TRANE™

Operation Maintenance

PRG-OM-4

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Literature Type	Operation/Maintenance
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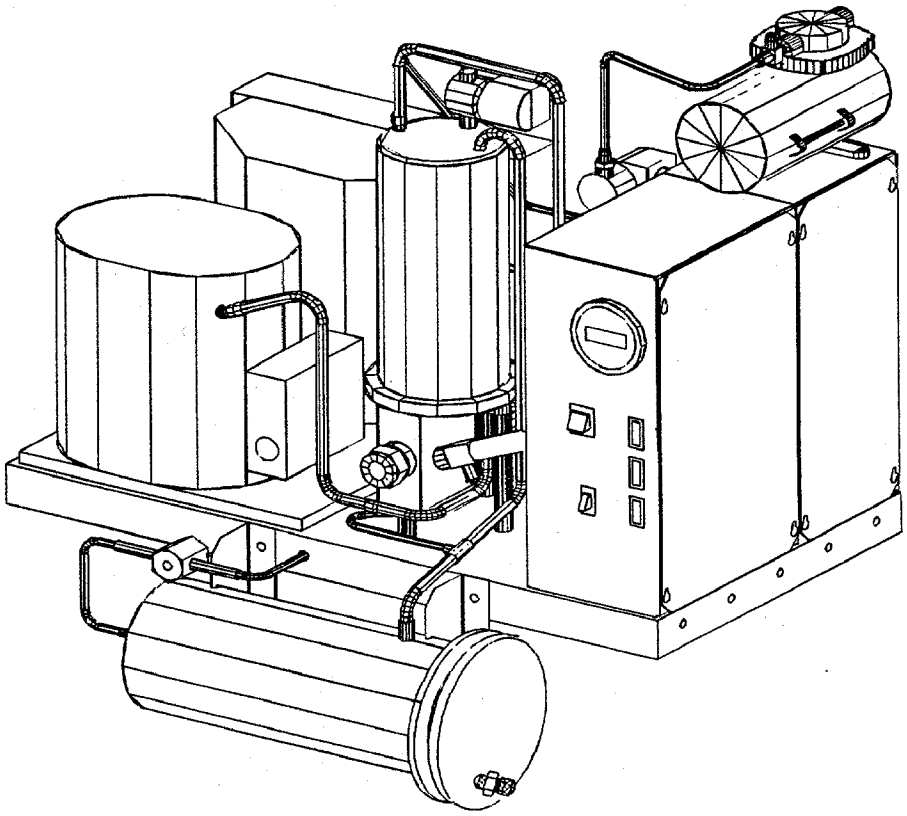
Trane "Purifier" Purge



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Notice

The Trane Company urges that all HVAC servicers working on Trane equipment, or any manufacturer's products, make every effort to eliminate, if possible, or vigorously reduce the emission of CFC, HCFC and HFC refrigerants to the atmosphere resulting from installation, operation, routine maintenance, or major service on this equipment. Always act in a responsible manner to conserve refrigerants for continued use even when acceptable alternatives are available. Conservation and emission-reduction can be accomplished by following recommended Trane service and safety procedures published in Trane General Service Bulletin CTV-SB-81. The information and procedures provided in CTV-SB-81 supersedes those published in this manual. Copies of this bulletin may be obtained by contacting your local Trane commercial product representative.

Specifications

Electrical Power Requirements
103-127 VAC, 60 Hz., 1-Phase, 8 Amps.
99-121 VAC, 50 Hz., 1-Phase, 8 Amps.

Fault Relay (3K4) Output Rating
120 VAC; 240 VA

Operating Environment
40 F to 120 F; 5% to 95% relative humidity, non condensing.

Storage Environment
-40 F to 150 F; 5% to 95% relative humidity, non condensing.

Mounting
Direct-Mounted on Condenser Shell above liquid-level of highest condenser.

Dimensions (Approx.)
25 1/4" high x 24 3/4" wide x 18 3/4" deep, With filter drier canister removed.

Weight
115 pounds (With filter drier canister installed).

Model Number Description

The operating components and options for any Trane Purifier Purge are assigned a multiple-character alphanumeric model number that precisely identifies each unit. An explanation of the identification code that appears on the unit nameplate is shown here.

Use of the service model number will enable the owner/operator, installing contractors, and service technicians to define the operation, components and options for any specific unit.

Sample Model Number

Model No.	**P**	**R**	**G**	**B**	**A**	**0**	**0**	**1**	**A**	**A0**		**A**
Digit No.	**1,**	**2,**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10,11**		**12**

Digits 1,2,3
Unit Type
PRG = Purifier Purge

Digit 4
Development Sequence
A = First Generation
B = Second Generation

Digit 5
Controls Type
A = Standard
B = NEMA-4
S = Special

Digit 6
Digit Not Used

Digit 7
Digit Not Used

Digit 8
Electrical Characteristics
1 = 115/60/1
9 = 110/50/1
S = Special

Digit 9
Refrigerant Type
A = CFC-11/HCFC-123
B = CFC-113
S = Special

Digits 10, 11
Design Sequence
A0 = First (original) Design Sequence

Digit 12
Agency Approval
A = UL and CSA
B = None

General Information

Purge Start-Up

Before the Purifier Purge is operated for the first time, be sure to perform the following procedures:

1. Remove the cover from the filter-drier canister and install the two (2) filter-drier cores that shipped with the purge. Refer to "Purge Tank Service" in "Service Procedures" section.

Note: The drier-cores absorb moisture from ambient air, so they are shipped in sealed containers. Keep the cores sealed prior to installation.

2. Replace the filter-drier canister cover, positioning the drain at the bottom of the canister and tighten the bolts evenly.

Note: Be sure all internal components are in the proper position when replacing the canister cover (See Figure 10).

3. Perform the "Purge Pump-Out and Fault Check" as described in the "Maintenance" section of this manual.

4 Open the purge tank isolation valves on the purge tank inlet and liquid return lines.

5. Switch the purge control switch to the AUTO position for normal operation.

6. Check purge fault timer setting. Factory setting is 12.8 minutes (12 minutes, 48 seconds). Adjust setting as needed later, based on purge system pumpout requirements.

7. If there is an excessive amount of air in the chiller, put purge in 24-hour (bypass) mode by pressing the Timer Bypass switch.

Literature Change History

PRG-OM-3 (December 1990)

Original issue of manual, describing operation, control, start-up, maintenance and troubleshooting of the Trane Purifier Purge unit. This manual applies to design sequence "1C" purge units only.

PRG-OM-3A (January 1992)
Manual revised to:

- Replace PDS description with unit model number descriptions; show updated nameplate; add HCFC-123 to Figure 2;
- Correct operational description, and;
- Update Troubleshooting chart.

PRG-OM-4 (November 1992)
Manual revised to:

- Incorporate HFC-134a Condensing Unit
- Redesigned purge tank
- Separate filter-drier canister
- Revised control panel configuration

About this Manual

This manual discusses the Purifier Purge system operating concepts, electrical control, operator interface, maintenance requirements and procedures, and presents basic purge troubleshooting procedures.

Warnings and Cautions

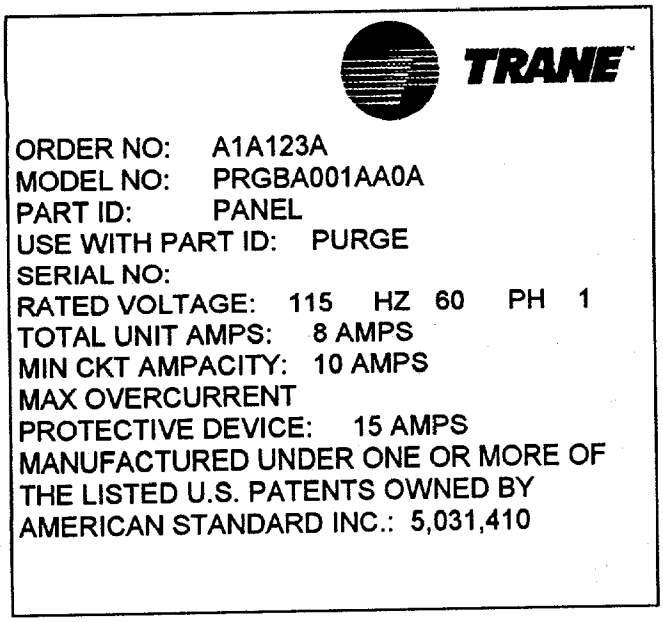
Notice that warnings and cautions appear at appropriate intervals throughout this manual. Warnings are provided to alert installing contractors and other personnel to potential hazards that could result in personal injury or death, while cautions are designed to alert personnel to conditions that could result in equipment damage.

Proper chiller performance and the personal safety of operating and service personnel depend upon strict observance of these precautions. The Trane Company assumes no liability for installation or service procedures performed by unqualified personnel.

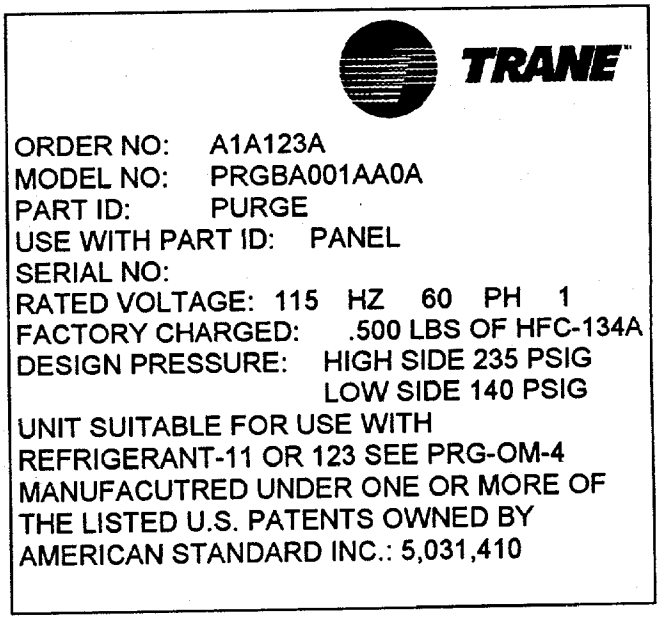
Purge Nameplate

Two nameplates are provided on the purge unit; one on the purge condensing unit and the other on the portion of the control panel that can be removed for remote mounting. Always provide the model number, serial number and product description information from the nameplate when making inquiries, or ordering parts or literature for the purge unit. (See Figure 1 for an example of a nameplate).

Figure 1
Remoteable Control Panel Nameplate



Purge Nameplate



Purge System Overview

Introduction

A purge system is required on all low pressure centrifugal water chillers to remove air, moisture and other noncondensibles that may leak into the machine. The Purifier Purge system is designed to accomplish this task efficiently.

The Trane Centrifugal Chillers, utilizing low pressure refrigerants CFC-11, CFC-113 and HCFC-123, operates at less than atmospheric pressure. This is in contrast to the "high-pressure" refrigerants CFC-12 and HCFC-22 which are used in refrigeration systems that operate above atmospheric pressure. Figure 2 compares the pressure/temperature relationship between low and the high pressure refrigerants and indicates the temperatures at which chiller system pressures are negative with respect to atmosphere.

Figure 3 illustrates the low pressure areas of a typical Trane CenTraVac (model CVHE shown) when the unit is running. Air and moisture may leak into the machine through these low pressure areas. Once it enters the chiller, the air will accumulate in the condenser during machine operation. The air in the condenser increases condensing pressure thus reducing the chiller's efficiency and cooling capacity.

The Purifier Purge utilizes a minute-meter to serve as an indicator of air leakage into the chiller. This feature is provided to inform the machine operator of purge activity. The ability to monitor purge operation is an important feature of the Purifier Purge unit.

IMPORTANT: "Normal" average pumpout time is approximately 7 minutes per day for a one-week period. If average accumulated pump-out time exceeds 7 minutes per day over any one-week time period, the chiller should be leak-tested and repaired. Purge operating time for the typical Trane CenTraVac will be less than this rate.

Purifier Purge Components

Purge system components are illustrated and identified in Figure 4. The four major parts of the system are:

1. Air-cooled condensing unit;
2. Purge condensing tank;
3. Pump-out compressor, and;
4. Controls

Figure 2
Temperature vs. Pressure for CFC-11, CFC-12, HCFC-22 and HCFC-123

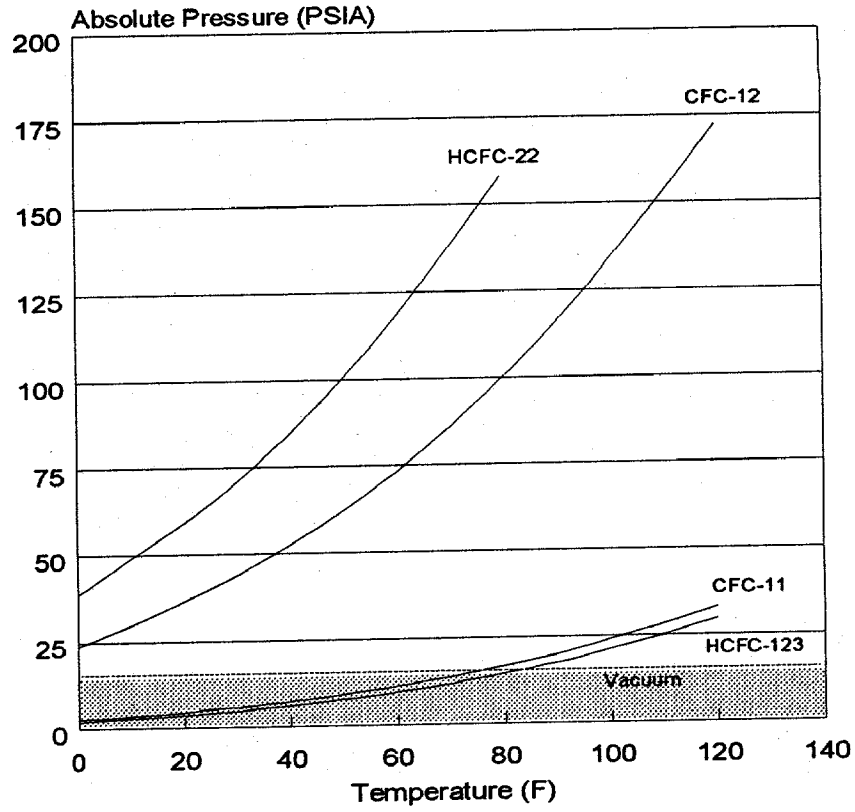


Figure 3
Low Pressure Areas of Operating CVHE Unit

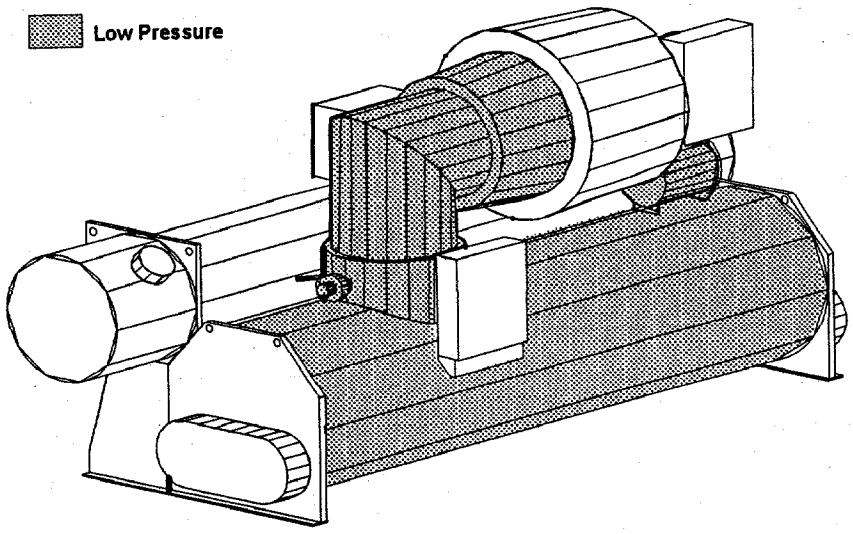
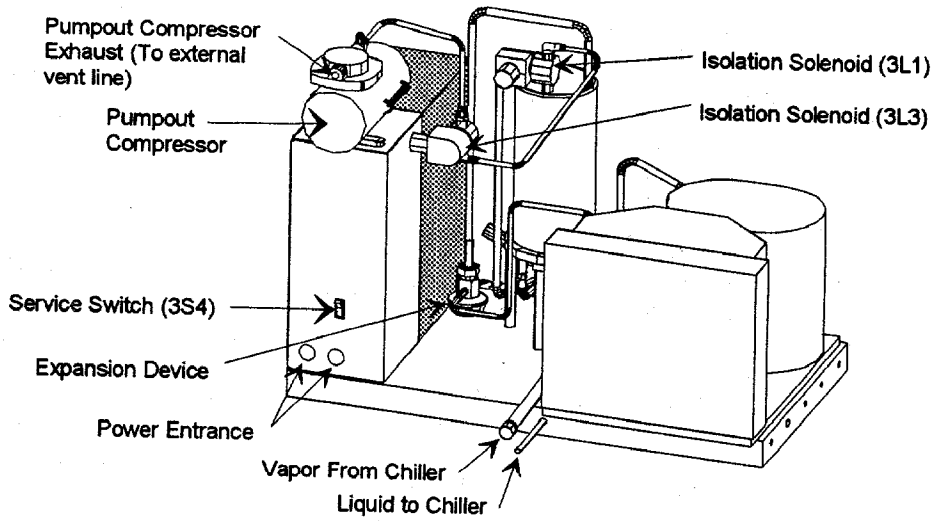
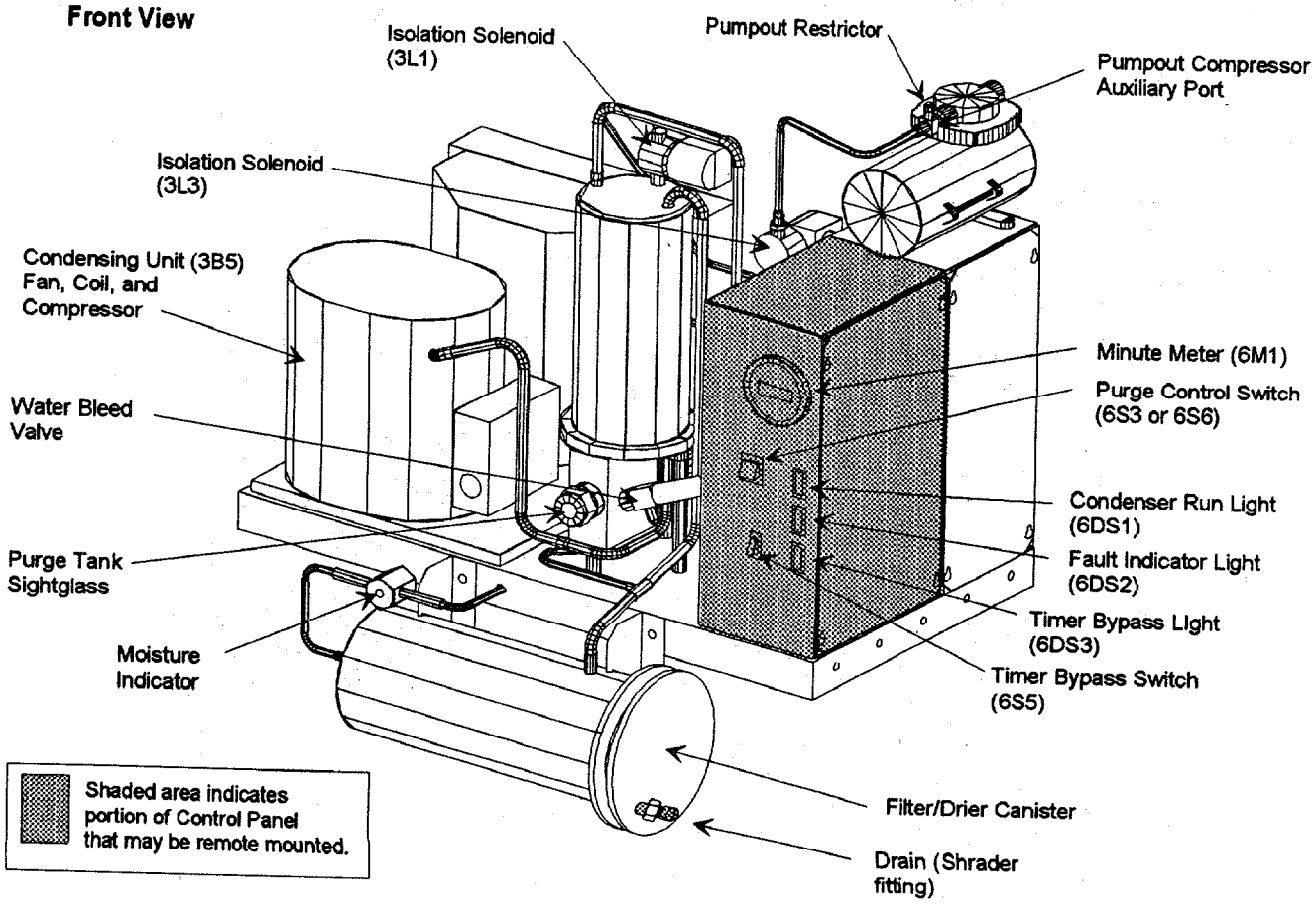


Figure 4: Purifier Purge Component Layout

Back View



Front View



Air-Cooled Condensing Unit

The air-cooled condensing unit, provides cooling for the purge coil (3/8-inch copper tubing coil in the purge tank). It and the purge coil are the cooling source that draws the refrigerant from the chiller.

The portion of the purge that removes heat from the circulating refrigerant and transfers it to the atmosphere is the heat transfer circuit. This is an enclosed refrigerant circuit consisting of an air-cooled condensing unit (compressor, fan and condensing coil), an expansion device and a coil in the purge tank (evaporator).

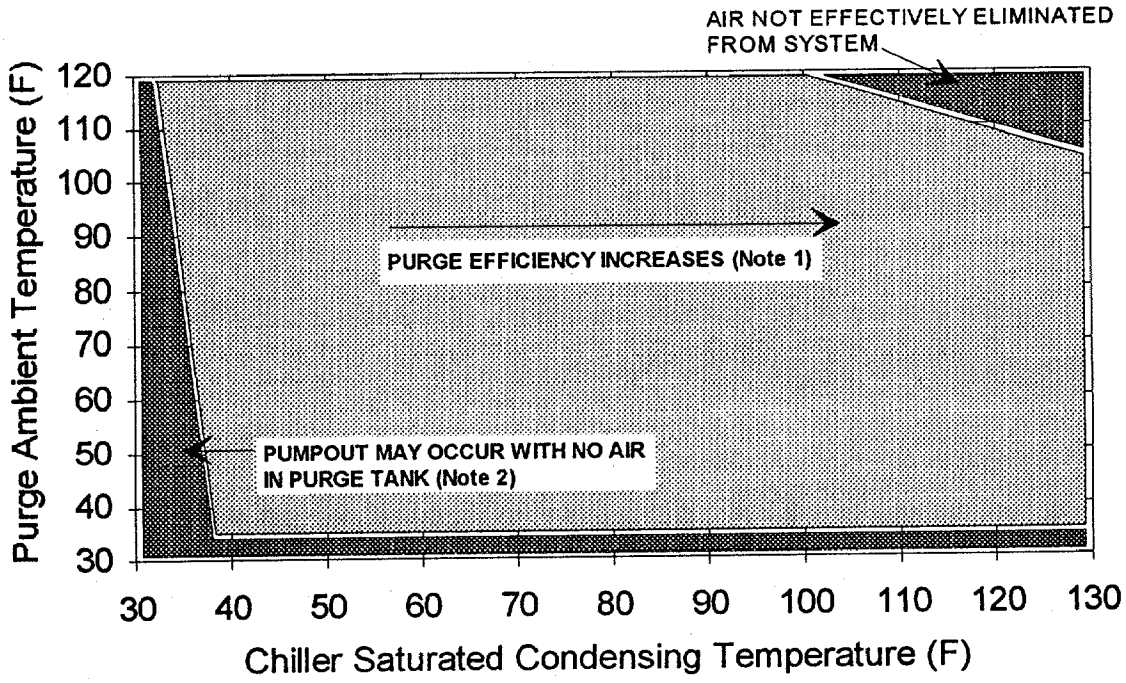
The condensing unit operates effectively over an ambient temperature range of 40°-120° F. As ambient temperature increases, condensing unit capacity decreases, reducing the rate at which the purge will remove air from the chiller (Figure 5).

Note: Because the Purifier Purge utilizes an air-cooled condenser, it is operable whether the chiller is running or not. No additional cooling source is required (e.g. water hookup).

IMPORTANT: No water connections are required to the Purifier Purge.

WARNING! Use Caution when working on certain areas of this unit. Surface temperatures may exceed 150° F, as with the condensing unit. Contact to bare skin could result in burns and injuries.

Figure 5
Purifier Purge Operating Limits



Notes:
1. Lowest amount of refrigerant loss during pumpout.
2. 24-Hour fault timer 6DL2 protects against extended operation under these conditions.

Purge Tank

The purge tank utilizes a cooling coil, water separation tube, sight glass, connections for the refrigerant gas from the chiller condenser and a liquid refrigerant return line to the chiller condenser, a water bleed valve and air discharge port. Air and water are separated from the refrigerant vapor and accumulated in the purge tank.

Pump-Out System

The pump-out system consists of a small compressor (pump-out compressor), two isolation solenoids and a restriction device located at the pump-out compressor suction connection. When the purge control system detects the presence of air in the purge tank, the isolation solenoids are opened and the pump-out compressor is turned on. The compressor and a restriction device shown in Figure 6, cause the purged air to be removed slowly. This slow air removal process enhances the efficiency of the purge system. The standard pump-out compressor is compatible with both CFC-11 and HCFC-123. An alternate pump-out compressor is available for CFC-113 applications.

Note: Trane recommends using 3/8-inch copper tubing to connect the purge pump-out compressor exhaust to the chiller rupture disc vent line.

Purge Controls

The operation of the Purifier Purge unit is controlled at the purge control panel. This control panel can be mounted on the purge base (as it is when it is shipped) or remotely mounted from the purge. When the control panel is remotely mounted on new Trane CenTraVac chillers, the panel is mounted on the right side of the chiller UCP. If the remote panel is provided for retrofit purposes, it can be placed in any convenient operating location. Purge operating controls accessed from the outside of the purge control panel (Figures 4 and 6) are:

- Reset Switch 6S6, or Purge Control switch 6S3;
- Service switch 3S4;
- Timer Bypass switch 6S5;
- Condenser Run light 6DS1;
- Fault Indication light 6DS2;
- Timer Bypass light 6DS3;
- Minute Meter 6M1.

Purge operating controls located inside the purge-mounted control panels are:

- Temperature Control switch 3S15;
- 24-Hour Purge Timer (Fault Timer) 6DL2;
- Control Relays 6K4 and 6K5, (Retrofit only) and;
- Terminal strips 3TB1 and 6TB1.

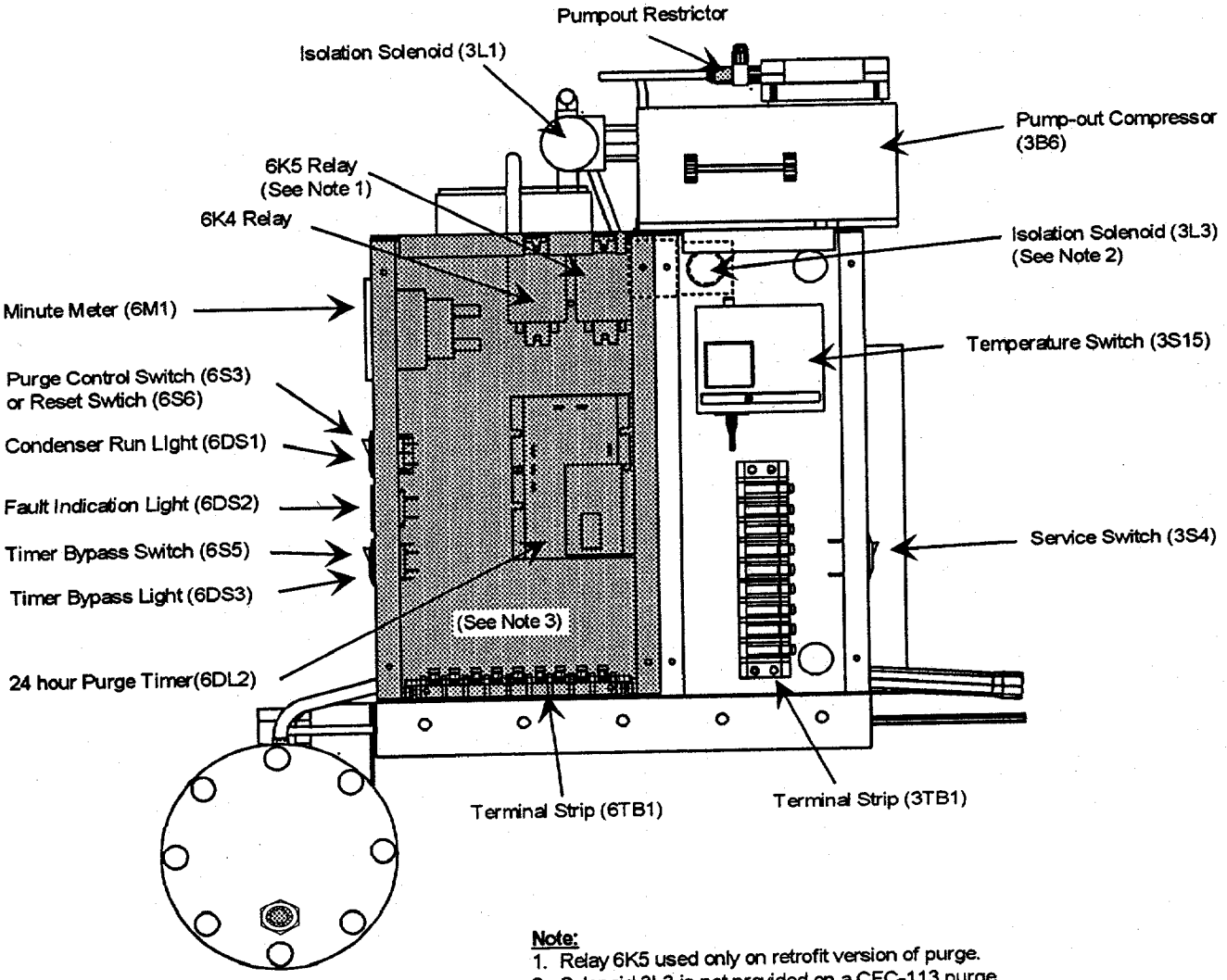
Purge operating controls that are not located in the purge control panel are:

- Isolation solenoid valves 3L1 and 3L3.

The location of 3L1 and 3L3 is shown in Figure 4.

Note: Solenoid valve 3L3 is not used on CFC-113 Purifier Purge units.

Figure 6
Purifier Purge Control Box Layout



Note:
1. Relay 6K5 used only on retrofit version of purge.
2. Solenoid 3L3 is not provided on a CFC-113 purge.
3. Shaded panel may be remote mounted.

Operation

General

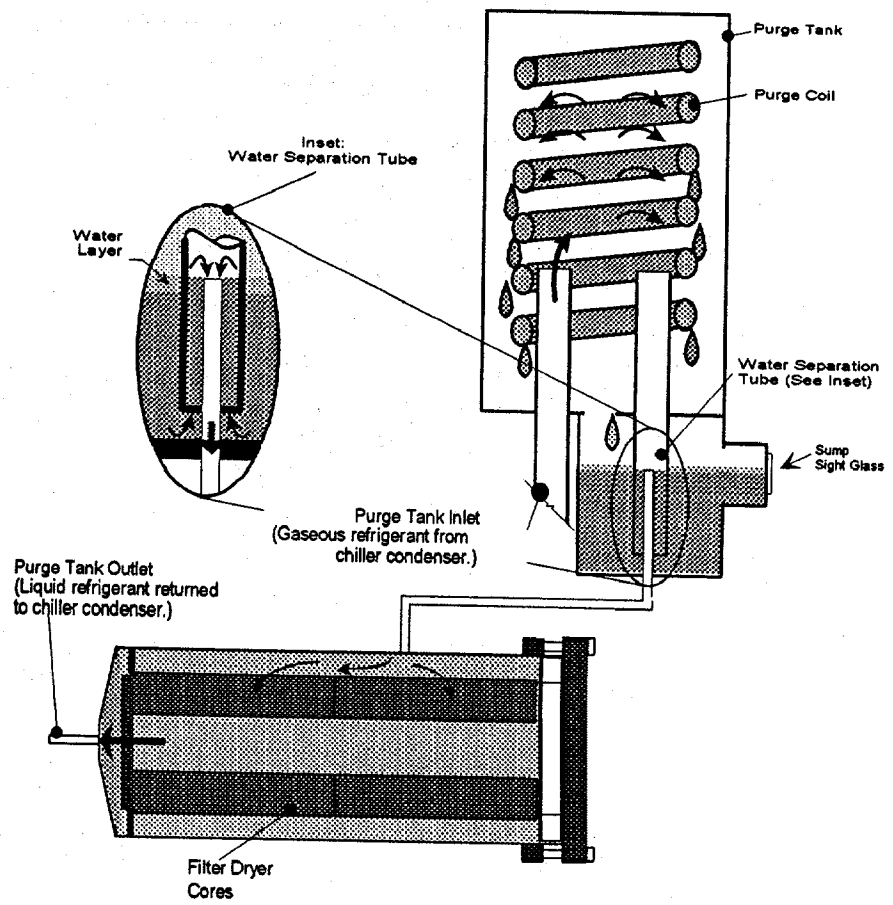
The purge is active when the purge condensing unit is powered. The condensing unit is used to condense refrigerant vapor in the purge tank. The condensing refrigerant lowers the pressure in the tank, drawing vapor from the chiller condenser. The vapor carries non-condensibles and moisture into the purge tank.

Refrigerant vapor enters the purge tank through a 5/8-inch line connected at the bottom of the purge tank (Figure 7). Once inside the tank, the refrigerant vapor condenses on the purge tank coil and falls to the bottom of the tank. Non-condensibles accumulate in the purge tank only when there is air in the chiller condenser.

A layer of liquid refrigerant is maintained in the bottom of the purge tank during purge operation. The refrigerant liquid level is determined by the height of the liquid refrigerant standpipe in the purge tank. When the purge is running, the liquid level is visible in the purge sump sight glass.

Note: Do not operate the purifier purge for prolonged periods of time with free water visible on the surface of the liquid refrigerant. It is best to remove the collected water and replace the filter drier cores to eliminate free water in the chiller refrigerant system.

Figure 7
Purge Tank Refrigerant Flow



Operating Cycle

The following discussion describes the Purifier Purge unit operating cycle at typical conditions (70° F ambient, 8 psig chiller condensing pressure). Figure 8 illustrates the cycle of the active purge (condensing unit compressor running). The conditions that should exist at points 1 through 5 in Figure 8 are:

- Point 1 = 0° F;
- Point 2 = greater than 22° F;
- Point 3 = 140° F;
- Point 4 = 85° F;
- Point 5 = 75° F

The purge condensing unit compressor suction temperature varies with the amount of air in the purge tank. When the amount of air present in the purge tank limits the available condensing surface in the tank, the condensing unit compressor suction temperature will fall. This activates temperature control switch 3S15 at 18° F (Figure 8), initiating a pumpout cycle. The air in the purge tank is then vented from the purge tank. As air is removed from the purge tank, condensing unit compressor suction temperature increases to open 3S15 which completes the cycle.

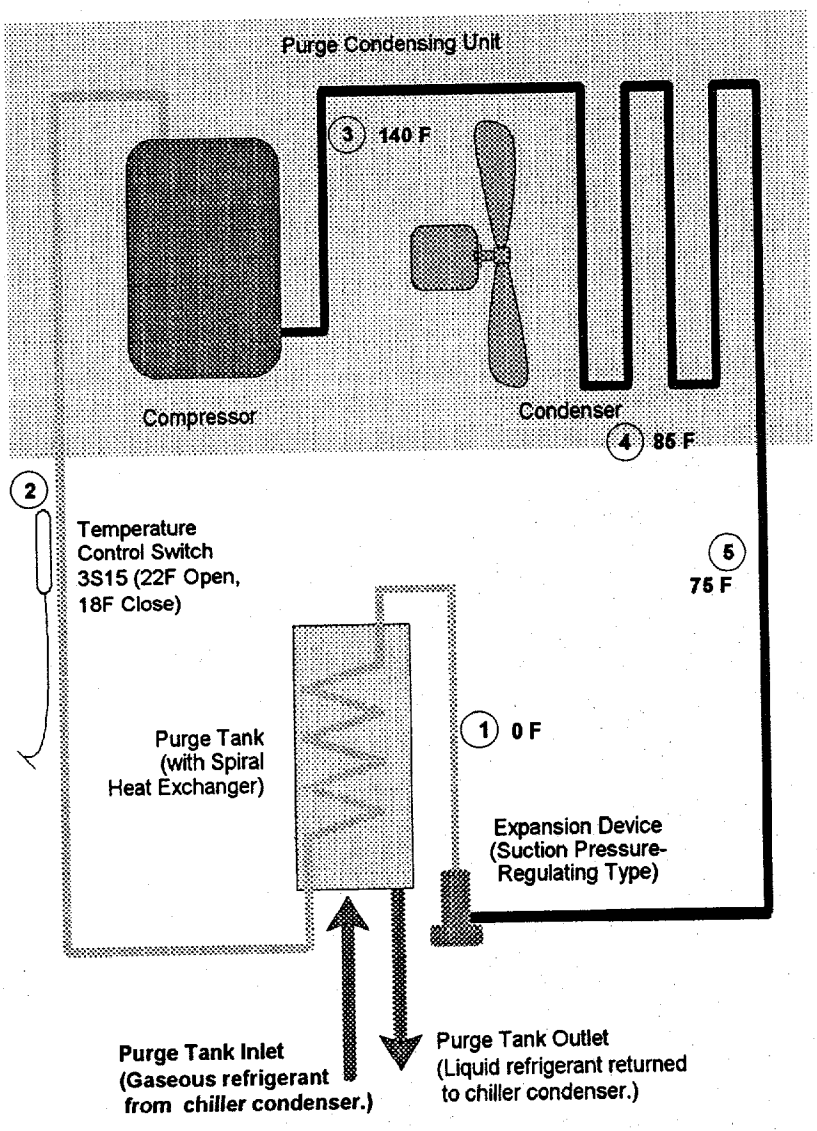


Figure 8
Purifier Purge Refrigerant Circuit Schematic

Operating Limits

Purge efficiency is dependent upon the chiller condenser pressure. Purge efficiency increases as the chiller condenser pressure increases. Figure 5 illustrates the purge operating limits and relative efficiency.

The Trane Purifier Purge can operate with a chiller saturated condensing temperature between 40°-130° F (Figure 5).

Higher saturation temperatures and corresponding higher chiller condensing pressures result in less refrigerant lost to the atmosphere when air is purged. For maximum efficiency, operate the purge during chiller powered cooling mode. The purge will operate in this mode when the purge control switch is in the AUTO position. Continuous purge operation (control switch in ON position) is intended for use primarily during service procedures as described in "Maintenance Procedures". If the chiller will start and run, it is recommended that purge operation be limited to "automatic" mode (control switch in AUTO position).

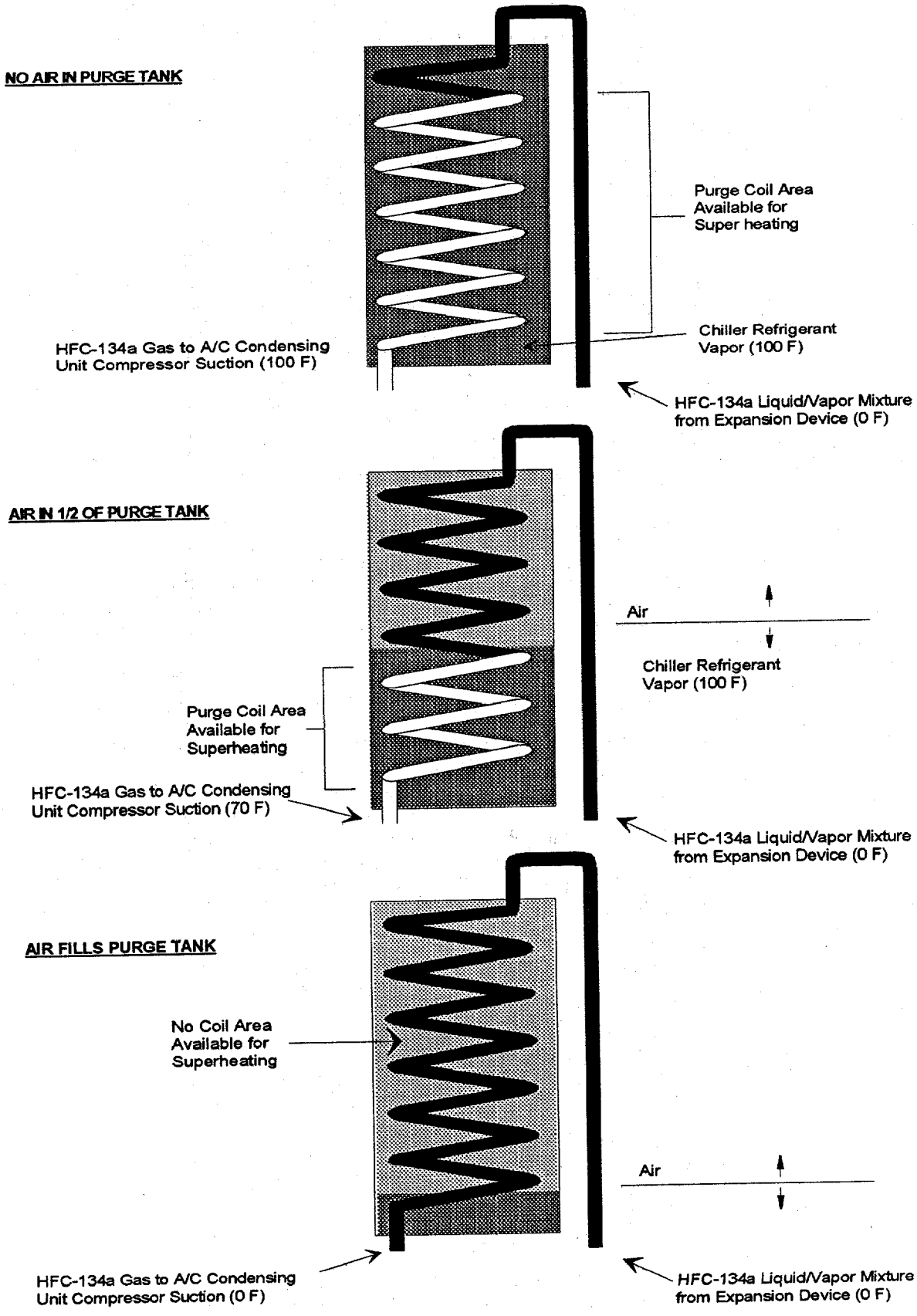
Caution: Do not operate the purge at the lower saturation temperatures that may occur when ice storage units are turned off or when a chiller is operating in free-cooling mode. Refer to Figure 5 for operating range information.

Air Removal

Figure 9 illustrates the air removal cycle as air accumulates in the purge tank. When there is no air in the purge tank, the refrigerant returning to the purge condensing unit compressor suction has a high superheat. As air accumulates in the tank, displacing the refrigerant vapor, the effective coil surface exposed to vapor decreases, reducing available superheat at the purge condensing unit compressor suction.

When condensing unit compressor suction temperature approaches approximately 18° F, temperature control switch 3S15 activates the isolation solenoids and the pump-out compressor to remove the accumulated non-condensibles. As air is removed from the purge tank, the coil is once again exposed to refrigerant vapor. The purge condensing unit compressor suction temperature rises and turns off the pump-out system. Pump-out cycle duration is typically 40 to 60 seconds.

Figure 9
Purge Tank Air Vs. Condensing Coil Superheat



Moisture Monitoring and Removal

A moisture indicator is provided in the liquid return line from the purge tank to the chiller condenser. This allows the machine operator to monitor the quality of the liquid refrigerant in the chiller.

Inspect the moisture indicator periodically. The indicator will show "wet" whenever the chiller moisture levels exceed the levels shown in Table 1. Notice that the indicator becomes more sensitive as the temperature decreases. (The moisture indicator normally operates at equipment room ambient temperatures.) A "wet" indication for more than 72 hours typically indicates that the filter drier cores are saturated and should be replaced.

Consult the moisture indicator only under these conditions:

1. The chiller is operating;
2. The purge unit is operating and has been allowed sufficient time to remove system moisture properly (minimum of 72 hours after replacing filter-drier cores.)

If the filter-drier cores are allowed to become saturated and the moisture indicator shows "wet" refrigerant, water will accumulate in the purge sump. Due to the small volume of the purge tank sump, free water will typically form a visible layer on top of the refrigerant and be visible in the purge tank sump sight glass. This free water must be removed to avoid corrosive conditions in both the purge and the chiller. To remove moisture refer to the "Service Procedures" of this manual.

If the chiller is expected to contain excessive moisture, the Purifier Purge can be operated in the FAULT-BYPASS mode with filter-drier cores removed to trap accumulated water. This mode may be useful on new start-up situations or after chiller repairs. After 24 to 48 hours of operation in the FAULT BYPASS mode, moisture in the chiller will collect in the purge tank sump. This moisture must be monitored and removed as soon as possible to prevent return to the chiller.

Depending on the amount of free water trapped in the purge tank during this time, a decision can be made as to when filter-drier cores should be installed in the filter drier canister. Installing the drier cores too soon, when excess moisture exists in the chiller, will result in premature filter-drier core saturation. Excessive water collection in the purge tank for an extended period may be an indication of other chiller problems.

Caution: Water accumulated in the purge tank may evaporate and return to the unit when the purge is turned off if drier cores are not in place.

Normally, the filter-drier cores should be installed. The drier cores dehydrate the refrigerant passing through the purge and prevent moisture from re-entering the chiller during the purge off-cycle. The drier cores will absorb the moisture of normal humid-air infiltration for a one-year period. This assumes a "tight" machine, free of tube leaks.

If the drier cores are removed from the canister, the moisture indicator will probably indicate "wet" refrigerant while the purge is running even though this moisture level may be acceptable for proper chiller operation.

Caution: Do not introduce humid air into the chiller. To determine if the filter-drier cores are saturated, check the sump sight glass and the moisture indicator after at least 72 hours of normal operation.

Table 1
Refrigerant Moisture Content As Determined By Moisture Indicator

Refrigerant Moisture Level	Temperature (°F)		
	75° F	100° F	125° F
Dry	Below 5	Below 10	Below 20
Normal	5-15	10-30	20-50
Wet	Above 15	Above 30	Above 50

Note: Refrigerant Moisture content given in parts per million (ppm)

Periodic Maintenance

The following information describes the maintenance requirements of the Purifier Purge. To assure efficient and reliable purge operation, perform all inspections and procedures at the prescribed intervals. Keep a record of all inspection results to establish proper service intervals and document changes that occur in purge activity that could reflect on chiller performance.

WARNING! To avoid injury or death due to inhalation of, or skin exposure to refrigerant, closely follow all safety procedures described in the Material Safety Data Sheet for the refrigerant and to all labels on refrigerant containers. Certain procedures common to refrigeration system service may expose operating and/or servicing personnel to liquid and/or vaporous refrigerant.

Weekly

[ ] With the purge unit operating, check the purge tank condensing activity by observing the liquid level in the sump sight glass. In addition, liquid refrigerant should also be visible in the moisture indicating sight glass located in the liquid line immediately after the filter drier canister. The liquid refrigerant flow and level in the sump sight glass may vary.

No refrigerant flow in the drain line sight glass indicates:

- a pump-out cycle is necessary;
- a problem exists with the purge heat removal circuit (air-cooled condensing unit, expansion device or purge tank coil), or;
- a problem exists with the purge control circuit.
- refrigerant vapor from the chiller condenser to the purge tank is restricted.

[ ] Check the moisture indicator on the purge liquid return line. If moist refrigerant is indicated, replace the filter-drier cores. Refer to "Service Procedures" in this section.

[ ] Check refrigerant in the purge tank sump for water. If water is present, there will be a visible line of separation between the water and the refrigerant in the tank. Remove any free water from the purge tank. (Refer to "Service Procedures" in this section).

Semi-Annually

[ ] Inspect the air-cooled condenser coil and clean as needed. Clean the coil from the fan-side using compressed air or coil cleaner. A fouled coil will reduce purge efficiency and capacity.

Annually

[ ] Perform the purge system control check described in the "Electrical Controls" section of this manual.

[ ] Perform "Purge Tank Service" as described in the "Maintenance" section of this manual.

Service Procedures

This section describes specific procedures that must be performed as part of the maintenance program of the purge system. Before conducting these procedures, shut the purge unit off.

Purge Tank Service

Checkout and Water Removal

[ ] Isolate the purge by closing the valves on the purge vapor inlet and liquid return lines (between the chiller condenser and the purge tank).

[ ] With the purge condensing unit turned off, pressurize the purge tank through the angle valve located on the tank sump to a maximum of 15 psig and test the solenoid valves to insure they seal properly.

[ ] Check the purge tank sump sight glass for water.

If no water is visible, proceed to Filter Drier Core Replacement

If a layer of water is visible on the refrigerant in the purge sump sight glass:

a. With the purge tank isolated from the chiller, pressurize the purge tank through the sump angle valve with dry air or nitrogen to a maximum of 15 PSIG. Close valve to contain pressure within purge. Disconnect nitrogen and connect a refrigerant hose from the angle valve to a suitable approved containment vessel. Open angle valve. The water and a small amount of refrigerant will flow into the containment tank.

WARNING! Exceeding 15 PSIG can result in personal injury or death.

Note: An alternative to pressurizing the purge tank would be to draw a vacuum on a suitable containment vessel and using the pressure differential to draw the water out of the sump.

b. Connect a suitable vacuum pump to the containment tank with the pump discharging back into the chiller or another suitable container. Pull a vacuum to 25 inches of mercury on the refrigerant and water mixture. The refrigerant will boil off leaving only the water in the vessel.

Note: Do not pull a deep vacuum as this will cause the water to also boil off.

Filter-Drier Core Replacement

Two high water capacity filter drier cores are inside the canister (Figure 10) located on the front of the purge unit. The following procedure should be followed when installing or changing the cores.

1. Isolate the purge unit from the chiller.

2. The canister must be drained of liquid refrigerant prior to opening. Use available pressure differential whenever possible or use nitrogen to raise the pressure inside the purge to slightly higher than chiller evaporator. Connect a refrigeration hose to the 1/4 in. schrader drain fitting (Figure 10) on the end of the canister and also to a service valve on the chiller evaporator. Open the chiller valve and drain the canister.

3. The refrigerant vapor inside the canister should be removed by connecting the suction side of a vacuum pump to the schrader drain fitting and the pump discharge to the chiller. Pull a vacuum for approximately 30 minutes.

Note: Due to the slow out-gassing of refrigerant from the cores, it will not be possible to pull and hold a deep vacuum.

4. Remove the canister end cap (Figure 10) and remove the cores. Butyl gloves are recommended when handling cores because of the direct contact with refrigerant. Immediately after removing cores, they should be placed in a sealable container for storage and disposal in accordance with local regulations.

5. Clean the inside of the canister and the drain screen (Figure 10) as necessary.

6. Install the new cores and gaskets making sure the canister cover is installed with the drain at the bottom.

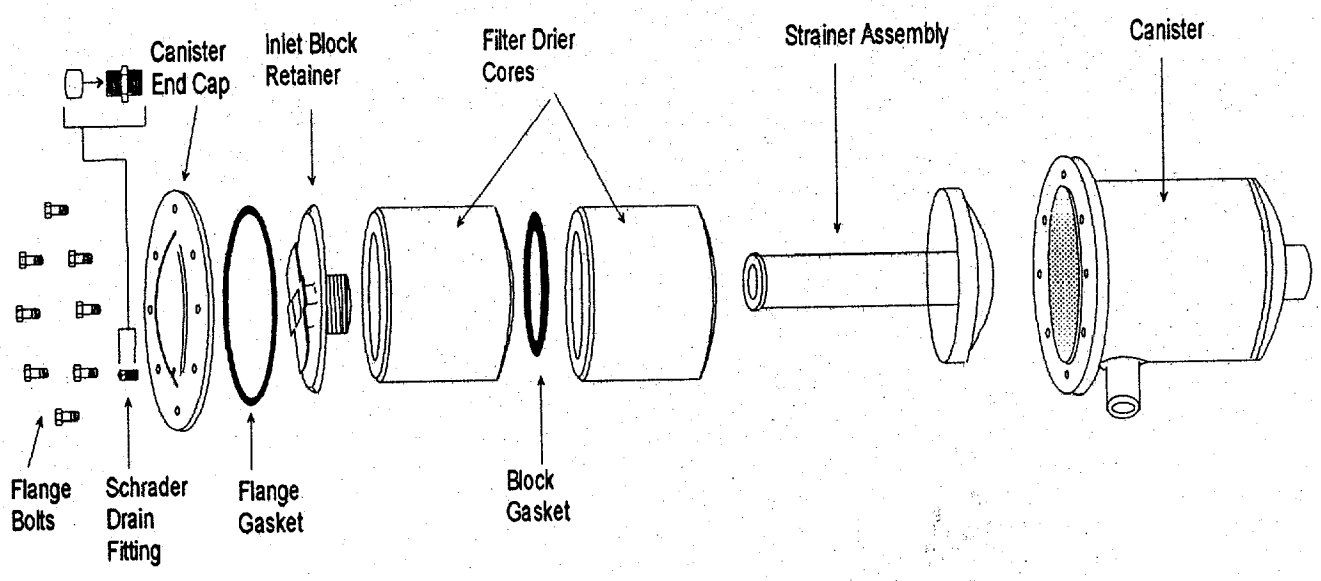
Note: The drier-cores absorb water vapor from ambient air, so they are shipped in sealed containers. Do not open them until they can be installed and sealed in the canister.

7. Pressurize the purge with dry air or nitrogen to 10 psig through the sump angle valve and check for leaks. Release the pressure through the sump angle valve.

8. Switch the purge system to the manual ON position and wait for the pump-out compressor to start.

9. Open the valves on the purge vapor tank inlet and liquid return lines at the chiller.

Figure 10
Filter-Drier Canister Assembly



Purge Pump-Out and Fault Check

This procedure tests the ability of the purge to remove non-condensibles from the chiller. This is done by isolating the purge from the chiller, adding air to the purge tank and then using the purge compressor to remove the air again. Perform the following procedure to verify proper purge pumpout sequencing.

CHECKOUT PROCEDURE:

1. Open all disconnect switches providing power to the purge.

2. Remove the metal shield over the fault timer switches. Note fault timer setting and reset to 1.6 minutes. Reconnect power to the purge unit.

3. Switch purge control switch 3S3 on the purge control panel to OFF and then to MANUAL ON or depress the RESET switch for a minimum of 1/2-second. This will reset the fault timer and turn on the purge condensing unit.

4. Close the shutoff valves on the purge tank inlet and liquid return lines to isolate the purge tank from the chiller.

5. Disconnect the 1/4-inch line from the inlet of the pump-out compressor.

6. Press and hold service switch 3S4 in the MOMENTARY ON position for approximately five seconds, energizing the pumpout solenoids and pump-out compressor. The purge will draw air into the purge tank back through the isolation solenoid valves.

Note: Repeat this procedure until sufficient air is drawn into the purge tank to energize 3S15 and initiate a pump-out sequence.

Within approximately five minutes, the pump-out compressor should start and run until the fault timer setting is exceeded (1.6 minutes). The pump-out compressor then shuts down and the red FAULT light on the control panel comes on.

7. Reconnect the 1/4-inch line at the inlet of the pump-out compressor.

8. Open all disconnect switches providing power to the purge.

9. Restore original fault timer setting. Re-install metal shield over timer switches.

10. Reconnect power to the purge unit. Restart the purge by turning the purge control switch to AUTO.

11. On retrofit (field-installed) purges, reset the fault circuit by turning purge control switch 6S3 to OFF. On factory installed purges, reset the fault by turning purge control switch 6S6 to RESET.

12. Open the shutoff valves on the purge tank inlet and liquid return lines.

Purge Tank Service After Internal Chiller Repairs

This section describes specific procedures that must be performed when the chiller refrigerant system has been opened to atmosphere. Before conducting these procedures, shut the purge unit off.

In those situations where air has entered the chiller during servicing, it will have to removed before the chiller can be started. The purge will do this in two stages; the "continuous-operation" stage and the "intermittent-operation" stage.

In these situations the fault timer should be placed in the FAULT-BYPASS mode. This mode will allow the purge to pump-out for extended periods of time without signaling a fault for excessive pump-out time. The FAULT-BYPASS mode will automatically de-energize after 24 hours.

When large amounts of air or nitrogen are involved, the purging efficiency can be enhanced by increasing refrigerant pressure in the purge tank. This can be done by operating the chiller as soon as practical or by circulating warm water (less than 100°F) through the chiller evaporator tube bundle. The amount of time that the purge pump-out compressor operates continuously will vary, depending on the initial pressure level and quantity of air/nitrogen in the chiller. Initially, the pump-out compressor operates continuously due to the large amount of non-condensibles and relatively small amount of refrigerant being drawn into the purge tank. It may be several hours before the pump-out compressor cycles off for the first time.

Note: The restriction device may be bypassed to decrease required pump-out time. Refer to "Bypassing Pump-Out Compressor Restrictor" that follows this procedure.

Once the level of non-condensibles present in the chiller falls to a point where increasing amounts of refrigerant are entering the purge tank, the temperature switch in the purge control system begins to cycle the pump-out compressor on and off. As the refrigerant in the system becomes less contaminated with non-condensibles, purge pumpout is activated less frequently.

If it is suspected that the chiller refrigerant is contaminated by excessive moisture, the purge should be run continuously (control switch in ON position) for 24 to 48 hours with filter-drier cores removed. This is done to circulate the refrigerant through the purge and concentrate all moisture in the purge tank sump. During this time, periodically check the purge tank sump for water. If water is present, perform "Purge Tank Checkout and Water Removal Procedure" in this section. After removing water, install the filter-drier cores. Refer to "Filter-Drier Core Replacement" in this section.

Bypassing Pump-Out Restrictor

The pumpout restrictor can be bypassed to accelerate non-condensible removal. However, this is a manual operation that will slightly reduce the air-separation efficiency of the purge. To bypass the restriction device, proceed as follows:

- Temporarily connect a bypass hose from isolation solenoid valve 3L3 to the auxiliary port on the pump-out compressor inlet. This is shown in Figure 4.
- Cap the open port on the pump-out compressor inlet.

Note: This should be done for only a short period since this operation will cause additional system refrigerant to be lost during purging.

Troubleshooting

Troubleshooting Procedures

If operational difficulties are encountered, utilize the checkout procedures and diagnostic chart provided in this manual to determine the cause and correct the problem. Refer also to the "Refrigerant System Diagnostic Procedure" in this section and to the "Electrical Control Checkout" procedure in the "Electrical Control" section of this manual.

WARNING! To avoid injury or death due to inhalation of, or skin exposure to refrigerant, closely follow all safety procedures described in the Material Safety Data Sheet for the refrigerant and to all labels on refrigerant containers.

Certain procedures common to refrigeration system service may expose operating and/or servicing personnel to liquid and/or vaporous refrigerant.

Troubleshooting Chart

The chart that follows is provided to help identify malfunctions that could occur. The chart has three columns:

- the Symptom column describes what the unit is doing;
- the Cause column identifies possible sources of the problem, and;
- the Solution column describes what must be done to correct the problem.

WARNING! To avoid injury or death due to electrical shock never open access panels to inspect or service the unit without first opening all disconnect switches.

Symptom	Cause	Solution
Fault light 6DS2 ON, purge not running, condensing unit OFF (pump-out operates too long).	Air Infiltration rate into unit too high. Excessive purging required.	Leak-check chiller. Repair Leaks.
	Fault timer 6DL2 duration set too low.	Determine proper value for chiller and reset. See "Electrical controls".
	Leakage in purge interconnecting pump-out tubing.	Leak-test and repair tubing.
	Fault timer 6DL2 failed closed.	Replace fault timer.
	Chiller refrigerant temperature too low. (Purge can pump-out continuously below 40 F saturation temperature.)	Do not operate purge unit at or below 40 F saturated refrigerant temperature.
	Ambient temperature too low (below 30 F)	Do not operate purge unit below 30 F ambient temperature.
	Temperature control switch 3S15 failed closed.	Replace switch 3S15.
	Isolation solenoids 3L1, 3L3 both fail to open. Air is not removed.	Repair or replace solenoid coils or valves.
	Isolation solenoids 3L1, 3L3 both fail to close and chiller is at a low temperature (air leaks into chiller.)	Repair or replace solenoid coils or valves.
Fault light 6DS2 ON, but condensing unit on, pump-out maybe on.	Fault relay 6K4 fails to energize. (Purge fails to fault -out.)	Replace fault relay 6K4
Fault light 6DS2 OFF, but pump-out continues beyond fault time.	Bypass light 6DS3 failed and purge is in BYPASS mode.	Replace fault light 6DS3.
	24-hour time 6DL2 fails to close after delay period.	Perform timer "self-test" procedure. Replace timer 6DL2.
Purge fails to pump-out noncondensibles when chiller is operating.	Depending on the unit type and operating conditions, air may accumulate in the unit condenser away from the purge gas take-off location.	Operate purge with chiller OFF. Any air in chiller will be removed as long as purge is functioning properly. If a large amount of air is removed, leak-test chiller and repair leaks.
Purge fails to pump-out noncondensibles. Chiller indicates high head-pressure fault.	Purge condensing unit: *a. is overcharged. *b. is undercharged (reduced cooling capacity.) *c. condenser fan failed.	Replace condensing unit or service as needed.

Symptom	Cause	Solution
* Refer to "Refrigerant System Diagnostic Procedure" in the "Troubleshooting" Section.	*d. regulating valve failed (low pressure). *e. Condensing unit compressor motor winding temp. sensor opened (may go out on high winding temperature).	
	*Regulator valve failed (regulating too high.) Condensing unit will flood until corrected.	Measure condensing unit compressor suction temperature. Replace expansion device if required.
	Temperature control switch 3S15 failed to close.	Check 3S15 capillary tube routing and insulation. Replace 3S15 if required.
Purge continues when CTV is OFF.	Purge control in ON position.	Normal continuous operation mode.
	Auto-Run signal failed or relay 6K5 failed closed.	Check RUN signal and relay. Replace 6K5 if required.
Purge runs when RUN light is OFF.	Run light 6DS1 failed.	Replace 6DS1.
Minute-meter does not advance.	Minute-meter failed.	Check for power during pump-out. Replace if required.
Purge tank sight glass:		
No refrigerant in purge tank sight glass.	Liquid refrigerant may evaporate and migrate back into the chiller with the purge off.	Liquid should return within 20 minutes of continuous purge operation.
Refrigerant level rises above sight glass.	Periodically the refrigerant will rise above the sight glass (usually occurs when the ambient temperature is above the saturation temperature).	a. Check for restrictions in the 5/8" purge tank inlet line and in the 1/4" liquid return line. b. Shutoff valves for these lines must be fully open. c. There can be no liquid traps in these lines.
	Liquid accumulation in the 5/8" gas line will cause excessive pressure drop, resulting in high liquid level in the purge tank.	a. Insure 5/8" gas line slopes toward chiller for the entire distance to condenser (1"/Ft. Min.). b. Insulate 5/8" gas line if needed. c. If problem persists, contact qualified Trane service representative.
Free water in purge tank.	Filter drier cores may be saturated with water.	Drain water manually or monitor the moisture indicator. If the condition persists, replace the filter/drier cores.

Refrigeration System Diagnostic Procedure

If there is concern that one of the components in the purge refrigeration system is not operating correctly, troubleshoot the system by taking surface temperature measurements.

Caution: To avoid refrigerant charge loss, do not attempt to measure purge system discharge or liquid line pressure.

Refer to Figure 8 in this manual. With the purge condensing unit operating, the expansion device will reliably regulate the low side of the purge refrigerant system, even with a relatively wide range variation in refrigerant charge.

Suction pressure is not a good indicator of proper charge. The best method to determine charge level is to measure surface temperature at various points on the refrigerant circuit. These points are shown in Figure 8 in this manual.

The condenser temperature (Point 4 on Figure 8), can be measured by reading the surface temperature of the second or third condenser tubing U-bend (from the top) on the side of the coil opposite of the discharge gas inlet.

Note: Use an accurate (±1° F) temperature probe (Range = 0°-200° F) to take temperature readings. Fasten the sensor of the probe tightly against the tubing surface. Insulate around the probe for accurate results. The critical temperature measurements needed to diagnose the system properly are Points 1, 2, 4, and 5 as shown in Figure 8. Temperatures at Points 1 and 2 can be obtained by moving aside a small portion of the insulation covering the tubing at these points. At Point 2, measure temperature approximately 2-3 inches away from the capillary temperature sensor. Do not disturb the temperature sensor.

With the purge condensing unit running, take temperature measurements at Points 4 and 5. The difference between these two values is the sub cooling. This value should be between 5° and 15° F with the proper refrigerant charge in the system.

- A sub cooling value of less than 5° F indicates a refrigerant undercharge.
- A sub cooling value greater than 15° F indicates a refrigerant overcharge.

The purge refrigerant system must have a proper HFC-134a charge before any other refrigerant circuit components can be evaluated.

The purpose of the expansion valve is to regulate refrigerant flow to maintain a constant pressure within the purge tank coil. To determine if the expansion valve is operating properly, measure temperature at Point 1 in Figure 8. An optimum constant temperature of 0° F should be measured at this point. However, a measurement between -5° F and 10° F is acceptable.

The operation of temperature control switch 3S15 can be checked by measuring the temperature at Point 2 in Figure 8. Perform the "Purge Pump-Out Check" procedure in the "Maintenance" section. Continuously monitor suction temperature at Point 2. After sufficient air has been drawn into the purge tank, the temperature at Point 2 will fall. When the temperature at Point 2 approaches 18° F, the pump-out system should energize. If pump-out does not start and Point 2 temperature reading remains below 10° F, a problem exists with temperature control switch 3S15, the insulation around the capillary sensor, or with the pump-out system.

Electrical Control

Control Components

This section identifies and explains the operation of the individual components of the Purifier Purge electrical control circuit. Refer to Figures 4 and 6.

Purge Control Switch

Purifier Purge units with the ON/OFF-RESET/AUTO control switch are intended for use primarily as retrofit devices for older chillers that have control systems that are not specifically designed to utilize the Purifier Purge. In this case, the switch is used to interlock purge Auto mode with a chiller RUN signal. These purge units are referred to as "retrofit" or "field-installed" purges.

The purge control switch (6S3) is the three-position (ON/OFF-RESET/AUTO) control switch located on the outside of the purge control panel or on the UCP-mounted remote panel which controls purge operation. Purge units that do not have the ON/OFF-RESET/AUTO switch (6S3) are intended for use with chillers whose control systems are specifically designed to utilize the Purifier Purge. For these purges, the ON/OFF/AUTO control switch is located on the chiller unit control panel. A reset switch is located with the purge controls.

Function. With the switch in the ON position, the purge will run continuously. Use of the ON switch position is recommended only for certain service procedures. Turning the switch to the OFF position will de-energize purge system operation.

The AUTO position interlocks purge operation with a chiller-generated "cooling/run" signal. On retrofit purges, this signal energizes RUN relay 6K5 in the purge control panel. On factory-mounted purges, this signal directly powers the purge condensing unit and circuits. The AUTO position is the recommended normal purge operating mode.

Purge Reset Switch

The purge reset switch (6S6) is found only on factory-mounted purges. This is a spring-return (ON/MOMENTARY OFF) switch located on the outside of the purge control panel or on the UCP-mounted remote panel which controls purge operation.

Function. Pressing the reset switch will reset the fault timer. When the reset control configuration is provided, the 6K5 relay is not used.

On retrofit purges, reset is accomplished by switching the purge control switch 6S3 to OFF, then back to AUTO or ON. This will reset the fault timer.

Temperature Control Switch (3S15)

When sufficient air and non-condensibles have been removed from the purge circuit, compressor suction temperature for the air-cooled condenser will begin to rise. When suction temperature rises to 22° F, 3S15 contacts open, closing pump-out solenoid valves 3L1 and 3L3 and stopping pump-out compressor 3B6. Minute-meter 6M1 de-energizes.

Note: The temperature control switch (3S15) set points are calibrated at the factory. Do not alter the switch set points.

Isolation Solenoids (3L1, 3L3)

Description. The isolation solenoid valves (Figure 4) are used to control purge exhaust from the purge tank.

Function. The operation of 3L1 and 3L3 is controlled by temperature control switch 3S15. Two pump-out solenoid valves are provided since their function in the system is a critical factor when the purge tank is at a positive pressure.

Note: Solenoid 3L3 is not used for CFC-113 applications.

Minute-Meter (6M1)

The minute-meter 6M1 connected in the pumpout compressor circuit, indicates total pump-out compressor operating time. The amount of pump-out compressor run time should be recorded periodically to:

1. Determine if the unit leak rate has increased.
2. Determine and set appropriate fault timer DIP switch setting.

24-Hour Fault Timer (6DL2)

Fault timer 6DL2 is used to sense excessive pump-out time.

The Purifier Purge "smart timer" is a key component for protecting the chiller's refrigerant charge. The timer is used to monitor the pumpout activity on the purge system and alert the operator if a high level of activity is present, by shutting down the purge via a fault.

The timer is used to sense and accumulate pumpout time within a 24-hour, sliding window. It does this by determining the length of each pumpout cycle and adding that time increment to an accumulation buffer. In order to accumulate time within the 24-hour constraint, the pumpout time measured 24 hours previously is erased from the buffer. When the accumulated time in the buffer exceeds the setting on the timer DIP switches, a fault terminal on the timer is energized.

This terminal, connected to a fault relay and indicator light, shuts down the purge unit. The fault condition remains in effect until the power is removed from the timer (Reset) for at least 0.5 seconds.

The desired time setting of the fault timer is operator-selectable on a 10-bit DIP switch located on the timer. The variable range is from 0.1 to 102.3 minutes per day. The factory setting is 12.8 minutes. Since different chillers operate at differing temperature conditions, run schedules and varying air-leak rates, the chiller operator may need to set a fault time appropriate for his particular system.

The operator should log the purge minute meter to develop a history of the pump-out activity for his machine. After gathering this pump-out data, the operator should set a fault time that will protect the chiller from any sudden increases of pump-out activity but that will not result in nuisance trips under what is normal pump-out activity for his machine.

The fault time as set on the timer DIP switches should be the maximum allowable accumulated pump-out time over a 24-hour period (factory setting of 12.8 minutes). Any time setting, from 0.1 to 102.3 minutes can be selected in 0.1-minute increments. Each DIP switch is labeled with its' corresponding time value. Any time value within the above range can be selected, using a combination of DIP switches. The maximum time setting available (102.3 minutes) is set when all switches are ON.

Note: Be certain that any normal increases in pump-out due to extended chiller-off cycles (normal duty rotation or week-ends) is taken into account.

The fault timer has a built-in fault bypass mode (not to be confused with the restrictor bypass on the pump-out system) for use when known large quantities of air or nitrogen must be removed from the chiller such as after chiller servicing.

The bypass is activated by a momentary input to the timer bypass terminal. When activated, the bypass light will energize and the timer will ignore all pump-out activity for a 24-hour period (no fault protection). Once 24 hours has elapsed, the bypass light will automatically be turned off and the timer will resume fault protection mode.

The 24-hour bypass timer is re-initialized each time that the bypass switch is pressed. If the timer-bypass light is on when the switch is pressed, the light will blink to confirm that the 24-hour timer has been re-initialized (24-hour period starts over again). The 24-hour bypass mode can be disabled at any time by resetting power to the timer (Reset switch on purge control panel).

Note: Since the purge has NO fault protection in the bypass mode, it is recommended that this mode be used sparingly and only when the purge and controls are known to be operating properly.

A diagnostic test can be performed to check the integrity of the timer DIP switches. This test is described in the "Electrical Control Checkout" section of this manual.

Fault Relay (6K4)

The fault relay controls the following:

- De-energizes the condensing unit and condenser run light 6DS1.
- De-energizes the pump-out system components (compressor 3B6 and isolation solenoids 3L1 and 3L3).

Indicator Lights

Three indicator lights display the operating and diagnostic condition of the purge.

When energized, the "condenser run" light 6DS1 indicates that the purge is energized and the condensing unit is operating.

When energized, the "fault" light 6DS2 indicates a fault mode.

The "timer-bypass" light 6DS3 indicates that the fault bypass mode is On.

Timer Bypass Switch (6S5)

Momentary On switch 6S5 used to initiate the 24-hour "timer-bypass" mode. This mode starts timing from the last switch closure. 24-hour bypass can be de-energized by resetting the fault timer.

Service Switch (3S4)

Momentary On switch (3S4) is provided in the purge-mounted control panel. This switch is used to open the solenoid valves and energize the pump-out compressor when conducting service procedures or operational checks of the purge system.

Purifier Purge Electrical Configurations

There are two available electrical variations for the Purifier Purge. Each are illustrated by the electrical schematics shown in Figures 11 and 12. These variations are:

1. Factory-mounted purge (Figure 11);

2. Retrofit (field-installed) purge (Figure 12).

Purge units that are factory-mounted on chillers have a reset switch located on the purge control panel. For these units, purge On/Off control is located on the chiller UCM control panel (Figure 11).

Retrofit or field-installed purge units utilize an On/Off-Reset/Auto switch for purge On/Off control that is located on the purge operator panel - not on the chiller control panel.

For purge units that mount in locations that are not operator-accessible, the operating controls are provided on a panel that may be remote mounted (Figure 4). This panel may be removed from the purge platform and placed at the chiller control panel or other convenient location.

Purge units designed for chillers using CFC-11 and HCFC-123 use two pumpout solenoid valves (3L1, 3L3). Purge units designed for chiller using CFC-113 do not have solenoid valve 3L3. See Figures 11 and 12.

Except for the minute meter 6M1, all components are identical between 50 Hz. and 60 Hz. units.

Figure 11
Electrical Schematic for Factory-Mount
2307-2805C

DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
3	PURGE PANEL 1
8	PURGE PANEL 2

	LEGEND
DEVICE DESIGNATION	DESCRIPTION
3B5	CONDENSING UNIT
3B6	PUMPOUT COMPRESSOR
6DL2	TIME DELAY RELAY
6DS1	CONDENSER RUN LIGHT
6DS2	FAULT INDICATION LIGHT
6DS3	BYPASS LIGHT
6K4	CONTROL RELAY
3L1 & 3	SOLENOID VALVES
6M1	MINUTE METER
3S4	SERVICE SWITCH
6S5	BYPASS SWITCH
6S6	RESET SWITCH
3S15	TEMPERATURE SWITCH
3TB1	PANEL 1 TERMINAL BLOCK
6TB1	PANEL 2 TERMINAL BLOCK

⚠ WARNING

HAZARDOUS VOLTAGE!

DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.

FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

⚠ AVERTISSEMENT

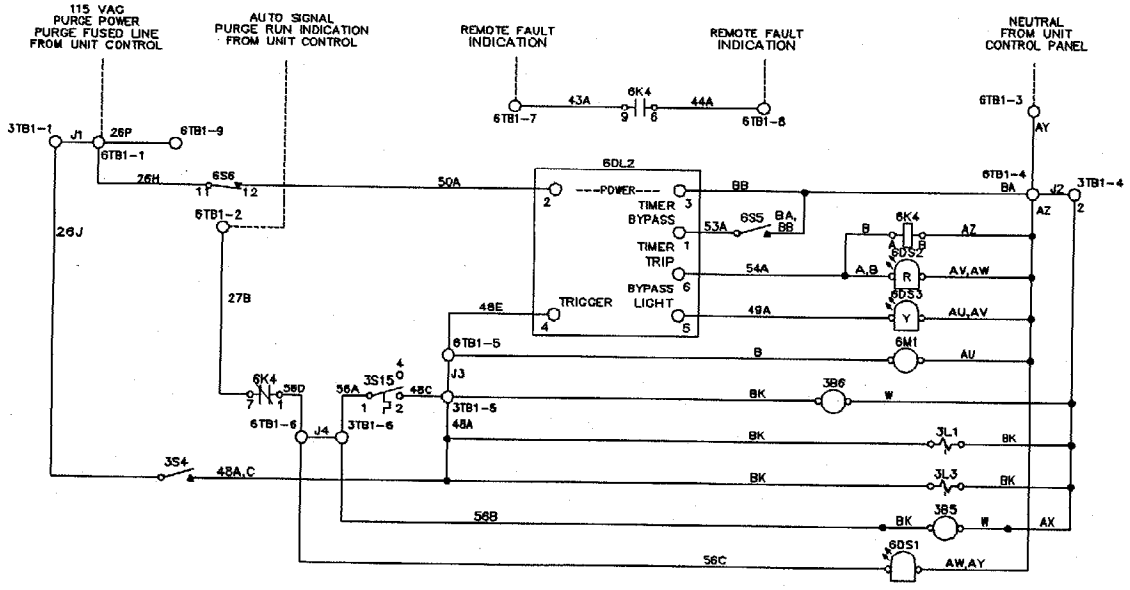
VOLTAGE HASARDEUX!

DECONNECTEZ TOUTES LES SOURCES ELECTRIQUES INCLUANT LES DISJONCTEURS SITUES A DISTANCE AVANT D'EFFECTUER L'ENTRETIEN.

FAUTE DE DECONNECTER LA SOURCE ELECTRIQUE AVANT D'EFFECTUER L'ENTRETIEN PEUT ENTRAINER DES BLESSURES CORPORELLES SEVERES OU LA MORT.

IMPORTANT

USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE. UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT ANY OTHER WIRING.



DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
3	PURGE PANEL 1
6	PURGE PANEL 2

1. 115 VAC, #14 AWG-600V WIRE, MAX OVERCURRENT PROTECTIVE DEVICE = 15A. POWER SOURCE FOR PURGE MUST COME FROM CHILLER.
2. FAULT RELAY CONTACT RATING = 120 VAC, 240 VA.
3. WIRE TO SIDE HOT WHEN UNIT IS RUNNING.
4. SOLID LINES INDICATE TRANE WIRING. DASHED LINES INDICATE FIELD WIRING. FACTORY INSTALLED JUMPERS J1 THRU J4 ARE TO BE REPLACED WITH FIELD WIRING WHEN PURGE PANEL 2 IS REMOTE MOUNTED.
5. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC). OTHER COUNTRIES APPLICABLE NATIONAL AND/OR LOCAL REQUIREMENTS SHALL APPLY.
6. BONDING REQUIRED ONLY WHEN PANEL IS REMOTELY MOUNTED AWAY FROM CHILLER.

LEGEND	
DEVICE DESIGNATION	DESCRIPTION
3B5	CONDENSING UNIT
3B6	PUMPOUT COMPRESSOR
6DL2	TIME DELAY RELAY
6DS1	CONDENSER RUN LIGHT
6DS2	FAULT INDICATION LIGHT
6DS3	BYPASS LIGHT
6K4 & 5	CONTROL RELAYS
3L1 & 3	SOLENOID VALVES
6M1	MINUTE METER
6S3	MAIN PURGE SWITCH
3S4	SERVICE SWITCH
6S5	BYPASS SWITCH
3S15	TEMPERATURE SWITCH
3TB1	PANEL 1 TERMINAL BLOCK
6TB1	PANEL 2 TERMINAL BLOCK

⚠ WARNING

HAZARDOUS VOLTAGE!

DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.

FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

⚠ AVERTISSEMENT

VOLTAGE HASARDEUX!

DECONNECTEZ TOUTES LES SOURCES ELECTRIQUES INCLUANT LES DISJONCTEURS SITUES A DISTANCE AVANT D'EFFECTUER L'ENTRETIEN.

FAUTE DE DECONNECTER LA SOURCE ELECTRIQUE AVANT D'EFFECTUER L'ENTRETIEN PEUT ENTRAINER DES BLESSURES CORPORELLES SEVERES OU LA MORT.

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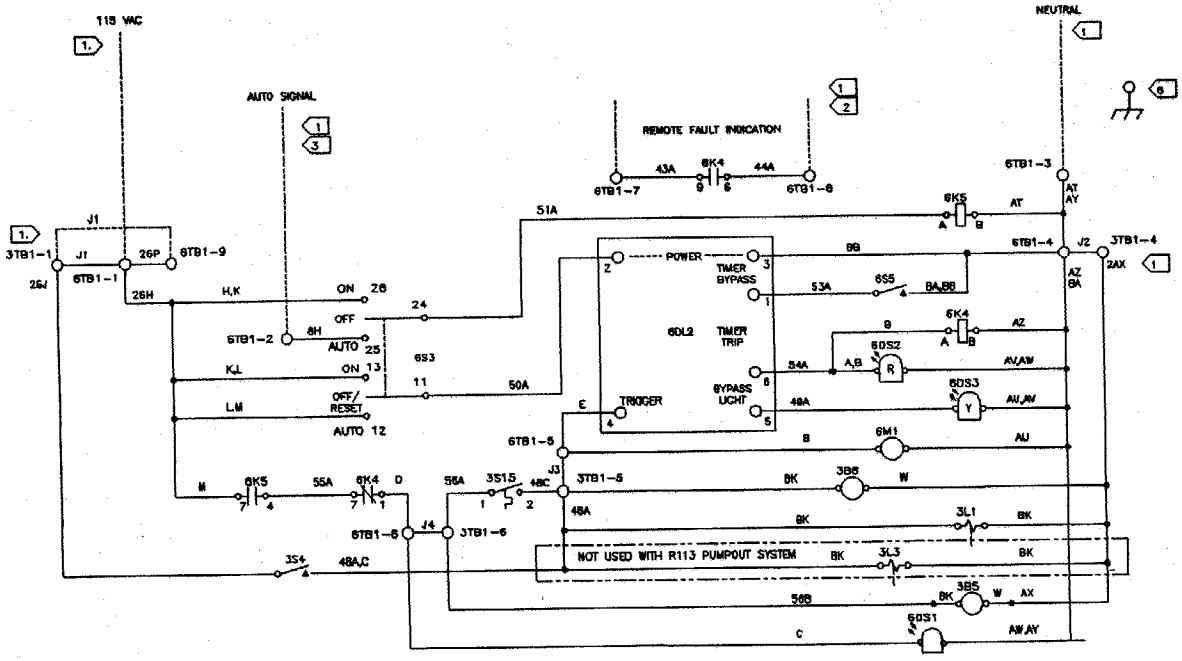

Figure 12 Electrical Schematic for Retrofit Purg
X3947071 2C

Electrical Sequence of Operation

The following is a technical description of the purge electrical circuit operation under normal conditions.

Power is supplied to hot terminal 6TB1-1.

Run Signal

The method used for the purge to receive its start signal depends on whether the purge is factory mounted or field-installed:

a. The factory-mounted purge unit receives a RUN signal from 1TB1-7 in the chiller UCP which connects to 6TB1-2 and then passes through 6K4 normally-closed fault relay contacts to 6TB1-6.

b. Retrofit or field-installed purges receive a RUN signal from the "hot" side of the chiller hour meter (or other chiller RUN signal source) to 6TB1-2 which then goes to the purge control switch AUTO position. If the switch is in this position, run relay 6K5 energizes. Run relay normally open contacts close providing a path to fault relay 6K4 normally-closed contacts, providing current to 6TB1-6, and powering purge condensing unit 3B5 and Condenser Run light 6DS1.

24-Hour Fault Timer Signal

The method used for the fault timer 6DL2 to receive its initializing signal (Terminal #2 of timer) also depends on whether the purge is factory-mounted or field-installed:

a. For retrofit or field-installed purges, the fault timer initialization signal originates at 6TB1-1 and is supplied to the purge control switch 6S3, ON or AUTO switch position. Either position (but not OFF/RESET) will allow power to pass through the switch and on to Terminal #2 of fault timer 6DL2. Switching to the OFF/RESET position removes power and resets the timer.

b. For factory-mounted purges, the fault timer initialization signal also originates at 6TB1-1, but then is supplied through the normally-closed contacts of the reset switch 6S6 to Terminal 2 of fault timer 6DL2. Reset occurs when reset switch 6S6 normally-closed contacts are momentarily opened by pressing the switch.

As previously discussed, the condensing unit 3B5 and Condenser Run light 6DS1 turn on when a RUN signal is received.

Pump-out

When temperature switch 3S15 senses a decrease in temperature, indicating non-condensibles present in the purge tank, 3S15 normally-open contacts close which starts pumpout by supplying power to 3TB1-5, 6TB1-5.

Note: Pump-out component operation can be tested by momentarily pressing service switch 3S4 which supplies power from 3TB1-1 to 3TB1-5 .

At this time, pump-out compressor 3B6, minute meter 6M1 and solenoid valves 3L1 and 3L3 (CFC-11 & HCFC-123 only) are energized. Power is also provided to Terminal #4 of fault timer 6DL2. The presence of power at this terminal indicates pump-out operation, thus it begins to accumulate pump-out time. The timer will allow only a predetermined and preset amount of total pump-out time during the succeeding 24-hour period.
When the non-condensibles are adequately removed from the system, 3S15 contacts open and pumpout operation stops.

If the accumulated amount of pumpout time ever exceeds the preset amount, the timer will issue a FAULT signal from Terminal #6, which energizes fault relay 6K4 and fault light 6DS2. The normally-closed contacts of 6K4 open, removing power from 6TB1-6 and disabling pumpout and condensing unit operation. The normally-open fault relay contacts close between 6TB1-7 and 6TB1-8 to provide for remote fault indication.

If an extended pumpout time is required for any reason (service procedures, etc.) the fault function can be bypassed by pressing timer bypass switch 6S5 momentarily. Once this is done, the purge can be operated for a period of 24-hours without registering any pumpout time on the fault timer. When 6S5 is pressed, timer bypass light 6DS3 will light, indicating the timer is in FAULT BYPASS mode. If, during this 24-hour period, timer bypass switch 6S5 is pressed, timer bypass light 6DS3 will blink and the 24-hour bypass period will restart.

24-Hour Fault Timer Self-Test

Use this procedure to test the functioning of fault timer 6DL2 DIP switches. Refer to Figures 10 and 11.

To perform the fault timer self-diagnostic test, follow this procedure:

1. Switch all even-numbered DIP switches on the fault timer to ON.

2. Start the purge. The purge bypass indicator light 6DS3 will blink twice at purge startup.

3. Turn purge off.

4. Switch all even-numbered DIP switches to OFF and all odd numbered DIP switches to ON.

5. Start the purge. The purge bypass indicator light 6DS3 will blink once at purge startup. Proper response from the purge bypass light indicates properly functioning software and proper DIP switch operation. Purge operation will continue and the fault timer will accept DIP switch settings as a valid minimum 24-hour pumpout time.

Purge Control Circuit Test

Use this procedure to test the functioning of the electrical control circuit. Refer to Figures 10 and 11.

WARNING! To avoid injury or death due to inhalation of, or skin exposure to refrigerant, closely follow all safety procedures described in the Material Safety Data Sheet for the refrigerant and to all labels on refrigerant containers. Certain procedures common to refrigeration system service may expose operating and/or servicing personnel to liquid and/or vaporous refrigerant.

Test Setup

WARNING! To prevent injury or death due to electrical shock, exercise extreme caution when servicing unit with circuits energized.

1. Turn the chiller OFF and remove the purge power fuse located in the chiller control panel.

a. Confirm that there is no power between:

- 6TB1-1 to 6TB1-3;
- 6TB1-2 to 6TB1-3;

b. Remove power from 6TB1-7 and 6TB1-8.

This will disable the "Remote Fault Indication" circuit, if used.

2. Disconnect and isolate the RUN signal lead that connects the chiller control panel to 6TB1-2.

Caution: Failure to disconnect and isolate the RUN signal lead will cause the chiller to start during testing procedure.

3. Connect a test switch between terminals 6TB1-1 and 6TB1-2 in the purge control panel to simulate a chiller RUN signal during testing. Turn this switch OFF.

4. On retrofit units, switch purge control switch 6S3 to OFF.

5. Record original timer setting and reset fault timer 6DL2 time setting to 1.6 minutes.

6. Manually close the shutoff valves on both the purge tank inlet (suction) line and the liquid return line to isolate the purge tank from the chiller condenser.

7. Disconnect the 1/4-inch copper line between the pump-out compressor 3B6 and isolation solenoid valve 3L3.

Disconnect the line that vents the pump-out compressor discharge to the rupture disc vent line at the pump-out compressor outlet.

Using a temporary line (1/4-inch minimum), connect the vent line to the outlet of solenoid valve 3L3 (on top of control panel). This will vent the purge tank to outside atmosphere during testing.

8. Replace the purge power fuse and confirm power across terminals 6TB1-1 to 6TB1-3.

Test Procedure

WARNING! To prevent injury or death due to electrical shock, exercise extreme caution when servicing unit with circuits energized.

TEST CONDITIONS:
- Control power ON;
- All purge indicator lights OFF.

1. "AUTO" MODE CHECKOUT.

a. On retrofit units, turn purge control switch 6S3 to AUTO position:

- No change.

b. Turn CTV RUN signal test switch (installed during setup procedure) to ON position. On retrofit unit, this simulates a CTV RUN signal by energizing run relay 6K5.

- Purge condensing unit 3B5 starts;
- Purge condensing unit RUN light 6DS1 lights.

Allow condensing unit to operate 1-2 minutes to cool the purge tank coil.

2. SERVICE SWITCH 3S4 (6S4) FUNCTION TEST.

a. Press and hold service switch 3S4 in ON position for approximately 5 seconds:

- Isolation solenoids 3L1 and 3L3 energize;
- Pump-Out Compressor 3B6 starts;
- Minute-meter 6M1 starts.

Air will be drawn into the purge tank through the open isolation valve (3L3) outlet. Check to insure minute-meter is operating.

Note: If 3S4 is held in longer than fault timer 6DL2 setting (1.6 minutes), a fault will occur.

b. Release service switch 3S4; it will return to OFF position:

- Isolation solenoids 3L1 and 3L3 de-energize;
- Pump-Out Compressor 3B6 stops;
- Minute-meter 6M1 stops.

Repeat Steps 2a and 2b several times during the succeeding 5 minute period to completely fill the purge tank with air.

With air in the purge tank, the purge condensing unit suction temperature will fall because there is no refrigerant entering the purge tank. When temperature switch 3S15 contacts close due to the falling suction temperature, pump-out is activated:

- Isolation solenoids 3L1 and 3L3 energize;
- Pump-out compressor 3B6 starts;
- Minute-meter 6M1 starts;
- Fault timer 6DL2 continues timing (set at 1.6 minutes).

3. FAULT TIMER 6DL2 FUNCTION TEST.

a. Pumpout continues until fault timer 6DL2 time setting is exceeded (pump-out time greater than 1.6 minutes, which is its current set point). It should detect a fault and:

- Energize fault relay 6K4;
- Turn on fault indicator light 6DS2;

Stop purge unit operation as follows:

- Isolation solenoids 3L1 and 3L3 de-energize;
- Pump-out compressor 3B6 stops;
- Minute-meter 6M1 stops.
- Purge condensing unit 3B5 stops;
- Purge condensing unit RUN light 6DS1 goes off.

b. Turn CTV RUN test switch OFF. Reset the fault circuit by pressing reset switch 6S6 on factory-mounted purges or by turning purge control switch 6S3 to OFF for retrofit (field installed) purges:

- Fault relay 6K4 de-energizes;
- Fault indicator light 6DS2 turns off.

4. TIMER BYPASS SWITCH 6S5 FUNCTION TEST.

a. Momentarily press timer bypass switch 6S5 to ON:

- Timer bypass indicator light 6DS3 lights;
- Fault timer 6DL2 is bypassed;
- Fault relay 6K4 is disabled;
- Fault indicator light 6DS2 is disabled.

b. "ON" MODE CHECKOUT (Retrofit purge units only.)

Turn purge control switch 6S3 to ON position:

- Purge condensing unit 3B5 starts;
- Purge condensing unit RUN light 6DS1 lights.

Turn purge control switch 6S3 to OFF position:

- Purge condensing unit 3B5 stops;
- Purge condensing unit RUN light 6DS1 goes off.

Turn purge control switch 6S3 to AUTO position.

5. TEMPERATURE SWITCH 3S15 FUNCTION TEST.

a. Disconnect the temporary 1/4-inch line installed during setup to vent the purge tank to outside atmosphere. Replace the 1/4-inch copper line between the pumpout compressor (3B6) and isolation solenoid valve 3L3.

Reconnect the line that vents the pump-out compressor discharge to the rupture disc vent line at the pump-out compressor outlet.

b. Turn CTV RUN signal test switch (installed during setup procedure) ON:

- Purge condensing unit 3B5 starts;
- Purge condensing unit RUN light 6DS1 lights.

When temperature switch 3S15 contacts close due to the falling suction temperature, pump-out is activated:

- Isolation solenoids 3L1 and 3L3 energize;
- Pump-out compressor 3B6 starts;
- Minute-meter 6M1 starts.

c. Manually open the shutoff valves on both the purge tank inlet (suction) line and the liquid return line.

Pump-out continues until temperature switch 3S15 contacts open. This occurs when most of the air has been pumped out of the purge tank and purge condensing unit suction temperature rises as refrigerant vapor enters the purge tank. When 3S15 contacts open:

- Isolation solenoids 3L1 and 3L3 de-energize;
- Pump-out compressor 3B6 stops;
- Minute-meter 6M1 stops.

The air that was introduced into the purge tank during the test procedure has been removed.

6. Turn CTV RUN signal test switch (installed during setup procedure) to OFF position.

Note: This simulates a CTV OFF signal. Purge unit operation will stop at this time:

- Run relay 6K5 de-energizes.
- Purge condensing unit 3B5 stops;
- Purge condensing unit RUN light 6DS1 goes off.

7. On retrofit (field-installed) purges, turn purge control switch 6S3 to OFF.

– No change.

Post-Test Procedure

1. Again, remove the purge power fuse located in the chiller control panel.

a. Confirm that there is no power between:

- 6TB1-1 to 6TB1-3, and;
- 6TB1-2 to 6TB1-3;

b. Enable the "Remote Fault Indication" circuit, if used.

2. Disconnect the test switch between terminals 6TB1-1 and 6TB1-2 in the purge control panel that was used to simulate a chiller RUN signal during testing.

3. Confirm that there is no power at the RUN signal lead. Reconnect this lead (connects chiller control panel to 6TB1-2).

4. Reset fault timer 6DL2 time setting to proper setting.

5. Replace the purge power fuse located in the chiller control panel.

6. Check flare connections for tightness on the 1/4-inch copper line between the pump-out compressor (3B6) and isolation solenoid valve 3L3.

All test procedures are complete and the chiller is ready to be restarted and/or purged as needed.