TURMOIL

WEST SWANZEY, NH 03469
603-352-0053

INSTALLATION, MAINTENANCE and OPERATION MANUAL

MODEL OC-100 R

TABLE OF CONTENTS

Description	Page
Unpacking & Inspection	2
Cooler Placement	2
Description	2
Plumbing Hook-up	2
Coolant	2
System Filling	3
Electrical Hook-up	3
Temperature Controller	3
Start-up	3
Operation	4
Pump Pressure	4
Safety Interlocks	4, 5
Maintenance	5
Troubleshooting	6
Electrical Diagram with Parts	7
Flow Diagram with Parts	8
Dimensional Diagram	9

Model OC-100 R continued

WARNING

DO NOT ATTEMPT TO START UP THIS COOLER UNTIL YOU HAVE READ THROUGH THE INSTRUCTIONS COMPLETELY. IMPROPER START-UP WILL VOID THE COOLER WARRANTY AND DAMAGE THE MACHINE.

UNPACKING & INSPECTION

Rough handling during shipment may cause obvious and/or concealed damage. Upon arrival, the cooler should be inspected carefully and claims for damage must be filed immediately with the trucker.

When uncrating the cooler, inspect it thoroughly for signs of concealed damage. Coolers that have been dropped or shipped on their side may not show external damage. If damages are found, a claim must be filed with the carrier within 30 days of delivery.

COOLER PLACEMENT

All *OC* units are designed for indoor operation in a clean industrial environment. The units are air cooled. Air intake is at the front of the unit and warm air discharge is at the rear. The unit must be placed in an area where air intake and discharge are not impeded. Lack of adequate cool air will cause a reduction in cooling capacity and/or completely shutdown the refrigeration compressor. The cooler is provided with an air intake filter. This filter must be kept clean.

DESCRIPTION

TURMOIL OC coolers are designed to provide a continuous supply of clean, water based coolant to liquid cooled spindles. The OC is a completely self-contained unit consisting of a reservoir, digital temperature controller, recirculating pump and air cooled refrigeration system. After the unit is filled and the proper electrical and plumbing connections are made, the OC will operate virtually maintenance free, supplying cooling fluid at constant temperature and pressure.

OCN units are designed for use indoors in a clean industrial environment. Ambient temperature should not fall below 55° F (13° C) or rise above 110° F (43° C).

PLUMBING HOOK-UP

Make hose connections to the 1/2" FPT fittings on the rear panel tagged DISCHARGE and RETURN. Coolant flow will be out the DISCHARGE connection. Assemble the connector fitting to the ½" FPT Discharge/Return fittings using thread sealing tape.

COOLANT

Clean tap water or distilled water should be used in the coolant system. A glycol based coolant conditioner should be used. Contact the machine tool manufacturer for the proper coolant conditioner that is compatible with the spindle. A mixture of 30% ethylene or propylene glycol to 70% distilled water is suggested. *DO NOT USE AUTOMOTIVE ANTI-FREEZE AS COOLANT.*

Model OC-100 R continued

SYSTEM FILLING

Remove the fill port cap located on the top panel and fill the reservoir with clean cooling fluid. Fill the tank to the top of the level gauge. Do not overfill. After the cooler has operated for a few minutes, add more coolant as necessary to fill the tank.

ELECTRICAL HOOK-UP

See electrical diagram attached. Check nameplate tag for proper voltage, hertz and phase. The supply voltage must be within 10% of the rated voltage on the tag. Make power connections to the terminals provided on the fuse block in the electrical enclosure at the rear of the cooler. Connect ground to the grounding terminal provided. The cooler is provided with terminals for HIGH/LOW TEMP INTERLOCK (terminals #10 and #11). The HIGH/LOW TEMP interlock opens on fault. The cooler is provided with a LOW FLOW INTERLOCK (terminals #12 and #13). The LOW FLOW interlock opens on loss of coolant flow. Check for loose wires.

TEMPERATURE CONTROLLER

This cooler is supplied with a digital temperature controller (CTC-106) mounted on the front panel. The controller maintains the coolant temperature within 0.5° F of the adjustable set-point. The temperature sensor is installed in the DISCHARGE line. The controllers will alternate flashing the set point temperature (S) and the actual temperature (F). See the attached instruction sheet for operating this controller.

START-UP

Once the cooler has been filled with coolant and the proper plumbing and electrical connections have been made, the cooler can started by pushing the ON/OFF switch on the front panel to the ON position. When the switch is turned to the ON position, an internal light will energize as will the display on the controller. The pump, compressor and fan will also start and run continuously.

The pump will prime itself and start pumping coolant through the coolant loop. Check for leaks and make any repairs necessary. After operating the pump for several minutes to allow the coolant to fill the complete coolant loop, add more coolant as necessary to fill the coolant tank.

OPERATION

When the ON/OFF switch on the front panel is pushed to the ON position, the pump, compressor and fan will start and run continuously. The temperature controller will also energize and alternately display the set point and coolant temperatures (See controller instructions).

When the controller calls for cooling, the solenoid valve on the liquid line is open and refrigerant flows through the expansion valve to absorb heat and evaporate in the evaporator/heat exchanger. When the controller calls for heating, the solenoid valve on the liquid line closes, stopping the flow of refrigerant to the expansion valve. The compressor keeps pumping refrigerant out of the evaporator causing the suction pressure to drop. When the suction pressure drops to about 25 psi, the hot gas bypass valve

Model OC-100 R continued

opens, allowing hot refrigerant gas to bypass the condenser and enter directly into the evaporator where it is cooled by the recirculating coolant. The cooler should now be ready for continuous operation.

PUMP PRESSURE

The coolant is recirculated at a rate of 4 GPM by a rotary vane, positive displacement type pump. An adjustable pressure relief bypass valve has been installed in the discharge line to limit the maximum pump pressure that can be developed. The factory set pressure limit is 60 psi. To adjust the discharge pressure, turn the adjustment stem on the relief valve clockwise to increase pressure and counterclockwise to decrease pressure.

SAFETY INTERLOCKS

HIGH/LOW PRESSURE SWITCH

The compressor is protected from excessively high discharge pressure or low suction pressure by a High/Low pressure switch (H/L PS) mounted inside the cabinet. High head pressure can be caused by a dirty condenser or by too little air flow through the condenser. Low suction pressure can be caused by loss of refrigerant charge, operating at too low an outlet temperature (below 50° F), a faulty solenoid valve, or to little flow of coolant through the evaporator.

The High/Low Pressure Switch is factory set as follows:

Head Pressure - Cut Out	275 psi
Low Pressure - Cut In	35 psi
Differential	25 psi

If the cooler shuts down on the Low Pressure switch, it will come back on after the pressure has built back-up. If the cooler continuously cycles on the Low Pressure switch, it most likely is operating at too low an coolant temperature or has a low refrigerant charge.

If the cooler shuts down on the High Pressure switch, it will stay off until the Blue reset button on the High/Low pressure switch is pushed in. If the cooler goes out on High Pressure, most likely the condenser or the condenser filter is clogged or blocked.

The cooler is supplied with safety interlocks to prevent damage to the spindle if there is a malfunction with the cooler. The interlocks are contacts that open on default.

Low Flow Interlock:

The cooler is supplied with a flow switch to prevent damage to the spindle if coolant flow is substantially reduced. The switch contacts across terminals #12 and #13 are designed to open when the flow through the spindle has dropped to approximately 2 GPM.

Model OC-100 R continued

High/Low Temperature Interlock:

The temperature controller K2 contacts open across terminals #10 and #11 when coolant temperature rises above or falls below a preset limit delta T (1° to 20° F above and below the set-point). See controller instructions for setting this limit.

MAINTENANCE

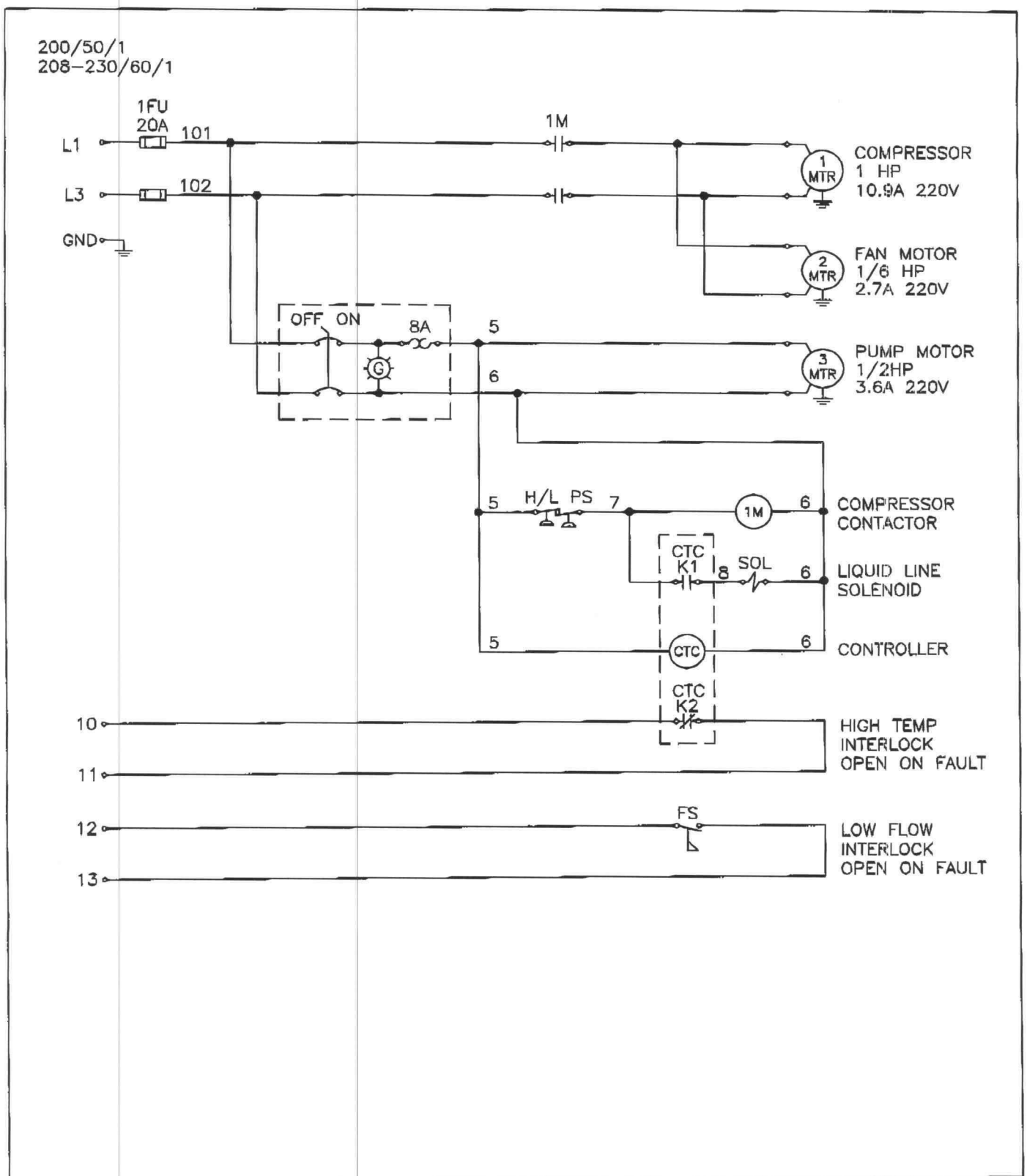
Air cooled OCN units pull substantial amounts of air through the front panel and across a fin coil refrigerant to air heat exchanger. A cleanable air filter has been provided but a build up of dust or debris on the heat exchange fins will interfere with the transfer of heat and prevent proper operation of the system. Normally, periodic vacuuming of the front condenser fins will prevent a loss of cooling capacity. It is recommended that a visual inspection be made monthly after initial installation. Vacuum accumulated dust when necessary. Clean the air filter when needed.

Once each week check the coolant level in the system reservoir. Replenish as required any loss to evaporation. The coolant must be kept clean, and should be changed every 2000 hours of operation or at least once a year.

TROUBLE SHOOTING

PROBLEM	CAUSE	SOLUTION
Pump and Compressor Run but the Cooler does Not Cool.	A. Dirty Air Filter B. Blocked Air Flow C. Condenser Clogged D. No Coolant Flow E. Cooler Undersized F. Faulty Controller G. Low Refrigerant Charge H. Faulty Solenoid Valve/Coil I. Faulty Compressor J. Incorrect Expansion Valve setting K. Incorrect Hot Gas Bypass Valve (HGBV) setting	Clean Remove Blockage Clean Check pump rotation or low coolant level Checking Cooling Load Repair/Replace Repair* Replace* Repair/Replace* Adjust Expansion Valve to proper setting* Adjust Hot Gas Bypass Valve to proper setting*
Cooler inoperative or does not start	A. Faulty Power Source B. Blown fuse C. Pump Overload tripped D. Faulty On/Off Switch	Check & Correct Replace Fuse Reset and Check Amps Repair/Replace
Pump does not run or start	A. Pump Overload tripped	Reset Overload and check Amps
Pump Runs Compressor OFF	A. Compressor OFF on High Head Pressure B. Compressor OFF on Low Suction Pressure	Push Blue Reset Button on Pressure Switch Check For: Dirty Air Filter Dirty Condenser Bad Fan Motor Incorrect Expansion Valve or HGBV Setting* Check for: No or Low Coolant Flow through Evaporator Low Ambient Wrong Setting on H/L Pressure Switch Low or Lost Refrigerant Charge* Incorrect Expansion or HGBV Valve Setting*
Coolant leaking	A. Loose connection B. Faulty pump seal	Repair Repair
No Coolant Flow	A. Wrong Pump Rotation B. Faulty Pump C. Pump bypass set too low D. Obstruction in lines E. Pump will not prime	Check and correct Repair or replace Adjust Repair Add Coolant to sump

- Actions designated with * should only be done by a ***Qualified Refrigeration Service Person.*** Check with factory for proper settings.

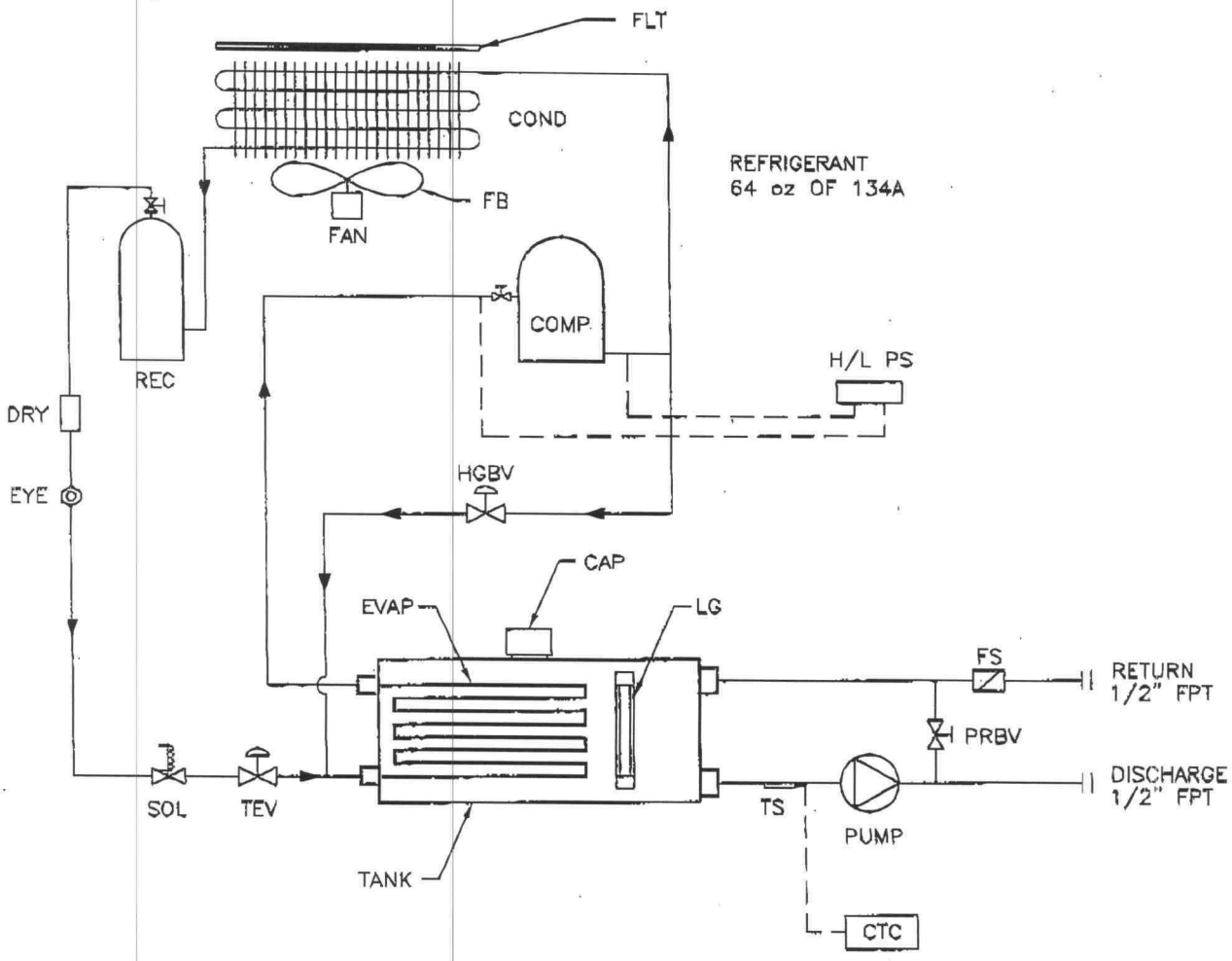


BY:	DATE:	REV
PH	11/11/09	–

OC-100 R-CTC
ELECTRICAL

TURMOIL
735 West Swanzey Road
West Swanzey, NH 03469

AIA OC-100 R-LF-HT 1PH Electrical

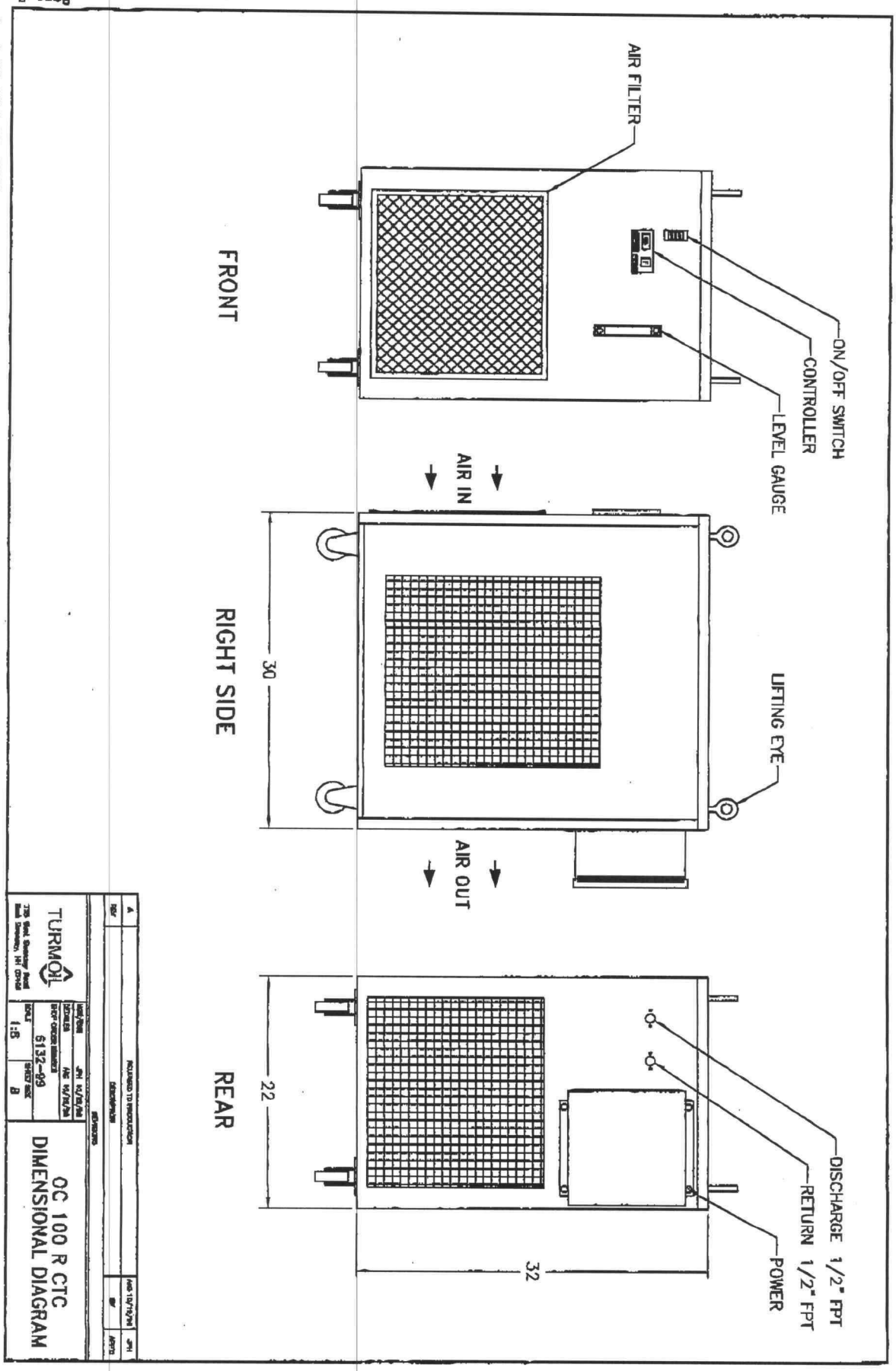


BY:	DATE:	REV
EAM	11/11/2002	–

OC-100 R-CTC
FLOW DIAGRAM

TURMOIL
735 West Swanzey Road
West Swanzey, NH 03469

Generic OCN-100 R-CTC-LF Flow



TURMOIL	OC 100 R CTC DIMENSIONAL DIAGRAM
6132-99	
SCALE 1:5	SHEET SIZE B

TURMOIL

WEST SWANZEY, NH 03469
603-352-0053

INSTALLATION & MAINTENANCE INSTRUCTIONS

CTC-106 TEMPERATURE CONTROLLER

MODEL: DIN FJ32ZU-N-N-106
RANGE: 32° F to 120° F
LINE INPUT VOLTAGE: 85-265 VAC
SENSOR: Thermister, 2252 ohms @ 25° C
OUTPUT: Relay K1; 15 amps max. De-energizes when the sensor temperature exceeds the set point temperature
Relay K2; 15 amps max. De-energizes when the sensor temperature exceeds the second set point temperature.

PROGRAMMING SEQUENCE:

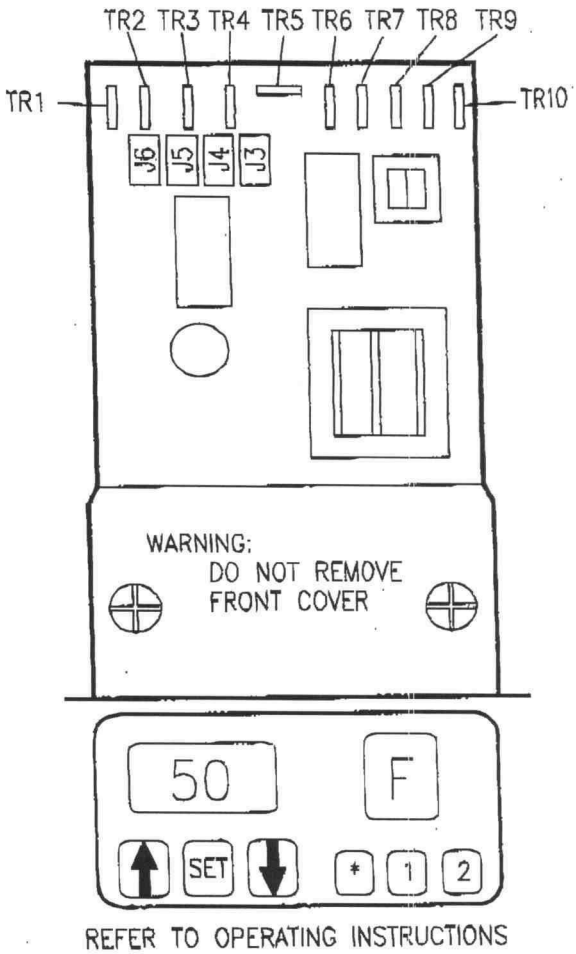
POWER ON:
Upon power up, the process temperature will be displayed. The rightmost character will indicate F to show readout in degrees Fahrenheit (or C for degrees Centigrade if jumper J5 is ON). The control dead-band is fixed at 0.5 degrees F. During normal control operation , the display scrolls between Process Temperature(F or C) and Set point (S) approximately every 5 seconds.

PUSH SET: To enter the SET POINT programming mode or to see the set point setting, push SET once. The display will be indicating the set point temperature of the cooler. The '1' LED will illuminate. Adjust the set point with the up and down arrow keys.

PUSH SET 2nd TIME: To enter the HIGH LIMIT, LOW LIMIT, or HIGH/LOW LIMIT setting, push SET a second time. The '2' LED will illuminate and the display will be indicating the LIMIT DELTA T (the degrees above or below the set point that will indicate fault). Push the UP or DOWN arrows to adjust the LIMIT DELTA T between the limits of 1 and 20 degrees F (1 and 10 degrees C). Temperature Limit Indication is optional and is not provided on all models.

PUSH SET 3rd TIME: This will take you back to the beginning of the programming sequence, alternately displaying process temperature (F or C) and set point (S). If, when in any of the programming modes, no button is pushed for approximately 8 seconds, the controller will automatically return to the beginning of the program sequence.

TR #	DESCRIPTION
TR1	SENSOR 2252 OHMS @ 25 C THERMISTOR
TR2	SENSOR
TR3	K1 CONTROL CLOSES "ON RISE"
TR4	K1 CONTROL ARM
TR5	K1 CONTROL OPENS "ON RISE"
TR6	K2 LIMIT ARM
TR7	K2 LIMIT CLOSES "OUT OF RANGE"
TR8	K2 LIMIT OPENS "OUT OF RANGE"
TR9	VAC COMMON
TR10	VAC HOT



REFER TO OPERATING INSTRUCTIONS

J3	J4	MODE
OFF	OFF	HI/LO
ON	OFF	HI
OFF	ON	LO

J5	J5 IN = Degrees "C" J5 OUT = Degrees "F"
J6	J6 IN = Program Mode J6 OUT = Program Lockout

MODEL NO. —— DINF J32ZU-N-N-106
RANGE ——— 32 TO 122 °F (0-50 °C)
LINE VOLTAGE — 85 to 265 VAC

TURMOIL
735 West Swanzey Road
West Swanzey, NH 03469

TEMPERATURE CONTROLLER CTC-106

CTC-106 NEW

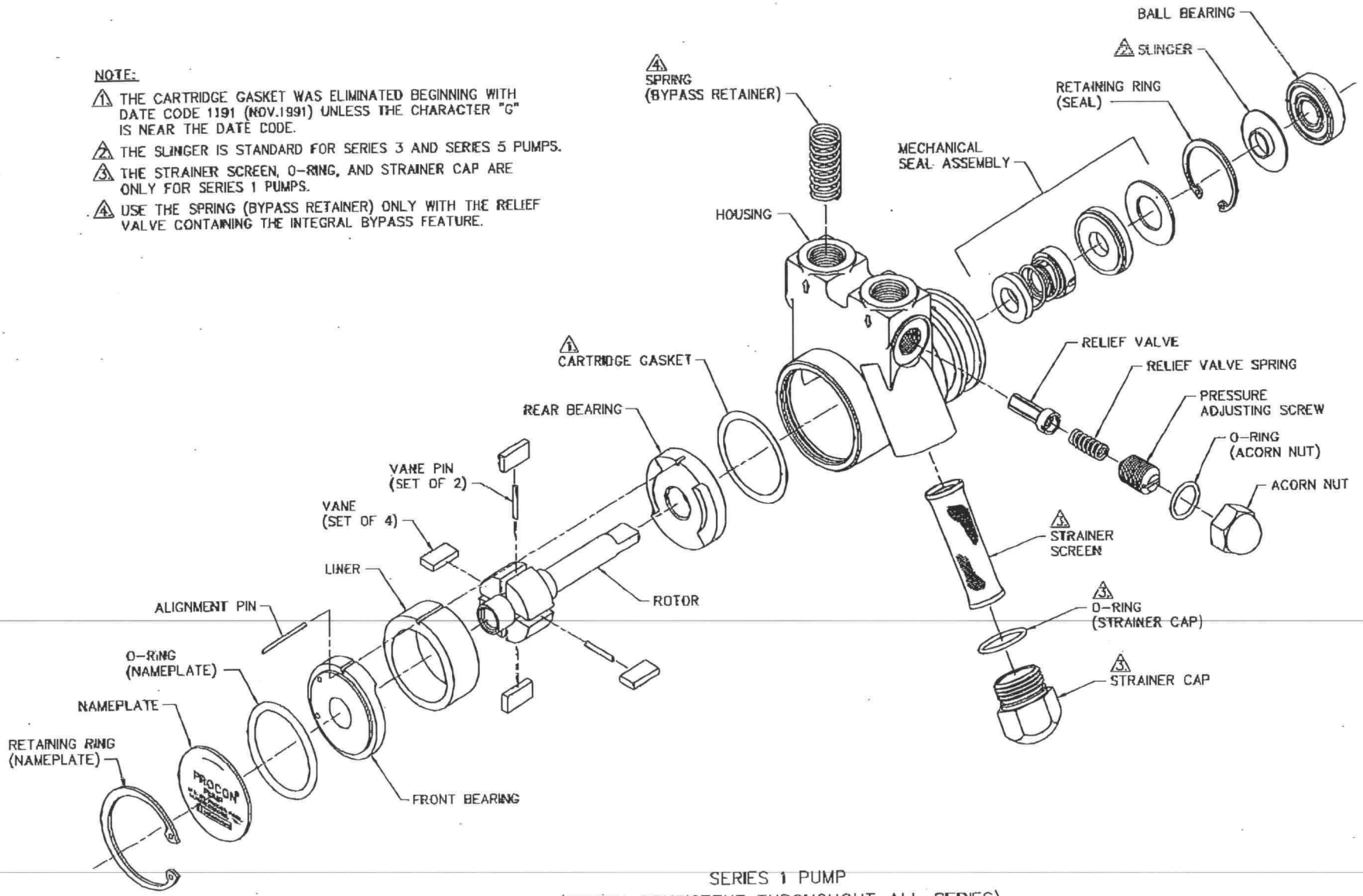
Troubleshooting Tips for PROCON Pumps

Warning: *Before you try to work on the pump or the system, turn the motor off and disconnect the power to the motor.*

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Pump is working below its capacity	inlet is clogged or restricted internal strainer is clogged or restricted	Clean out the inlet line. If you have an inlet filter or internal strainer, clean it (replace it if more than 20% clogged). Do not allow debris to fall into pump from filter.
	Inside of the pump is wearing out, caused by foreign or abrasive materials getting into the pump	Have the pump rebuilt by PROCON. To prevent future failures, make sure you have an adequate filter on the inlet line.
	Relief valve setting is incorrect	Check discharge pressure and turn adjusting screw under acorn nut to change pressure.
Pump is leaking	mechanical shaft seal or rubber o-ring is failing	Have the pump rebuilt by PROCON
	relief valve cap or strainer cap is loose	Tighten the cap on the relief valve or strainer.
	relief valve cap or strainer cap o-ring or gasket are damaged	Replace the damaged o-ring or gasket. Contact PROCON for these parts.
	Inlet or outlet port fittings are loose or sealant failed	Apply joint compound or tape and reinstall the fittings. Do not allow sealant to fall into pump.
Pump is noisy	Inlet is clogged or restricted internal strainer is clogged or restricted	Clean out the inlet line. If you have an inlet filter or internal strainer, clean it (replace it if more than 20% clogged), Do not allow debris to fall into pump from filter.
	Acorn nut on the relief valve or strainer cap is loose	Tighten the acorn nut on the relief valve or the strainer cap.
	Gasket or o-ring on the acorn nut or strainer cap is defective	Replace the gasket or the o-ring on the acorn nut or the strainer cap. Do not tamper with the relief valve setting. Contact PROCON for parts
	coupling, mounting bolt, or V-band clamp is loose	Turn off the motor and disconnect the power to the motor. Then, properly align and tighten the loose component.
Motor is stalling or overloads are tripping out	lime and mineral deposits in the pump are causing internal binding	Have the pump rebuilt by PROCON
	motor may be defective	Contact your motor supplier.
	Motor may be wired for wrong voltage	Check wiring against wiring diagram supplied with the motor.

NOTE:

1. THE CARTRIDGE GASKET WAS ELIMINATED BEGINNING WITH DATE CODE 1191 (NOV.1991) UNLESS THE CHARACTER "G" IS NEAR THE DATE CODE.
2. THE SLINGER IS STANDARD FOR SERIES 3 AND SERIES 5 PUMPS.
3. THE STRAINER SCREEN, O-RING, AND STRAINER CAP ARE ONLY FOR SERIES 1 PUMPS.
4. USE THE SPRING (BYPASS RETAINER) ONLY WITH THE RELIEF VALVE CONTAINING THE INTEGRAL BYPASS FEATURE.



SERIES 1 PUMP
(DESIGN CONSISTENT THROUGHOUT ALL SERIES)