TRANE™

Operation Maintenance

PRG-OM-5

Library	Service Literature
Product Section	Refrigeration
Product	Centrifugal Liquid Chiller, Water-Cooled
Model	PRGC
Literature Type	Operation/Maintenance
Sequence	5
Date	October 1993
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Supersedes	

Trane "Purifier" Purge

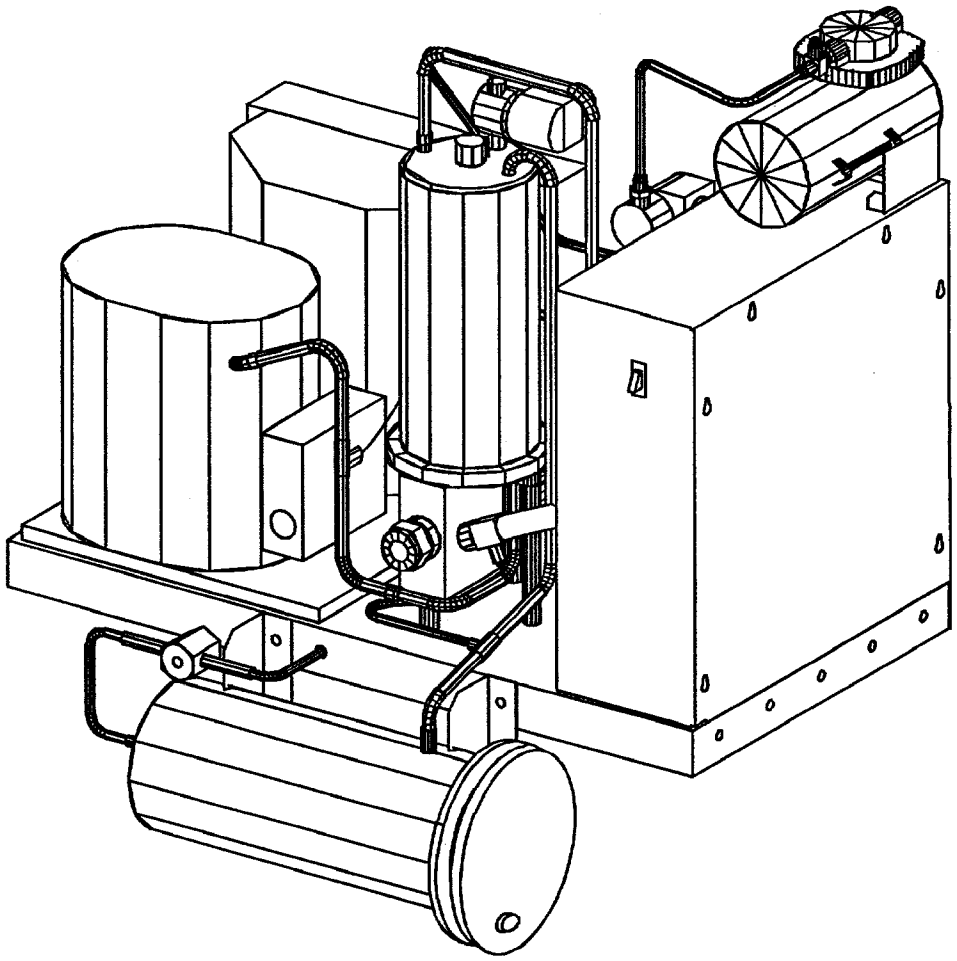

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Table of Contents

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 Output Rating
120 VAC, 1 Amp

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 1/2" high x 24 3/4" wide x 18 3/4" deep, with filter-drier canister installed.

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	C	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
C = Third Generation

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

Digit 6
Digit Not Used

Digit 7
Human Interface Type
0 = UCP2 Based Display
1 = Purge Based Display

Digit 8
Electrical Characteristics
1 = 115/60/1, 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

About this Manual

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

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 Model PRGA 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
- Update Troubleshooting chart

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

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

PRG-OM-5 (July 1993)
Manual revised to:

- Model PRGC
- Incorporate UCP2 microprocessor control with adaptive operating mode and improved diagnostic capability
- Incorporate tank float switch

PRG-OM-5 (October 1993)
Manual revised to:

- Clarification of existing information.

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

The nameplate is located on the control panel. 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
Typical Purge Nameplate

TRANE

ORDER NO:
MODEL NO: PRGCA011AA0A
SERIAL NO:
RATED VOLTAGE: 110/50/1,115/60/1
TOTAL UNIT AMPS: 8 AMPS
MIN CKT AMPACITY: 10 AMPS
MAX OVERCURRENT
PROTECTIVE DEVICE: 15 AMPS
FACTORY CHARGED: .500 LBS OF HFC-134A
DESIGN PRESSURE: HIGH SIDE 235 PSIG
LOW SIDE 140 PSIG
UNIT SUITABLE FOR USE WITH REFRIGERANT-11 OR 123 SEE PRG-OM-5
MANUFACTURED UNDER ONE OR MORE OF THE LISTED U.S. PATENTS OWNED BY AMERICAN STANDARD INC.: 5,031,410

Operating The Purge

Introduction

The incorporation of a microprocessor into the purge control system greatly enhances the flexibility of operation of the unit. The operator may adjust various setpoints, select an operating mode, and receive information on system operating status, current and cumulative purging activity, and any active fault diagnostics via a human interface.

There are two basic types of purges covered by this manual:

- UCP2 based display purges
- Purge based display purges

The primary difference between these two types of purge units is the human interface - the device through which the purge is controlled by the operator. The human interface provides the means to adjust operating parameters and setpoints, and is the means by which the purge module reports purge unit function and performance data.

For UCP2 based display purges, the human interface is the UCP2 chiller main panel. For purge based display purges, the human interface is a separable unit which may be mounted in any convenient location on or near the chiller.

The operation of these two types of human interfaces is somewhat different. Each is described fully in the following sections. The operator should reference the section appropriate to the unit being worked on.

The following sections describe in detail the features and operation of the two versions of the purge human interface:

- UCP2 Human Interface
- Purge Based Human Interface

These two specialized sections are then followed by three general sections on the operation of the purge:

- Operating the Purge
- Purge Start-Up
- Data Logging

UCP2 Human Interface

The UCP2 chiller main control panel is the human interface providing a means of communication between the operator and the purge microprocessor. This is accomplished via a two row alphanumeric screen display. The display panel is illustrated below. The keys which will be used for purge control are indicated. The applicable screens related to the setup of purge operating parameters, the selection of operating mode, and the review of performance reports are shown in the following sections. The left column of each set illustrates the screens as they actually appear, while brief explanatory notes are given in the right column.

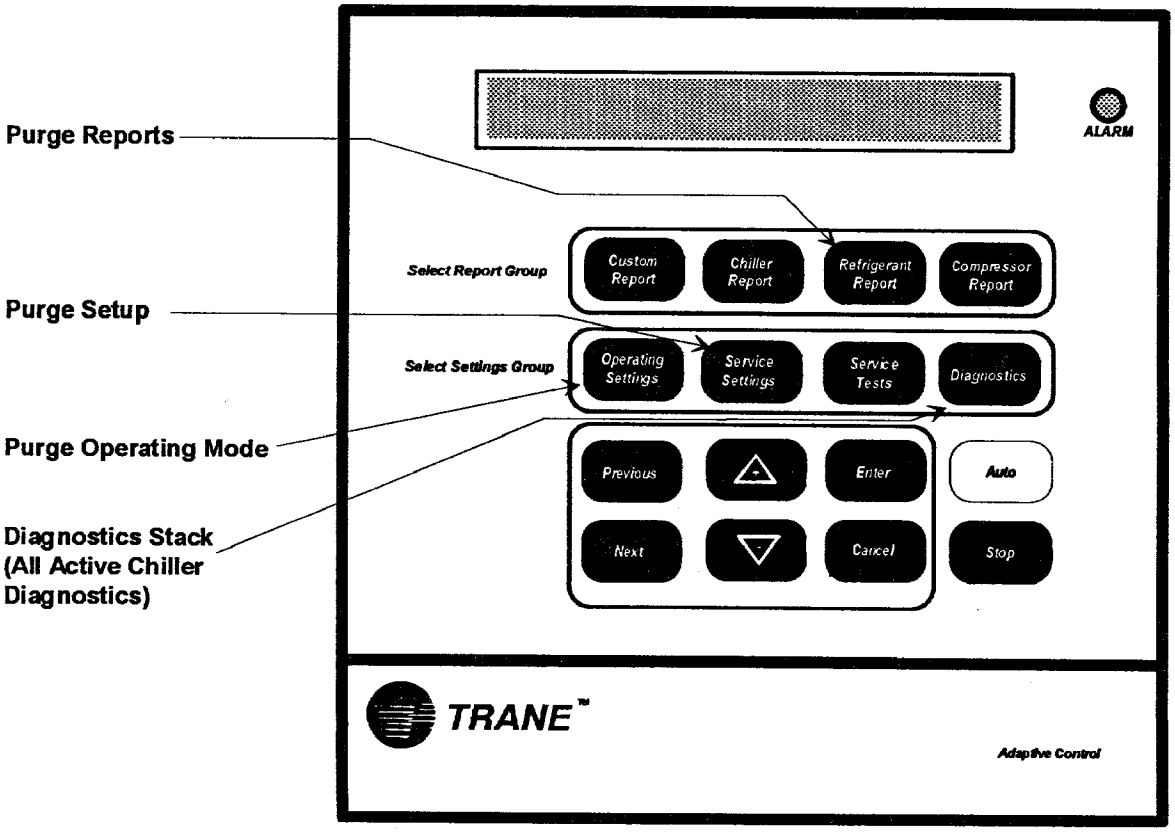
UCP2 screens for the setup, selection of operating mode, and reporting functions of the purge, while grouped together for convenience, are in reality a subset of the larger set of screens used for the control of the centrifugal water chiller. They are accessed through the UCP2 panel via the keys on that panel. The purge setup screens are accessible within the "Field Startup" group found under the "Service Settings" key on the main panel. The purge operating mode screen is accessible using the "Operator Settings" key on the main panel. The report screens may be displayed using the "Refrigerant Reports" key on the main panel. The sections entitled "Setup", "Operating Mode", and "Reports" which follow explain in detail the various required screens and how to access them.

Note: Purge based display purges utilize a different type of human interface. While functionally similar, details of its menu structure and command set are different. See the section "Purge Based Human Interface" for a detailed discussion of this interface.

The following sections describe in some detail the features and operation of the microprocessor controlled UCP2 based display purges:

- Setup
- Operating Mode
- Reports
- Restarting the Purge Following a Latching Diagnostic

UCP2 Based Display



Setup

The operator may establish the desired operating parameters of the Purifier Purge via the human interface by indicating the purge type, the desired operating mode, and various setpoint values.

For the UCP2 based display purge, operating parameter setup is accomplished by pressing the "Service Settings" key on the panel. The "Next/Previous" keys scroll down and up through all available service settings. Scroll to the "Field Startup" screen. Entering the password gains entry to the required area for establishing purge operating parameters. The password is entered by pressing the sequence (+)(+)(-)(-)(+)(+) followed by the "Enter" key. Within the field startup area the "Next/Previous" keys scroll down and up through all available field startup screens. These include the screens required for setting up the purge operating parameters. The "+/-" keys scroll through available options or increment numerical values within a given field startup screen. The "Enter" key enters the displayed value into the microprocessor.

The following sections describe purge setup in the following categories:

- Type
- Service Log Reset
- Setpoints

Type

Purge Control/Type: 01-Micropurge	01-Micropurge = standard

The current Purifier Purge type is 01-Micropurge.

Service Log Reset

A service log is provided as a convenience to the operator. This service log accumulates pumpout time and elapsed calendar days since the log was last reset. The purpose is to provide a means for the operator to track purge operation relative to any required service intervals. For example, the optional Purifier Plus requires service after a given number of elapsed pumpout minutes or a given number of elapsed calendar days. This service log provides a convenient means to monitor these parameters.

Service Log: Press (enter) to reset Purge Pumpout Time: X,XXX.X Min	Service log reset Displays current value of log
Service Log: Press (enter) to reset Time Since Last Reset: X,XXX Cal Days	Service log reset Displays current value of log

Two reset entries are available. These are:

Purge Pumpout Time

This is to reset service log cumulative pumpout time to zero. The current log value is displayed.

Time Since Last Reset

This is to reset service log cumulative calendar days to zero. The current log value is displayed.

Setpoints

The operation of the purge is constrained by specifying the following setpoints:

Purge Max Pumpout Rate: XXX.X Min/24 hrs "Press (+) (-) to Change Setting"	Range is 1 to 100 minutes Default is 20
Purge Disable Pumpout Alarm for: XX hrs "Press (+) (-) to Change Setting"	Range is 1 to 72 hrs, displays the remaining time as it counts down
Purge Low Liquid Temp Limit: enable,disa "Press (+) (-) to Change Setting"	Enable / disable for low liquid temp limit (next setpoint)
Prg Low Liquid Temp Inhibit Setpt:XX.X F "Press (+) (-) to Change Setting"	Range is 32-50 F (0-10 C). Default is 40. Will display only if enabled

Purge Maximum Pumpout Rate

The maximum allowable minutes of pumpout activity in a 24 hour period. This value may range from 1 to 100 minutes.

Purge Disable Pumpout Alarm For XX Hrs

The alarm indicating pumpout activity has exceeded the set maximum value may be disabled for a given number of hours. This setpoint may be activated if it is anticipated that a large amount of air is in the unit due to service, etc. This value may range from 1 to 72 hours.

Purge Low Liquid Temp Limit: Enable, Disable

Purge pumpout activity may be inhibited if the chiller condenser saturation temperature falls below a set value as established below. This setpoint enables or disables the low temperature inhibit. This setpoint should be enabled for chillers with a free cooling operating mode or ice storage chillers to avoid the pumpout of refrigerant when the purge is in the ON or ADAPTIVE mode.

Purge Low Liquid Temp Inhibit Setpoint

Purge pumpout activity may be inhibited when the chiller condenser saturation temperature is too low to assure effective purging. This setpoint establishes the minimum condenser saturation temperature below which pumpout activity is to be inhibited. Values of this setpoint may range from 32° F to 50° F. This setpoint becomes effective when it is enabled by the preceding setpoint.

Operating Mode

The operator may establish the desired operating mode of the Purifier Purge via the human interface.

For the UCP2 based display purge, operating mode selection is accomplished by pressing the "Operator Settings" key on the panel. The "Next/Previous" keys scroll down and up through all available operator settings. The "+/-" keys scroll through available options within a given operator setting screen. The "Enter" key enters the displayed value into the microprocessor.

Purge Operating Mode: [Mode] "Press (+) (-) to Change Setting"	[Mode] = STOP, ON, AUTO, ADAPTIVE

The purge system operating mode indicates the desired mode of operation. Available operating modes are:

Stop

The condensing unit will not run.

On

The purge system is in the normal operation state and runs continuously regardless of chiller operational status.

Auto

The purge system runs in the normal operation state when the chiller is running.

Adaptive

In this mode, purge operation is totally dependent on past purge activity.

With the chiller operating in powered cooling, the purge module will keep track of the last 30 days of chiller operation and will store the amount of pumpout time, the amount of run time for the chiller, and the number of chiller starts (0 to 15 max). Using the data for all days with more than 1/2 hour of chiller operation, the average pumpout time is computed. If the last day's pumpout time is greater than 5 times the average, the last day's pumpout activity will be used to determine the purge off cycle duration; otherwise the average will be used. The purge will start when the chiller starts, and will continue to operate until 60 consecutive minutes of operation without pumpout occur. The purge will then shut down for a period of time based on the average pumpout time.

Average pumpout with chiller running	Purge off cycle duration
< 1 minute	4 hours
1 to 3 minutes	3 hours
3 to 5 minutes	2 hours
5 to 8 minutes	1 hour
> 8 minutes	no off cycle

The purge module will store the accumulated pumpout time for the first 3-hour period during the last 5 chiller shutdowns. A time period will be calculated based on the average amount of pumpout occurring for these last 5 cycles. This time period represents the amount of chiller run time permitted before the purge will run at chiller shutdown. When this amount of chiller run time elapses, the purge will be run the next time the chiller is shut down.

Average pumpout, last 5 shutdowns	Chiller run time to next purge run at shutdown
< 2 minutes	80 hours
2 to 4 minutes	40 hours
> 4 minutes	20 hours

If it is determined that the purge is to run at chiller shutdown, the purge will start 5 minutes after the chiller shuts down. The purge will continue to run for 3 hours or until 30 consecutive minutes of run time without pumpout are recorded.

The purge module will calculate the average pumpout time for the last 30 days of extended chiller off periods. This average is used to determine an allowable number of consecutive off days that may elapse before purge operation is required.

Average pumpout during extended chiller off periods	Number of consecutive off days before the purge runs
< 1 minute	14 days
1 to 2 minutes	10 days
2 to 3 minutes	6 days
3 to 4 minutes	4 days
4 to 5 minutes	3 days
5 to 8 minutes	2 days
> 8 minutes	1 day

If it is determined that the purge is to run during a chiller off cycle, the purge will continue to run until 60 minutes of consecutive run time without pumpout are recorded.

Reports

The current and cumulative operating status of the purge is reported via the human interface. This report includes any current system diagnostics.

For the UCP2 purge, reports on status of operation, any active diagnostics, current performance data, and 30 day summary data may be viewed by pressing the "Refrigerant Report" key on the panel. The "Next/Previous" keys scroll down and up through all available chiller reports, including those on purge activity.

For the UCP2 purge, diagnostics may be reviewed and reset by pressing the "Diagnostics" key on the panel. The "Next/Previous" keys scroll down and up through all active chiller diagnostics, including those on purge activity.

The following sections describe purge reports in the following categories:

- Status of Operation
- Performance Data
- 30 Day Summary Data
- Diagnostics

Status of Operation

The purge status indicates the current operating status.

Purge Operating Mode:	Adaptive	See "Operating Mode"
Purge Status:	Running	See "Status of Operation"

Values of operating status are:

Idle

Condensing unit is off.

Running

Condensing unit is on.

Pumpout

Condensing unit is on, pumpout initiated by purge refrigerant compressor suction temperature.

Service Pumpout

Pumpout initiated by service switch (manual).

Running - Pumpout Inhibited By Low Temp

Condensing unit is on, pumpout inhibited by low condenser saturation temperature.

Pumpout Maximum Rate Disabled

Condensing unit is on, maximum pumpout rate alarm has been disabled by the operator. See PURGE DISABLE PUMPOUT ALARM FOR XX HRS in "Setpoints" under "Setup".

Performance Data

Purge Suction Temp: XXX.X F Purge Liquid Temp: XXX.X F	Purge refrigerant comp suction temp Chiller condenser saturation temp
Purge Pumpout Rate: XXX.X Min/24Hrs Purge Max Pumpout Rate: XXX.X Min/24Hrs	Current purge pumpout rate Max pumpout rate setpoint
Purge Total Pumpout Time: XX,XXX.X Min Purge Total Run Time: XX,XXX.X Hrs	Log of total accumulated pumpout and run time since installation
Purge Adapt Cycle T/Chlr On : XXX.X Hrs Time to Purge Remaining: XXX.X Hrs	Adaptive mode off-interval/time-to-run based on pumpout history
Purge Adapt Cycle T/Chlr Off: XXX.X Hrs Time to Purge Remaining: XXX.X Hrs	Adaptive mode off-interval/time-to-run based on pumpout history
Service Log: Reset log in field start up Purge Pumpout Time: X,XXX Pumpout Min	Accumulated service interval run time
Service Log: Reset log in field start up Time Since Last Reset: X,XXX Cal Days	Accumulated service interval calendar time

Current operating performance data includes:

Purge Suction Temp

The current purge refrigerant compressor suction temperature. This temperature is monitored to initiate and terminate pumpout activity. Pumpout is initiated at 18F and terminated at 22 F.

Purge Liquid Temp

The current chiller condenser saturation temperature. For UCP2 purges, this is reported from the chiller sensors. For purge based display purges, this data is acquired from an additional sensor mounted on the purge liquid return line (to the chiller condenser).

Purge Pumpout Rate

Current pumpout rate expressed in minutes of activity in a 24 hour period.

Purge Max Pumpout Rate

The current maximum allowable pumpout rate established as user entered data. When the current pumpout rate exceeds the maximum, an alarm diagnostic is generated.

Purge Total Pumpout Time

Log of accumulated pumpout activity over the life of the unit to this point.

Purge Total Run Time

Log of accumulated purge system run time over the life of the unit to this point.

Purge Adaptive Cycle Time/Chiller On

The purge off cycle time computed by the adaptive mode based on cumulative pumpout history for chiller on operating periods.

Purge Adaptive Cycle Time/Chiller Off

The purge off cycle time computed by the adaptive mode based on cumulative pumpout history for chiller on and off operating periods.

Time To Purge Remaining

The time remaining from the Purge Adaptive Cycle Time until purge activity resumes.

Service Log: Purge Pumpout Time

A cumulative log of purge pumpout time since this log was last reset. This output is provided to help the operator track desired service intervals which are dependent upon purge activity.

Service Log: Time Since Last Reset

A cumulative calendar day log since this log was last reset. This output is provided to help the operator track desired service intervals which are dependent upon elapsed time.

30 Day Summary Data

Historical data is available via the human interface for a number of variables for the previous 30 calendar days, independent of whether the chiller or purge was run. This historical data is used by the ADAPTIVE mode to adjust purge operational parameters to optimize purge performance. The operator may study this data to analyze chiller leak patterns.

30 Day Purge Pumpout Avg: XXX.X Min/Day Chiller Average Run Time: XXX.X Hrs/Day	Pumpout activity indicative of total chiller leak picture
30 Day Purge Pumpout Avg, Chiller Running: XXX.X Min/Day	Pumpout activity indicative of chiller running leaks
Last 5 Cycle Pumpout Avg, Interval From Shtdn to 3 Hrs after shtdn:XXX.X Min/Day	Pumpout activity indicative of chiller air storage during operation
30 Day Pumpout Avg, Interval From 3 Hrs after Shtdn to next start: XXX.X Min/Day	Indicative of seal, o-ring, etc leakage during chiller off periods

The summary data includes:

30 Day Purge Pumpout Average

Average pumpout activity per 24 hour period over the last 30 days.

Chiller Average Run Time

This is the summation of chiller run time in hours divided by the number of days of available data.

30 Day Purge Pumpout Avg, Chiller Running

This summary includes all pumpout data for periods when the chiller is running. Large service pumpouts are not included if they occurred more than 7 days in the past.

Last 5 Cycle Pumpout Avg, Interval From Shutdown To 3 Hours After Shutdown

Data is available for the previous 30 calendar days for pumpout data during the first 3 hours following chiller shutdown. Large service pumpouts are included. From this data, the average for the last 5 shutdown cycles is reported here.

30 Day Pumpout Avg, Interval From 3 Hours After Shutdown To Next Start

This summary includes all pumpout data for extended chiller shutdowns (beyond the 3 hour period covered above). Large service pumpouts are not included if they occurred more than 7 days in the past.

Diagnostics

Faults that occur during the operation of the purge result in the generation of a diagnostic message indicating the nature of the fault. These diagnostic messages are communicated via the human interface. Chiller operation is unaffected by purge diagnostics.

When a diagnostic is detected, the display will automatically go to the "Diagnostics" menu and the following screen will appear:

A New Warning Has Been Detected Press (Next) For More	A new diagnostic has been detected

This is a "one-time" screen that will not reappear. Pressing "Next" causes the following screen to appear:

Diagnostic Report Follows Press (Next) For More	Scroll down to review diagnostic messages

The next screen will be:

Press (Next) to Display Operating Mode at Time of Last Diagnostic	Display chiller operating mode at time of diagnostic

Pressing "Next" will display the chiller operating mode at the time the diagnostic was generated. Following that screen, all active chiller diagnostics will be displayed in order of occurrence from newest to oldest. Diagnostics are displayed on 2 screens. The first screen contains the diagnostic message itself, along with a sequence number and a brief help message. An example purge diagnostic message is:

[sn] Max Pumpout Rate Exceeded (Prg) Purge Inoperative: See Purge OM Manual	Example diagnostic/help message

The second screen for each diagnostic message contains the sequence number and a date and time stamp. The form of this screen is:

[sn] Occurred at HH:MM xm Mon xx, 199x	Example diagnostic/help message time and date stamp

Following the active diagnostics may be a series of diagnostics labelled "historic only." These are diagnostics for which corrective action has been taken and which have been cleared. A buffer containing up to 20 of these historic diagnostics is retained for reference only. All diagnostics may be cleared by a set of commands at the end of these screens. See the section "Restarting the Purge Following a Latching Diagnostic" for more information on clearing diagnostics and restoring purge operation.

Non-latching diagnostics are cleared when the fault causing the diagnostic is corrected. No reset is required.

A list of all available purge diagnostics is on the following page.

Available purge diagnostics are as follows:

Purge Cprsr Suction Temp Sensor

The purge compressor suction temperature sensor has failed, the connection has been broken, or a short has occurred in the wiring. This latching diagnostic is set on a short or open.

Chlr Sat Cond Temp Sensor (Purge)

The chiller condenser liquid temperature sensor has failed, the connection has been broken, or a short has occurred in the wiring. This diagnostic is operational only in a purge based display application, and then only if low chiller liquid temperature protection is enabled. This latching diagnostic is set on a short or open. See Table 2 for Sensor Resistance Values.

Max Pumpout Rate Exceeded-SVC (Prg)

The pumpout rate timer exceeded the maximum pumpout rate setpoint while the service pumpout switch was in the service position. This is a latching diagnostic. When this diagnostic is cleared the pumpout rate timer will be reset to zero.

Max Pumpout Rate Exceeded (Prg)

The pumpout rate timer exceeded the maximum pumpout rate setpoint while the service pumpout switch was in the auto position (normal purge operation). This is a latching diagnostic. When this diagnostic is cleared the pumpout rate timer will be reset to zero.

Purge Liquid Level Too High

The liquid level sensor indicates liquid refrigerant is filling the primary purge tank. This is a latching diagnostic. Fault on open.

Purge: Loss of Comm With Chiller

Communications with the human interface (chiller module) have been lost for 15 consecutive seconds. This is a non-latching diagnostic.

Purge: Loss of Comm With Starter

Communications with the starter module have been lost for 15 consecutive seconds. This diagnostic is active for UCP2 applications only. This is a non-latching diagnostic. The diagnostic will be cleared when communications resume.

Purge: Loss of Comm With Stepper

Communications with the stepper module have been lost for 15 consecutive seconds. This diagnostic is active for UCP2 applications only. This is a non-latching diagnostic. The diagnostic will be cleared when communications resume.

Purge Memory Error III

A shadow RAM memory error was detected. This diagnostic is active for UCP2 applications only. No setup parameters were lost. This is an informational diagnostic only. Occurrence of this diagnostic should be an isolated event. If this diagnostic occurs repeatedly, the purge module should be replaced.

Purge Memory Error Type I: NOVRAM

A NOVRAM memory error was detected. This diagnostic is active for purge based display applications only. The purge module is operating on engineering ROM default setup parameters. Check all setup parameters and continue to operate purge. Replace the purge module at the first opportunity.

Purge Memory Error Type II: Shadow RAM

A Shadow RAM memory error was detected. This diagnostic is active for purge based display applications only. No setup parameters were lost. Compressor starts and hours were lost for not more than the last 24 hours. This is an informational diagnostic only. Occurrence of this diagnostic should be an isolated event. If this diagnostic occurs repeatedly, the purge module should be replaced.

Purge Memory Error Type III

A Shadow RAM error was detected. This diagnostic is active for purge based display applications only. Setup parameter changes made within the last 24 hours were lost. Check the operating parameters and update as required. Compressor starts and hours were lost for not more than the last 24 hours. This is an informational diagnostic only. Occurrence of this diagnostic should be an isolated event. If this diagnostic occurs repeatedly, the purge module should be replaced.

Restarting the Purge Following a Latching Diagnostic

All latching diagnostics force the purge to the STOP state. An alarm relay available for use by the operator is activated. The purge may only be restarted by clearing these latching diagnostics after appropriate corrective action has been taken.

Latching diagnostics are cleared by a command from the human interface in the "Diagnostics" area. See the illustration of the UCP2 Based Display on page 6.

If any active purge diagnostics are present, the following screen will appear at the end of the "Diagnostics" section below all active and historic diagnostic messages:

Press (Enter) to Clear Purge Diagnostics	Message to clear active purge diagnostics

Pressing "Enter" at this point will clear active purge diagnostics, and the following screen will be displayed for 4 seconds:

Purge Diagnostics Have Been Cleared Diagnostic Report is Being Reset	Message stating diagnostic reset has occurred

Following this display, the purge will restart automatically.

Note: Do not press "Enter" when the following screen is displayed:

Press (Enter) to Clr Active Diagnostics and Shutdown / Reset System	Chiller reset. **Do not use to clear purge diagnostics**

Pressing "Enter" at this point will shut down the chiller and reset all system operating parameters.

Continue to scroll down until the screen specifically intended to clear purge diagnostics is encountered.

Purge Based Human Interface

Purifier Purge units supplied as purge based display purges have a different human interface than UCP2 based display purges on Trane CenTraVac chillers.

UCP2 based display purges have access to the chiller main panel for input and report screen display. In general, purge based display purges will not have a compatible main panel display available. For this reason, purge based display purges are supplied with their own interface. The interface ships attached to the microprocessor panel as shown in Figure 4, but may be easily separated and mounted in any convenient location on or near the chiller.

There are two primary differences between the UCP2 human interface and the purge based human interface:

1. Because of a smaller screen display area, the messages outlined in the preceding sections "Setup" and "Reports" are somewhat abbreviated for display on the purge based human interface.
2. Because the purge based human interface is a free-standing unit not linked to the main chiller panel, its function is wholly dedicated to control and operation of the purge. Since the screens do not form a subset of a larger group of screens, the menu structure is simpler and more direct.

The following sections explain the menu concept and slightly modified command set of the purge based human interface.

Display Overview

The purge based human interface contains 8 keys and a 2 x 16 character display on the front panel. A display backlight will illuminate when the display keys are pressed. The information displayed on the purge based human interface is constantly updated from the purge control module inside the purge control box.

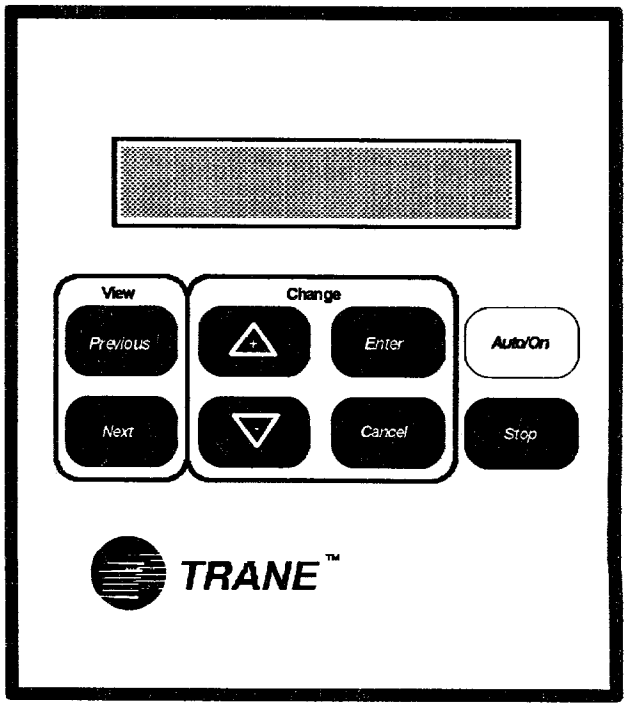
The keys on the human interface are functionally grouped to start and stop the purge, "change" the purge setpoints, and "view" the contents of the purge menus.

- The "view" keys include the <Next> and <Previous> keys. These keys will display the next or previous menu entry.

- The "change" keys include a <+> and <-> key to change the operator setpoints in the SETTINGS report and an <Enter> and <Cancel> key to either accept or reject the changed setting.

- The <Stop> key is used to stop the purge. The <Auto/On> key is used to return the purge to an active state after the stop key is pressed. The <Auto/On> key will place the purge into the mode set up in the SETTINGS report for "Purge Control Mode".

Purge Based Display



Menu Overview

The purge based human interface uses a major menu structure with entry points into side menus (see the following chart entitled "Purge Based Human Interface Menu Structure"). The <NEXT>, <PREVIOUS> keys are used to navigate vertically through the menus. If the side menus are not accessed, only the major menu entries are displayed (those shown on the left column of the chart entitled "Purge Based Human Interface Menu Structure"). The side menus are accessed by pressing the <ENTER> key at the entry points into the side reports. Once a side menu is accessed, the <NEXT>, <PREVIOUS> keys are used to navigate vertically through the screens. The <NEXT>, <PREVIOUS> keys will return to the major menu loop once the side menu is exhausted.

A brief description is given in the chart for each menu entry. Additional explanation may be found in the UCP2 human interface section.

Alarm Messages

If an alarm is active, an alarm message will display alternately with the alarm heading. The list of alarm messages that may be displayed for the purge based human interface are:

> Suction Temp Sensor Fail
> Liquid Temp Sensor Fail
> Liquid Level Too High
> NOVRAM Error 1
> NOVRAM Error 2
> NOVRAM Error 3
> Lost Communication
> Max Pumpout Rate Exceeded
> Max Pumpout Rate Exceeded - Service

A further explanation of these alarm diagnostics may be found in the "Diagnostics" section for the UCP2 human interface.

As indicated in the above referenced section, some diagnostics are latching, that is, they force the purge to the STOP state, and some are non-latching. Non-latching diagnostics are cleared when the fault causing the diagnostic is corrected. No reset is required, and purge operation resumes automatically. Latching diagnostics are cleared by pressing the <+> key after appropriate corrective action has been taken. The purge will then restart.

Status Messages

Valid status messages for the purge based human interface are:

> IDLE - Condensing unit is off
> RUNNING - Condensing unit is on
> PUMPOUT - Temperature initiated pumpout is active
> SVC-PUMP - Pumpout initiated by the service switch
> LOW TEMP - Pumpout inhibited by a low liquid temperature
> SVC-OVRD - Max pumpout rate alarm is disabled

A further explanation of the status displays may be found in the "Status of Operation" section for the UCP2 human interface.

Default Displays

After 20 minutes of inactivity a default screen is displayed. The default screen consists of either an alternating status display or an alternating alarm display if an alarm is currently active. The alternating status display consists of the Mode/Status screen and the Last 24 hour pumpout rate screen. The alarm display consists of an alarm screen and an alarm message. The backlight will flash when the alarm screen is displayed and an alarm is active.

Operating The Purge (Continued)
Purge Based Display

Purge Based Human Interface Menu Structure

Major Menu	Side Menus	Description/Ranges
Mode: ADAPTIVE Status: RUNNING		Purge operating mode [STOP, ON, AUTO, ADAPT] Purge Status See "STATUS MESSAGES"
Last 24 Hr Pump Rate: XXXX.X Min		Current purge pumpout rate for the last 24 hours
**** ALARM! **** Press + to Reset		Alarm status - Backlight will flash when in alarm (See "ALARM MESSAGES"
1 TEMP Report <Enter> to View		Entry point into the **TEMPERATURE** Report
	Prg SUCTION Temp = XXX.X F	Purge refrigerant compressor suction temperature
	Prg LIQUID Temp = XXX.X F	System refrigerant liquid temperature returned to the chiller from the purge
2 RUNTIME Report <Enter> to View		Entry point into the **RUNTIME** Report
	PUMP Time Last 24 hr=XXXX.X min	Current purge pumpout rate for the last 24 hours
	PUMP Time Total = XXXXX.X min	Log of total purge pumpout time since installation
	PURGE Run Time Ttl= XXXXX.X hrs	Log of total purge run time since installation
	ADAPT Cycle Time w/CHLR ON= XXhrs	Adaptive mode "off-interval" - for use when chiller is running (varies from 0 to 4 hrs).
	ADAPT Cycle Time w/CHLR OFF=xxxhr	Adaptive mode "off-interval" - for use when chiller is off (varies from 1 to 14 days, displayed in hours).
	Time until Purge Runs: =XXX.X hrs	Amount of time left on the adaptive cycle timer until the purge runs
	LOG <+> to Reset XXXXmin XXXXdays	Service log - accumulated pumpout time and calendar days since the log was last reset.
3 30 Day Report <Enter> to View		Entry point into the **30 DAY** Report
	Avg 30 Day Pump = XXXX.X min/day	Last 30 day pumpout activity - indicative of total chiller leak picture
	Avg 30 Day Chlr Run=XX.X hrs/day	Last 30 day chiller run activity
	Avg Pmp;CHLR RUN = XXXX.X min/day	Last 30 day pumpout activity while the chiller was running - indicative of chiller low side leakage
	Avg Pmp;CHLR OFF = XXXX.X min/day	Last 30 day pumpout activity while the chiller was off - indicative of low and high side leakage
	Avg Pmp;CHLR DWN =XXX.Xmin/Shtdwn	Pumpout activity during 3 hours after chiller shutdown - indicative of air storage during operation
4 SETTINGS Reprt <Enter> to View		Entry point into the **SETTINGS** Report
	Purge Control Mode = ADAPTIVE	Operator entry to select purge operational mode. Mode may be set to [ON, AUTO, ADAPTIVE]
	Max Pump Rate = XXX min/24 hr	Operator entry for 24 hour maximum pumpout. Range from 1 to 100 minutes, Default is 20 min.
	Disable Pump Alarm for XX hrs	Max pumpout rate override. Range is from 0 to 72 hours. Display will count down as time elapses.
	Low Liquid Temp Protect= DISABLE	Enable / disable for low liquid temp limit (next setpoint)
	Low Liquid Temp Limit = XX F	Pumpout is disabled when liquid temperature falls below this setting (range is 32 to 50 F when enabled).
	Display Units = ENGLISH	Select units display "English" or "SI".
	Language Setting ENGLISH	Select language (entries are - English = Standard
	Prg Control/Type 01-Micropurge	01-Micropurge = standard

Operating the Purge

The basic purpose of the Purifier Purge is to remove non-condensibles from the chiller. The available ADAPTIVE mode allows this to be accomplished in the most efficient manner. The AUTO and ON modes are available to allow alternate operating modes better suited to certain applications and in chiller service environments.

The ability to monitor current and historical purge activity via the purge reports allows the operator to monitor chiller leakage, resulting in an effective means to protect the chiller's refrigerant charge.

Purge pumpout minutes are used to :

- Allow the operator to determine and set appropriate PURGE MAXIMUM PUMPOUT RATE setting
- Allow the ADAPTIVE mode to determine the most effective pumpout schedule for the individual chiller
- Determine if the chiller leak rate has increased

The microprocessor monitors the pumpout activity of the purge system and alerts the operator if an unexpectedly high level of activity is present by shutting down the purge via a diagnostic.

The pumpout 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 PURGE MAXIMUM PUMPOUT RATE setting as specified at the purge human interface, a purge latching fault is generated and the purge is disabled. The 24 hour buffer is cleared and the purge is allowed to resume operation after the operator clears the MAX PUMPOUT RATE EXCEEDED diagnostic. The PURGE MAXIMUM PUMPOUT RATE setting is selectable at the human interface. The selectable range is from 1 to 100 minutes per 24 hours. The factory setting is 20 minutes. Since individual chillers operate at differing temperature conditions, run schedules, and air-leak rates, the chiller operator may need to set a rate more appropriate for his particular system.

At initial startup, the operator should log the purge pumpout activity to develop a short history for his machine. After gathering this pumpout data, the operator should set a PURGE MAXIMUM PUMPOUT RATE that will protect the chiller from any sudden increases of pumpout activity but will not result in nuisance trips under what is normal pumpout activity for his machine.

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

The MAX PUMPOUT RATE EXCEEDED diagnostic may be disabled when known large quantities of air must be removed from the chiller (such as after major chiller servicing). The PURGE DISABLE PUMPOUT ALARM FOR XX HRS setting is programmable from the purge human interface. The disable interval may be selected from 1 to 72 hours. The remaining time for the disable mode may be determined by monitoring the human interface. The displayed interval will decrease as time elapses. The set point for the disable mode may be modified at any time by modifying the disable time and entering the new value.

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

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 "Filter-Drier Core Replacement" in "Service Procedures" section.

Note: The drier cores adsorb 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 Pumpout and Fault Check" as described in the "Service Procedures" section.

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

5. Program the purge control mode to AUTO or ADAPTIVE for normal operation.

6. Check maximum pumpout rate setting. Factory setting is 20 minutes/24 hours. Adjust setting as needed later, based on purge system pumpout requirements.

7. If there is an excessive amount of air in the chiller:

a. Temporarily bypass the pumpout restrictor (see "Bypassing Pumpout Restrictor")

b. Program the PURGE DISABLE PUMPOUT ALARM for 24 hours.

Data Logging

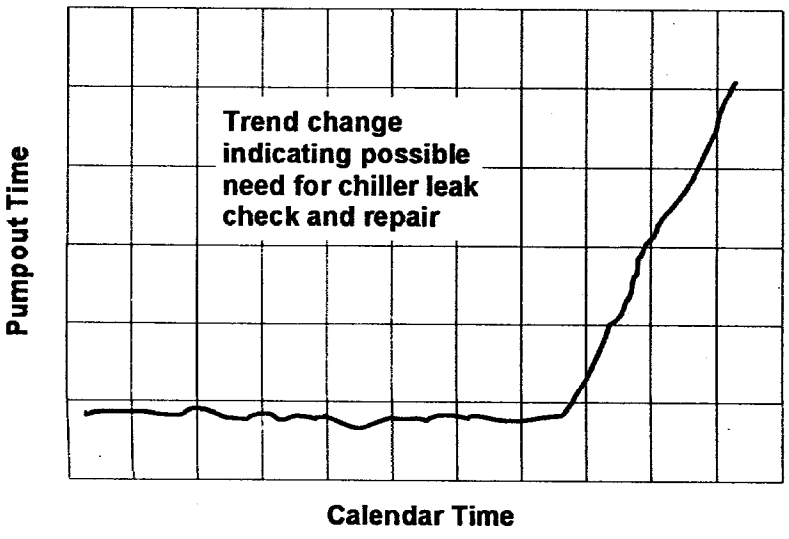
One of the most valuable features of the microprocessor based purge is the ability to use stored purging data to monitor the condition of the chiller. It is strongly recommended that the operator maintain a log on a daily or weekly basis, recording at least the following data:

- Purge pumpout last 24 hours
- 30 Day purge pumpout average
- 30 Day purge pumpout average, chiller running
- Last 5 cycle pumpout average, interval from shutdown to three hours after shutdown
- 30 Day pumpout average, interval from three hours after shutdown to next start.

A sudden change in the trend of this data, which cannot be accounted for by a change in chiller operational patterns, may indicate the need for a chiller leak check and repair. See the example chart below.

A graphical data log will be easier to interpret than a tabular log.

PURGE DATA TREND



Purge System Overview

Introduction

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

Trane centrifugal chillers utilizing low pressure refrigerants CFC-11, CFC-113 and HCFC-123 operate 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 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, thereby reducing the chiller's efficiency and cooling capacity.

The Purifier Purge is a device mounted externally to the chiller. It consists basically of a tank, inlet and outlet valves, and a refrigeration system. The purge tank is connected to the chiller condenser by supply and return lines through which refrigerant may freely flow. The purge refrigeration system has its evaporator located inside this tank. The purge evaporator coil presents a cold condensing surface to the chiller refrigerant contained in the tank. When the purge is running, chiller condenser refrigerant is attracted to the cold surface of the purge evaporator. When the gaseous refrigerant contacts the surface of the purge evaporator it condenses into a liquid, leaving a partial vacuum behind. More condenser refrigerant vapor migrates to fill this vacuum. As the refrigerant condenses into a liquid, any non-condensibles present in the chiller are left behind to fill more and more of the space in the tank. The liquid refrigerant returns to the chiller condenser via the liquid return line. Increasing quantities of non-condensibles present in the purge tank reduce the heat transfer capability of the purge evaporator coil, and the purge compressor suction temperature decreases. This temperature is monitored to activate the pumpout compressor to remove the accumulated air. When enough air has been removed, the increasing purge refrigerant compressor suction temperature terminates the pumpout cycle.

The Purifier Purge will track the pumpout activity for a given machine 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 for PRGB and PRGC model purges installed on typical CFC-11 or HCFC-123 chillers is approximately 15 minutes per day for a one week period. This value, however, will vary widely depending on chiller size, operating conditions, and operating schedule. The purge activity for each individual chiller should be carefully monitored for an appropriate period of time (one week or more) in order to establish a baseline value for PURGE MAXIMUM PUMPOUT RATE appropriate for that individual installation. The PURGE MAXIMUM PUMPOUT RATE should be set high enough to avoid nuisance trips, but low enough to trigger an alarm diagnostic should the pumpout rate suddenly increase. The "Troubleshooting" section and the chiller purge history should be carefully reviewed before a decision is made to shut down the chiller for leak testing and repair.

Purifier Purge Subsystems

From a functional standpoint, the purge system can be divided into four subsystems of components. There are:

- Air-Cooled Condensing Unit
- Purge Tank
- Pumpout System
- Purge Control System

These four subsystems and their component parts are shown in Figure 4 and discussed in the following material.

Figure 2
Temperature/Pressure Relationship for Common Refrigerants

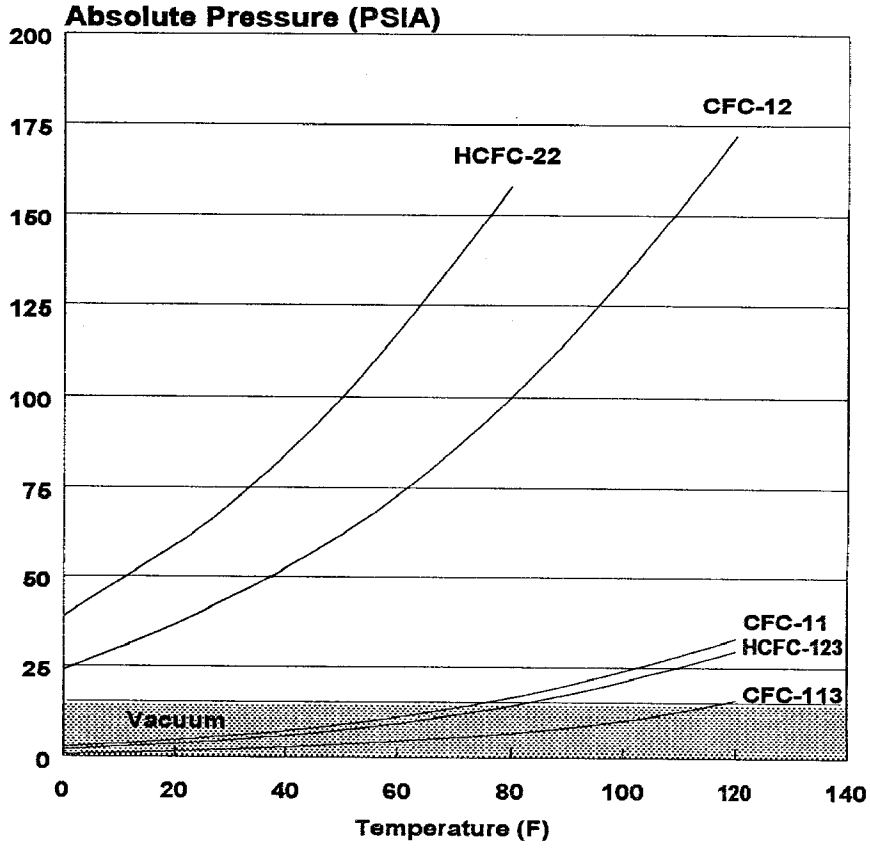


Figure 3
Low Pressure Areas of Operating CVHE Unit

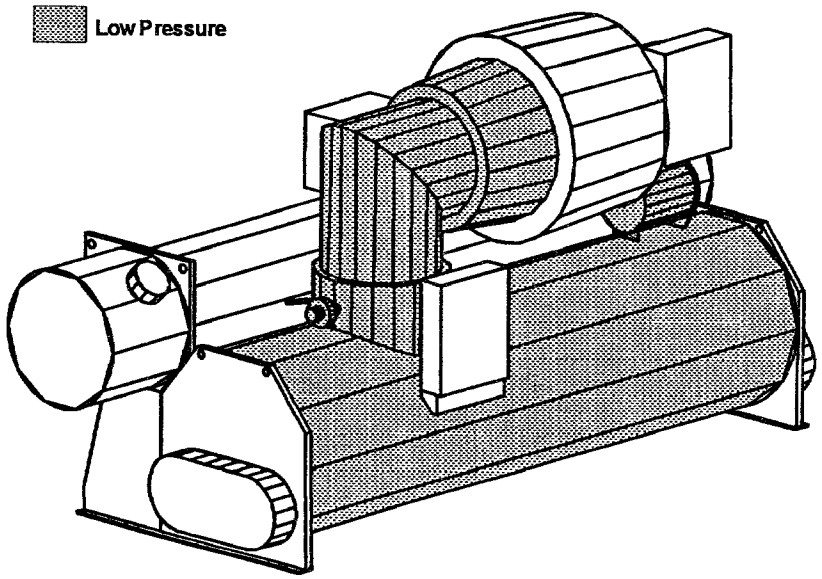
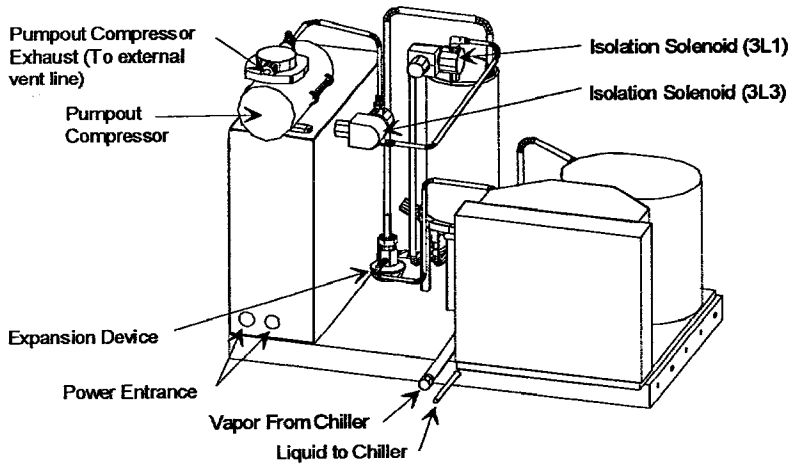
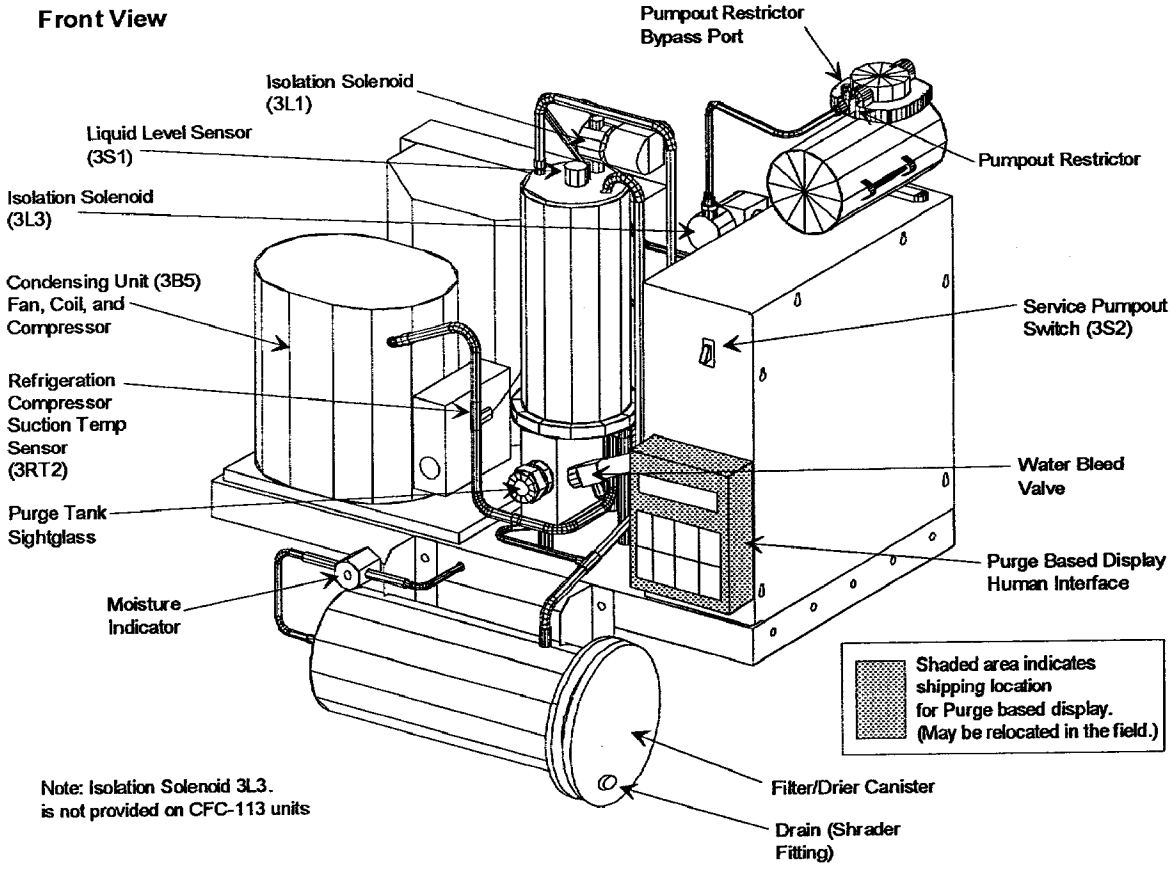


Figure 4 Purifier Purge Component Layout

Back View



Front View



Note: Isolation Solenoid 3L3. is not provided on CFC-113 units

Air-Cooled Condensing Unit

The portion of the purge that removes heat from the circulating purge 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 air-cooled condensing unit provides cooling for the purge coil (3/8-inch copper tubing coil in the purge tank). In conjunction with the purge coil, it is the cooling source that draws the refrigerant from the chiller condenser for the separation of non-condensibles.

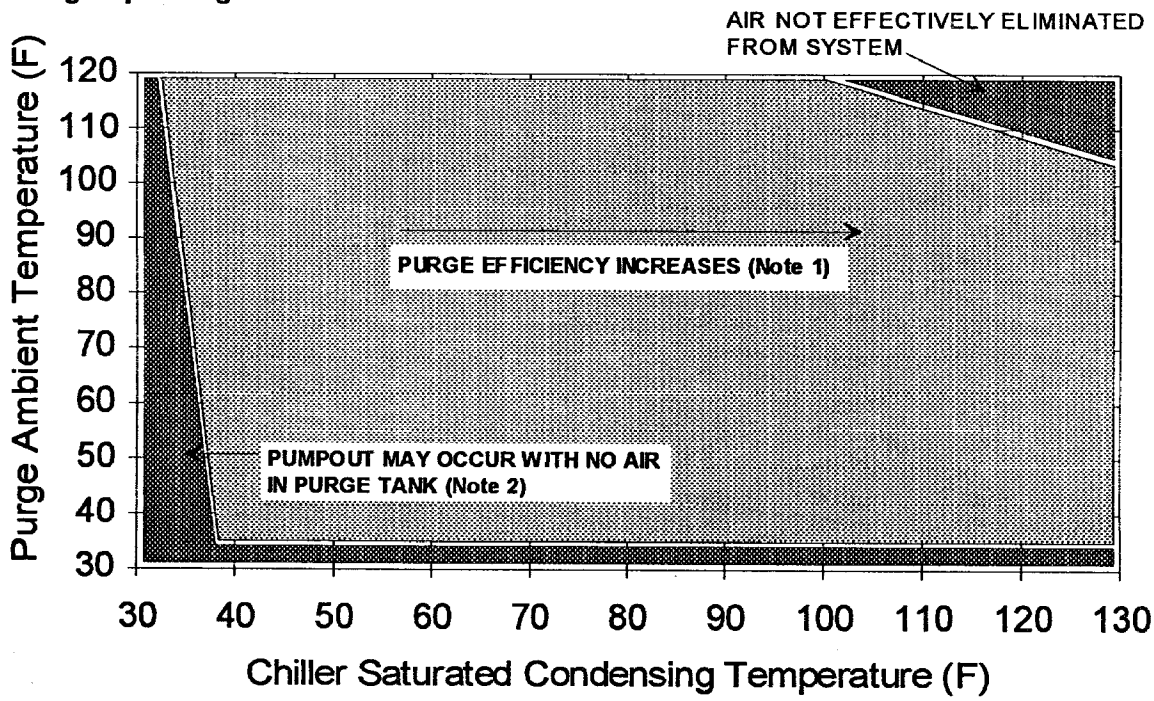
The condensing unit operates effectively over an ambient temperature range of 40°-120° F. As ambient temperature increases, condensing unit capacity decreases, reducing the rate at which the purge will remove air from the chiller (Figure 5).

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 temperature may exceed 150 F on the condensing unit. Contact with bare skin could result in burns and injuries.

Figure 5
Purifier Purge Operating Limits



Notes:
1. Lowest amount of refrigerant loss during pumpout.
2. Low Liquid Temperature Inhibit protects against 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, and a water bleed valve and air discharge port. Air and water are separated from the refrigerant vapor and accumulated in the purge tank.

Pumpout System

The pumpout system consists of a small pumpout compressor, two isolation solenoids, and a restriction device located at the pumpout compressor suction connection. When the purge control system detects the presence of air in the purge tank, the isolation solenoids are opened and the pumpout 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 pumpout compressor is compatible with both CFC-11 and HCFC-123. An alternate pumpout compressor and restrictor are available for CFC-113 applications.

Note: Trane recommends using 3/8-inch copper tubing to connect the purge pumpout compressor exhaust to the chiller rupture disc vent line. If the optional Purifier Plus is installed, 3/8-inch copper tubing should be used to connect the purge pumpout compressor exhaust to the Purifier Plus, with 3/8-inch copper tubing from the Purifier Plus to the chiller rupture disc vent line.

Purge Control System

The purge control system is comprised of a microprocessor control module mounted in the purge control box and a human interface. For purges operating with UCP2 controls, purge information is displayed on the UCP2 human interface. For purge based display installations, a separable purge display panel is provided. This purge based display human interface may be remotely mounted from the purge in any convenient operating location.

A service switch is mounted on the purge control box. This manual switch will start the pumpout system. All other control functions and data access are controlled through the purge human interface.

Purge operating controls located inside the purge control panel are:

- Microprocessor module
- Transformer
- Terminal strip

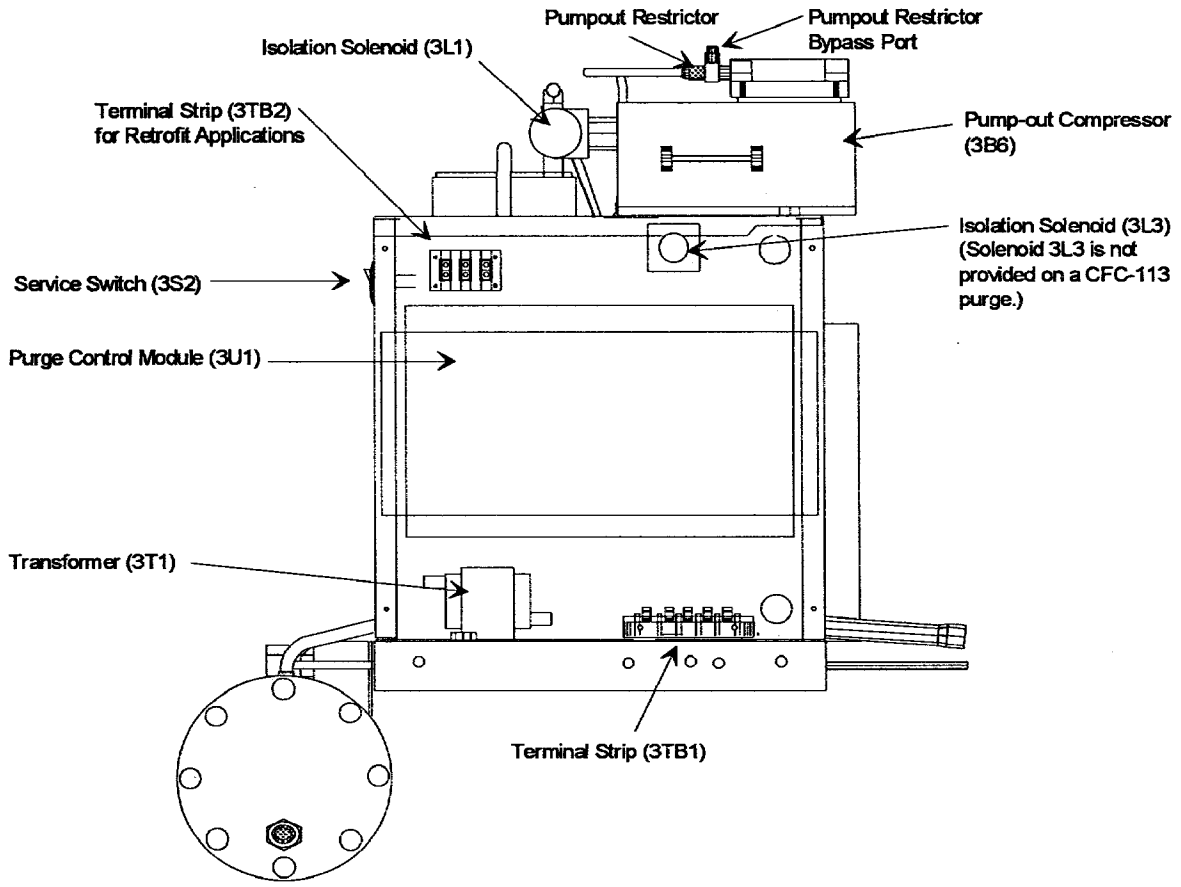
Purge operating controls not located inside the purge control panel are:

- Service switch for manual operation of pumpout system
- Isolation solenoid valves 3L1 and 3L3
- Purge based display human interface
- Float switch
- Temperature sensors

The location of these items is shown in Figures 4 and 6.

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

Figure 6
Purifier Purge Control Box Layout



Operating Principles

General

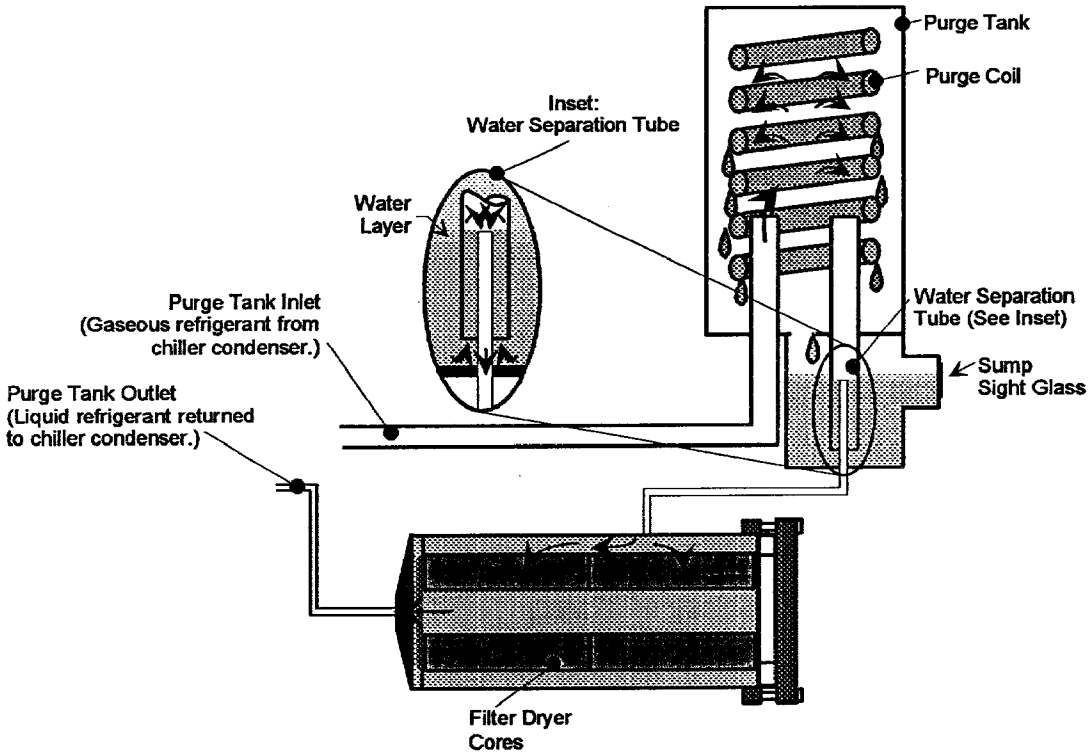
The purge is active when the purge condensing unit is powered. The condensing unit is used to condense refrigerant vapor in the purge tank. The condensing refrigerant lowers the pressure in the tank, drawing vapor from the chiller condenser. The vapor carries non-condensibles and moisture into the purge 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: Free water in the purge sump is an uncommon occurrence. It may be seen during purge start-up, if major leaks occur, or if the drier cores are saturated.

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. The purge module will initiate a pumpout cycle when the suction temperature reaches 18 F. 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 terminate the pumpout cycle.

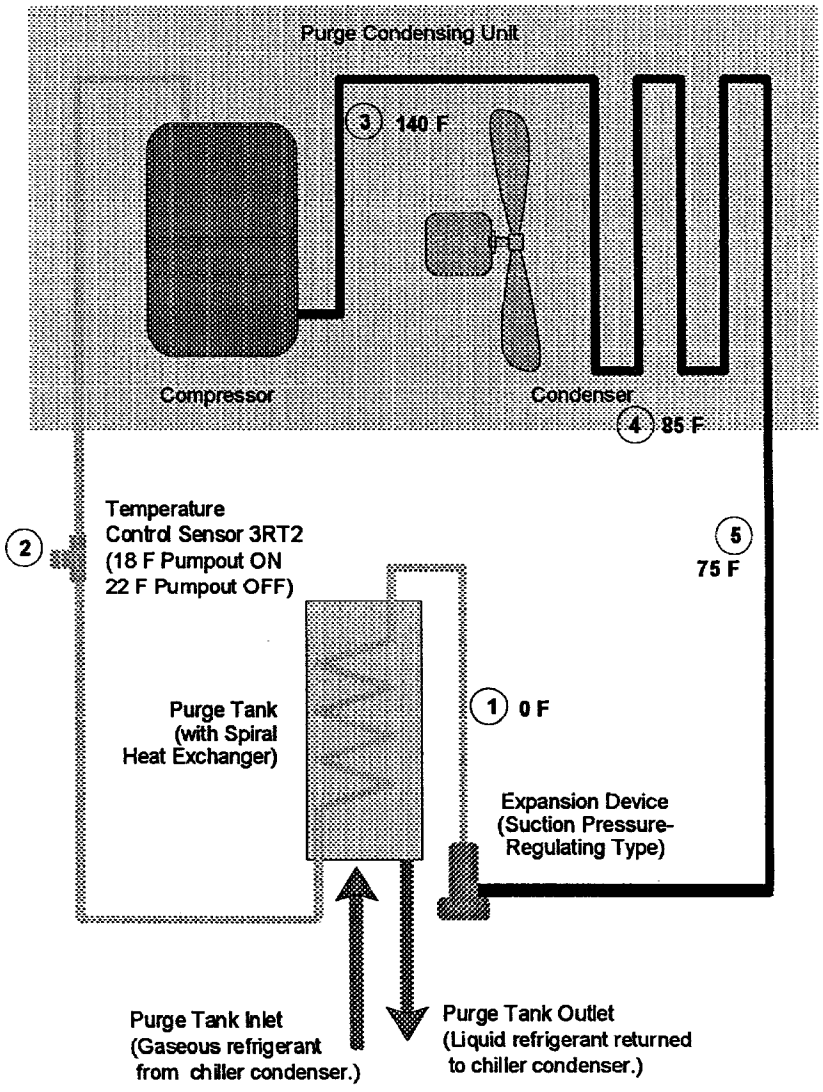


Figure 8
Purifier Purge Refrigerant Circuit Schematic

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.

In the AUTO mode, the purge will run whenever the chiller is running. Continuous purge operation (mode set to ON) is intended for use primarily during service procedures as described in "Maintenance". The ADAPTIVE operating mode will run the purge at various times when the chiller is both operational and off. The purpose of the ADAPTIVE control is:

- To limit how often the purge is run (to save energy)
- Run the purge during chiller shutdown to insure air is removed from the chiller
- Keep pumpout statistics to help diagnose chiller leak patterns.

Caution: Do not operate the purge when saturation temperatures are less than 40 F as seen when ice storage units are turned off or when a chiller is operating in free-cooling mode. The low liquid temperature setting provides automatic lockout based upon saturated condensing temperature.

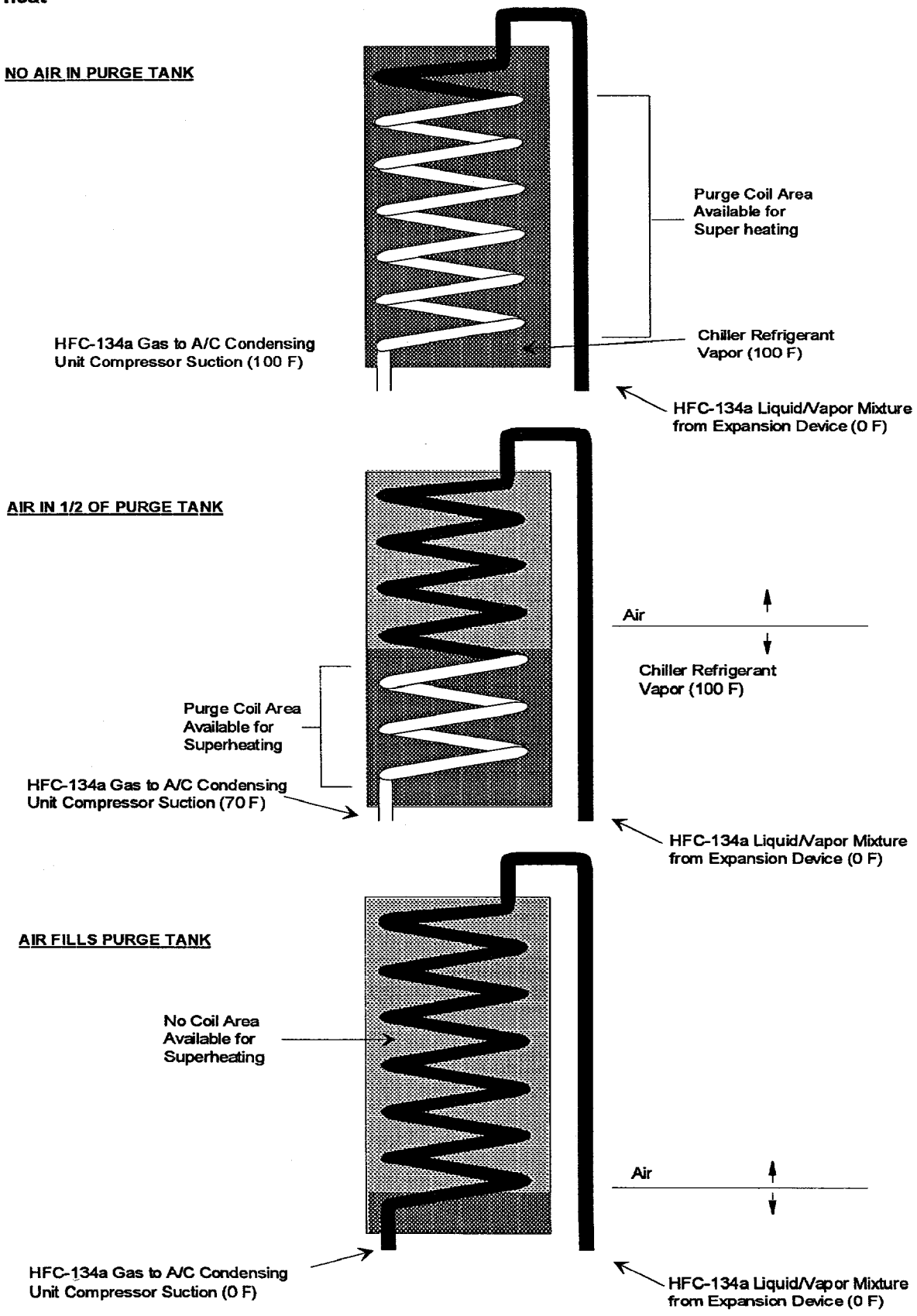
Air Removal

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 reaches 18 F, the purge control activates the isolation solenoids and the pumpout 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 pumpout system. Pumpout 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 level exceeds 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" section of this manual.

If the chiller is expected to contain excessive moisture, the Purifier Purge can be operated in the ON 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 ON 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 removed from 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.

Note: 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.

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. The nominal life of the drier cores is one year. Significant chiller tube or air leaks will shorten the drier core life.

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.

Table 1
Refrigerant Moisture Content As Determined By Moisture Indicator

Refrigerant Moisture Level	CFC-11			HCFC-123		
	75° F	100° F	125° F	75° F	100° F	125° F
Dry	Below 5	Below 10	Below 20	Below 20	Below 30	Below 35
Caution	5-15	10-30	20-50	20-50	30-80	35-100
Wet	Above 15	Above 30	Above 50	Above 50	Above 80	Above 100

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.

The following sections describe the required periodic maintenance:

- Weekly
- Semi-Annually
- Annually

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

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.

WARNING! Use caution when working on certain areas of this unit. Surface temperature may exceed 150 F on the condensing unit. Contact with bare skin could result in burns and injuries.

Weekly

1. 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 flow should 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. A lack of refrigerant flow in the drain line sight glass indicates:

- a pumpout cycle is necessary, or,
- 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, or,
- refrigerant vapor from the chiller condenser to the purge tank is restricted.

2. Check the moisture indicator on the purge liquid return line. If moist refrigerant is indicated, replace the filter-drier cores. Refer to "Filter-Drier Core Replacement" in the "Service Procedures" section.

Note: The frequent change of drier cores indicates the possibility of significant chiller tube or air leaks.

3. 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).

Note: The removal of water indicates the possibility of significant chiller tube or air leaks

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

1. Perform the purge system control check described in "Control Circuit Diagnostics" in the "Troubleshooting" section.

2. Perform "Purge Tank Checkout and Water Removal" as described in the "Service Procedures" 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.

The following sections describe the required service procedures:

- Purge Tank Checkout and Water Removal
- Filter-Drier Core Replacement
- Purge Pumpout and Fault Check
- Purge Operation After Major Chiller Repairs
- Bypassing Pumpout Restrictor

Purge Tank Checkout and Water Removal

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

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

3. 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 water bleed 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 water bleed valve. The water and a small amount of refrigerant will flow into the containment tank.

WARNING! Exceeding 15 psig can damage the unit and/or result in personal injury or death.

Note: An alternative to pressurizing the purge tank is to draw a vacuum on a suitable containment vessel and use 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 vacuum deeper than 25 inches of mercury as this will cause the water to also boil.

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. Drain the canister 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 condenser. 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. Remove the refrigerant vapor inside the canister 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 direct contact with refrigerant. Immediately after removing the 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 new cores and gaskets making sure the canister cover is installed with the drain at the bottom.

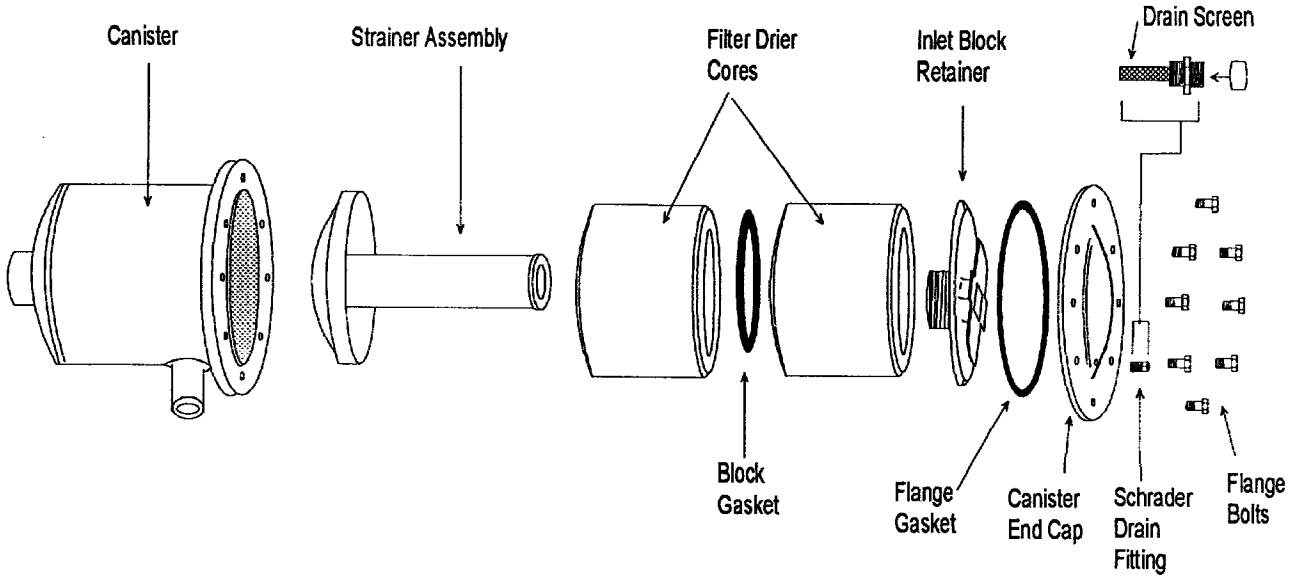
Note: The drier-cores adsorb water vapor from ambient air, so they are shipped in sealed containers. Do not open them until immediately before they are installed and sealed in the canister.

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

8. Set mode to ON and wait for the pumpout 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 Pumpout 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 pumpout compressor to remove the air again. Perform the following procedure to verify proper purge pumpout sequencing:

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

2. Disconnect the 1/4-inch line from the inlet of the pumpout compressor.

3. Record current maximum pumpout rate setting, and temporarily change maximum pumpout rate to 2 min/24 hrs.

4. Temporarily shut off power to the purge and disconnect the float switch 3S1 from the microprocessor unit 3U1. Restore power and set operating mode to ON. The condensing unit should not start.

5. Temporarily shut off power to the purge and reconnect float switch 3S1 to 3U1. Restore power. The condensing unit should start.

6. Press and hold service switch 3S2 in the MOMENTARY ON position for at least ten seconds, energizing the pumpout solenoids and pumpout compressor. The purge will draw air into the purge tank back through the isolation solenoid valves. Repeat this procedure until sufficient air is drawn into the purge tank to reduce the compressor suction temperature to 18 F as indicated on the human interface. At this point the pumpout compressor should start and run.

7. Set operating mode to STOP. Reconnect the 1/4-inch line at the inlet of the pump-out compressor. Open the shutoff valves on the purge tank inlet and liquid return lines.

8. Set operating mode to ON. Monitor compressor suction temperature. The pumpout compressor should stop when the compressor suction temperature reaches 22 F.

9. Continue to monitor pumpout time. When the total pumpout time reaches 2 minutes, the unit should display a MAX PUMPOUT RATE EXCEEDED diagnostic and stop.

10. Restore the maximum pumpout rate setting to its original value and reset the MAX PUMPOUT RATE EXCEEDED diagnostic. Set the operating mode to the desired value.

Purge Operation After Major Chiller Repairs

This section describes specific procedures that must be performed when the chiller refrigerant system has been opened to atmosphere.

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.

Go to the setup menu and set the PURGE DISABLE PUMPOUT ALARM FOR XX HRS to an appropriate value (programmable from 1 to 72 hours in 1 hour increments). Typically, 24 hours is sufficient.

This mode will allow the purge to pump-out for extended periods of time without signaling a diagnostic for excessive pump-out time. The PURGE DISABLE PUMPOUT ALARM FOR XX HRS mode will automatically de-energize after the selected time period.

The restrictor present at the inlet to the pumpout compressor may be bypassed to decrease required pumpout time. It is recommended that this be done during initial startup of the purge or chiller and whenever a service procedure may have resulted in excessive air in the unit. Refer to "Bypassing Pumpout Restrictor" in this section.

When large amounts of non-condensibles are present in the chiller, 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 pumpout compressor operates continuously will vary, depending on the initial pressure level and the quantity of non-condensibles in the chiller. Initially, the pumpout 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 pumpout compressor cycles off for the first time.

Excessive continuous pumpout may be caused by:

- Large amounts of non-condensibles in the chiller
- Leaks in the tubing between the purge tank and the pumpout compressor. Leak check tubing and bypass restrictor to remove excess air.

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 control in the purge control system will begin to cycle the pumpout 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 (purge mode ON) 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 Pumpout Restrictor

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

1. Remove the 1/4-inch line from isolation solenoid valve 3L3 to the pumpout compressor.

2. Temporarily connect a bypass hose or tube from isolation solenoid valve 3L3 to the restrictor bypass port on the pumpout compressor inlet. This is shown in Figure 4 and 6.

3. Cap the open port on the pumpout compressor inlet.

Note: This should be done for only a short period since bypassing the pumpout restrictor reduces purge separation efficiency. Ensure that reconnected 1/4-inch fittings are tight and leak free before returning purge to normal operation.

Troubleshooting Procedures

If operational difficulties are encountered, use the diagnostic chart and checkout procedures to determine the cause and correct the problem.

The following sections provide troubleshooting resources:

- Troubleshooting Chart
- Refrigerant System Diagnostic Procedure
- Control Circuit Diagnostics

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

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.

WARNING! Use caution when working on certain areas of this unit. Surface temperature may exceed 150 F on the condensing unit. Contact with bare skin could result in burns and injuries.

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
- the Solution column describes what must be done to correct the problem

Symptom	Cause	Solution
Purge diagnostic MAX PUMPOUT RATE EXCEEDED, purge not running, condensing unit IDLE (pumpout operates too long)	Air Infiltration rate into chiller too high. Excessive purging required	Leak-check chiller. Repair Leaks
	Maximum pumpout rate set too low	Determine proper value for chiller and reset. See "Setup"
	Leakage in purge interconnecting pumpout tubing	Check flare nuts for tightness. Leak-test and repair tubing
	Chiller refrigerant temperature too low (pumpout below 40 F saturation temperature is not effective)	Do not operate purge unit at or below 40 F saturated refrigerant temperature. Set the low liquid temp inhibit to ENABLE and program setpoint to a higher value
	Isolation solenoids 3L1or 3L3 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
Purge fails to pump out non-condensibles when chiller is operating	Depending on the chiller type and operating conditions, air may accumulate in the chiller condenser away from the purge gas pick-up location	Operate purge with chiller OFF. Any air in chiller will be removed if purge is functioning properly. If a large amount of air is removed, leak-test chiller and repair leaks. Consider using ADAPTIVE mode. This mode will run the purge as required when the chiller is OFF
Purge fails to pump out non-condensibles. Chiller indicates high head pressure	Pumpout restrictor clogged	Operate purge with pumpout restrictor bypassed (refer to "Bypassing Pumpout Restrictor"). Replace as indicated
	Purge condensing unit is overcharged or undercharged	Refer to "Refrigeration System Diagnostic Procedure" to evaluate purge charge level
	Purge expansion valve has failed	Refer to "Refrigeration System Diagnostic Procedure" to evaluate expansion valve performance
	Pumpout circuit fault	Run diagnostic of purge control circuit. Refer to "Control Circuit Test"
	Condenser fan has failed	Replace fan as indicated
	Condensing unit compressor motor winding temperature sensor opened (may go out on high winding temperature)	Replace temperature sensor or compressor as indicated

Troubleshooting (Continued)

Symptom	Cause	Solution
Purge unit does not run or pumpout system does not run	Control circuit problem	Run diagnostic of purge control circuit. Refer to "Control Circuit Test"
Purge continues to operate when chiller is OFF	Purge in ON or ADAPTIVE mode	ON mode should be used only for certain service procedures. ADAPTIVE is a normal operating mode
	Purge mode in the AUTO setting and the chiller RUN signal failed at high voltage	Check chiller RUN signal
Pumpout compressor operates continuously: Suction temperature is less than 18 F	Excessive air in chiller	Temporarily bypass pumpout restrictor to increase rate of non-condensible removal (refer to "Bypassing Pumpout Restrictor")
	Leakage in purge pumpout tubing	Check all connections between purge tank and pumpout compressor for leaks and repair
	Pumpout restrictor plugged	Operate purge with pumpout restrictor bypassed (refer to "Bypassing Pumpout Restrictor"). Replace restrictor tee assembly as required
Suction temperature is greater than 18 F	Suction temperature sensor has failed	Replace as required
	Purge control module has failed	Replace as required
Diagnostic PURGE LIQUID LEVEL TOO HIGH	Liquid accumulation in the 5/8" inlet gas line will cause excessive pressure drop, resulting in high liquid level in the purge tank	a. Ensure 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
	Purge liquid drain line restricted	Remove restrictions from drain line

Symptom	Cause	Solution
No refrigerant in purge tank sight glass	Liquid refrigerant may evaporate and migrate back into the chiller with the purge off	Liquid should appear within 10 minutes of continuous purge operation
Refrigerant level rises above purge tank sight glass	Restriction in the purge inlet gas line or liquid return line	a. Check for restrictions in the 5/8" purge tank inlet line and in the 1/4" liquid return line. b. Ensure that shutoff valves for these lines are fully open. c. Ensure that there are no liquid traps in these lines d. Insulate the inlet gas line
	Liquid drain line restricted	Open all valves and remove any restrictions
Free water visible in purge tank sight glass	Filter drier cores may be saturated with water	Refer to "Purge Tank Checkout and Water Removal". Drain water manually or monitor the moisture indicator. If the condition persists, replace the filter-drier cores. Refer to "Filter-Drier Core Replacement" **Note:** Multiple changes of filter drier cores may indicate need for chiller leak testing.

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.

WARNING! Use caution when working on certain areas of this unit. Surface temperature may exceed 150 F on the condensing unit. Contact with bare skin could result in burns and injuries.

The critical temperature measurements needed to diagnose the system properly are Points 1, 2, 4, and 5 as shown on the figure below. The temperature at Point 1 may be obtained by moving aside a small portion of the insulation covering the tubing. The condensing unit suction temperature, Point 2, is a part of the purge control system and may be read directly from the purge human interface. The condenser temperature, Point 4, may 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 the discharge gas inlet.

Note: Use an accurate (±1 F) temperature probe with a range of -10 F to 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 following sections describe diagnostic procedures for these elements of the refrigeration system:

- Charge Level
- Expansion Valve

Charge Level

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

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 on the figure below.

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

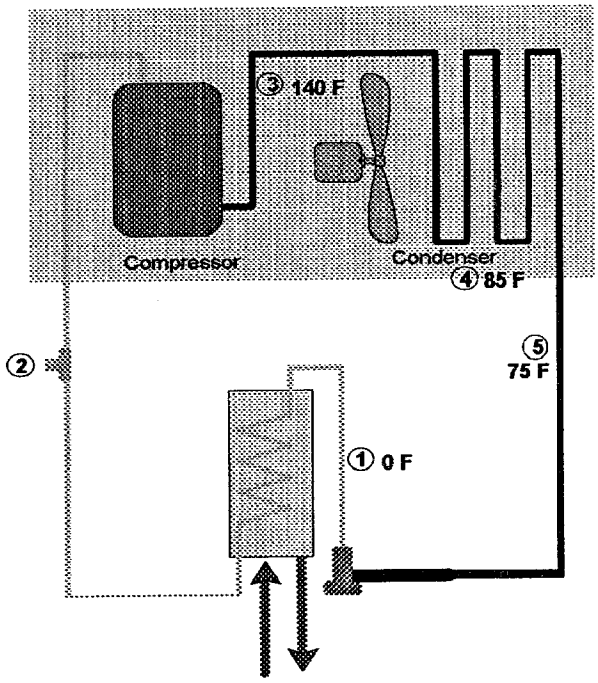
- A subcooling value of less than 5 F indicates a refrigerant undercharge and a probable leak
- A subcooling value greater than 15 F indicates a refrigerant overcharge

Expansion Valve

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 of variation in refrigerant charge.

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 on the figure below. An optimum constant temperature of 0 F should be measured at this point. However, depending upon operating conditions and or measurement error a measurement between -5 F and 10 F is acceptable.

Critical Temperature Measurement Locations



Control Circuit Test

The incorporation of a microprocessor into the purge control system integrates many functions and eliminates most of the electro-mechanical control elements found in earlier purges. It is therefore difficult to test components and functions in isolation.

This procedure uses an approach of stepping through a thorough test of the entire control system, allowing evaluation of individual components and functions along the way. Problems noted at any point will indicate required service.

Refer to Figures 11 and 12 in the "Electrical System" section.

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

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

Test procedure:

1. Record current maximum pumpout rate setting, and temporarily change maximum pumpout rate to 2 min/24 hrs.

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

3. Each time purge power is removed in this test procedure, confirm that there is no power between 3TB1-1 and 3TB1-3.

4. Remove power from J16, 1-3. This will disable the external alarm relay circuit, if used.

5. For purge based display purges, disconnect and isolate the RUN signal lead that connects the chiller control panel to J26, 1-2.

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

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

8. Disconnect the float switch 3S1 from P3B, 5-6.

9. Restore power to the purge and set operating mode to ON. The purge unit should not start.

10. Remove power from the purge and reconnect float switch 3S1 to P3B, 5-6.

11. Restore power to the purge. The purge unit should start.

Note: Successful completion of these steps verifies function of:

- float switch circuit
- microprocessor
- condensing unit

12. Press and hold service switch 3S2 in MOMENTARY ON position for approximately 10 seconds. Isolation solenoids 3L1 and 3L3 should energize, and pumpout compressor 3B6 should start. Air will be drawn into the purge tank through the open isolation valve 3L3 outlet.

13. Release service switch 3S2. It should return to OFF position. Isolation solenoids 3L1 and 3L3 should de-energize, and pumpout compressor 3B6 should stop.

Note: Successful completion of these steps verifies function of:
- service switch 3S2
- isolation solenoids 3L1,3L3
- pumpout compressor 3B6

14. Repeat Steps 12 and 13 until sufficient air is drawn into the purge tank to reduce the compressor suction temperature to 18 F. At this point, the isolation solenoids 3L1 and 3L3 should energize and pumpout compressor 3B6 should start.

15. Set operating mode to STOP. Reconnect the 1/4-inch copper line between the pumpout compressor 3B6 and isolation solenoid valve 3L3. Open the shutoff valves on the purge tank inlet and liquid return lines.

16. Set operating mode to ON. Pumpout compressor 3B6 should start. Monitor compressor suction temperature. The pumpout compressor should stop when the compressor suction temperature reaches 22 F.

Note: Successful completion of these steps verifies function of:
- microprocessor
- refrigeration compressor suction temperature sensor
- pumpout control circuit

17. Continue to monitor pumpout time. When the total pumpout time reaches 2 minutes, the unit should display a MAX PUMPOUT RATE EXCEEDED diagnostic and stop. It may be desirable to use the service switch 3S2 to hasten the accumulation of sufficient pumpout time to check this diagnostic and confirm remote fault indication relay closure at J16, 1-3.

Note: Successful completion of this step verifies function of:
- microprocessor
- remote fault relay indication

18. Restore the maximum pumpout rate setting to its original value and reset the MAX PUMPOUT RATE EXCEEDED diagnostic. Verify the remote fault indication relay has de-energized

19. For purge based display purges, complete the following steps:

a. Remove power from the purge.
b. Bring a 115 VAC power source with a momentary on switch to the RUN signal input J26, 1-2.
c. Restore power to the purge and set operating mode to AUTO. Purge should not start.
d. Press the momentary ON switch, supplying a simulated chiller RUN signal. The purge should start. Repeat several times.
e. Remove power from the purge and remove simulated RUN signal power source.

Note: Successful completion of these steps verifies function of:
- microprocessor
- run signal input

20. Remove power from the purge.

21. Enable the external alarm relay circuit, if used.

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

23. Restore power to the purge. Check to be sure all settings have been restored to their original values and all diagnostics generated by this test procedure have been reset.

24. For UCP2 based display purges, set the mode to AUTO and verify that the purge starts at the next chiller start. Following this verification, restore the mode to its desired value.

Note: Successful completion of these steps verifies function of:
- microprocessor
- condensing unit
- pumpout system
- float switch circuit

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

Electrical System

Control Components

This section identifies and explains the operation of the major systems and individual components of the Purifier Purge electrical control circuit. Refer to Figures 4, 6, 11, and 12.

The following sections cover the major systems and components of the electrical system:

- Microprocessor Module
- Pumpout System
- Service Pumpout Switch
- Chiller Liquid Refrigerant Temperature
- Liquid Level Sensor
- Isolation Solenoids

Microprocessor Module

The Purifier Purge unit is controlled by microprocessor module 3U1. The operation of the purge is coordinated with chiller operation in both a UCP2 and purge based display system. In a UCP2 module system (as installed on new Trane chillers and older chillers which have been retrofitted with UCP2 controls), data is shared with the purge module via the interprocessor communication link (IPC). This link conveys chiller operating information to the purge and purge operational parameters to the UCP2 human interface. For purge based display installations, data transfer to the purge human interface is accomplished via the IPC link. However, chiller information is gathered via an additional binary (chiller running) and analog (purge liquid temperature) input to the purge module.

Purge operating mode is selected in the menu on the human interface (see the "Operating Mode" section for more details) -

- Purge Mode set to STOP

This mode will not allow the purge condensing unit to run. This mode is accessed by pressing the STOP key on the Purge Human interface or by selecting the STOP mode on the UCP2 human interface.

- Purge Mode set to ON

The purge will run continuously. Use of the ON switch position is recommended only for certain service procedures.

- Purge Mode set to AUTO

The AUTO mode will run the purge when the chiller is running. This mode is one of the recommended purge operating modes. The AUTO position interlocks purge operation with a chiller-generated "cooling/run" signal. For UCP2 chiller systems, this signal is transmitted as data on the IPC link. On purge based display purges, this voltage signal input is located on connection point J26.

- Purge Mode set to ADAPTIVE

This mode commands the purge to run depending on the pumpout history developed over the previous 30 days of operation. This mode is explained more fully in the section "Operating Mode"

Pumpout System

The refrigerant compressor suction temperature sensor 3RT2 is used to control the pumpout cycle to remove air from the purge tank. As air and non-condensibles accumulate in the purge tank, the refrigerant compressor suction temperature falls. When this temperature reaches 18 F a pumpout cycle is initiated by energizing solenoid 3L3 and pumpout compressor 3B6 followed by solenoid valve 3L1. The pumpout cycle is terminated when the refrigerant compressor suction temperature rises to 22 F.

Service Pumpout Switch

A service pumpout switch (3S2) is provided in the purge-mounted control panel. This switch is used to manually open the solenoid valves and energize the pumpout compressor when conducting service procedures or operational checks of the purge system. The switch is a normally open momentary rocker switch, momentarily closed to initiate pumpout.

Chiller Liquid Refrigerant Temperature

The pumpout cycle may be inhibited when the chiller condenser saturation temperature is low. The input value on UCP2 control systems is condenser liquid temperature (chiller on) or evaporator refrigerant temperature (chiller off), and is transmitted to the purge module via the IPC link. For purge based display installations, the input value is provided by a temperature sensor mounted to the bottom of the filter-drier canister and connected to purge module 3U1 at connection points J3-1 and 2. The minimum allowable condenser saturation temperature for purge pumpout may be set via the human interface. The pumpout inhibit may be enabled and disabled via the human interface.

Liquid Level Sensor

A liquid level sensor (3S1) is mounted in the top of the purge tank. This sensor will generate a latching fault if the purge tank fills with liquid. This condition can arise from purge lines that are plugged or have closed valves, or a purge suction line that contains a trap which accumulates liquid.

Isolation Solenoids

The isolation solenoid valves (Figure 4) are used to control purge exhaust from the purge tank. The operation of 3L1 and 3L3 is controlled by purge module 3U1. Two pumpout 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.

External Alarm Relay

An external alarm relay is provided for operator use. This relay is activated whenever a purge latching diagnostic occurs. This relay is located in the J16 output block of the 3U1 microprocessor. See Figures 11 and 12 in the "Purifier Purge Electrical Configurations" section.

Purifier Purge Electrical Configurations

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

1. UCP2 based display purge (Figure 11)

2. Purge based display (field-installed) purge (Figure 12)

UCP2 based display purges are part of an integrated UCP2 control system. As part of an integrated control system, appropriate information is shared between the chiller modules and the purge module via a communication link. Purge based display or field-installed purge purges have a dedicated human interface and additional binary and analog input and output.

For purge based display purges mounted in inaccessible locations, the purge human interface may be remote mounted (Figure 4). The interface 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 chillers using CFC-113 do not have solenoid valve 3L3. See Figures 11 and 12.

Figure 11
UCP2 Based Display Purge - 2306-7137B

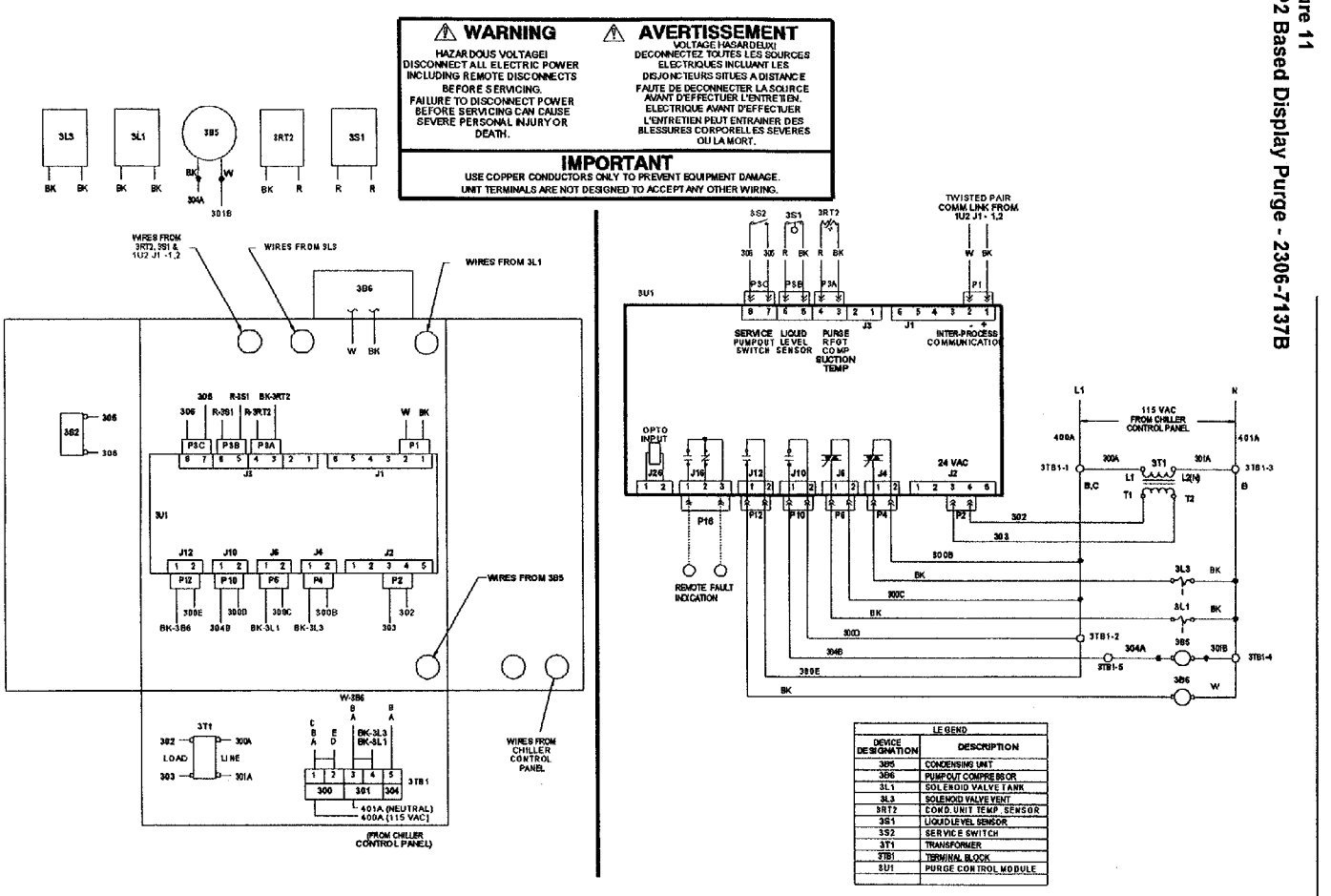


Figure 12
Purge Based Display (Field Installed) Purge

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

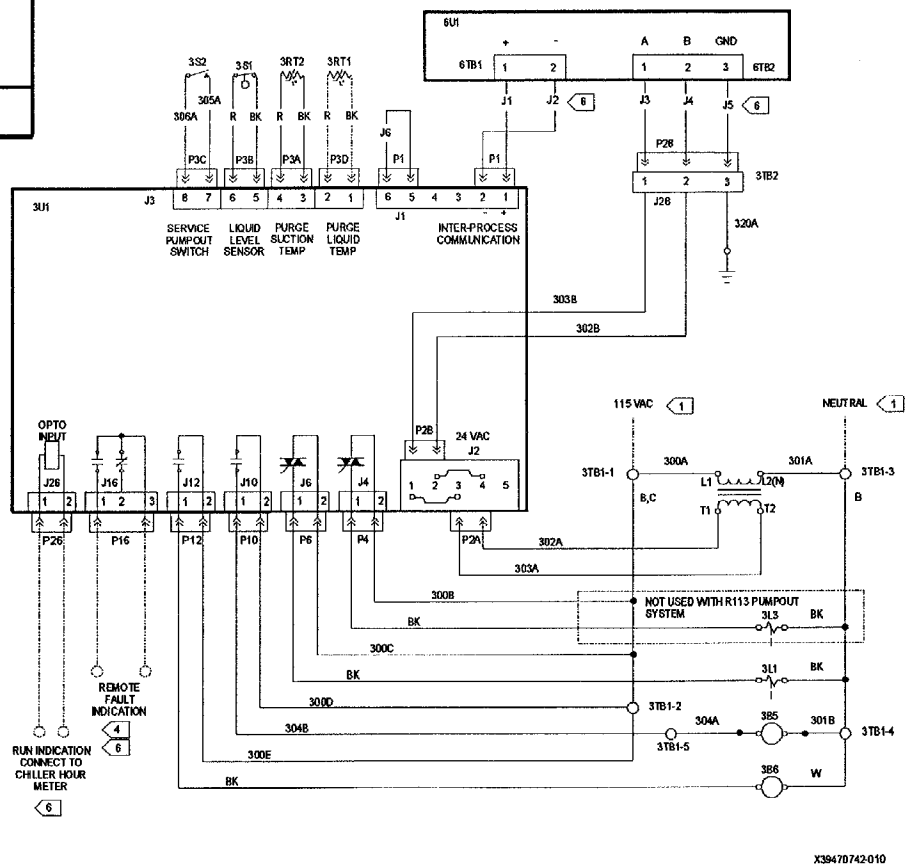
IMPORTANT
USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE.
UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT ANY OTHER WIRING.

NOTES:

1. 115 VAC #14 AWG-600V WIRE. MAX OVERCURRENT PROTECTIVE DEVICE = 16A. POWER SOURCE FOR PURGE MUST COME FROM CHILLER.
2. SOLID LINES INDICATE TRANE WIRING. DASHED LINES INDICATE FIELD WIRING.
3. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC). OTHER COUNTRIES APPLICABLE NATIONAL AND/OR LOCAL REQUIREMENTS SHALL APPLY.
4. FAULT RELAY CONTACT RATING = 120 VAC, 1 AMP.
5. FACTORY INSTALLED JUMPERS J1 THRU J6 ARE TO BE REPLACED WITH FIELD WIRING WHEN HUMAN INTERFACE 6UI IS REMOTE MOUNTED.
6. UNLESS OTHERWISE SPECIFIED ALL FIELD WIRING MUST HAVE INSULATION RATED AT 150 VOLTS MINIMUM.

LEGEND	
DEVICE DESIGNATION	DESCRIPTION
3B5	CONDENSING UNIT
3B6	PUMPOUT COMPRESSOR
3L1	SOLENOID VALVE TANK
3L3	SOLENOID VALVE VENT
3RT1	PURGE LIQUID TEMP SENSOR
3RT2	PURGE SUCTION TEMP SENSOR
3S1	LIQUID LEVEL SENSOR
3S2	SERVICE SWITCH
3T1	TRANSFORMER
3TB1	TERMINAL BLOCK
3TB2	TERMINAL BLOCK
3UI	PURGE CONTROL MODULE
6UI	HUMAN INTERFACE MODULE
6TB1	TERMINAL BLOCK
6TB2	TERMINAL BLOCK

DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
3	PURGE CONTROL PANEL
6	HUMAN INTERFACE OPT. REMOTE MTD.



Sequence of Operation

Power is supplied to hot terminal 3TB1-1.

The microprocessor 3U1 controls purge operation according to the mode set by the operator. This control includes initiation and duration of purge operation. Input is also received from the liquid level sensor 3S1 and from a device indicating chiller condenser saturation temperature. Communication with the operator is via a human interface.

Pumpout is initiated and terminated by purge compressor suction temperature sensor 3RT2. Pumpout may be manually initiated by the momentary contact service switch 3S2.

Table 2
Sensor Temperature Vs Resistance

Temperature (°F)	Resistance (Ohms)
10	63,554
20	46,725
30	34,666
40	26,074
50	19,830
60	15,229
70	11,805
80	9,231
90	7,279
100	5,785
110	4,632
120	3,735

PW