PolyScience Model 6305P Chiller

Installation & Operation

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Revision History

Revision	Date	Author	Comments
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INTRODUCTION

All output devices (except the 3230 Trendsetter) that utilize the 40 Watt "V" Thermal Head will require an externally located Chiller unit to provide the cooling water to the Head. The Chiller is connected to the output device with a 3 meter (10 ft.) long water hose assembly and a 15 pin signal cable. The Chiller is fitted with casters and can be located as required to allow recorder access but adequate air flow through the Chiller must be provided. The Chiller requires a 110V outlet.

Up to August, 1999 the chiller shipped with output devices was a PolyScience Model 6305P. During August, 1999 the PolyScience Model 6305P chiller will replace the Neslab as the standard external chiller. The main reasons for the change are improved features and better reliability.

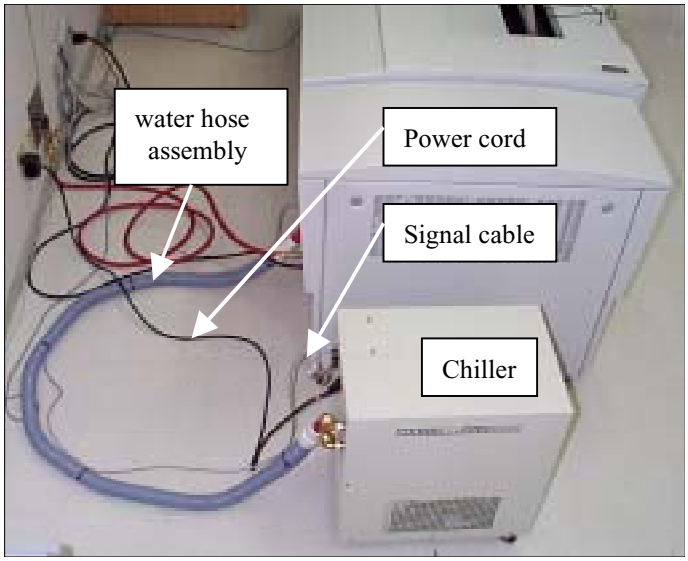


Fig. 1
Typical Chiller Installation

RELATED DOCUMENTS

77-0038A: Thermal Exposure Head Installation Procedure"

"Site Prep. & Requirements" for the relevant output device.

INSTALLATION

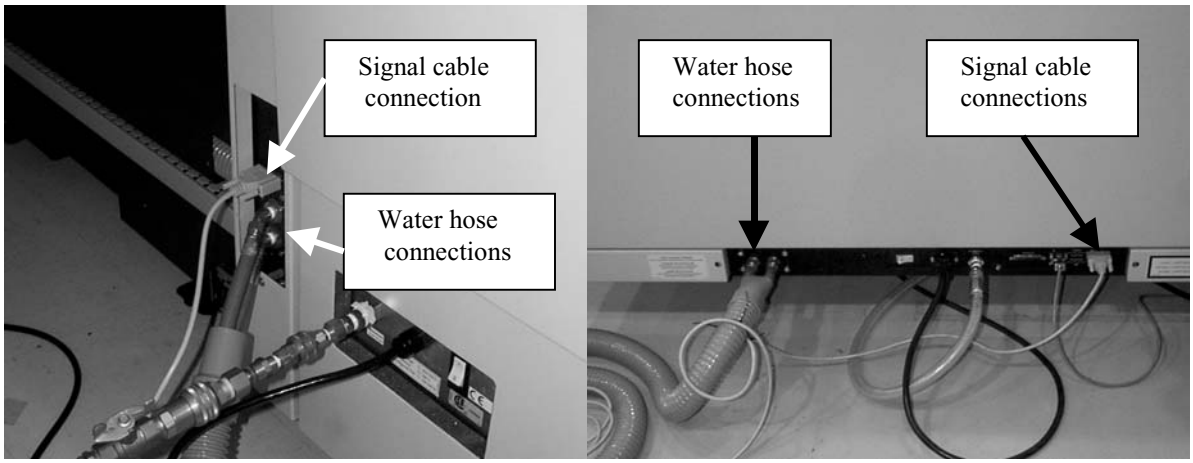
The PolyScience Model 6305P Chiller will be supplied with the water reservoir empty and the connecting hoses and cables separate. Three - 4 liter jugs of pre-mixed Coolant (P/N 82-1032A), a system drain hose and a Chiller tester will also be supplied.

TOOLS REQUIRED:

- 3/4" wrench
- teflon sealing tape
- Paper towels

CONNECTING TO MACHINE:

1. Apply teflon sealing tape to the threads of the bulkhead fittings and connect the coolant hoses to the fittings (see Fig. 2). **NOTE: The hoses can be connected to either fitting as the direction of flow is not important.**
2. Connect the signal cable plug to the socket on the lower frame (see Fig. 2). NOTE: DO NOT CONNECT THE SIGNAL CABLE TO THE CHILLER AT THIS TIME.



Trendsetter VLF Trendsetter

Figure 2.

3. Connect the quick disconnect fitting on the hose assembly to the quick disconnect plugs on the back of the Chiller (see Fig. 3). **NOTE: the hoses can be connected to either plug as the direction of flow is not important.**

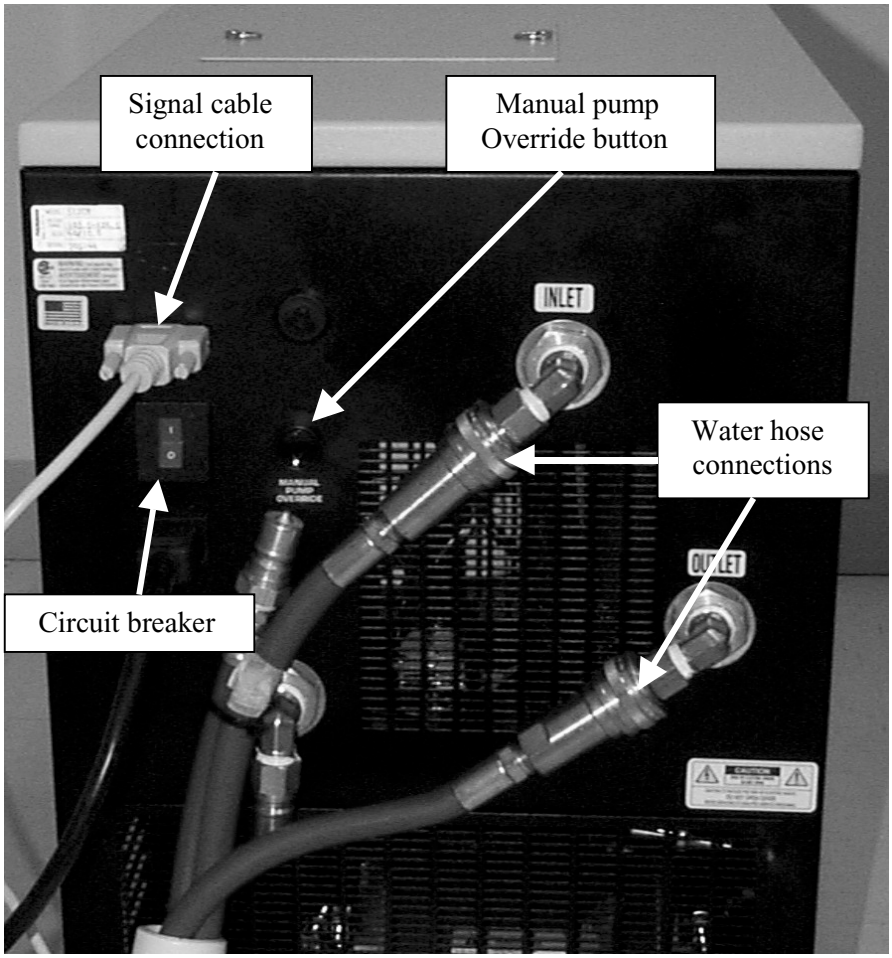


Fig. 3

4. Locate the Chiller Unit within the reach of the hoses, but leave 18” clearance around the unit for airflow.

5. Check the Chiller’s data plate for required voltage and plug the Chiller’s power cord into a suitable power outlet. Refer to the output devices' "Site Prep. & Requirements" document for power outlet requirements.

CHILLER START-UP

1. Install the Head in accordance with "Thermal Exposure Head Installation Procedure" (77-0038A) and connect the water hoses to the Head fittings with the longest hose connecting to the fitting nearest the drum.

2. Check that the quick disconnect fittings at the Head and the Chiller are completely engaged and locked.
   IMPORTANT: DO NOT OPERATE CHILLER WITH WATER HOSES DISCONNECTED FROM HEAD !!

3. Turn on the red circuit braker (**1**) on the back of the chiller (see fig. 3). Check that the orange "Low Fluid Level" light on the front panel is illuminated (see fig. 4).

4. Remove the cover plate from the top of the Chiller and remove the reservoir cap. Fill the reservoir with the pre-mixed coolant (P/N 82-1032A) to the bottom of the filler neck. See COOLANT INFORMATION for handling precautions. Check that the "Low Fluid Level" light on the front panel goes out.

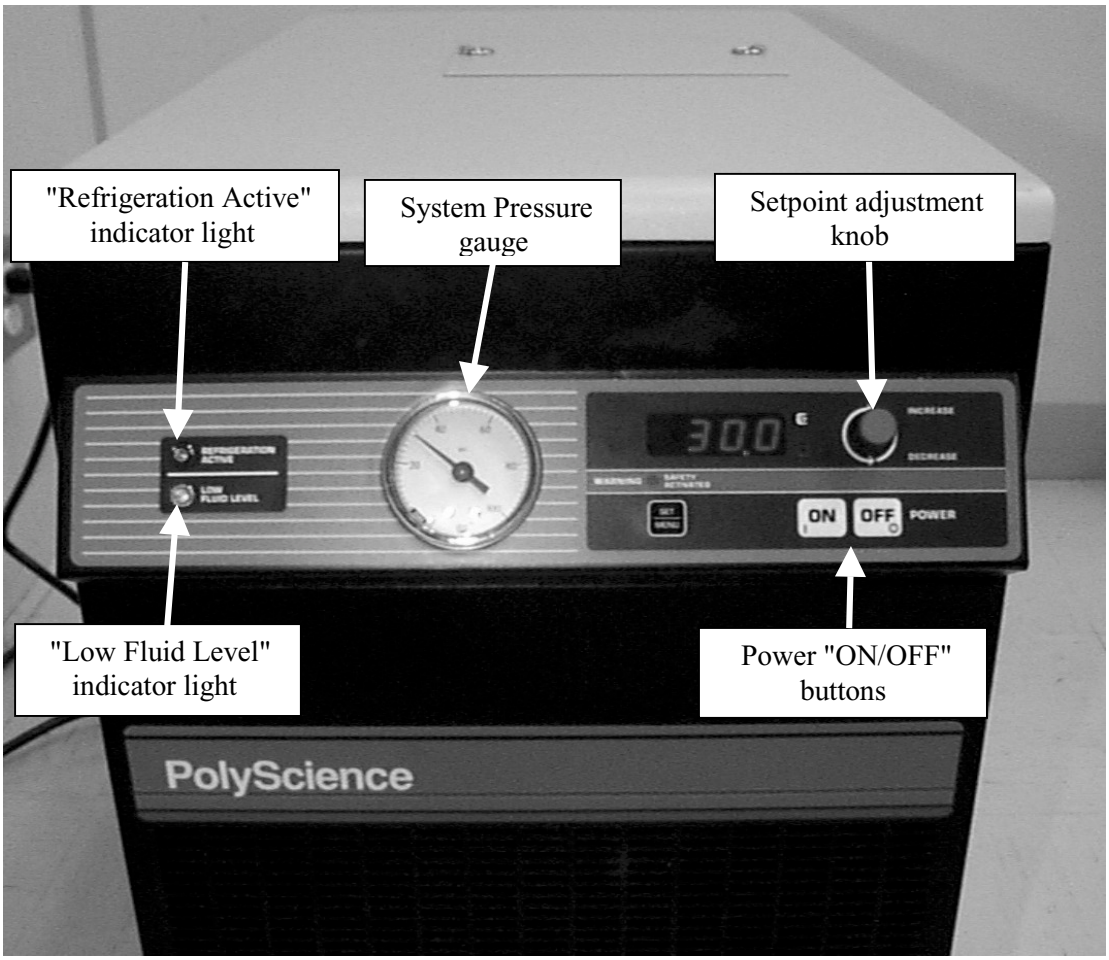


Fig. 4

5. Press the "Manual Pump Override" button on the back of the chiller (see fig. 3) to activate the coolant circulating pump and fill the Head's cooling system. Check the flow indicator on the side of the chiller (see fig. 5) to confirm coolant flow. If there is no flow, check that all hose connectors are fully connected and that the water hoses are not kinked or obstructed.

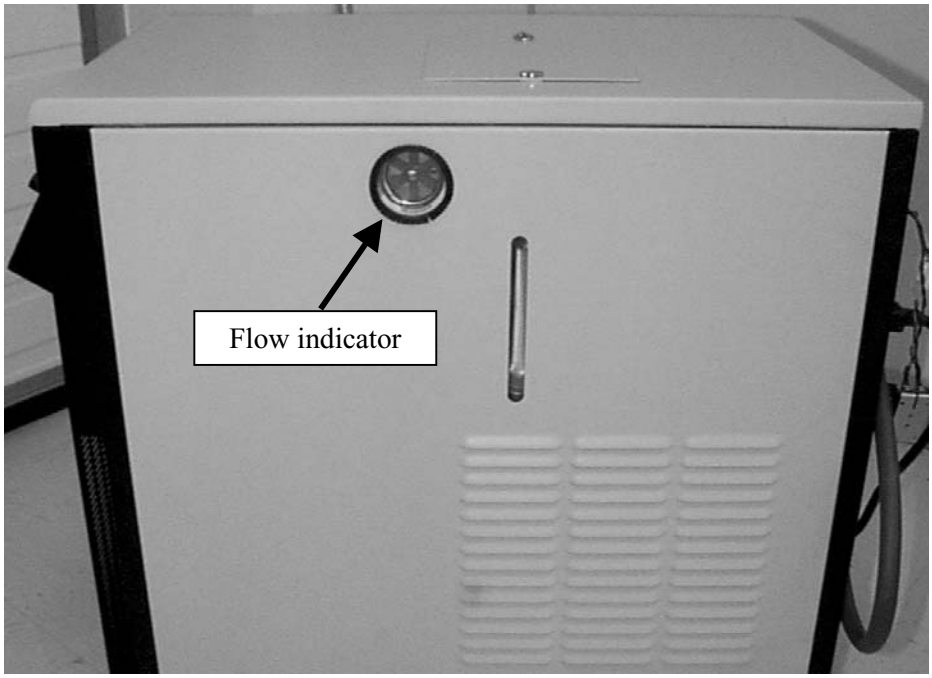


Fig. 5

6. Top up the coolant in the reservoir as required.

7. Connect the Signal Cable from the Recorder. (see Fig. 3) Ty-wrap the signal cable to the water hose assembly leaving some slack in the signal cable at each end.

CONFIGURING FIRMWARE

1. In a Diagnostic Terminal window, enter "list version" and confirm that the MPE firmware version and the Head firmware version are as listed below.

Product	MPE version	Head version
VLF Platesetter	2.30 or higher	1.30 or higher
VLF Trendsetter	1.20 or higher	1.30 or higher
3244 Trendsetter	2.20 or higher	1.30 or higher
AL trendsetter	1.10 or higher	1.30 or higher
Spectrum	1.00 or higher	1.30 or higher
Proofer	1.00 or higher	1.30 or higher
Thermoflex	1.00 or higher	1.30 or higher

NOTE: The firmware versions listed above are due to be released by the end of November 1998. Contact the product TTE for the required beta firmware code.

2. Initiate the Chiller controls in the firmware:

```
"set sys chin 1"
"nvs save sys"
```

3. Remove the mask from the chiller signal cable:

```
"mask"
```

locate mask number for "chiller\blower sensor cable"

```
"mask off XX"
"nvs save status 1"
"nvs save status 2"
"nvs save status 3"
"nvs save status 4"
"nvs save status 5"
```

4. Check that the chiller control setpoints are active and saved:

```
"set head"
```

casehigh = 32
caselow = 28

If necessary, set the correct values:

```
"set head casehigh 32"
"set head caselow 28"
" nvs save head"
```

5. Check for correct operation of firmware:

Note: Chiller pump must be turned on before the compressor can be turned on.

```
"chiller pump on"   chiller circulating pump should start
"chiller on"  chiller compressor should start
"chiller off"  chiller compressor should stop
"chiller pump off" chiller circulating pump should start
```

6. Wait fifteen minutes to allow the refrigeration system to stabilize and do a machine reset. When the machine starts up, the chiller circulating pump will start, but the compressor will NOT start until the head case temperature reaches 32°C.

SETTING THE TEMPERATURE CONTROLLER

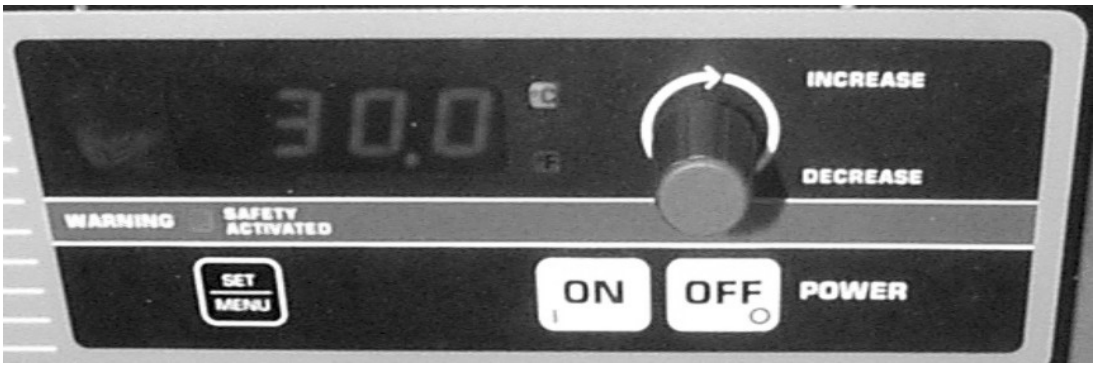


Fig. 6

1. **NOTE:** The refrigeration compressor does NOT have to be running to set the Temperature Controller.

2. Press the power ON button.

3. Refer to Fig. 6. Press the **SET/MENU** button. The green **°C** will start flashing and the current **setpoint** will be displayed. The factory default setting is **30°C.** If the setpoint requires adjusting, turn the **INCREASE/DECREASE** knob until the desired setting (**30°C**) is displayed. Press the **SET/MENU** button and the green **°C** light will stop flashing and the current reservoir water temperature will be displayed.

CHILLER OPERATIONS

The thermal head will read the case temperature and ambient temperature every thirty seconds to determine alarm and warning conditions. There are a total of six case temperature thresholds and three ambient temperature thresholds used by the thermal head firmware to determine alarm and warning conditions. Three thresholds are used to determine alarm conditions, three thresholds are used to determine warning conditions and three thresholds are used to determine normal conditions.

The **case temperature high alarm** occurs when the case temperature is above 50°C (hardcoded), the **case temperature low alarm** occurs when the case temperature is below 10°C (hardcoded) and the **ambient temperature high alarm** occurs when the ambient temperature is above 60°C (hardcoded). These alarms will cause the thermal head to shutdown and generate an error message that will abort a plot (if a plot is in progress). In addition to the temperature alarm message, a thermal head shutdown message is generated every thirty seconds until the temperature alarm is cleared. These alarms are the same that were used on the 1.0 (air-cooled) Head.

The **case temperature high warning** occurs when the case temperature is above the NVS parameter *casehigh*, the **case temperature low warning** occurs when the case temperature is below the NVS parameter *caselow* and the **ambient temperature high warning** occurs when the ambient temperature is above 50°C (hardcoded). These warnings will cause the thermal head to generate a warning message that will not abort the plot (if a plot is in progress). The case temperature warnings are used by the MPE to enable / disable the thermal head cooling. The normal condition occurs when the case temperature is below the NVS parameter *casehigh* minus hysterisis of 0.5°C (hardcoded), the case temperature is above the NVS parameter *caselow* plus hysterisis of 0.5°C (hardcoded) and the ambient temperature is below 48°C (hardcoded). The normal condition will cause the thermal head to generate an information message that will not abort the plot (if a plot is in progress).

The normal, warning and alarm conditions will only generate one message (as opposed to one message every thirty seconds) and are prioritized by case temperature, ambient temperature and normal temperatures. Assuming that the NVS parameters *casehigh* and *caselow* are set to 32C and 28C respectively, the following table outlines an example.

Case	Ambient	Condition	Comments
30.0	30.0	Normal	Initial conditions.
30.0	50.0	Normal	No action is taken (the threshold must be exceeded).
30.0	50.1	Ambient High Warning	Since the condition has changed, generate a warning message.
30.0	52.0	Ambient High Warning	No action is taken.
32.0	54.0	Ambient High Warning	No action is taken (the threshold must be exceeded).
32.1	**56.0**	**Case High Warning**	**Since the condition has changed, generate a warning message. The warning message will enable the thermal head cooling. (*Turns compressor on)***
40.0	58.0	Case High Warning	No action is taken.
50.0	60.0	Case High Warning	No action is taken (the threshold must be exceeded).
50.1	60.1	Case High Alarm	Since the condition has changed, generate an alarm message and a shutdown message. The thermal head is shutdown and the plot is aborted (if a plot is in progress). Note that the case temperature warnings and alarms take precedence over ambient temperature warnings and alarms.
50.0	60.1	Case High Warning	No action is taken. Note that the case temperature warnings and alarms take precedence over ambient temperature warnings and alarms.
31.5	48.0	Case High Warning	No action is taken. Note the affect of the hysterisis.
31.4	48.0	Ambient High Warning	Since the condition has changed, generate a warning message.
31.4	47.9	Normal	Since the condition has changed, generate an information message.
28.0	0.0	Normal	No action is taken. Note that the ambient temperature low warnings and alarms do not exist.
27.9	**0.0**	**Case Low Warning**	**Since the condition has changed, generate a warning message. The warning message will disable the thermal head cooling. *(turns compressor off)***
10.0	0.0	Case Low Warning	No action is taken (the threshold must be exceeded).
9.9	0.0	Case Low Alarm	Since the condition has changed, generate an alarm message and a shutdown message. The thermal head is shutdown and the plot is aborted (if a plot is in progress).
10.0	0.0	Case Low Warning	No action is taken.
28.5	0.0	Case Low Warning	No action is taken (the threshold must be exceeded).
28.6	0.0	Normal	Since the condition has changed, generate an information message.

The normal sequences of events with a Chiller installation operating in a 20 – 25 °C environment are:

Machine start-up	At some point during the machine initialization, the Chiller will power up and the water pump will start, as indicated by the pressure gauge. The temperature read-out indicates the temperature in the Chiller reservoir, which will probably be close to the room temperature. Until the Head case temperature reaches 32°C, the Chiller's refrigeration compressor will be off and the Chiller's temperature controller will be ineffective.

Head case temperature = 32.1°C	The firmware will turn the refrigeration compressor on (green indicator light – see Fig. 5) and the Chiller's temperature controller becomes effective and will cool the reservoir water to 30°C (the set-point). NOTE: the Chiller can only cool the reservoir water to 30°C +1°. If the machine is idle and the ambient temperature is low, the reservoir temperature may go 2 - 5°C below the set-point.
Head case temperature = 27.9°C	The firmware will turn the refrigeration compressor off. This is to prevent the head being cooled too much and possibly causing condensation to form inside the head. Again, the Chiller's temperature controller will become ineffective.

ERROR CODES AND MESSAGES

The following table defines the Recorder's error codes and messages generated for the alarms and warnings.

Condition	Error Code	Error Message	Comments
Case High Alarm	17735	"case temperature high alarm, xx C"	Thermal head has shutdown and will abort a plot (if a plot is in progress).
Case High Warning	17736	"case temperature high warning, xx C"	Enables the thermal head cooling.
Case Low Alarm	17737	"case temperature low alarm, xx C"	Thermal head has shutdown and will abort a plot (if a plot is in progress).
Case Low Warning	17738	"case temperature low warning, xx C"	Disables the thermal head cooling.
Ambient High Alarm	17739	"ambient temperature high alarm, xx C"	Thermal head has shutdown and will abort a plot (if a plot is in progress).
Ambient High Warning	17740	"ambient temperature high warning, xx C"	Information message only.
Normal	17741	"case and ambient temperature normal"	Information message only.
Shutdown	17742	"shutdown of thermal head due to temperature alarm"	Thermal head has shutdown and will abort a plot (if a plot is in progress). This will occur every thirty seconds until the temperature alarm is cleared.

TROUBLE-SHOOTING

Unit will not start

- Check that Chiller power cord is plugged in to a suitable power outlet and that the circuit breaker hasn't blown.
- Check the voltage of the power source. It must be within the label voltage range.
- Check that the circuit breaker is on.
- Check that the ON button has been pushed.
- Confirm that the Chiller is operational. Disconnect the signal cable from the back of the Chiller and plug in the Chiller Tester (see fig. 7). If the Chiller fails to start, check the 9V battery and its connections.
- Check that the signal cable is connected at the Chiller and the Recorder frame.
- Check that signal cable is not masked in the firmware.
- Check that Chiller is installed in firmware by entering
- "`set sys chin =1`".
- Check that the firmware and signal cable function by entering

"`chiller pump on`" and "`chiller on`"

Unit will not circulate coolant

- Check the reservoir level. Fill if necessary
- Check the flow indicator (see Fig.5). If there is no flow indication, check that all the quick disconnect fittings are fully engaged and there no hose kinks or obstructions.

Unit won't cool
"Case High Warning" error message

- Check that Chiller is operating. See "Unit will not start"
- Check the Head NVS parameters "casehigh" and "caselow". The active settings should be 32°C and 28°C respectively.
- Check the Head case temperature by entering "`head status`" and reading the head case temp. If the head case temp. is greater that 32.1° C, signal the compressor to turn on by entering "`chiller on`". The "compressor on" indicator light on the front of the Chiller should be on. (see Fig. 5) If the compressor does not turn on, check the signal cable.
- Check that unit has sufficient air flow.
- Check that ambient temperature does not exceed +35 °C

- Check that the refrigeration unit's condenser is free of dust and debris.
- If the compressor short-cycles (a clicking sound), turn off the Chiller. Check that the line voltage is within 10% of the specified voltage. Wait 15 minutes before restarting the unit.

Unit cools too much "Case Low Warning" error message

- Check the setpoint is set at 30°C. See "Setting the Temperature Controller"
- Cool ambient temperature has cooled the coolant in the reservoir below 28° C. When the "head case temp" goes below 27.9°C, the compressor should tun off and the "compressor on" indicator light will go out.

IF THE PROBLEM PERSISTS, CONTACT RESPONSE CENTER FOR A REPLACEMENT CHILLER UNIT.

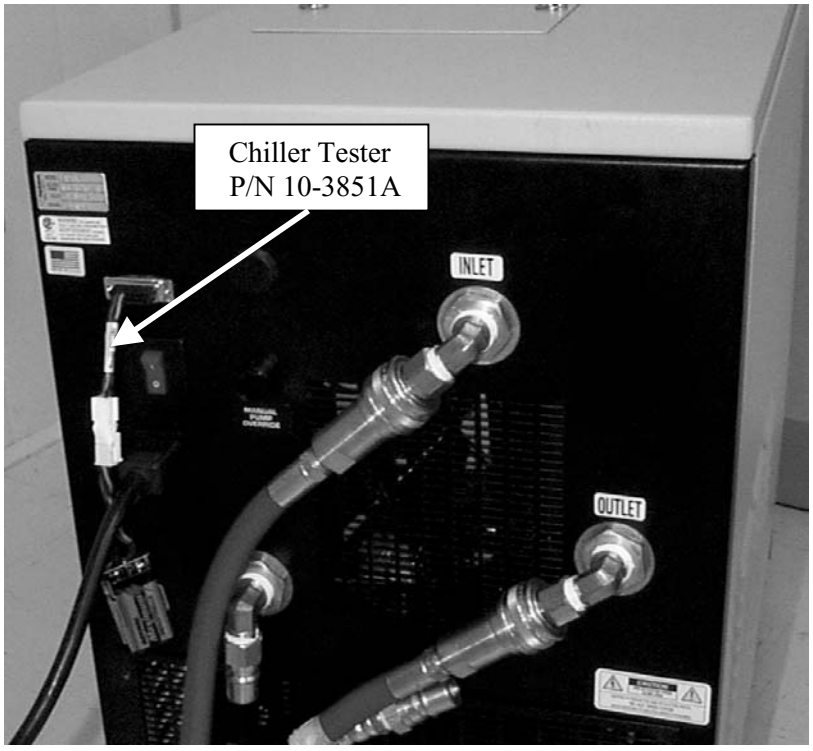


Fig. 7

Chiller Tester, P/N 10-3851A, is stored inside reservoir recess. Disconnecting the white connector will disable the compressor. Wait 15 minutes before restarting the compressor to allow the internal pressures to equalize.

REPLACING THE CHILLER

TOOLS REQUIRED:

- drain hose (attached to water hose assembly)
- coolant container
- paper towels

1. Obtain a replacement Chiller unit from the Response Center
2. Disconnect the signal cable from the back of the Chiller unit.
3. Disconnect the hose from the **INLET** fitting on the back of the Chiller. Connect the drain hose (ty-wrapped to the hose assembly) to the disconnected hose and place the open end of the drain hose in a container. (see fig. 8)

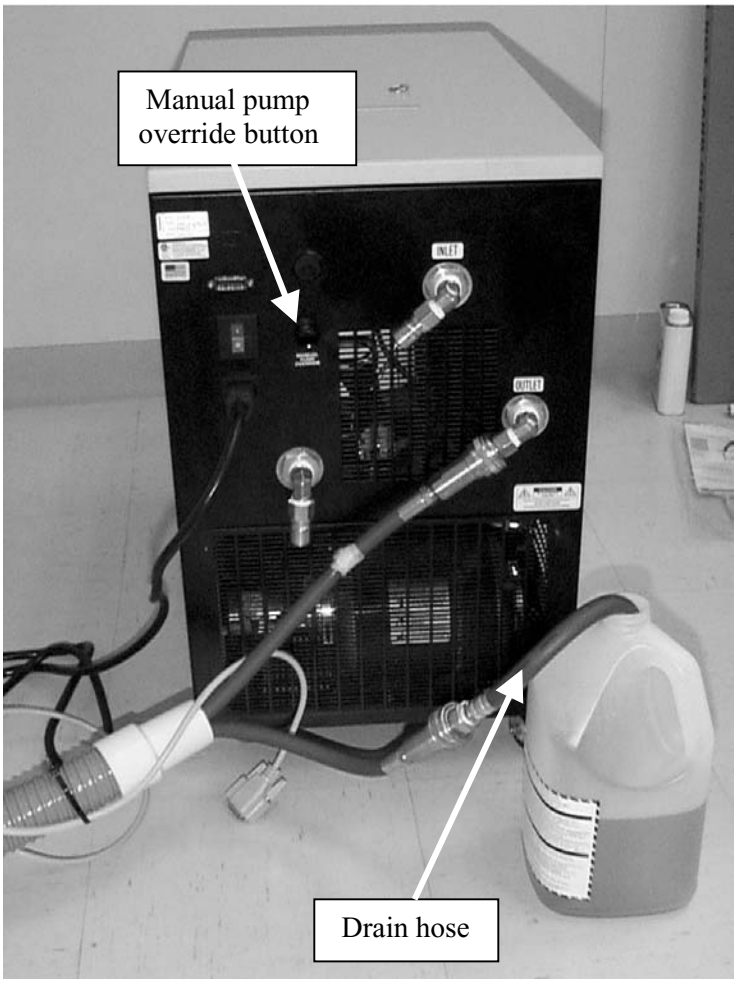


Fig. 8

4. Press and hold the Maual Pump Override button until the coolant flow starts to spurt.
5. Disconnect the remaining water hose from the Chiller, turn off the circuit breaker and unplug the power cord.
6. Exchange chiller with replacement unit.
7. Refer to section 3 for Chiller Start-up.

COOLANT INFORMATION

The pre-mixed Coolant provided (P/N 82-1032A), is 30% by volume ethylene glycol (Dowtherm SR-1) and 70% by volume distilled water.

NOTE: If the pre-mixed coolant is not available, use distilled water only.

DO NOT USE AUTOMOTIVE ANTIFREEZE. IT WILL DAMAGE THE PUMP AND VOID THE WARRANTY.

WARNING

Do not drink solution. Accidental poisoning can cause central nervous system, cardiopulmonary and kidney effects.

Avoid contact with eyes, skin, or clothing. Wash thoroughly after handling. Avoid breathing vapour. Keep container closed. Use with adequate ventilation.

DO NOT STORE IN OPEN OR UNLABELLED CONTAINERS.

DO NOT USE WITH GALVANIZED STEEL.

FIRST AID

INGESTION:

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

NOTE TO PHYSICIAN:

Early administration of ethanol may counter the toxic effects of ethylene glycol (cardiopulmonary effects attributed to metabolic acidosis and renal damage). Hemodialysis or peritoneal dialysis have been of benefit.

For additional information, consult the MATERIAL SAFETY DATA SHEET for this product.

DISPOSAL

Dispose of any waste coolant in accordance with local hazardous materials disposal requirements.