item # 38 as shown on page 33) will be installed).**

   d. Stand the camshaft assembly (90A-102) on the cylinder casting (90A-74).

      CAUTION: The pilot bearing MUST be properly nested in the bearing race (90A-102) during assembly. If misaligned, the bearing will be damaged and the pump will fail within the first hours of operation.

   e. Install the O-ring (90A-105) and slide the housing (90A-89) down over the shaft and onto the threaded studs (from step c). Be sure the holes in the housing and the cylinder casting are properly aligned.

   f. Using the two threaded studs in the Wanner Tool Kit, put a nut on the studs. Thread the nut down on the stud so the threaded end of the stud can be put through one of the bolt holes in the cylinder casting and through the housing casting. Start another nut on this end of the stud.

      Now put the other stud through the hole on the other side of the cylinder casting and through the housing. Start this nut.

      Using both studs and the nuts, tighten evenly to draw the cylinder casting tight to the housing. Be sure the O-ring (90A-105) stays in place when pulling the two parts together. When tight, install the bolts (item # 38 as shown on page 33) and washer into the cylinder casting to hold it to the housing. Remove the two studs and nuts that were part of the Wanner Tool Kit.

   g. Turn the shaft again to check its alignment.

7. Replace Shaft Seals

   a. Apply a thin film of grease on the seal protector tool (part of the Wanner Tool Kit). Slide both seals onto the tool, with the spring side of the seals toward the open end of the tool.

   Apply a heavier coat of grease between the seals and press them together.

   b. Apply a coating of Loctite® 601 or equivalent locking compound to the outside surface of both seals and the inside surface of the opening in the pump housing where the seal will rest.

   c. Apply a light film of grease to the drive shaft. Slide the seal protector tool (with the two seals) over the end of the shaft.

   d. Slide the seal inserter tool (from the Wanner Tool Kit) over the seal protector tool, and press the seals completely into place. Tap the tool with a soft mallet to firmly seat the seals.

8. Adjust Camshaft Endplay

   a. If the three set screws (90A-72) are in the cylinder casting (90A-74), remove and clean them.

   b. Insert the centerbolt (90A-51) into the hole in the center of the cylinder casting. Turn it in to move the bearing adjusting plate (90A-101) and cup tight against the bearing cone.

   c. Back out the centerbolt two **full turns, then turn it back in again until it is tight against the adjusting plate (90A-101).**

   d. Back out the centerbolt or set screw exactly 1/4 **of a turn.**

   e. With a plastic mallet (or a regular mallet and wooden board) to prevent damage to the shaft, rap the end of the shaft 3 or 4 times. This will provide about .006 in. (0.15mm) endplay in the shaft.

   f. Apply removable threadlocker to the threads of the three cleaned set screws (90A-72).

   Screw the three set screws (90A-72) into the cylinder casting until they contact the bearing adjusting plate (90A-101).

   g. Remove the centerbolt (90A-51).

9. Reinstall Plungers

   NOTE: If the plungers (90A-71) have been removed from the valve plungers (90A-94), do not reuse them. Install new ones instead.

   a. Place a plunger on the screw end of the plunger guide tool from the Wanner Tool Kit. The flat side of the plunger should face the tool.

   b. Screw the guide (with the plunger) into the valve plunger (90A-94) until tight.

   c. Hold the stud with a wrench, and tighten the nut against the plunger guide. This will press-fit the plunger onto the valve plunger. Never reinstall used plungers (90A-71).

   NOTE: Do not remove the plunger guide until the diaphragm is installed (see below).

   d. Install the diaphragm as outlined below, then repeat the procedure (steps 9a-9c) for the other two plungers and diaphragms.

10. Reinstall Diaphragms

   a. With the plunger guide tool still screwed into the valve plunger (90A-94), pull the valve plunger up until the cross-holes in the valve plunger are exposed.

   b. Insert a diaphragm Allen wrench (from the Wanner Tool Kit), or similar dowel-type object, through the holes – to hold the plunger (90A-71) away from the cylinder casting, and to keep the valve plunger from turning when the diaphragm is being installed.

c. Place the diaphragm (90A-70) onto the plunger (90A-71), ridge-side out.

d. Center the diaphragm follower (90A-69) on the diaphragm.

e. Place the O-ring (90A-68) onto the follower screw (90A-67).

f. Apply a small amount of Loctite 242 threadlocker to the threads of the follower screw.

g. Insert the follower screw (with O-ring) through the diaphragm follower (90A-69) and diaphragm (90A-70), and screw it into the valve plunger (90A-94).

h. Hold the diaphragm Allen wrench, and tighten the follower screw to 18 in.-lbs (2.0 N-m) of torque.

i. Repeat the above procedure for the plungers and diaphragms of the other two cylinders.

j. Fill the reservoir with fresh oil and prime the pump, as outlined in the Fluid-End Service Section.

11. Reassemble Pump Head

    Reassemble the pump head as outlined in the Fluid-End Service Section.

12. Reconnect Electrical Power to Motor (or remove lock-out from power source)

POWERSTREAM HIGH PRESSURE COOLANT SYSTEM TROUBLESHOOTING GUIDE

The following chart will show some problems, their probable causes and possible solutions.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
(1) High-Pressure Pump Cavitation	(a) Inadequate fluid supply because inlet supply line vavle is closed	Open the valve .
	(b) Inadequate fluid supply because of inlet line collapsed or clogged:	Replace inlet line.
	(c) Inadequate fluid supply because of clogged filter element.	Replace clogged filter element.
	(d) Inadequate fluid supply because of malfunction in transfer pump or hose.	Inspect and repair transfer pump and/or hose.
	(e) Fluid is too hot for the inlet suction piping system.	Determine cause of heat and correct the problem.
	(f) Air entrained in fluid piping system	Purge air from piping.
(2) Drop in Volume or Pressure:	(f) Aeration and turbulence in supply tank	Determine cause of turbulence and correct problem.
	(a) Air leak in suction piping.	Seal air leak.
	(b) Clogged suction line, suction strainer, or tank filters.	Clean clogged line, strainer or filters.
	(c) Suction line inlet above fluid level in tank.	Fill tank to proper level or extend suction line if it is too high.
	(d) Inadequate fluid supply.	Insure transfer pump sized & operating correctly.
	(e) Pump not operating at proper RPM.	Change motor if necessary.
	(f) Relief valve bypassing fluid.	Repair or replace relief valve.
	(g) Worn pump valve parts. (HydraCell only)	Replace worn valve parts.
	(h) Foreign material in inlet or outlet valves. (HydraCell only)	Clean inlet and/or outlet valves.
	(i) Loss of oil prime in cells because of low oil level. (HydraCell only)	Add oil to proper level.
	(j) Ruptured diaphragm. (HydraCell only)	Replace diaghragm.
	(k) Cavitation.	See #1 above.
	(l) Warped manifold from overpressurized system.	Replace manifold and review system operation. Repair system as required.
	(m) Cracked suction hole.	Replace section casting or pump.
	(n) O-rings forced out of their grooves from overpressurization. (HydraCell only)	Replace o-rings and review system operation. Repair system as required.
	(o) Empty supply tank.	Fill with clean coolant to proper level.
	(p) Excessive aeration and turbulence in supply tank.	Review coolant flow from machine tool to the coolant tank. Reduce or eliminate excessive turbulence.
	(q) Worn regulator seat or plunger.	Replace regulator seat or plunger.
	(r) Cracked cylinder casting.	Replace damaged cylinder casting or pump.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
(3) Pump Runs Rough:	(a) Worn pump valves. (HydraCell only)	Replace worn pump valves.
	(b). Air lock in outlet system. (HydraCell only)	Purge air.
	(c) Oil level low. (HydraCell only)	Add oil as required.
	(d) Wrong weight oil for cold operating temperatures (change to lighter weight). (HydraCell only)	See recommended oil for operating conditions as shown in this manual.
	(e) Cavitation.	See #1 of this chart.
	(f) Air in suction line. (HydraCell only)	Seal suction line.
	(g) Restriction in inlet/suction line.	Clear restriction in inlet/suction line.
	(h) Hydraulic cells not primed after changing diaphragms. (HydraCell only)	
	(i) Foreign material in inlet or outlet valves. (HydraCell only)	Clean inlet and outlet valves.
	(j) Damaged diaphragm. (HydraCell only)	Replace damaged diaphragm.
	(k) Fatigued or broken valve spring (13). (HydraCell only)	Replace damaged valve spring.
	(l) Broken piston return spring (inside hydraulic end). (HydraCell only)	Replace damaged return spring.
(4) Premature Failure of Pump Diaphragm (HydraCell only):	(a) Frozen pump.	
	(b) Puncture by a foreign object..	Replace diaphragm.
	(c) Elastomer incompatible with fluid being pumped.	Consult factory to determine if there is a more suitable diaphragm material for the coolant being used.
	(d) Cavitation.	See #1 on this chart.
	(e) Pump running too fast.	Review motor specifications and changes if necessary.
	(f) Broken piston return spring (50).	Replace piston return spring.
	(g) Excess pressure.	Inspect bypass relieving valve.
(5) Water in Oil Reservoir (HydraCell only):	(a) Condensation.	
	(b) Ruptured diaphragm.	Replace diaghragm.
	(c) Hydraulic cells not properly primed after diaphragm replacement.	See priming procedures in this manual.
	(d) Frozen pump.	
	(e) Diaphragm screw O-ring (18) missing or cracked.	Replace damaged or missing o-ring.
	(f) Cracked cylinder casting.	Replace damaged cylinder casting or pump.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
(6) Pump Flow Pulsations (HydraCell only):	(a) Foreign object lodged in pump valve.	Clean pump valve and repair if necessary.
	(b) Loss of prime in hydraulic cells because of low oil level.	Add oil to proper operating level.
	(c) Air in suction line.	Purge air from suction line and seal if necessary.
	(d) Valve spring (13) broken.	Replace damaged valve spring.
	(e) Cavitation.	See #1 of this chart.
	(f) Aeration or turbulence in supply tank.	Determine cause of turbulence and correct.
(7) Valve Wear (HydraCell only).	(a) Normal wear.	Replace valve.
	(b) Cavitation	See #1 of this chart.
	(c) Abrasives in the fluid.	Inspect filter elements to insure they are not damaged and are properly installed and seated in the filter housing.
	(d) Valve incompatible with corrosives in the fluid.	Change fluid if possible or replace valve with compatible seals.
	(e) Pump running too fast.	Review motor specifications and changes if necessary
(8) Loss of Oil (HydraCell only):	(a) External seepage.	Determine cause and correct.
	(b) Rupture of diaphragm.	Replace diaphragm.
	(c) Frozen pump.	
	(d) Diaphragm screw O-ring (18) missing or cracked.	Replace damaged diaphragm screw o-ring.
	(e) Worn shaft seal.	Replace damaged seal.
	(f) Oil drain piping or fill cap loose.	Tighten piping or fill cap.
	(g) Valve plate and manifold bolts loose.	Tighten valve plate and manifold bolts.
(9) Premature Failure of Pump Valve Spring or Retainer (HydraCell only):	(a) Cavitation.	See # 1 of this chart.
	(b) Foreign object in the pump.	Disassemble and clean pump.
	(c) Pump running too fast.	Review motor specifications and changes if necessary
	(d) Spring/retainer material incompatible with fluid being pumped.	Change fluid if possible or replace spring/retainer with compatible material.
	(e) Excessive inlet pressure.	Check pressure relieving valve.

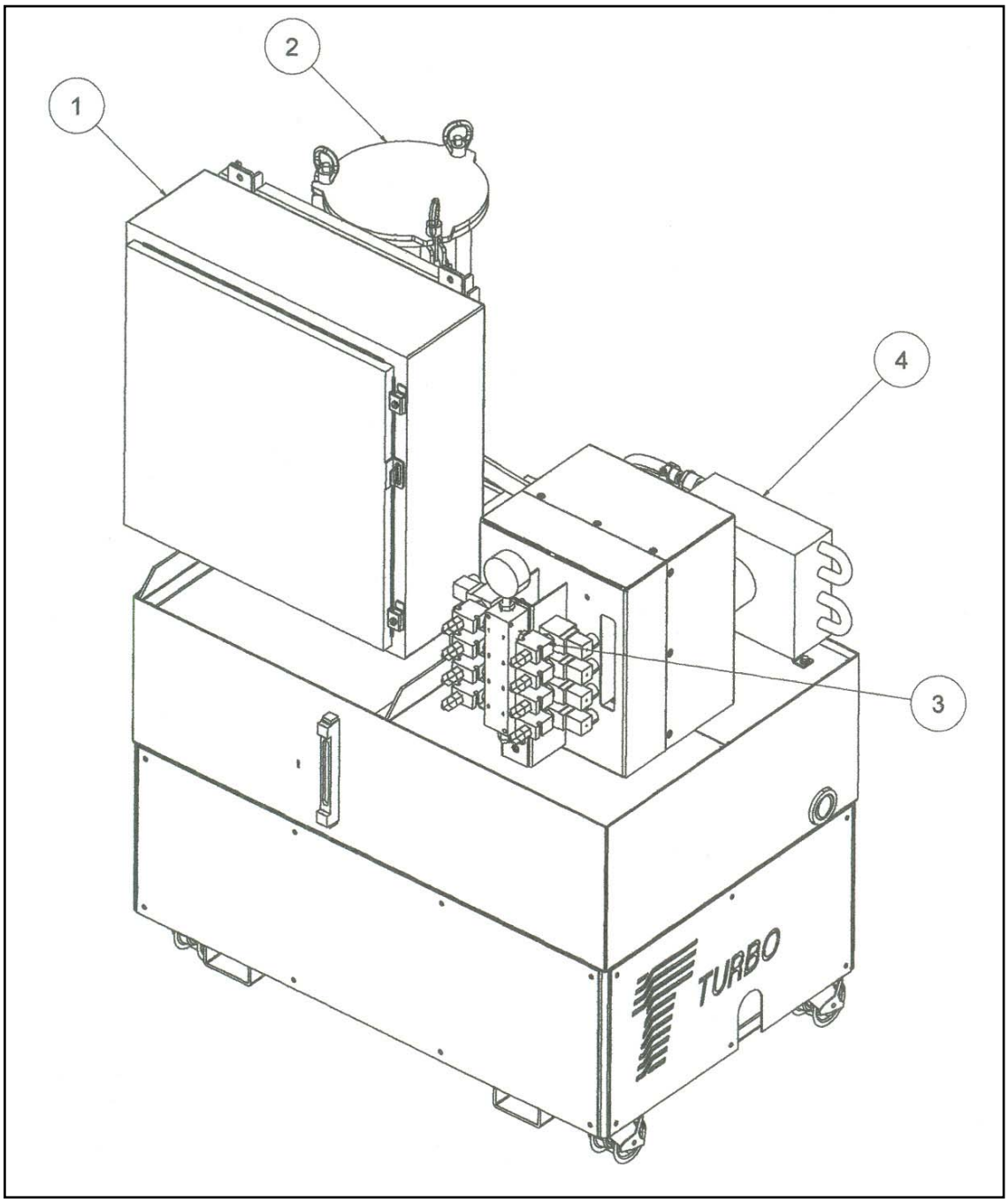
PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
(10) The high-pressure system will not start.	(a). The overload relay or fuse is tripped.	Reset the overload relay or replace the fuse. Check to insure the relay or fuse is properly sized. Check to insure the system is wired correctly.
	(b) Contacts in the motor starter overload are faulty	Replace motor starter contacts.
	(c) Check to insure no alarms are present. If so, trouble shoot cause of the alarm. 1). Check reservoir coolant level to insure the low level alarm is not on. 2). Check to insure transfer pump is operating and that filter bags are not clogged. 3). Check pressure switch to insure proper setting and operation.	Pre-fill reservoir to the correct coolant level and insure the transfer pump is working correctly. Insure that the filter bag(s) are not clogged. If so troubleshoot pump or change bag filters. Reset pressure switch if necessary or replace if it has failed.
	(d) The pump is mechanically blocked.	Remove the mechanical blockage of the pump.
	(e) Motor winding is defective.	Replace the motor.
	(f) Cable connection is loose or faulty.	Fasten or replace the cable connection.
(11). The high-pressure pump will not reach full pressure upon start-up	(a) The pump is running backwards.	Reverse the motor leads so that the belt is running in the correct direction.
	(b) Wrong voltage or phase is being provided to the pump.	Inspect pump motor nameplate to insure proper voltage and phase.
(12) Excess Pressure Required to Bypass Fluid at Pressure Regulating Valve	(a) Regulator pressure is not properly adjusted.	Reset regulator to proper operating pressure.
	(b) Not enough fluid is being continuously bypassed.	Disassemble regulator, inspect parts, clean and replace any damaged parts or regulator.
	(c).Nozzles are worn.	Replace regulator nozzles.
(13) Fluid is Leaking from the Hole in the Regulator(HydraCell only):	(a) Regulator seals are worn.	Replace regulator seals.
(14) Pressure Spikes	(a) Minimum bypass of 10% is not being maintained at pressure regulating valve.	Disassemble regulator, inspect parts, clean and replace any damaged parts or regulator.
	(b) Pressure regulating valve nozzles are worn.	Replace regulator nozzles.
	(c). Pressure regulator pressure is not properly adjusted.	Reset regulator to proper operating pressure.
(15) The motor does not run when started.	(a) Supply failure.	Connect the electricity supply.
	(b) Fuses are blown.	Replace fuses.
	(c) Motor starter overload has tripped out.	Reactivate the motor protection.
	(d) Main contacts in motor starter are not making contact or the coil is faulty.	Replace contacts or magnetic coil.
	(e) Control circuit is defective.	Repair the control circuit.
	(f) Motor is defective.	Replace the motor.

POWERSTREAM HIGH PRESSURE COOLANT SYSTEM MAINTENANCE SCHEDULE

The following chart shows a suggested maintenance schedule for the conveyor to insure proper operation and longevity.

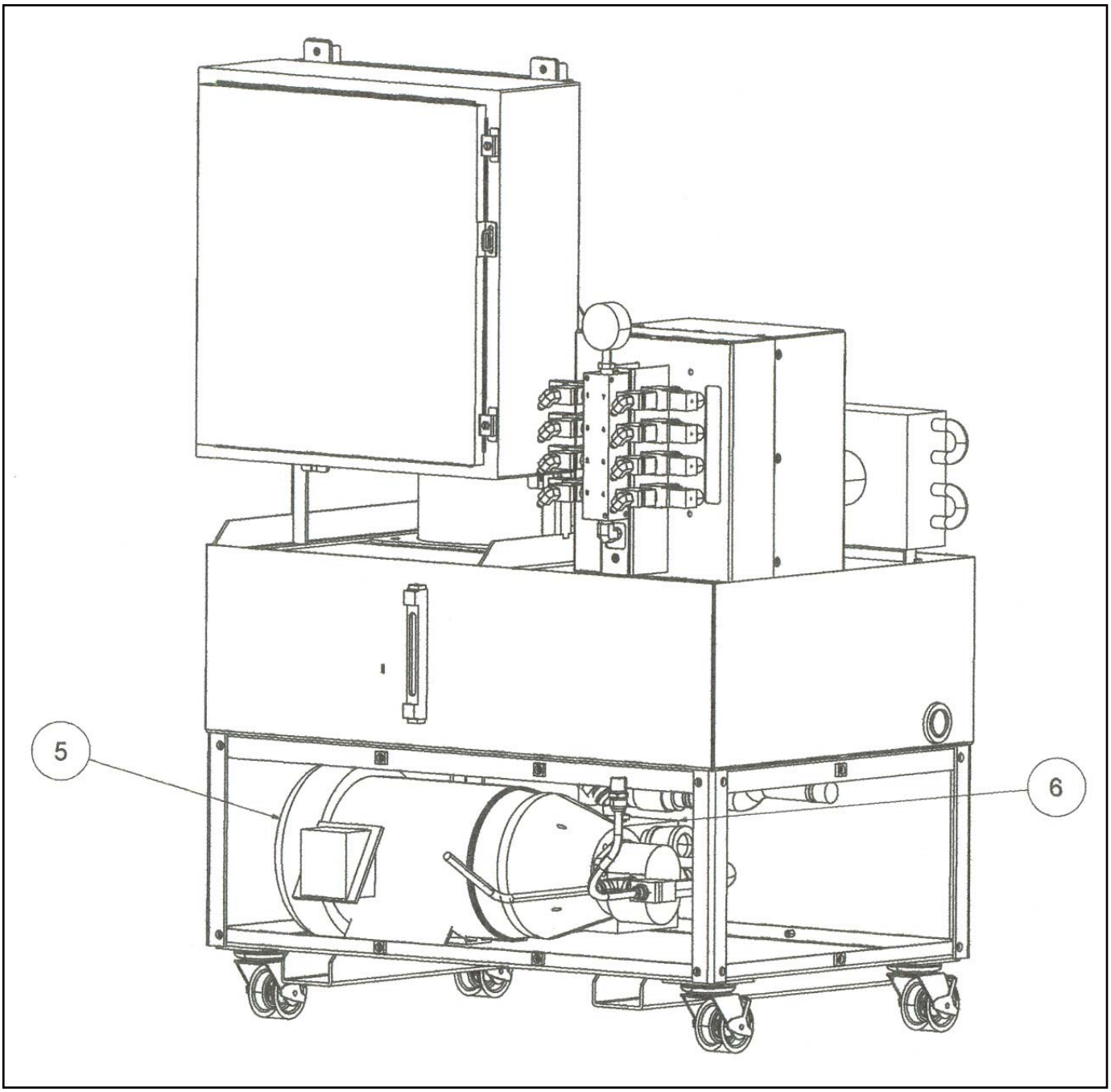
Time Frame	Procedure	Problem	Resolution
Daily	Check the filter housing to determine if bag filters are clogged.	Bag filter is clogged.	Clean or change bag filter.
Daily	Check transfer pump for proper operation, excessive noise and coolant leaks.	If transfer pump is not operating correctly, the high-pressure coolant system will not have an adequate coolant supply.	Repair as required.
Daily	Check the oil level and condition of the oil in the oil reservoir of the high pressure pump. (HydraCell Pump Systems Only!)	Pump may run hot or noisy if oil level is too low.	Add oil or change oil as needed. (1000 PSI Systems Only!)
Weekly	Inspect Pressure Regulating Valve for proper operation and leaks.	An improperly functioning pressure regulating valve leads to unstable system pressure.	Repair valve and seal leaks as required.
Monthly	Inspect High-Pressure pump for proper operation, noise and leaks.	Noisy pumps normally indicate a pump problem. Leaks can lead to premature pump wear and/or performance problems.	Repair pump and seal leaks as required.
Every 3 months	Check the pressure switch to insure it is set properly	Improperly set pressure switch may not provide adequate alarm that filters are clogged.	Pressure Switch must be set to 15 +/- 2 PSIG for proper operation. (Duplex Filter)
Every 3 months	Check float level switches to insure they are working correctly.	Inspect float level switches to insure the floats move up and down freely and the switches work correctly.	Clean the floats if necessary to insure they move freely.
Every 6 months	Change pump oil after first 100 hours of operation and every 1000 hours or six months thereafter, whichever comes first. ((HydraCell Punp Systems Only!)	If oil is not changed regularly it can lead to excessive wear on pumps parts and possible failure.	Change pump oil per the specified maintenance schedule. (1000 PSI Systems Only!)
Annually	Clean High-Pressure tank reservoir.	Depending upon the level of filtration, sludge may accumulate in the bottom of the tank reservoir.	Drain all coolant from the reservoir and clean sludge from the tank. Recharge with clean coolant.

POWERSTREAM-ST HIGH PRESSURE SYSTEM STAND-ALONE SYSTEM



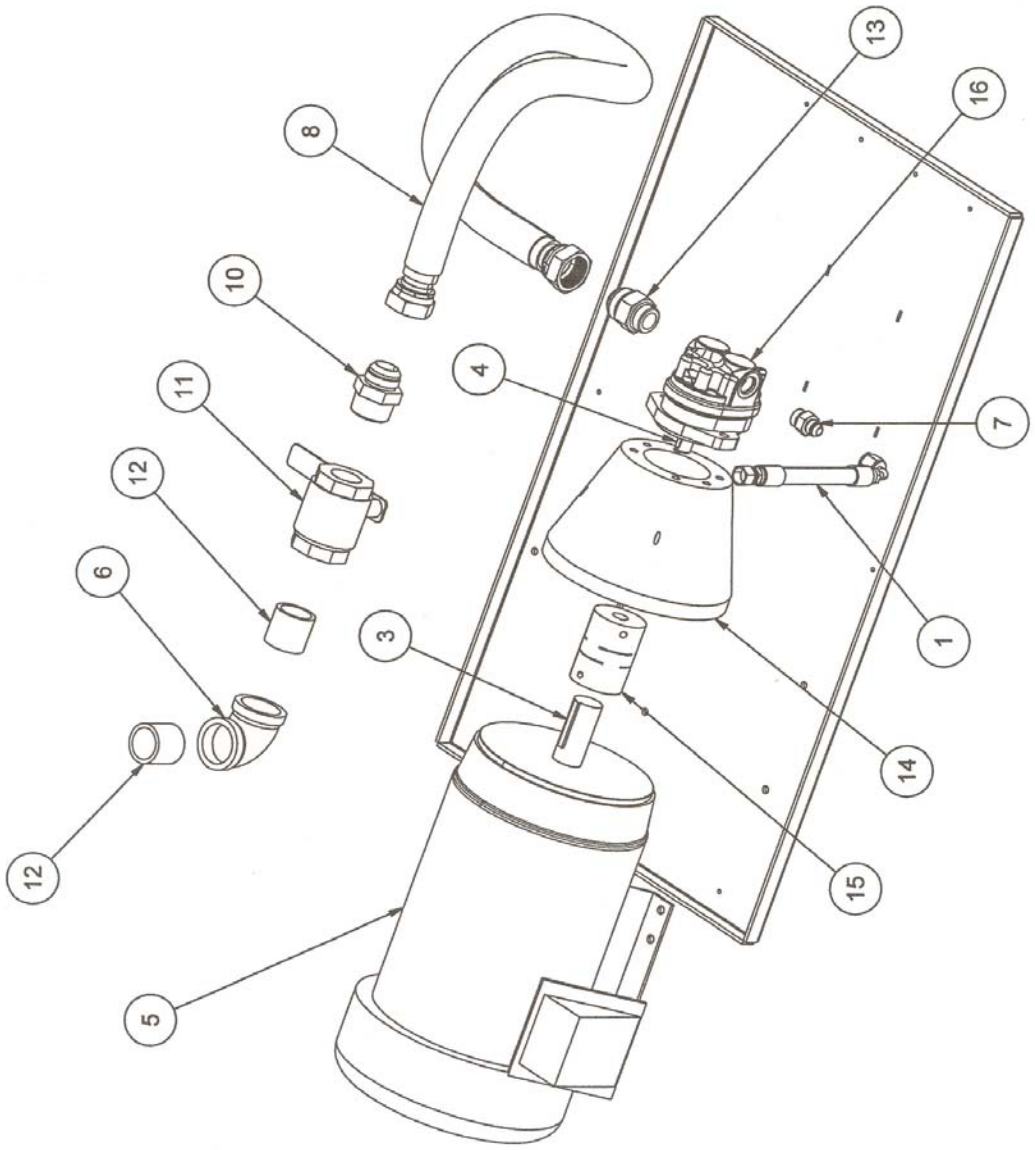
ITEM NO.	CATALOG NO.	PART NAME
1	91A-1	ELECTRICAL CONTROL
2	91A-2	FILTER CANISTER ASSEMBLY
3	91A-3	VALVE MANIFOLD ASSEMBLY
4	91A-4	RADIATOR ASSEMBLY

POWERSTREAM-ST HIGH PRESSURE SYSTEM STAND-ALONE SYSTEM



ITEM NO.	CATALOG NO.	PART NAME
5	91A-5	HIGH PRESSURE PUMP ASSEMBLY
6	91A-6	TRANSFER PUMP ASSEMBLY

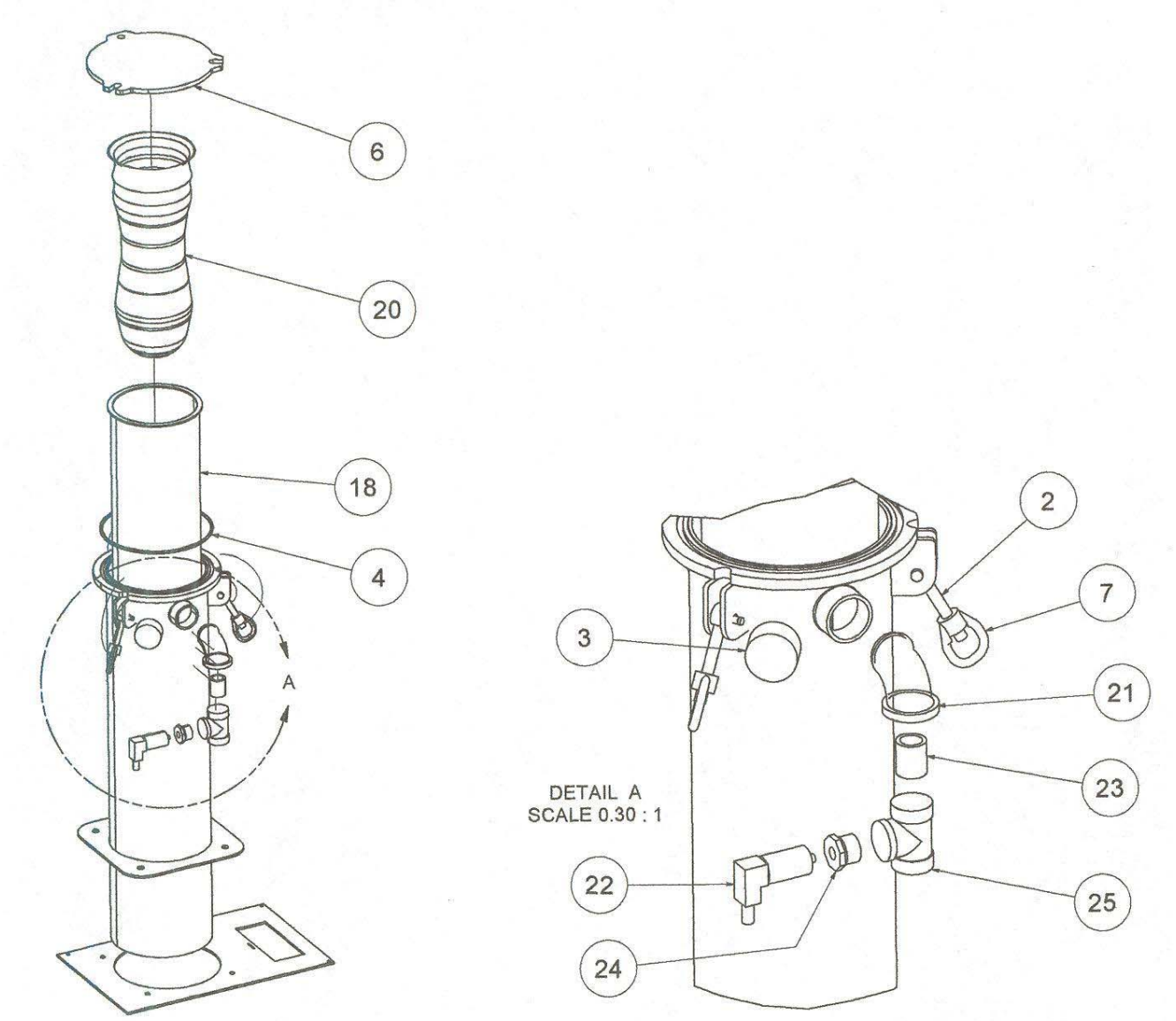
2000 PSI GEAR PUMP ASSEMBLY



ITEM NO.	CATALOG NO.	PART NAME
1	91A-11	HOSE ASSEMBLY
3	91A-12	KEY
4	91A-13	HIGH-PRESSURE GEAR PUMP
5	91A-14	MOTOR
6	91A-15	ELBOW
7	81A-16	NIPPLE
8	91A-17	HOSE ASSEMBLY

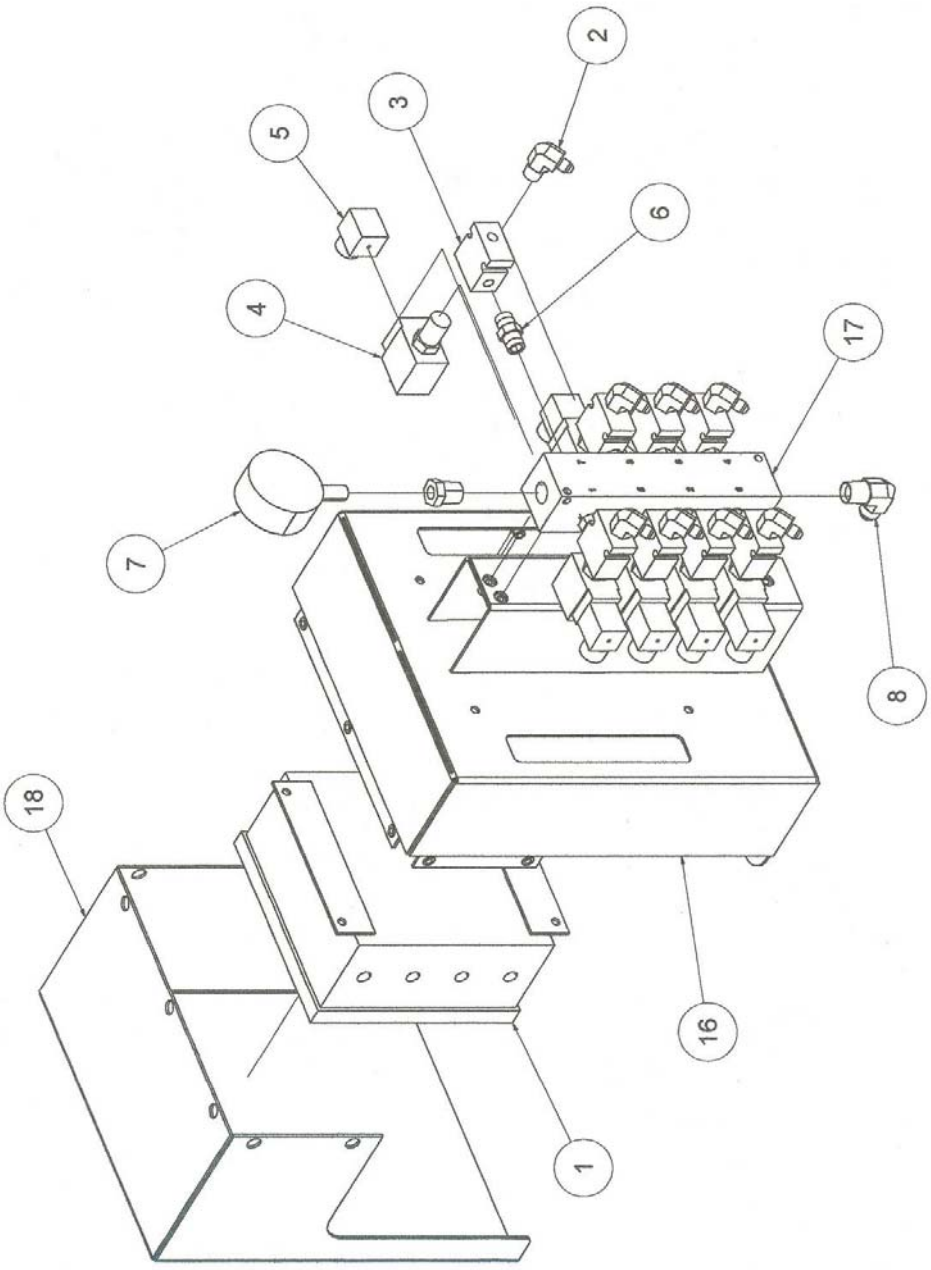
ITEM NO.	CATALOG NO.	PART NAME
10	91A-18	NIPPLE
11	91A-19	BALL VALVE
12	91A-20	BUSHING
13	91A-21	NIPPLE
14	91A-22	C-FACE MOTOR ADAPTER
15	91A-23	COUPLING

FILTER ASSEMBLY



ITEM NO.	CATALOG NO.	DESCRIPTION		ITEM NO	CATALOG NO.	DESCRIPTION
2	90A-17	ROD END		20	90A-19	FILTER BAG
3	90A-15	PRESSURE GAUGE		21	90A-27	ELBOW
4	90A-14	O-RING		22	90A-24	PRESSURE SWITCH
6	90A-11	FILTER LID		23	90A-22	NIPPLE, CLOSE
7	90A-16	EYE NUT		24	90A-26	REDUCER BUSHING
18	90A-12	BASKET WELDMENT		25	90A-25	TEE

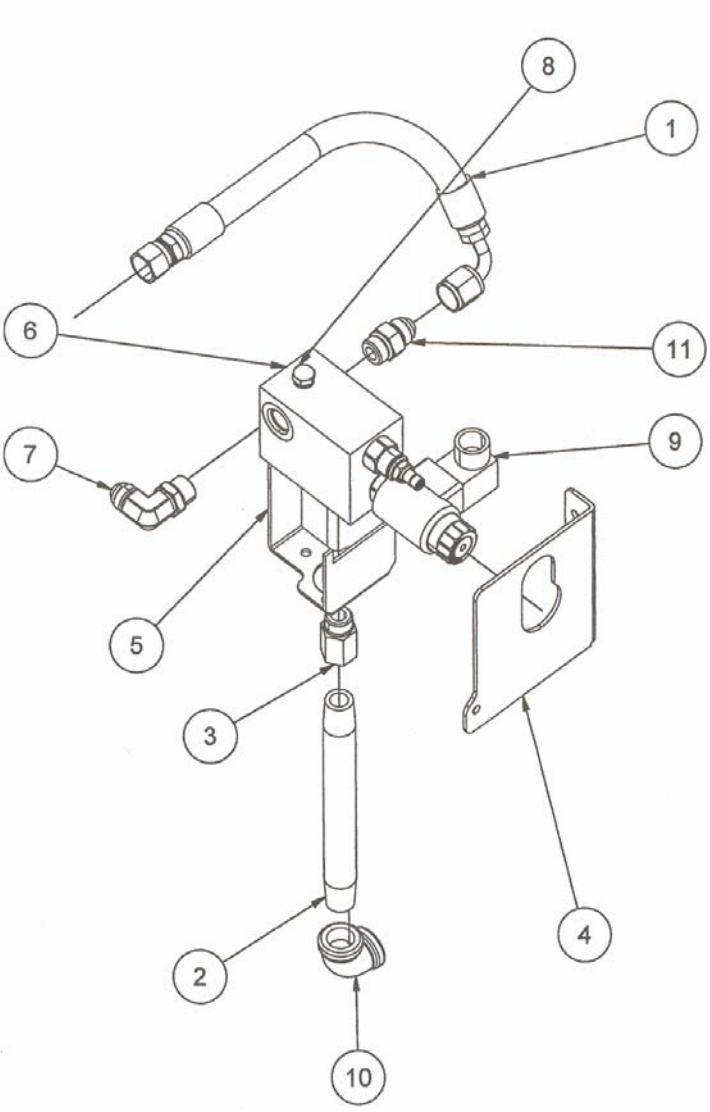
HIGH PRESSURE SYSTEM VALVE ASSEMBLY & COVERS



ITEM NO.	CATALOG NO.	PART NAME
1	91A-31	ELECTRICAL TERMINAL BOX
2	91A-32	ELBOW
3	91A-33	VAVLE BODY
4	91A-34	SOLENOID VALVE
5	91A-35	ELECTRICAL DIN CONNECTOR
6	91A-36	NIPPLE

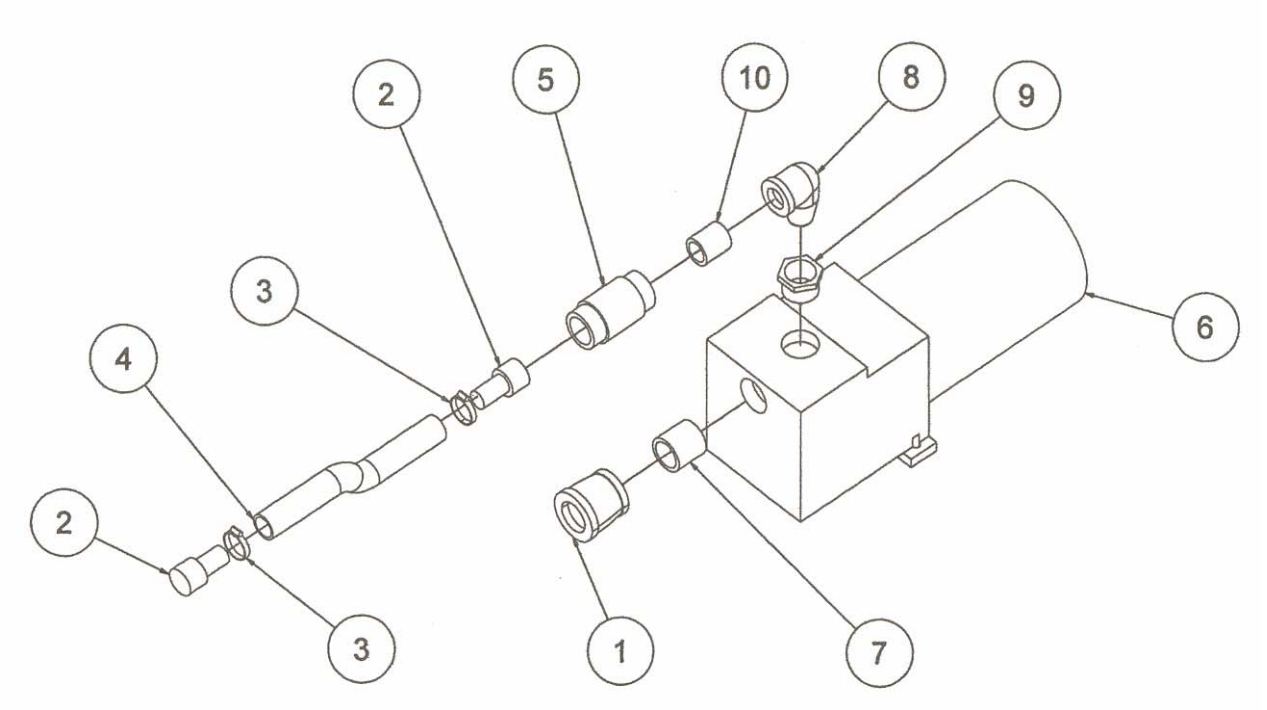
ITEM NO.	CATALOG NO.	PART NAME
7	91A-37	PRESSURE GAUGE
8	91A-38	ELBOW
16	91A-39	SUPPORT BRACKET, VLAVE ASSY.
17	91A-40	MANIFOLD
18	91A-41	COVER

RELIEF VALVE ASSEMBLY



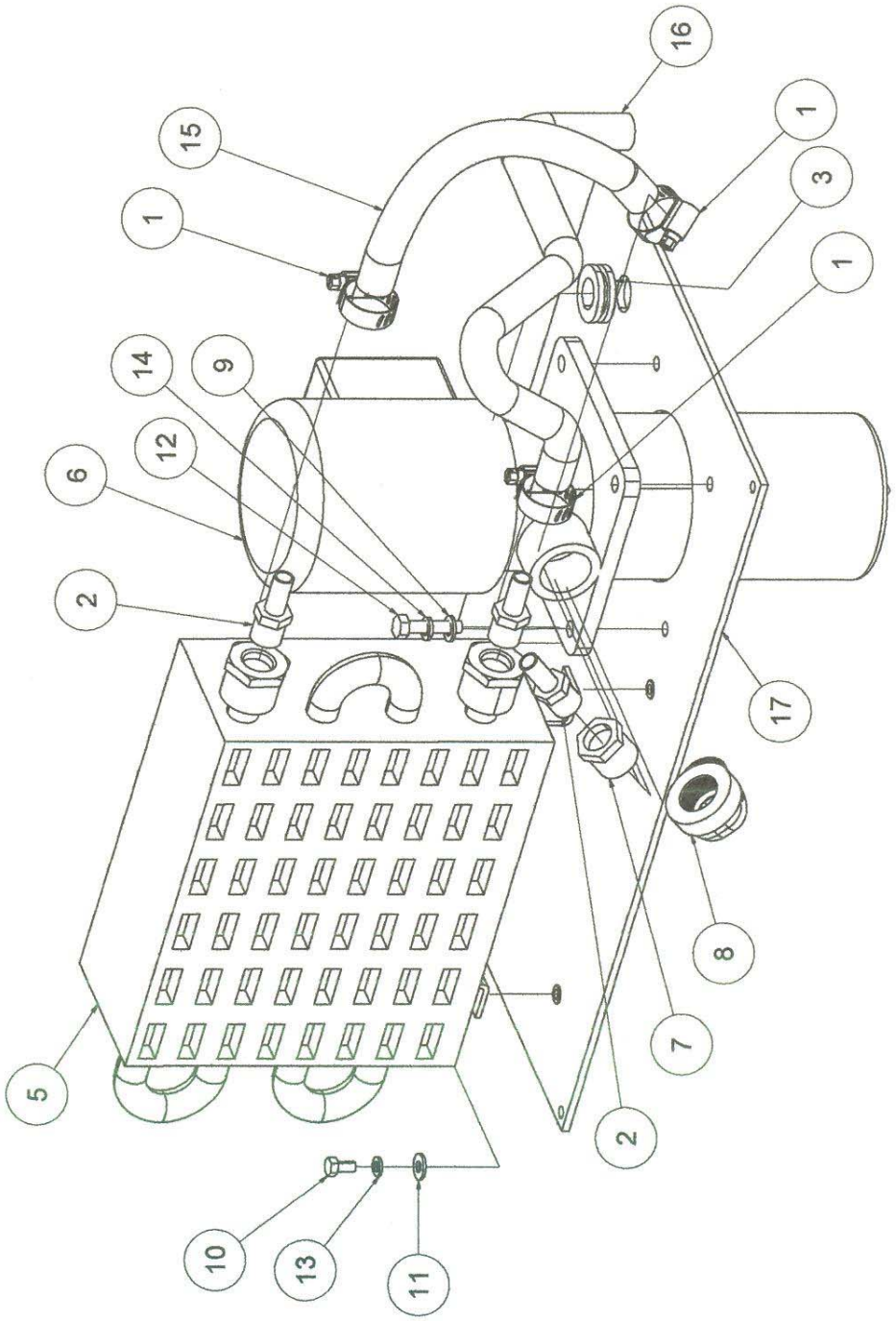
ITEM NO.	CATALOG NO.	DESCRIPTION		ITEM NO	CATALOG NO.	DESCRIPTION
1	91A-70	HOSE ASSY.		7	91A-77	ELBOW
2	91A-71	PIPE		8	91A-78	PLUG
3	91A-73	BUSHING		9	91A-79	ELECTRICAL DIN PLUG
4	91A-74	VALVE COVER		10	91A-80	ELBOW
5	91A-75	VALVE SUPPORT		11	91A-81	NIPPLE
6	91A-76	RELIEF VAVLE				

TRANSFER PUMP ASSEMBLY



ITEM NO.	CATALOG NO.	DESCRIPTION		ITEM NO	CATALOG NO.	DESCRIPTION
1	91A-90	REDUCER BUSHING		6	91A-95	TRANSFER PUMP
2	91A-91	HOSE BARB		7	91A-96	NIPPLE, CLOSE
3	91A-92	HOSE CLAMP		8	91A-97	ELBOW, STREET
4	91A-93	HOSE		9	91A-98	REDUCER BUSHING
5	91A-94	CHECK VALVE		10	91A-99	NIPPLE

OIL COOLER ASSEMBLY (OPTIONAL)



	CATALOG NO.	PART NAME		ITEM NO.	CATALOG NO.	PART NAME
1	91A-51	HOSE CLAMP		10	91A-58	BOLT
2	91A-52	HOSE BARB		11	91A-59	FLAT WASHER
3	91A-53	GROMMET		12	91A-60	BOLT
5	91A-54	RADIATOR		13	91A-61	LOCK WASHER
6	91A-55	PUMP		14	91A-62	LOCK WASHER
7	91A-55	REDUCER		15	91A-63	HOSE
8	91A-56	ELBOW		16	91A-64	HOSE
9	91A-57	FLAT WASHER		17	91A-65	MOUNTING PLATE

POWERSTREAM HIGH PRESSURE SYSTEM ELECTRICAL INFORMATION

Turbo Systems' high pressure systems are supplied with a variety of electrical controls and interfaces, depending on customer's application and machine tool high pressure system interface. Only a qualified electrician or machine service technician should perform any maintenance, repairs or adjustments on this equipment**. READ THIS SECTION BEFORE APPLING ELECTRICAL POWER TO THIS EQUIPMENT.**

WARNING!

ONLY QUALIFIED ELECTRICIAN OR SERVICEMAN SHOULD PERFORM ANY ELECTRICAL TROUBLESHOOTING OR MAINTENANCE TO THIS EQUIPMENT.

DO NOT PERFORM ANY MAINTENANCE, REPAIRS OR ADJUSTMENTS ON THIS EQUIPMENT WITHOUT FIRST LOCKING OUT ALL ELECTRICAL CONTROLS.

PERSONNEL SHOULD BE TRAINED IN OSHA COMPLIANT LOCK-OUT/TAG-OUT AND ELECTRICAL SAFETY PROCEDURES.

MAKE CERTAIN THAT THE POWER SUPPLY IS DISCONNECTED BEFORE ATTEMPTING TO SERVICE OR REMOVE ANY COMPONENTS!

AT NO TIMES SHOULD CIRCUIT CONTINUITY BE CHECKED BY SHORTING TERMINALS WITH A SCREWDRIVER OR OTHER METAL DEVICE.

NEVER SHOULD ADJUSTMENTS, MAINTENANCE OR CLEANING BE PREFORMED WITHOUT FOLLOWING PROPER SAFETY PROCEDURES IN ACCORDANCE WITH LOCAL, STATE AND NATIONAL SAFETY CODES.

Before making any electrical connections be certain the voltage for which the conveyor drive and control are wired is the same as incoming voltage being delivered by the electric power supply. Failure to do so may result in injury or damage to the equipment. It may be necessary in the case of 220/440V, 3 phase, for example, to change the motor wiring from one voltage to another. Normally a wiring diagram is supplied with the equipment documentation package, which indicates proper wiring for the incoming voltage supplied.

Refer to the machine tool's electrical schematics along with the electrical schematic provided with the high-pressure coolant system to determine the proper electrical interface wiring instructions. Some machines are equipped with internal electrical controls and a multi-pin type accessory plug for connecting the high-pressure coolant system. In these cases, Turbo Systems' high pressure system may be ordered with a electrical mating plug, so that connecting the high-pressure coolant system is as simple as plugging it in.

The best and most common source of power for the chip conveyor is the machine electrical cabinet. It is the customer's responsibilities at the time of order to determine what, if any, electrical components are present and/or order the appropriate high-pressure coolant system electrical control.

Before starting the high pressure coolant system, check to be sure no tools, packing, or other material have been left on the on or in the high pressure coolant system. Before starting the high pressure coolant system read the start-up procedures and insure the system is properly set-up with all holes connected and the tank filled with the proper level of coolant. After start-up procedures have been reviewed, start the conveyor and verify proper rotation of the coolant pumps. Reverse polarity if the pumps are rotating in the wrong direction. If the pumps are running in the wrong direction, damage can be caused to the pump and due to inadequate operating effectively of the system, tooling and/or the work piece may be damaged.

AC SUPPLY CIRCUIT AMP LOAD FOR MICROFINE® S CONVEYORS

Your Turbo Systems' Powerstream High-Pressure System is equipped with an AC motor to drive the high-pressure pump. The full load amp draw is based on the horsepower of the AC motor, as well as the input AC voltage. The Turbo Systems' Powerstream High-Pressure System, may be supplied with an optional transfer pump equipped with an AC motor. These motors will place an additional load on the AC power supply circuit.

The Powerstream High-Pressure System motor control circuit is not separately fused. The customer must provide a circuit breaker or a fused disconnect switch on the power supply to the conveyor

It may be necessary to change a circuit protection device on the incoming power supply line to accommodate the higher full load amp draw. Refer to the following tables to determine the full load amp draw on the AC supply circuit:

AC CURRENT REQUIREMENTS FOR POWERSTREAM HIGH-PRESSURE SYSTEM

VOLTAGE 3 PHASE	PUMP TYPE	MOTOR HORSEPOWER	CURRENT AT RATED FULL AMP. LOAD
208/230 VAC	High Pressure Pump	7.5	22.0/19.4
460 VAC	High Pressure Pump	7.5	9.7

OPTIONAL MOTORS CURRENT REQUIREMENTS FOR POWERSTREAM HIGH-PRESSURE SYSTEM

VOLTAGE 3 PHASE	PUMP TYPE	MOTOR HORSEPOWER	CURRENT AT RATED FULL AMP. LOAD
208/230 VAC	Chiller Fan	.25	1.3
460 VAC	Chiller Fan	.25	.65
208/230 VAC	Chiller Pump	.43	1
460 VAC	Chiller Pump	.43	.6
208/230 VAC	Transfer Pump	.75	3
460 VAC	Transfer Pump	.75	2

