OAM Purger®

Installation, Operation & Maintenance Manual

Redi Controls, Inc.

Literature File No. 1105-05

Oil Acid & Moisture Purge Unit

for use on...

Low Pressure
Centrifugal Chillers

Model: OAM-PRG-LP100

For use with Refrigerants
R-11, R-113, R-114 & R-123

Patent Pending

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GENERAL INFORMATION

YOU ARE URGED TO READ THIS MANUAL COMPLETELY *BEFORE* INSTALLING AND/OR OPERATING THIS UNIT

Upon Receiving Your Unit

Inspect the unit for possible damage caused during shipping. **Contact Equipment Servicing before attempting to use a damaged unit.**

WARNINGS and Cautions

NOTE: WARNINGS **and** *Cautions* **appear in highlighted boxes as illustrated below at appropriate points throughout this manual. Give special attention to these items.**

WARNINGS: Provided to alert you to special situations that could result in serious personal injury, damage to your equipment, or cause your equipment not to work properly. Warnings may appear in this manual or on the equipment. Heed all Warnings.

Cautions: Designed to alert you to situations that may result in damage to your equipment.

Personal safety and the proper operation of your equipment require strict observance of these precautions.

EQUIPMENT SHOULD BE INSTALLED AND OPERATED ONLY BY QUALIFIED PERSONNEL

WARNING: Certain servicing procedures may expose you to harmful materials and dangerous conditions. To minimize the possibility of injury, follow safety procedures and instructions described in this manual, on product labels and provided in material safety data sheets.

NOTE: *The manufacturer has a continuous equipment improvement policy and reserves the right to change specifications and design of it's products without notice* **.**

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INSTALLATION

Before You Start

The **OAM Purger** is designed to remove Oil, Acid & Moisture from the refrigerant charge of low pressure Centrifugal Chillers and automatically return the oil to the Chiller's oil sump.

This section discusses the proper procedures for installing the OAM Purger.

WARNING: Installing or servicing refrigerant support equipment can be hazardous due to system pressures and dangerous voltages. Only qualified service personnel should work on such equipment.

OAM Purger Specifications

Electrical Power Requirements: 120 VAC, 50/60 Hz., 1-Phase, 15 Amp Fused Circuit
Actual current draw Approximately 4 Amps

Remote Alarm Relay (RLY) Contact Rating: 120 VAC; 15 Amp

Operating Environment: 70°F to 105°F, 5% to 80% relative humidity, non condensing

Storage Environment: 0°F to 130°F, 5% to 80% relative humidity, non condensing

Dimensions (approximate): 33" height x 12" length x 12" depth

Weight (approximate): 42 pounds

Shipping weight (approximate): 65 pounds

Operating Distillation Temperature: 145 degrees F

Operating pressures: 30" TO 15 psig

Distillation Tank Factory Pressure Tested At: 350 psig

Average Refrigerant/oil mixture in Purge Tank per distillation (varies depending upon installation and refrigerant level in Chiller): 10 to 20 lbs.

Average Rate of refrigerant/oil mixture processed (depends upon installation, refrigerant level in Chiller, and whether Chiller is Running or Off): 500 to 800 lbs. per week

NOTE: **The OAM Purger unit comes equipped with a remote alarm capability.**

Contents of the OAM Purger Installation Kit

Each "kit" includes: One Installation, Operation and Maintenance Manual.
One OAM Purger with EZ-Change Refrigerant Filter attached.
One Oil Filter/Drier.
One Liquid-line Stainless Steel Strainer.
One 3/8" charging Valve Adapter with copper ferrules and cap.
One 1/2" charging Valve Adapter with copper ferrules and cap.
Two 5/8" charging Valve Adapters with copper ferrules and cap.
One ¾" to 5/8" Reducing Flare Union (*for use with Charging Valve Adapter if necessary*).
One 5/8" to 1/2" Reducing Flare Union (*for use with Charging Valve Adapter if necessary*).
One 1/2" to 3/8" Reducing Flare Union (*for use with Charging Valve Adapter if necessary*).

One plastic tool for inserting power line into electrical terminal block.

One Brass Three-way Internal Branch Tee and Copper Ferrule.
One Check Valve for use with Option 2 optional oil removal procedure.

Two ¼" NPT to ¼" Brass Flare Fittings.
Two ¼" NPT to ¼" Brass 90 degree Flare Fittings.
Two ¼" NPT Pipe Plugs
Twelve ¼" Flare Nuts
One six feet length of 3/8" ID ¾" Line Insulation
One ten feet length of 1/8" adhesive backed Insulation Tape.
One 18" x 24"x ½" sheet of adhesive backed Insulation.

Field-Provided Items

To be furnished by the installer: OAM Purger Unit mounting hardware.
Electrical conduit and wiring materials.
1/4-inch copper refrigerant tubing.
Refrigerant cylinder (for collection of excess oil) **IF** excess oil is not initially returned directly to the Chiller's oil sump.

Preliminary Inspection

Before installing the OAM Purger, check the data on the Purger unit nameplate and verify that it is the appropriate model for the refrigerants in the Chiller it is to be installed on. Make sure the voltage is correct for the application. Visually inspect all components for damage in shipment before installing. Pay particular attention to the Temperature Sensor (TS-1) capillary tube.

OAM PURGER OPERATIONAL OVERVIEW

The Redi Controls **OAM Purger** is designed to continually remove **oil, acids and moisture** from a Chiller's refrigerant. However, it's main purpose is to remove **oil** from the refrigerant and return it to the Chiller's lubrication circuit **(oil sump)** where it belongs. This is accomplished in two phases. The first phase, or **initial oil stripping process,** occurs at initial start-up of the OAM Purger. This is when all the excess oil that has been added to the system over time is removed and discarded. Often times the initial stripping process can yield several gallons to multiple tens of gallons depending on how severely the refrigerant is saturated with oil.

The second phase begins when all **excess oil** has been removed from the refrigerant. The OAM Purger will, from that point on, maintain the system in **lubrication balance**. Lubrication balance meaning virtually **100 percent** of the compressor's lubricating oil is **kept in the oil sump where it belongs.**

Operation of the OAM Purger is accomplished by a **"Patent Pending"** process utilizing **gravity, heat and pressure** in conjunction with **special high capacity desiccants** to completely remove **oil, acids and moisture** from a Chiller's refrigerant charge.

The OAM Purger works by repeatedly extracting about **10 to 20 pounds** of oil-contaminated refrigerant for processing from the Chiller each purge cycle. The oil-contaminated refrigerant is heated by means of an electric heater and the liquid refrigerant is vaporized off. As the refrigerant vaporizes it passes through the special **E-Z Change "High Capacity" Moisture/Acid** filter-drier where it is cleaned before returning to the Chiller evaporator.

At the end of the distillation process, any **oil** remaining in the distillation tank is **automatically returned to** the Chiller's **oil sump through** a separate in-line **"High Acid Capacity" filter-drier** where any residual acids are removed.

The OAM Purger is able to maintain the Chiller in an **oil free state** because it operates continuously twenty four hours a day **whether the Chiller is running or not.** In this way the OAM Purger is able to process between **500 and 800 pounds of refrigerant per week.**

How It Works

OAM Purger operation is **cyclic** and **non-stop** as long as power is applied, it operates whether the Chiller is running or not. Each complete purge cycle comprises **four (4) operational phases** and is approximately 2 ½ to 3 1/2 hours in duration.

The Four Operational Phases:

1. **"Fill phase" (Phase 1):** Refrigerant **contaminated with oil, acid and moisture** flows by **gravity** from the Chiller's evaporator into the OAM Purger **Distillation Tank**. This is a timed phase pre-set at **75 minutes** duration at the end of which distillation **(Phase 2)** is initiated.

2. **"Primary Distillation" (Phase 2): During Phase 2, t**he **distillation heater is energized,** heats the **refrigerant-oil mixture** and causes the liquid refrigerant to be vaporized. The pressurized refrigerant vapor flows from the Distillation Tank back to the lower pressure Chiller evaporator. The refrigerant vapor is passed through a "**High Acid / Moisture Capacity" Filter-Dryer** where acids and moisture are removed before entering the evaporator.

In the process, as refrigerant is distilled from the refrigerant-oil mixture, oil accumulates at the bottom of the OAM Purger Distillation Tank. As more and more refrigerant vaporizes, the temperature of the remaining oil rises. Upon temperature rise to **145 degrees F,** Phase 3 is initiated. The average time for the Primary Distillation Phase is about 1 to 1 1/2 hours, depending upon the refrigerant level in the Distillation Tank at the conclusion of the "Fill" Phase.

3. **"Secondary Distillation" (Phase 3):** Secondary Distillation is a timed phase. During this phase, the **distilled oil** is maintained at **145 degrees F.** for an additional **45 minutes** where any **residual refrigerant** is distilled off, leaving behind virtually **pure oil.** At the end of the pre-set time period, Phase 4 is initiated.

4. **"Oil Transfer" (Phase 4):** At the conclusion of phase 3 the distilled oil is automatically transferred from the Distillation Tank to the Chiller's oil sump. The oil flows through the in-line **"High Acid Capacity" Filter** where residual acids are removed before entering the oil sump. Oil Transfer is a **6 minute** pre-set timed phase.

How the OAM Purger transfers oil to the Chiller's oil sump

During both the **Primary** and **Secondary Distillation Phases** an approximate **5 to 7 psi** pressure differential is maintained between the OAM Purger **Distillation Tank** and the **Chiller's oil sump**. This pressure differential is maintained by cycling the **Equalization Solenoid Valve (SOL-1**) open and closed via the **Pressure Differential Switch (DPS-1)**. On Distillation, tank pressure **increases to 7 psid** above Chiller oil sump pressure. **SOL-1** opens and on **decrease to 5 psid,** re-closes. Thus, there is always **sufficient pressure differential** present at the end of **Phase 3** to push the distilled oil from the Distillation Tank back to the Chiller's oil sump in Phase 4.

Operating Parameters

1. **FILL PHASE:** Fill phase is a timed function pre-set at **75 minutes.** This setting is factory programmed and **cannot be changed in the field.**

2. **PRIMARY DISTILLATION:** Primary Distillation Phase is based on **temperature** and continues as long as necessary until the **temperature** of the **distilled refrigerant / oil** mixture in the Purger Distillation Tank reaches **145 degrees F.** Because the refrigerant level in the Distillation Tank is determined by the refrigerant level in the Chiller evaporator, actual Distillation Tank level will vary from Chiller to Chiller. Therefore, the time required for the refrigerant / oil mixture to ultimately reach 145 degrees F. will vary. **Average** Primary Distillation time is approximately **1 to 1 ½ hours.**

3. **SECONDARY DISTILLATION:** Secondary Distillation Phase is a timed function pre-set at **45 minutes.** This setting is factory programmed and **cannot be changed in the field.**

4. **OIL TRANSFER PHASE:** The Oil Transfer Phase is a timed function pre-set at **6 minutes.** This setting is factory programmed and **cannot be changed in the field.**

5. **OIL TEMPERATURE:** The temperature of the distilled oil is limited to **145 degrees** F. by **Temperature Sensor (TS-1).** This setting can be calibrated in the field when necessary. However, **DO NOT change the factory setting unless calibration is absolutely necessary.** Refer to the Maintenance section for calibration instructions.

6. **DIFFERENTIAL PRESSURE:** Differential Pressure Switch **(DPS-1)** is pre-set at approximately **5 to 7 psid** This setting is factory set and **cannot** be calibrated in the field. Should DPS-1 ever get out of calibration it **MUST be replaced with a new factory calibrated switch.**

WARNING: Do Not tamper with the Differential Pressure Switch setting. Improper setting will result in OAM Purger malfunction.

7. **REFRIGERANT PROCESS CAPACITY:** The OAM Purger, on average, processes approximately **500 to 800 pounds** of refrigerant per week. Thus, each week 500 to 800 pounds of the Chiller's total refrigerant charge is processed and made progressively cleaner until **all oil**, **acids and moisture** have been removed. To completely clean the refrigerant, the Purger must **cycle the Chiller's total refrigerant charge several times.**

8. **REFRIGERANT / OIL SEPARATION EFFICIENCY:** The amount of refrigerant returned to the Chiller's oil sump along with the oil being returned at the conclusion of a complete cycle is proportionate to the level of oil concentration in the refrigerant. The higher the oil concentration, the more refrigerant will be returned with the oil to the oil sump. However, under any condition, the amount of refrigerant reaching the oil sump is insignificant. **Example** - A Chiller with a **500 pound** charge containing an average of **12% oil by weight** means that the OAM Purger will return approximately **1 Lb. of oil** and approximately an ounce or so of refrigerant to the Chiller oil sump on any given cycle. This is only during the initial clean-up period. **Once the excess oil is removed, only trace amounts of refrigerant (if any) will ever reach the oil sump.** The ounce or so of refrigerant that does reach the Chiller oil sump every 2 1/2 to 3 ½ hours during the initial clean-up period is inconsequential and will have no bearing on Chiller operation. The Chiller's oil sump heater will quickly vaporize such a miniscule amount of refrigerant long before the next oil transfer cycle occurs.

9. **POWER CONSUMPTION:** Distillation is accomplished by means of a 350 watt electric heater. However, because the heater is only energized approximately **50%** of the time **during distillation Phases 2, 3 and the oil transfer Phase 4,** power consumption is approximately that of a **200 watt light bulb.**

Operational LED Indicators

A series of **6 LED indicators** located on the upper right side of the Solid State Logic Board are provided as a means of monitoring purger operation. **(See Figure 7, page 33.)**

Purger Operation LED indicators

D1 Green LED Blinking Indicates purger is in the 75 minute ***FILL Phase 1*** and the Distillation Tank is currently being filled by gravity with refrigerant / oil mixture from the Chiller evaporator.

D2 Green LED Blinking Indicates the purging cycle has advanced to ***PRIMARY DISTILLATION Phase 2*** and is currently in the process of vaporizing off the bulk of the liquid refrigerant from the refrigerant / oil mixture.

D3 Green LED Blinking Indicates that the bulk of the liquid refrigerant has vaporized, the distilled oil temperature has risen to 145 degrees F. and, the purging cycle is now in ***SECONDARY DISTILLATION Phase 3.*** Distillation of remaining residual refrigerant will continue for an additional **45 minutes at 145 degrees F.**

D4 Green LED Blinking Indicates purging cycle is currently in ***OIL TRANSFER Phase 4.*** Oil Is currently being transferred from the OAM Purger Distillation Tank to the Chiller oil sump. Oil transfer will continue for **6 minutes** then initiate the next Fill Phase.

D5 Green LED On Solid When D5 is on solid during phases 2, 3, & 4, Indicates **Heater is on**.

Diagnostic LED indicators

When diagnosing purger problems it is helpful to be able to verify various system components for proper operation. **(See "Using Switch SW2 dip switches as diagnostic aid" page 40.)**

Fault LED indicators

The LED indicators are also used to indicate certain **Purge Fault** conditions. **(Refer to the "Trouble Shooting Section" page 41.)** The following is a description of the possible fault conditions:

D6 Red LED Blinking with D1 Green LED ON Solid: Indicates temperature of the oil in the Distillation Tank **did not drop below 145 degrees F**. within a pre-programmed time limit of **14 minutes** after initiating a **Fill Phase**. **Refer to Trouble Shooting Section page 41** for probable cause.

D6 Red LED Blinking with D2 Green LED ON Solid: Indicates temperature failed to reach **145 degrees F**. within a pre-programmed **4 hour** time limit after initiation of the **Primary Distillation Phase. Refer to Trouble Shooting Section page 41** for probable cause.

D6 Red LED Blinking with D3 Green LED ON Solid: Logic board failed to see any activations of Equalization Solenoid Valve (SOL-1) anytime during the **Distillation Phases. Refer to Trouble Shooting Section page 41** for probable cause.

D6 Red LED Blinking with D4 Green LED ON Solid: Logic board failed to see the pre-programmed **minimum 2 activations** of Equalization Solenoid Valve (SOL-1) during the **Distillation Phases. Refer to Trouble Shooting Section page 41** for probable cause.

NOTE: **When you see the** Red FAULT **light** "ON", DO NOT **immediately turn the power switch OFF.** First**, remove the cover from the control box and** observe and record which of the LED light(s) are "ON"**. This will tell you the kind of fault that has occurred. Turning the switch** OFF resets **the Logic Board,** terminating the Fault indicator**. Retain the record of the purge fault. Examine the purger for any apparent problems, and check the troubleshooting section for possible causes of the fault. If there is no readily apparent problem, reset the purger one and only one time, then allow purger to operate normally to see if the fault repeats.**

INSTALLING THE OAM PURGER

Location

There are **two critical location requirements** for proper operation of the OAM Purger:

1. The OAM Purger **must** be located within **four (4) feet** of the Chiller's refrigerant charging valve or other appropriate valve located near the bottom of the evaporator to which the liquid refrigerant **"Fill"** line is to be connected.
2. The OAM Purger **must** be mounted **directly on the floor** so the liquid refrigerant **"Fill"** inlet port is as **low as possible** relative to the refrigerant level in the evaporator**.** When the Chiller is mounted on a pad, the OAM Purger still **must sit on the floor**. The extra height of the pad provides additional liquid head to aid in gravity flow of liquid refrigerant from the Chiller to the purger. **The only exception** is when the refrigerant level in the evaporator would cause the level in the Purger Distillation Tank to exceed its maximum height of 16 inches. **(See Figures 1a and 1b page 14.)**

Mounting

The OAM Purger comes mounted on it's own integral base sufficient for proper support. Unit piping normally provides adequate support necessary to stabilize the unit. Additional support may be provided as deemed necessary. (See Figures 1a & 1b, page 14.)

The OAM Purger **MUST** be installed standing in an **upright** (vertical) position on the floor with its base as **low as possible** relative to the bottom of the Chiller evaporator, so that liquid refrigerant, when flowing by gravity from the Chiller evaporator into the OAM Purger **Distillation Tank,** is allowed to seek a level as **high as possible BUT no higher than a maximum of 16 inches.** In installations where the refrigerant level in the evaporator would cause a level in the Distillation Tank to exceed the specified maximum 16 inches, it will be necessary to adjust the height of the OAM Purger accordingly using a spacer or mounting pad of appropriate thickness. **(See Figures 1a & 1b below.)**

WARNING: If the refrigerant level in the Distillation Tank is **too *HIGH*** the Purger will not remove oil from the refrigerant. If the refrigerant level is **too *LOW (less than the minimum 1.0 inch above the inlet FILL port)*** the Purger ***may not fill properly*** causing nuisance faults.

Figure 1a. - *Mounting OAM Purger Direct on Floor*

WARNING: **entire Fill line** MUST be insulated including the refrigerant charging valve **and** all interconnecting piping **up to the evaporator shell.**

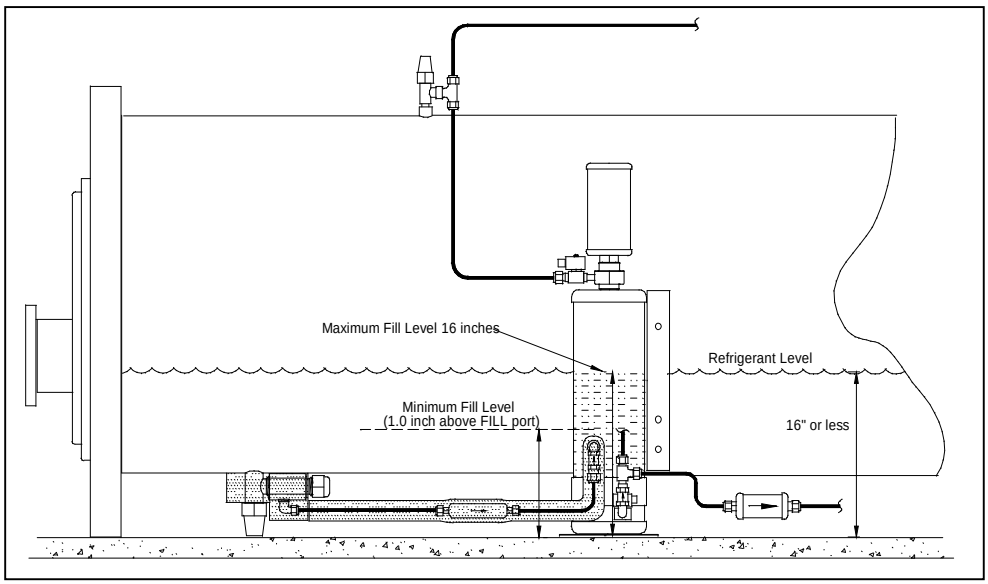


Figure 1b. - *Mounting OAM Purger on Height Adjusting Spacer*

WARNING: **entire Fill line** MUST be insulated including the refrigerant charging valve **and** all interconnecting piping **up to the evaporator shell.**

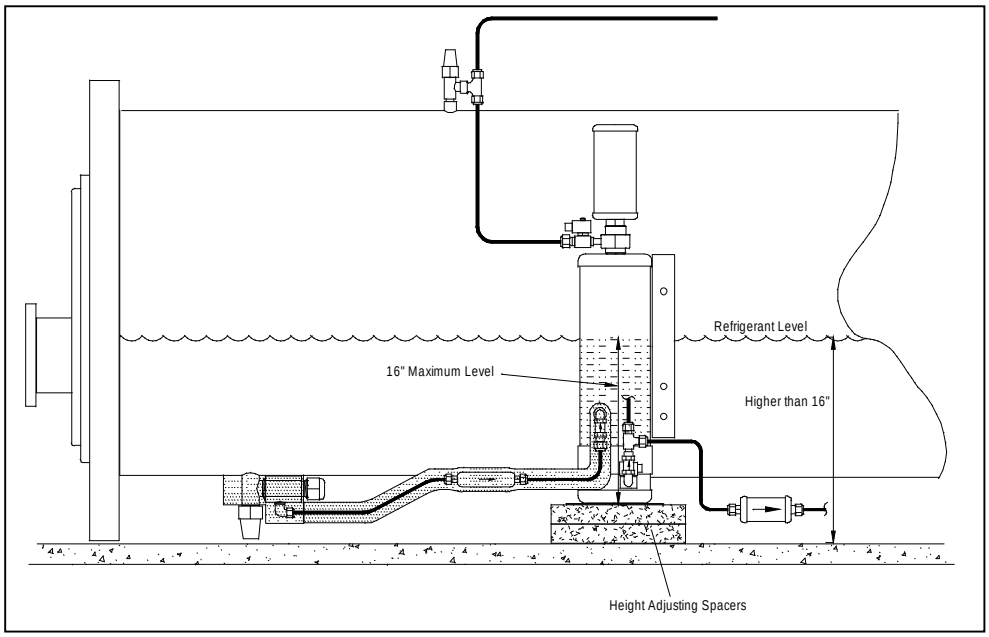
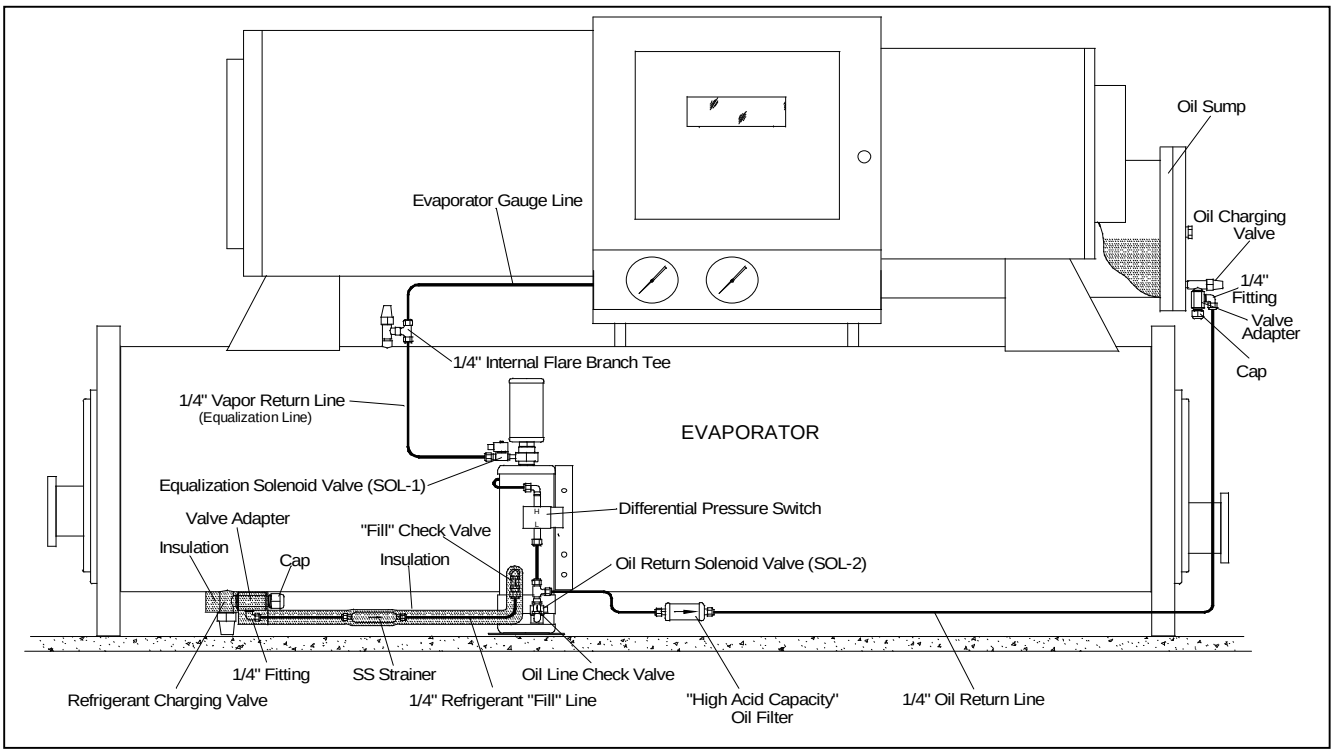


Figure 2. - **OAM Purger Hook-up**



WARNING: FILL LINE *AND* INTERCONNECTING PIPING UP TO EVAPORATOR SHELL MUST BE COMPLETELY INSULATED to avoid vapor locking, which will prevent filling.

NOTE: *DO NOT open any Chiller valves during installation.*

Plumbing the OAM Purger

To facilitate connection of the refrigerant **"Fill"** line and the **"Oil Return"** line to their respective Chiller Charging Valves, special brass **"Valve Adapter"** fittings and **Copper Ferrules** have been provided in the **OAM Installation Kit.** These special adapters allow hook-up to the Chiller's refrigerant and oil charging valves without interfering with normal service access.

NOTE: *Each **Valve Adapter** has opposing ¼" **FNPT side ports**. To determine which of the ports to use, temporarily screw the Valve Adapter onto the charging valve hand tight. Usually only one of these ports will be accessible. This is the port you will use. The other port will be plugged. From the OAM Installation Kit select the appropriate fitting, as called for in the piping instructions, and install in this port. Then, using a ¼" **pipe plug** from the Installation Kit**, plug the unused side port**.*

Each Valve Adapter comes with **Flare Cap** and **Ferrule** to cap off the Adapter's charging access port. Be sure to **always use a Ferrule** when installing the Valve Adapter and cap.

Liquid Refrigerant Fill Line (with Stainless Steel Strainer)

IMPORTANT:

***NOTE**: Although the following instructs you to connect the Liquid Refrigerant Fill Line to the Chiller's refrigerant charging valve, **this is not always best**. Some Chillers have the charging valve located very close to where liquid refrigerant from the condenser enters the evaporator. Usually, when this is the case, the Chiller manufacturer provides an alternate access valve elsewhere near the bottom of evaporator. When this is the case, you should connect to the alternate valve. The OAM Purger **will function and remove oil from the refrigerant in either case**. However, connecting to the correct valve assures fastest **oil removal**.*

WARNING: Some Chillers have had their original angle charging valves removed and replaced with a water type ball valve for ease of use. **This is not a good practice** since this type ball valve does not have a seal cover over the operating stem. This type of ball valve can leak air into the Chiller**. <u>This is absolutely not acceptable when the OAM Purger is attached</u>.** Air leakage, even a small amount of leakage, will prevent the Purger from filling by gravity, consequently, preventing the OAM Purger from functioning.

Note: **On some** Carrier Series D **centrifugal chillers the refrigerant charging valve is located about even with the refrigerant level in the cooler. Therefore, for the OAM Purger to fill by gravity it will be necessary to cut into the** horizontal section **of the refrigerant charging line where it exits the bottom of the cooler and add a fitting and valve for connection of the** OAM Purger "Fill Line".

1. Select the appropriate size Valve Adapter from the Installation Kit that fits the Chiller's refrigerant charging valve. Depending on how the Fill Line is to run, select either a straight (U1-4B) or 90 degree (E1-4B) brass ¼" NPT x 1/4" Flare fitting from the Installation Kit and install in the appropriate side port. Install a ¼" pipe plug from the Installation Kit into the opposite side port.
2. Using the appropriate Copper Ferrule, permanently install the Valve Adapter onto the Chiller's refrigerant charging valve. **(See Figure 2, page 15.)**
3. Using ¼" **O.D.** copper tubing, run a line from the valve adapter fitting to the ¼" **Fill Inlet** fitting on the OAM Purger. **(See Figure 2, page 15.)**

NOTE 1: **Be absolutely sure to keep the Fill Line** <u>LOWER</u> **than the Liquid** Fill Inlet **connection on the Distillation Tank. If any part of the Fill Line rises higher than the Fill Inlet, liquid refrigerant** <u>will not flow by gravity</u> **from the Chiller into the Distillation Tank.**

NOTE 2: **The inlet** "Fill**" connection is a check valve. Because the check valve does not have a bias spring it** <u>MUST</u> **be installed vertically with the directional arrow pointing** "UP". <u>DO NOT</u> ALTER THE POSITION OF THIS CHECK VALVE. **The OAM Purger** <u>WILL NOT</u> **function if the check valve is in any other position.**

4. Next, from the Installation Kit select the Stainless Steel Strainer and two ¼" flare nuts and install the Strainer anywhere in the Fill Line. **Make certain the connections to the strainer are tight.**

5. Before making final connection to the purge unit, **INSULATE THE ENTIRE REFRIGERANT FILL LINE AND STRAINER**. Insulation materials have been included in the Installation Kit. **IMPORTANT- (See WARNING on next page about INSULATING.)**

WARNING: The entire Fill Line and Strainer, the refrigerant charging valve and ALL interconnecting piping UP TO THE EVAPORATOR SHELL MUST be insulated. Failure to properly insulate the refrigerant Fill Line will cause vapor lock preventing the OAM Purger from filling by gravity and consequently prevent the Purger from functioning. (*See Figure 2, on page 15.*)

6. **DO NOT** open the refrigerant charging valve at this time.

Vapor Return Line

1. Close the evaporator gauge stop valve.

2. Disconnect the gauge line from valve.

3. From the Installation Kit, select the **¼" Brass T6-4 Three-way Internal Branch Tee and Copper Ferrule.** Connect the Tee to the gauge stop valve ¼" port. **(See Figure 2, page 15.)**

4. Re-connect gauge line to one end of Tee.

5. From the other end of the Tee, run a ¼" copper line to the **Equalization Solenoid Valve (SOL-1)**. (See Figure 2, page 15.)

NOTE: Avoid sagging or traps **in the Vapor Return (Equalization) Line where vapor can condense and accumulate causing a blockage**

6. **DO NOT** re-open evaporator gauge valve at this time.

Oil Return Line and Oil Filter-Dryer installation

NOTE: IMPORTANT! *Based on the severity of oil contamination in your system, the amount of oil that will be removed by the OAM Purger on initial start-up could be several gallons more ("excess oil") than the capacity of your Chiller's Oil Sump. For example, a 500 pound refrigerant charge with 12% oil by weight will contain approximately 8.5 gallons of excess oil. Until the Chiller's refrigerant is purged free of oil, you must decide how you are going to deal with the excess oil before the initial start-up of the OAM Purger.*

UNDERSTAND: The above example is for illustrative purposes only. A smaller refrigerant charge with a higher percent oil concentration, or a larger refrigerant charge with a lower percentage, may yield much more than 8.5 gallons of excess oil. **Before proceeding estimate how much excess oil you will accumulate. To estimate the excess oil** you are likely to accumulate, refer to the most recent **refrigerant analysis** for your Chiller**.** You will also need to know the weight of your Chiller's refrigerant charge. Then refer to the **"Percent of Oil" Chart 1** on Page 19. Once you know approximately how much excess oil you will be dealing with **YOU HAVE TWO OPTIONS:**

NOTE: It is important to note that the percentage of oil in a sample can vary by as much as 8 percent depending upon where the oil sample is taken from the Chiller. For example, if the sample is taken from a location near where the refrigerant is returned from the condenser, obviously pure refrigerant is being returned to the evaporator at that location and the sample will indicate a lower percentage of oil contamination than actually exists in the Chiller.

1. Option 1: Plumb the **"Oil Return Line"** as per **"Option (1)" Piping Instructions (See page 20).** This option allows the excess oil, as it is being stripped from the refrigerant, to flow direct to the Chiller's oil sump where it can accumulate. With **Option (1)**, it will be necessary to **periodically monitor** the sump's oil level and **remove excess oil** as it accumulates. Once the initial oil stripping process is complete and all excess oil has been removed from the oil sump, further monitoring will no longer be necessary. **See Option (1) Piping Instructions.**

Advantage…once the initial oil stripping process is complete no further action is required.

Disadvantage…the main disadvantage to **Option (1)** is the necessity for someone to periodically monitor and drain-off oil from the oil sump. This can be both time consuming and inconvenient, especially since the oil stripping process can take days or weeks to complete.

Option 2: Plumb the **"Oil Return Line"** as per **"Option (2)" Piping Instructions (see page 20).** As determined by previous calculation, install sufficient containment capacity, **such as a single 50, 100, 200, etc., pound refrigerant recovery cylinder**, in the **"Oil Return"** line between the OAM Purger and the Chiller's oil sump. The cylinder will retain and hold the excess oil as it is stripped from the refrigerant, preventing it from accumulating in the oil sump. **(See Figures 3 & 4 on page 22 which includes approximate oil holding capacities of various size refrigerant recovery cylinders.)** Once the stripping process is complete the cylinder and excess oil must be removed from the system.

Advantage…does not require periodic monitoring and draining of oil in order to maintain proper oil level in the oil sump.

Disadvantage…requires temporary installation of a containment vessel and temporary check valve in the Oil Return Line. Also, once the oil stripping process is complete and the excess oil is collected, the containment vessel **and check valve** must be removed from the system.

Use this chart to estimate the amount of excess oil in the Chiller's Refrigerant Charge. According to ASHRAE study 601-TRP, the Average Chiller has 12 % oil by weight in its Refrigerant Charge. A 500 lb. Refrigerant Charge at 12% by weight contains 60 lbs., or 8.5 gallons of oil.

	CHILLER REFRIGERANT CHARGE BY WEIGHT IN lbs.											
	100	200	300	400	500	600	700	800	900	1000	1100	1200
% OIL		lbs. of Oil in Refrigerant Charge based on % by weight										
1%	1	2	3	4	5	6	7	8	9	10	11	12
2%	2	4	6	8	10	12	14	16	18	20	22	24
3%	3	6	9	12	15	18	21	24	27	30	33	36
4%	4	8	12	16	20	24	28	32	36	40	44	48
5%	5	10	15	20	25	30	35	40	45	50	55	60
6%	6	12	18	24	30	36	42	48	54	60	66	72
7%	7	14	21	28	35	42	49	56	63	70	77	84
8%	8	16	24	32	40	48	56	64	72	80	88	96
9%	9	18	27	36	45	54	63	72	81	90	99	108
10%	10	20	30	40	50	60	70	80	90	100	110	120
11%	11	22	33	44	55	66	77	88	99	110	121	132
12%	12	24	36	48	60	72	84	96	108	120	132	144
13%	13	26	39	52	65	78	91	104	117	130	143	156
14%	14	28	42	56	70	84	98	112	126	140	154	168
15%	15	30	45	60	75	90	105	120	135	150	165	180
16%	16	32	48	64	80	96	112	128	144	160	176	192
17%	17	34	51	68	85	102	119	136	153	170	187	204
18%	18	36	54	72	90	108	126	144	162	180	198	216
19%	19	38	57	76	95	114	133	152	171	190	209	228
20%	20	40	60	80	100	120	140	160	180	200	220	240
21%	21	42	63	84	105	126	147	168	189	210	231	252
22%	22	44	66	88	110	132	154	176	198	220	242	264
23%	23	46	69	92	115	138	161	184	207	230	253	276
24%	24	48	72	96	120	144	168	192	216	240	264	288
25%	25	50	75	100	125	150	175	200	225	250	275	300
		OIL WEIGHS APPROXIMATELY 7 Lbs. PER GALLON										
				60 Lbs = approximately 8.5 Gallons								

Chart 1. – ***Refrigerant-Oil Contamination Chart***

OPTION 1 Oil Line Piping Instructions

1. From the Installation Kit select the appropriate Valve Adapter that fits the Chiller's oil charging valve. Depending on how the line is to be run, select either a straight (U1-4B) or a 90 degree (E1-4B) brass ¼" NPT x ¼" flare fitting and install in the appropriate adapter side port. Then, using a ¼" NPT pipe plug from the Installation Kit, plug the unused side port.
2. Screw the Valve Adapter **permanently** onto the Chiller's oil charging valve. Select the mating flare cap and Copper Ferrule from the Installation Kit and install on the Adapter's larger access port.
3. Next run a ¼" copper line from the Valve Adapter fitting to the ¼" flare outlet fitting on the OAM Purger **"Oil Return"** Solenoid Valve **(SOL-2). (See Figure 2, page 15.)**

NOTE: ***The outlet fitting of the Oil Return Solenoid Valve is installed vertically with the flow direction arrow*** *pointing up* ***and in the direction flowing toward the oil sump. Because the check valve does not have a bias spring it is*** *critical* ***that its position be vertical.*** *DO NOT ALTER THE POSITION OF THIS CHECK VALVE. The OAM Purger WILL NOT function properly if the check valve is in any other position.*

4. **DO NOT open the oil-charging valve at this time**.

OPTION 2 Oil Line Piping Instructions

CAUTION: This method is intended to be a temporary arrangement only and should be replaced once the excess oil has been removed and the refrigerant is OIL FREE.

1. **Option (2) Installation** is identical to **Option (1)** except you will **temporarily** install one**, and only one**, containment vessel in the oil return line. The size of the containment vessel (determined by previous calculation) should be of sufficient capacity to collect and hold **all excess oil.**

CAUTION: DO NOT connect multiple cylinders in series. The excess oil collection hook-up MUST be limited to a single cylinder: i.e., a single 50, 100, or 200 lb., etc. cylinder, and MUST not be filled to more than 80% of its rated liquid capacity. NOTE that the refrigerant cylinder will not hold the same weight of Oil as refrigerant. (See Figures 3 & 4 on page 22 which indicates the approximate oil holding capacities of various size refrigerant recovery cylinders.)

2. Plumb the selected excess oil containment vessel in the Oil-Return line **precisely** as illustrated in **Figure 3 on page 22**. Install the **temporary check valve** (provided in the OAM Purger Installation Kit) in the oil return line between the containment vessel and the oil sump, **precisely as shown in figure 3, on page 22**. The **Temporary check valve MUST** be

installed **vertically** with the directional arrow pointing **UP** with flow toward the oil sump. **DO NOT OMIT** the check valve. This check valve prevents back flow of oil from the oil sump into the oil collection cylinder.

WARNING: the OAM Purger will not function and also will not transfer oil to the oil containment vessel unless the vessel is properly connected to the Chiller's oil charging valve and the valve is open.

WARNING: Failure to use the Temporary Check Valve provided for use with Option 2 piping procedure may result in oil draining from the oil sump into the temporary oil containment vessel, causing the Chiller to shut down because of low oil level.

NOTE: ***Unless the excess oil that is collected is intended for reuse later,*** *DO NOT* ***install the*** *Oil Filter-Dryer* ***at this time. Wait until the oil stripping process is finished before installing the Oil Filter-Dryer.***

CAUTION: Option (2) **is intended only as a convenient method of dealing with excess oil. You** MUST **still occasionally monitor the oil sump for excessive oil accumulation since there may be more excess oil than anticipated. Refer to approximate oil holding capacities of the refrigerant recovery cylinders under Figure 3 on page 22.**

NOTE: On initial start-up the OAM Purger Distillation Tank will accumulate and retain approximately 2 pounds of recovered oil. Therefore, depending upon the level of oil contamination, a number of cycles may be required before actual oil transfer to the Chiller oil sump begins.

3. Once all excess oil has been stripped from the Chiller's refrigerant, **remove** the **containment vessel (with excess oil) and the extra Option 2 piping Temporary Check Valve** from the oil return line. *DO NOT remove the oil line check valve CK-1 attached to the outlet of the oil transfer Solenoid (SOL-2).*

Using ¼" copper tubing, reconnect the OAM Purger to the Chiller's oil sump as per **Option 1 Piping Instructions.** Be sure to install the oil filter at this time.

DO NOT open valve at this time.

Properly dispose of the accumulated excess waste oil.

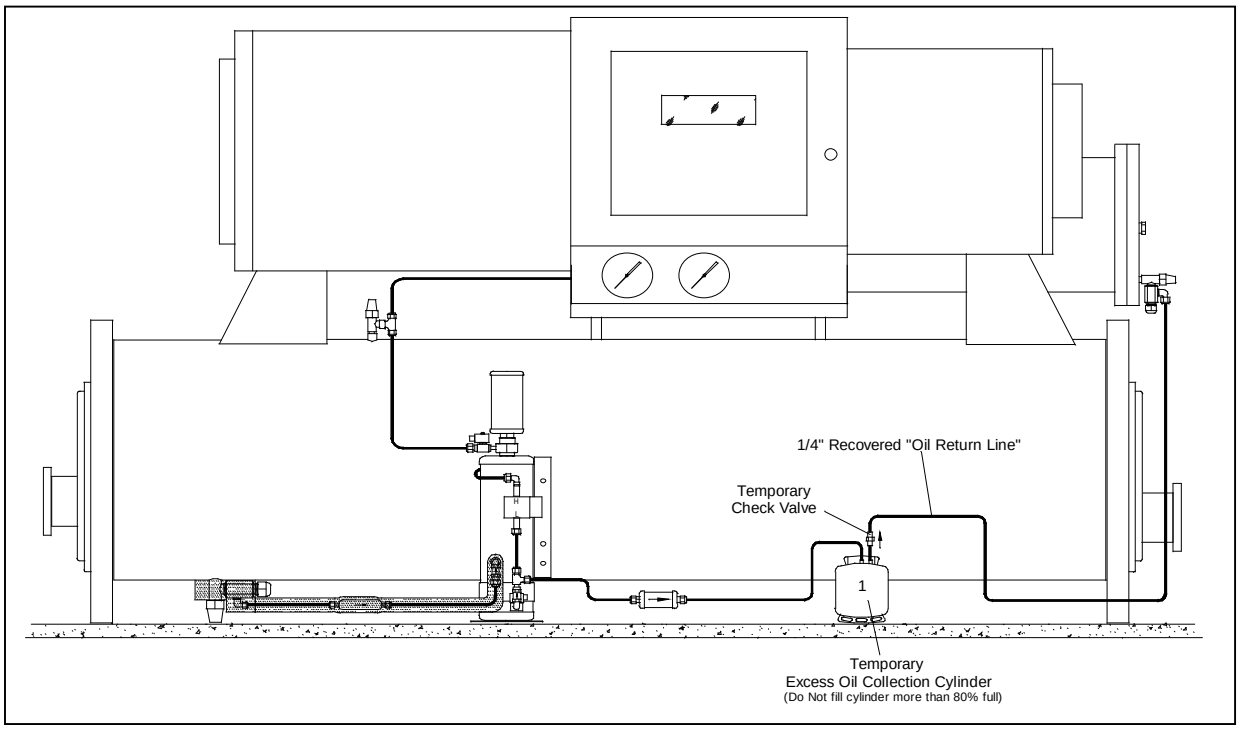


Figure 3. - ***CORRECT Optional Oil Collection Cylinder Hook-up***

Approximate <u>Oil holding capacities at 80% full</u> of various size refrigerant recovery cylinders.

50 lb. Cylinder…….. 23 pounds / 3.3 gallons
100 lb. Cylinder…… 46.4 pounds / 6.6 gallons
200 lb. Cylinder…… 92.8 pounds / 13.2 gallons

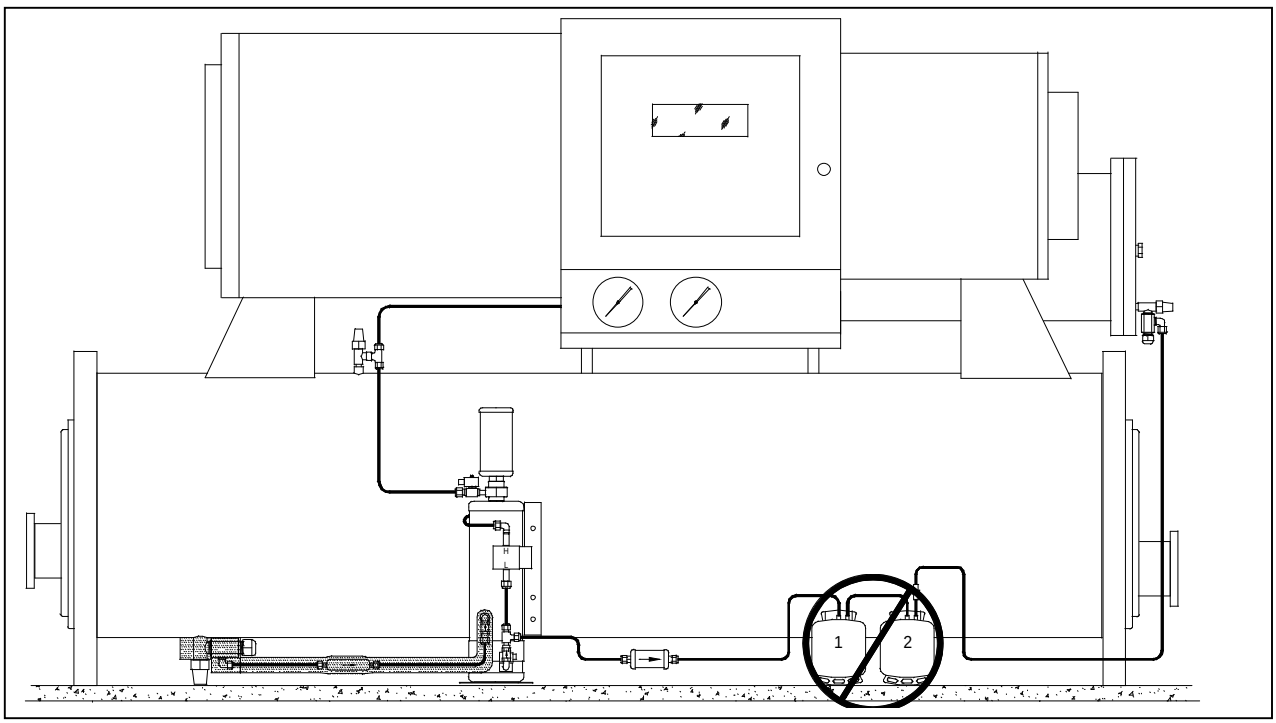


Figure 4. - ***<u>WRONG</u> Optional Oil Collection Cylinder Hook-up***

Electrical Connection

WARNING: Be sure to open and lockout all electrical disconnects to prevent possible injury or death caused by electrical shock during installation

NOTE: Use Class 1, 14 AWG copper wire and metal conduit. All field installed wiring must comply with applicable NEC and local electrical codes.

Power Requirement

The OAM Purger requires one power connection to the Chiller's fused control panel. The electrical requirement is:

120 VAC, 50/60 Hz., 1-Phase 15 Amp Fused Circuit.
Actual current draw approximately 4 amps.

Optional "Chiller Run" Signal

The OAM Purger Logic Board is provided with an optional ***"Chiller Run" Signal*** input terminal designated as "***IN3"***. In most instances it will not be necessary to provide a Chiller Run Signal to the OAM Purger. However, the option is available should there be a need.

An example of when a Chiller run signal may be needed is when installing the OAM Purger on a Chiller equipped with an ***automatic refrigerant protection system***, such as the ***Redi Control*s *"SavAll" System.*** Under certain conditions the OAM Purger can generate sufficient pressure differential to cause a partial transfer of refrigerant from the Chiller evaporator to the SavAll vessel. **Nuisance PURGE FAULTS will likely result** should the refrigerant level in the evaporator drop below the minimum level required for adequate gravity filling of the Purger Distillation Tank.

When the Chiller "Run Signal" option is used the OAM Purger will be active ***only while the Chiller is running*** (while purger receives a Chiller run signal). When the Chiller shuts down the OAM Purger will suspend operation. OAM Purger operation resumes when the Chiller re-starts.

If you think you have an application requiring use of the Chiller "Run Signal" option proceed with installation as follows:

1. Connect a Chiller Run Signal" from an appropriate 120 VAC source in the Chiller control panel to input **"IN-3**" on the OAM Purger Logic Board, Then, see Figure 7, page 33, for Switch SW1 Dip switch 4 activation instructions (See Wiring Diagram Fig. 9, Page 45, and Fig. 7, page 33, Logic Board for terminal location.)

Connecting Power to Purger

1. The pictures to the right and below show how to make electrical connections to Terminal Block TB-1. Strip 5/16" of the insulation on each wire. Insert the tool provided with the Installation Kit (or a small screwdriver) into the space above the place you are going to insert the stripped wire. Slightly pry the tool or screwdriver toward the center of the block until you hear a click. This opens the spring clip where the wire is to be inserted. Insert the wire, then remove the screwdriver. The wire should be held in place. Test by pulling on wire to make sure connection is firm.

2. Attach the **Line voltage wire to the first Terminal-1 slot** and the **Neutral lead to the first Terminal-4 slot**. Connect the **Ground wire to the ground lug** (see Figure 5 below).

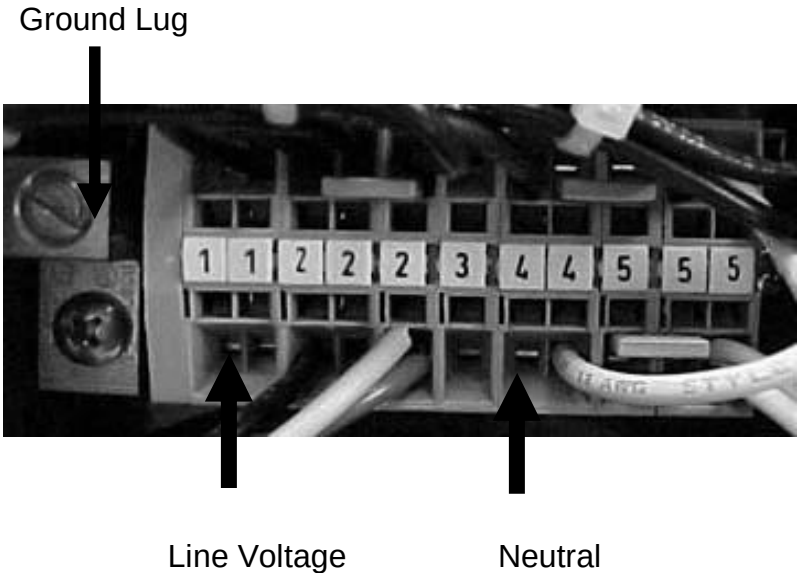


Figure 5.
Electrical Control Box Field Wiring

INITIAL START-UP

WARNING: **Before starting the OAM Purger for the first time be sure you have considered how you will be handling the excess oil that will be removed.** You have two options: see Oil Return Line installation instructions starting on page 18. Removal of excess purged oil from system is essential.

NOTE: *It is recommended that anytime power to the Chiller's oil sump heater is off, the OAM Purger should be off.*

Startup Procedure

NOTE: Even though each OAM Purger Unit is completely leak tested at the factory before shipment, it is possible for a fitting or line, etc. to become loosened during shipment. It is absolutely imperative that there be **NO LEAKS** anywhere in the OAM Purger system. A leak can either result in air entering the Chiller, or the **loss of refrigerant**.

NOTICE! ***It may be necessary to add refrigerant to the system during the initial oil stripping process.*** Every **pound of oil** removed from the refrigerant is **equivalent to a volumetric reduction of two (2) pounds of refrigerant** from the system. Therefore when significant quantities of oil are removed from the system it may be necessary to compensate for this volumetric loss by adding refrigerant. **If the refrigerant level in the evaporator is not at least *1.0"* above the inlet FILL port nuisance faults may result**.

1. Check **all** fittings and piping connection to make absolutely sure all are tight.

2. Verify that the **E-Z Change Filter** on top of the Purge Distillation Tank is tight.

3. With **all Chiller Valves** to the OAM Purger **CLOSED**, you will have to pressurize the OAM Purger Unit including all fittings and piping connections up to the Chiller's Valves, and test for leaks. To do this you will have to supply power to the purger. **HOWEVER, DO NOT turn on Power Switch at this time**. Remove the control box cover and on SWITCH SW2, flip dip-switches 2 and 3 to the ON position (See Figure 7, page 33 for location of SW2 and Dip Switches 2 and 3). This will energize the Purger Unit solenoid valves and allow the interconnecting lines to be pressurized up to the Chiller valves when the Unit Power Switch is turned ON.

4. Connect a pressure source, such as nitrogen, to the shrader port at the top of the Purger Distillation Tank. **(See Figure 8, page 35.)**

5. Pressurize OAM Distillation Tank to 50 psig.

6. Now, turn Power Switch to the ON position.

7. Leak test entire Purger circuit.

8. Repair any leaks.

9. Once the leak test procedure is complete, bleed off test pressure and connect a service vacuum pump to the Shrader access port and thoroughly evacuate, then remove pump. (See Figure 8, page 35 for location of Shrader access port.)

10. Turn Unit Power Switch to OFF position.

11. Flip dip switches 2 and 3 of Switch SW2 back to the OFF position.

12. Now, **OPEN all Chiller Valves to OAM Purger:** the Chiller refrigerant charging valve, the oil sump charging valve and the evaporator gauge stop valve.

13. Turn unit Power Switch back to the ON position. The power switch "Green" indicator light should be energized.

NOTE: **The OAM Purger always starts in** Fill Phase 1 **when power is turned on.**

14. The **Green LED** indicator **D1 (see Figure 7, page 33)** should now be **blinking,** indicating the purger is in Fill Phase 1 and the Distillation Tank is being filled by gravity with refrigerant / oil mixture from the Chiller.

After **75 minutes, D1** indicator will de-energize and **Green LED** indicator **D2** will energize and blink, indicating the purger is in **Primary Distillation (Phase 2).** At the same time, **Green LED** indicator **D5** will energize **and be on solid,** indicating the **Distillation Heater is "ON".**

You may not want to wait an additional **2 hours** to observe a complete purge cycle. However, within 15 minutes or so you should begin to hear **Equalization Solenoid Valve (SOL-1)** periodically **energizing and de-energizing**. This is good indication that the Purger is functioning properly. After about a day of operation, either the oil sump level should begin rising or the temporary collection cylinder should begin **accumulating oil. The oil removal rate will depend on several things: the percentage of oil in the charge, the amount of refrigerant processed in each cycle, and the location from which the refrigerant was removed from the Chiller.**

15. **Initial start-up is now complete**.

16.Replace Control Box Cover.

NOTE: ***The OAM Purger can remove several gallons of oil per day from a Chiller during the initial first few days of operation,*** *when properly installed and with a refrigerant charge that has a high percentage of oil****, then gradually decrease in amount day by day until all oil is eventually removed from the Chiller's refrigerant.***

DESCRIPTION OF OAM PURGER COMPONENTS

(See Figure 6, page 31, Figure 7, page 33 and Figure 8, pages 34 and 35.)

Distillation Tank

The Distillation Tank is where the **refrigerant is distilled and separated from the oil by heat.**

Distillation Heater

The Distillation Heater is a 350 watt flexible band heating element attached around the bottom of the Distillation Tank and supplies the heat to distill the liquid refrigerant from the oil. The heater temperature is regulated by Temperature Sensor (TS-1) to a maximum of **145 degrees F.** The heater is periodically energized during the **Primary** and **Secondary Distillation Phases and the oil transfer phase.** Because the heater is cycled ON and OFF to maintain the desired 145 degrees F. oil temperature, it is actually only energized about **50%** of the time. Therefore, heater power consumption averages about 200 watts per hour.

Temperature Sensor (TS-1)

Temperature Sensor (TS-1) controls the Distillation Heater and limits oil temperature in the Distillation Tank to **145 degrees F.**

Differential Pressure Switch (DPS-1)

The purpose of the Differential Pressure Switch is to maintain a pressure differential between the Distillation Tank and the Chiller's oil sump of APPROXIMATELY **5 to 7 PSID** during both the **Primary** and **Secondary Distillation Phases.** The **DPS-1** maintains this pressure differential by cycling Equalization Solenoid Valve (SOL-1) open and closed. The pressure differential assures there will always be **sufficient vapor pressure** remaining in the Distillation Tank to push the oil from the Distillation Tank back to the Chiller's oil sump during the oil transfer phase.

Electrical Control Box

The Electrical Control Box contains the Solid State Logic Board, Temperature Sensor (TS-1) and terminal strip. On top of the Control Box are the ON-OFF lighted rocker switch, Red **"FAULT"** light and Amber **"Filter Change"** alert light.

Refrigerant Inlet Check Valve (CK-2)

This Check Valve prevents back-flow of pressurized refrigerant from the Distillation Tank to the Chiller evaporator. This check valve does not have a bias spring; and therefore, must be installed in a vertical position with the directional arrow pointing up.

Safety Relief Valve (SR-1)

300 PSI Atmospheric Pressure Relief Valve protects OAM Purger form over pressurization.

Pressure Equalization Solenoid Valve (SOL-1)

Pressure Equalization Solenoid Valve (SOL-1) has a dual function. **Function one** is to promote filling of the Distillation Tank. During the **Fill Phase,** SOL-1 remains **open** allowing the pressures in the Distillation Tank and the Chiller evaporator to equalize. Once the pressures are equalized, the liquid refrigerant levels in the two vessels are free to **seek a common level by gravity. Function two** is to maintain a pressure differential within the Distillation Tank during the Primary and Secondary **Distillation Phases. [See Differential Pressure Switch (DPS-1)].**

Oil Transfer Solenoid Valve (SOL-2)

Oil Transfer Solenoid Valve (SOL-2) controls the transfer of distilled oil from the Distillation Tank to the Chiller's oil sump.

Oil Return Check Valve (CK-1)

This check valve prevents inadvertent **back-flow of oil from the Chiller's oil sump** into the OAM Purger Distillation Tank. This check valve **does not have a bias spring** and, therefore, **must** be installed in a vertical position with the directional arrow pointing **up** and **toward** the Chiller's oil sump.

EZ-Change "High Moisture Capacity" Filter-Dryer

The EZ-Change Filter-Dryer is an integral part of the OAM Purger. It's function is to remove **acids** and **moisture** from the vaporized refrigerant on it's return to the Chiller evaporator. The EZ-Change Filter-Dryer is connected to the OAM Purger Distillation Tank via a **"Quick-Connect"** coupler with **automatic flow shut-off**. This permits **quick and easy** replacement of the EZ-Change Filter-Dryer **without the necessity of shutting down either the Chiller or the OAM Purger.**

"High Acid Capacity" Oil Return Filter

The High Acid Capacity oil filter removes acids from the distilled oil as it passes from the Distillation Tank to the Chiller's oil sump.

Terminal Block (TB-1)

Terminal Block (TB-1) is used for control wiring and for providing convenient termination for unit power wiring.

Power Switch (PS-1)

Power Switch (PS-1) controls input power to the purger control circuit and illuminates when switched ON. The switch also functions as the unit **FAULT RESET** switch.

Solid State Logic Board --- Relays -- &– Dip Switches SW1 and SW2

(See Fig. 7, Page 33 for further information.)

Relay RLY-1 Controls the Distillation Heater via Temperature Sensor (TS-1).
Relay RLY-2 Not Used
Relay RLY-3 Controls Equalization Solenoid Valve (SOL-1)
Relay RLY-4 Controls Oil Transfer Solenoid Valve (SOL-2)
Relay RLY-5 Is a SPDT relay dedicated to Purge Fault indication. It can be utilized for remote purge fault indication.
Relay RLY-6 Is dedicated to the purpose of indicating when it is time to replace the EZ-Change Filter-Dryer.

Dip Switch (SW1) & (SW2) During normal operation All Dip Switches on the OAM Purger MUST be in the off position. During diagnostics and leak testing procedures certain Dip Switches on Switch SW2 are placed in the on position. If the "Chiller Run Signal Option" is utilized, Dip Switch 4 on Switch SW1 will be in the on position. (See Fig. 7, page 33.)

WARNING: During normal operation! All Dip Switches of SW1 & SW2 must be set to the OFF position, or the unit will not function correctly. **The only exceptions are:** when using SW2's Dip Switches during the leak testing procedures, **or** for diagnostic aids, **or** on SW1 if the "Chiller Run Signal Option" is chosen. See Using SW2 as diagnostic aid and Using SW2 during Leak Testing, page 40. See page 23 for information on the "Chiller Run Signal Option".

Safety Features

Safety guarding against over pressurization.

A **300 PSI Atmospheric Pressure Relief Valve** has been installed on the OAM Purger Distillation Tank to protect against over-pressurization.

Safety guarding against inadvertent closing of any Isolation Valve(s).

If any of the Chiller's Isolation Valves to which the OAM Purger is connected are closed, the OAM Purger will go into a fault condition to protect the Chiller and the OAM Purger. The OAM Purger will remain in the fault condition until power is removed and then reapplied.

Safety preventing transfer of un-distilled refrigerant into Chiller's oil sump.

The OAM Purger is designed so that if the Oil Transfer Solenoid (SOL-2) fails in the open position, the OAM Purger will go into a fault condition after one transfer of un-distilled refrigerant and will prevent any further un-distilled refrigerant from being returned to the Chiller's oil sump. (One transfer of un-distilled refrigerant will not harm the Chiller.) The OAM Purger will remain in the fault condition until power is removed and then reapplied.

Safety guarding against the heater failing in, On position, or Off position.

If the Heater fails in the ON position, or if the Heater does not work, the OAM Purger will go into a fault condition to protect the Chiller and the OAM Purger. The OAM Purger will remain in the fault condition until power is removed and then reapplied.

Safety guarding against Equalization Solenoid (Sol-1) failing in the open, or closed position.

The OAM Purger is programmed to determine if the equalization solenoid (SOL-1) fails in the open or closed position. If either occurs, the OAM Purger will go into a fault condition to protect the Chiller and the OAM Purger. The OAM Purger will remain in the fault condition until power is removed and then reapplied.

Safety guarding against Fill Check Valve (CK-2) failing in the open, or closed position.

The OAM Purger is programmed to determine if the Fill Check Valve (CK-2) fails in the open or closed position. If either occurs, the OAM Purger will go into a fault condition to protect the Chiller and the OAM Purger. The OAM Purger will remain in the fault condition until power is removed and then reapplied.

Safety guarding Temperature Sensor failing.

The OAM Purger is programmed to determine if the Temperature Sensor (TS-1) fails. If this occurs, the OAM Purger will go into a fault condition to protect the Chiller and the OAM Purger. The OAM Purger will remain in the fault condition until power is removed and then reapplied.

Safety guarding against Differential Pressure Switch failing.

The OAM Purger is programmed to determine if the Differential Pressure Switch (DPS-1) fails. If this occurs, the OAM Purger will go into a fault condition to protect the Chiller and the OAM Purger. The OAM Purger will remain in the fault condition until power is removed and then reapplied.

Safety guarding against the oil transfer Solenoid failing in the open position.

The OAM Purger is programmed to determine if the oil transfer Solenoid (SOL-2) fails in the open position. If this occurs, the OAM Purger will go into a fault condition to protect the Chiller and the OAM Purger. The OAM Purger will remain in the fault condition until power is removed and then reapplied.

Safety guarding against Solid State Logic Board Relays sticking or not making.

The OAM Purger is programmed to determine if the Relays on the Solid State Logic Board are either welded shut or if they fail to make. If this occurs, the OAM Purger will go into a fault condition to protect the Chiller and the OAM Purger. The OAM Purger will remain in the fault condition until power is removed and then reapplied.

Electrical Control Box

The Electrical Control Box contains the Solid State Logic Board, Temperature Sensor (TS-1) and terminal Block (TB-1). On top of the Control Box are the ON-OFF lighted rocker switch, Red **"FAULT"** light and Amber **"Filter Change"** light.

Terminal Block (TB-1)

Terminal Block (TB-1) is used for control wiring and for providing convenient termination for unit power wiring.

Temperature Sensor (TS-1)

Temperature Sensor (TS-1) controls the Distillation Heater and limits oil temperature in the Distillation Tank to **145 degrees F.**

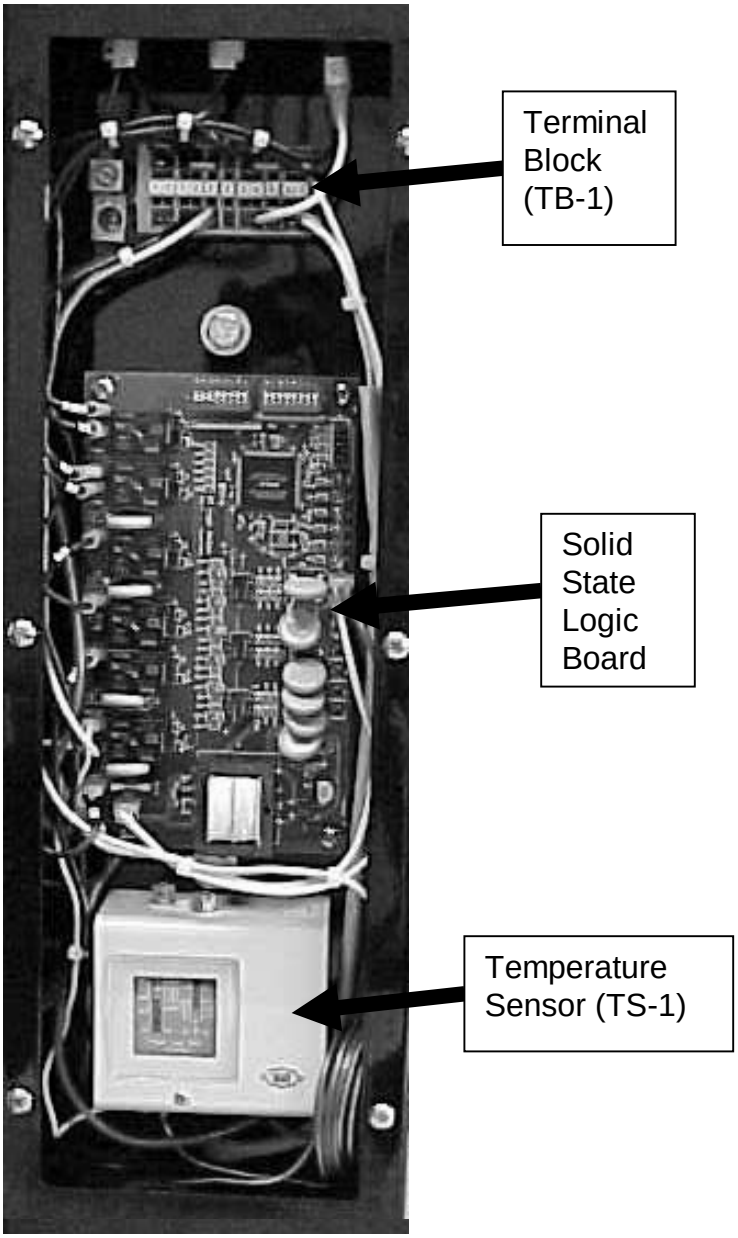


Figure 6. - Major Components Electrical Box

Logic Board Relays and Dip Switches

(See Figure 7, on page 33)

Relay RLY-1

Controls the Distillation Heater via Temperature Sensor (TS-1).

Relay RLY-2

Not used

Relay RLY-3

Controls Equalization Solenoid Valve (SOL-1).

Relay RLY-4

Controls Oil Transfer Solenoid Valve (SOL-2).

Relay RLY-5

A SPDT relay dedicated to Purge Fault indication. It can also be utilized for remote indication.

Relay RLY-6

Is dedicated to the purpose of indicating when it is time to replace the EZ-Change Filter-Dryer.

Dip Switches (SW1) & (SW2)

Dip Switch (SW1) & (SW2) During normal operation All Dip Switches on the OAM Purger MUST be in the off position. During diagnostics and leak testing procedures certain Dip Switches on Switch SW2 are placed in the on position. If the "Chiller Run Signal Option" is utilized Dip Switch 4 on Switch SW1 will be in the on position. (See Fig. 7, page 33.)

WARNING: During normal operation! All Dip Switches of SW1 & SW2 must be set to the OFF position, or the unit will not function correctly. **The only exceptions are:** when using SW2's Dip Switches during the leak testing procedures, **or** for diagnostic aids, **or** on SW1 if the "Chiller Run Signal Option" is chosen. See Using SW2 as diagnostic aid and Using SW2 during Leak Testing, page 40. See page 23 for information on the "Chiller Run Signal Option".

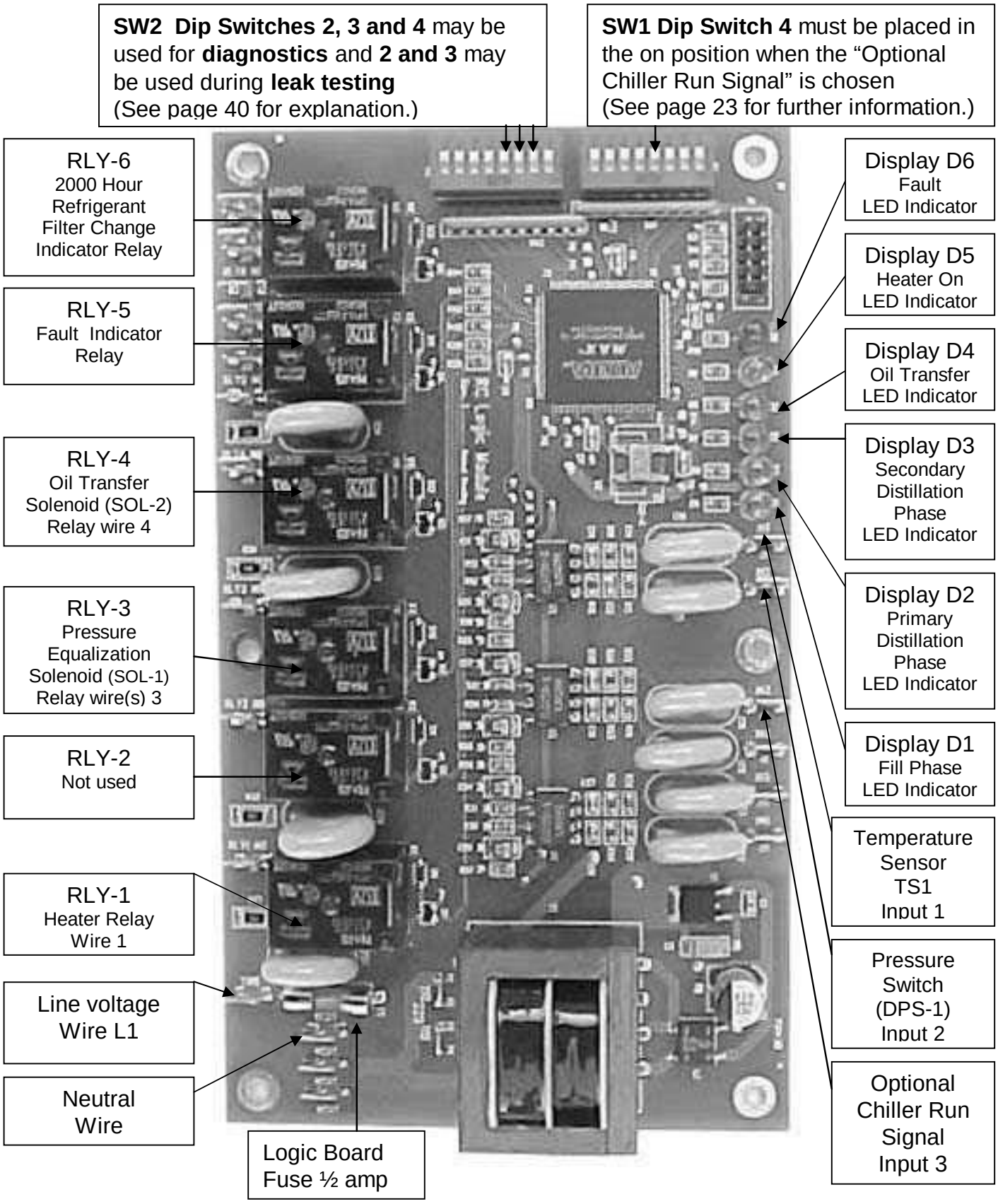


Figure 7. – ***Solid State Logic Circuit Board***

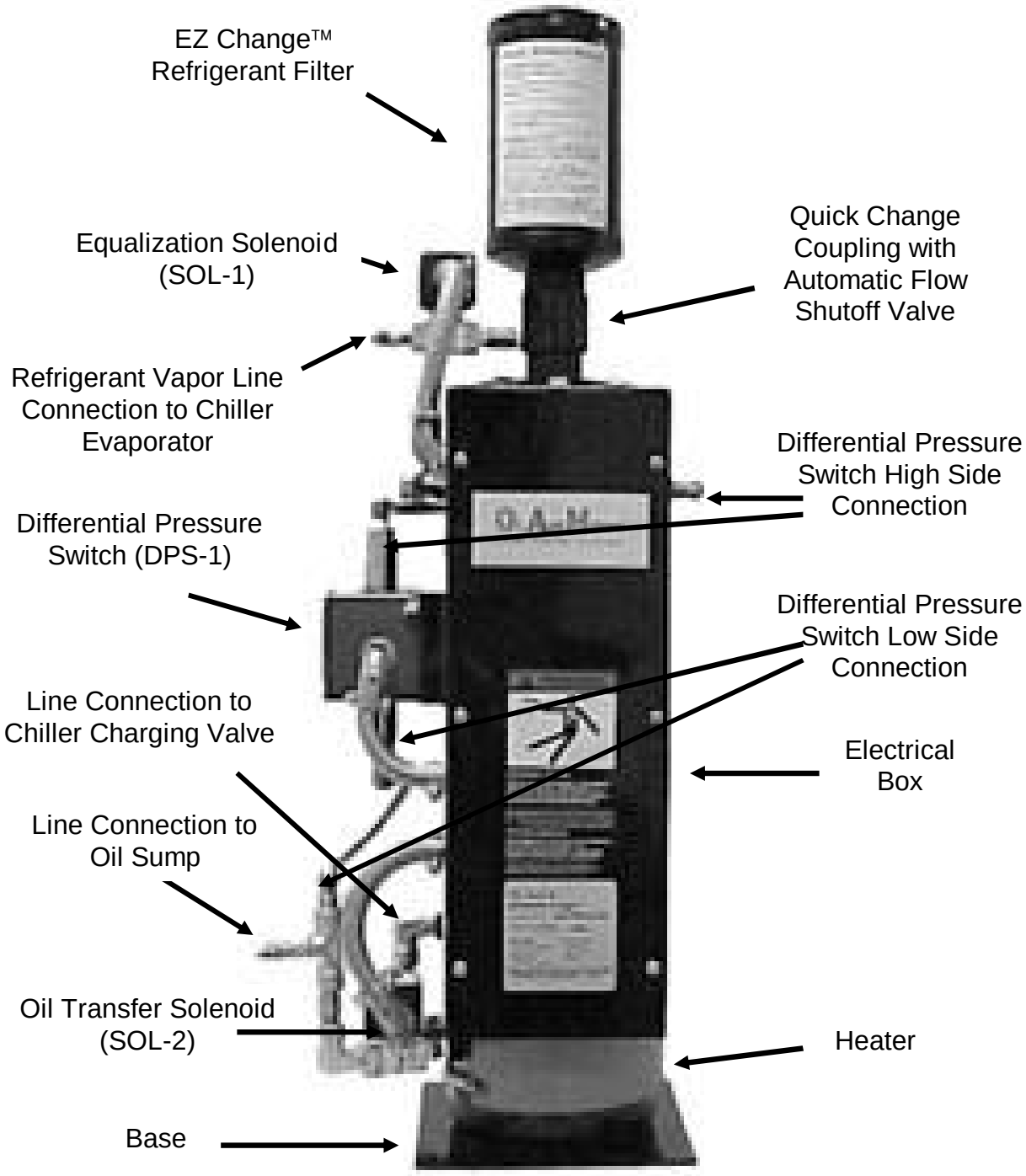


Figure 8. - ***Major Components of OAM Purger***
(Also See Next Page)

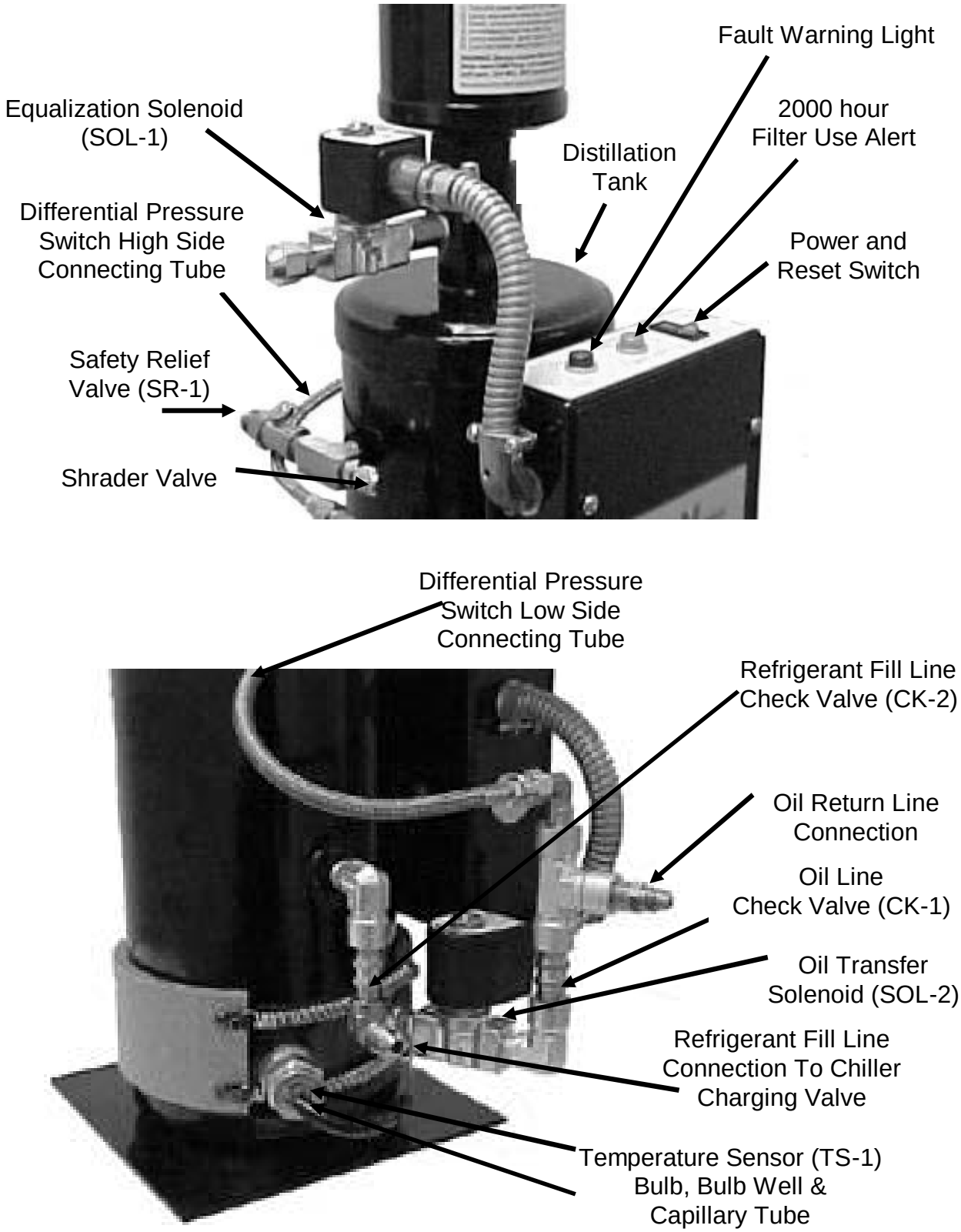


Figure 8. ***Major Components of OAM Purger (continued)***

MAINTENANCE

This section discusses the OAM Purger system maintenance requirements and procedures, electrical wiring diagram and basic OAM Purger troubleshooting procedures.

The following maintenance procedures are required to assure efficient and reliable operation of the OAM Purger.

WARNING: Certain servicing procedures may expose you to harmful materials and dangerous conditions. To minimize the possibility of injury, follow safety procedures and instructions described in this manual, on product labels and provided in material safety data sheets.

EZ Change® Refrigerant Filter Dryer Replacement Instructions

Most centrifugal Chillers have no means for removal of harmful oil, moisture and acids from the refrigerant. Typically, oil, moisture and acids are allowed to accumulate in the refrigerant until a refrigerant analysis indicates they have reached dangerous levels and it is time to do something about them. Usually this means either replacing the entire refrigerant charge or removing the charge and distilling it back into the Chiller. Leaving moisture, acid and oil in the Chiller's refrigerant charge not only subjects the Chiller to **unnecessary harmful conditions,** it is not a very cost-effective way to maintain a centrifugal Chiller.

The purpose of the OAM Purger is not just to **remove oil** from the Chiller's refrigerant. It removes **moisture** and **acids** as well. In fact, the OAM Purger is the most effective means, **if not the only means**, of continually purging **harmful moisture and acids** from a centrifugal Chiller.

The OAM Purger will continue removing oil from the refrigerant after the filter-dryer is saturated. However, the OAM Purger can **only** remove **moisture** and **acids** as long as the **EZ Change filter-dryer is fresh and active.**

The EZ Change Refrigerant Filter-Drier should be changed **every 2000 hours of actual distillation time** (about every three months). A place has been provided on the filter-dryer label to record the date the filter-dryer was installed. (See Caution at bottom of page 37.)

Also, a **"Filter Change"** indicator light has been provided on the OAM Purger control box to signal when it is time to change the filter-dryer. The signal is activated at the end of each **2000 hour interval of actual distillation time**.

Although 2000 hours may seem like a short time, you must remember that the OAM Purger processes approximately between 500 and 800 pounds of liquid refrigerant per week. This means that during each 2000 hour interval (or about three months) the OAM Purger will have processed **(removed moisture and acids)** from between **6,000 to 9,600 pounds** of refrigerant.

The OAM Purger incorporates an integral self-sealing ball-check valve between the filter-dryer and the Purger Distillation Tank. When the filter-dryer is unscrewed and removed, the ball-check valve closes off the flow path from the distillation tank preventing either refrigerant from escaping or air from being drawn in.

The EZ Change Filter-Dryer requires much less time for change-out than a typical in-line filter-dryer.

NOTE: *Although the OAM Purger unit self-seals when the EZ Change Filter-Dryer is removed, a small amount (de minimus) of pressure release from dryer canister should be anticipated when removing*.

Steps for Changing EZ Change Filter-Dryer

1. Turn unit power switch to "OFF" position.
2. Using appropriate wrenches, loosen filter dryer.
3. **SLOWLY** unscrew and remove spent filter dryer.
4. Immediately install new filter dryer. (Use small amount of O-ring lubricant on each O-ring.)
5. Using wrenches, gently tighten. DO NOT over-tighten.
6. Turn unit power switch back to "ON" position.

EZ Change™
Filter-Dryer

WARNING: Always complete filter change-out. Never leave OAM Purger Unit unattended with filter port open. Unit WILL NOT function with filter dryer removed.

NOTE: *Upon power-up, the OAM Purger will always initiate operation in a Fill Phase of the operating cycle.*

Periodic Maintenance

Quarterly

1. **Replace the EZ Change Refrigerant Filter Dryer.**

2. Visually inspect the Purger.

Caution: If the OAM Purger is turned **OFF** or if **power is interrupted** for any reason, the 2000 hour log will **re-set to zero hours**. Although this will not effect normal purge operation, it does render the 2000 hour indicator light meaningless until the next time the filter-dryer is replaced. You may not be aware that this has occurred, therefore the "**filter replacement date**" recorded on the filter-dryer is the primary replacement time indicator.

Annually

1. Replace the EZ Change Filter-Dryer if due (see last replacement date indicated on label).
2. Replace the **High Acid Capacity** Oil Filter. The oil filter also has a place on the label to record the replacement date. It is essential that the Oil Filter be replaced at least once a year. However, semi-annual replacement is preferred.
3. Visually inspect the Purger.

High Acid Capacity
Oil Filter

Control Calibration

Temperature Sensor TS-1

General instructions on maintenance and adjustments.

Avoid sharp bends or kinks in the capillary tube.

Do not allow capillary tube to rub and abrade against any moving surface. Avoid constant bending of the tubing to avoid work hardening effects.

<u>The readings on the temperature sensor are a guide only</u>. A separate thermometer must be used for exact adjustment of the setpoints. The temperature sensor in your OAM Purger came adjusted by use of a separate thermometer. The setting as it appears on the temperature sensor may not exactly correspond to the actual setpoint of 145 degrees F.

1. Use a flat screwdriver or a ¼" refrigeration (square) wrench to adjust setpoints.
2. Adjust the upper setpoint using the range spindle (the spindle to the left as you look at it).
3. Adjust the lower setpoint by turning the differential spindle (the spindle to the right as you look at it).

UPPER SETPOINT (minus) DIFFERENTIAL (equals) LOWER SETPOINT

Differential Pressure Switch DPS-1 (J21K-15562)
(*Not Field Adjustable***)**

Procedure to clear oil logged Distillation Tank

(Refer to Trouble Shooting Section on page 41 for symptoms.)

The following conditions can cause **"oil logging"** of the OAM Purger Distillation Tank:

1. The oil sump **"Oil Charging" valve** has been inadvertently left closed.
2. The **"Oil Return" Solenoid Valve (SOL-2)** fails in the closed position.
3. **"Relay (RLY-4)"** fails to energize Solenoid Valve (SOL-2) preventing oil return to oil sump.
4. The **"Oil Return"** line is kinked, or obstructed, preventing oil return to oil sump.

Should oil logging occur, clear the Distillation Tank using the following procedure:

1. Troubleshoot the purger to determine which of the above mentioned conditions has caused the oil logging problem.
2. Correct the problem. Only after the problem has been corrected can you proceed to the next step.
3. Turn OFF power to purger.
4. Isolate the purger from the Chiller by closing **all** valves to purger: Refrigerant Charging Valve, Oil Sump Charging Valve and the Evaporator Gauge Stop Valve.
5. Remove cover from Electrical Panel, on **Switch SW2** flip **Dip Switch 3** to the **ON** position. ***(This procedure allows the Oil Return Solenoid Valve ONLY to energize when power is reapplied.) (See Figure 7, on page 33 for location of SW2.)***
6. Using a manifold gauge set, connect a pressure source, such as nitrogen, to the Shrader Access Fitting located near the top of the Distillation Tank. Pressurize the tank to approximately 4 **psig.**
7. Now, **RE-OPEN** the oil sump oil-charging valve.
8. Turn power to purger back **ON**.
9. The 4 psig pressure will now push the oil from the Distillation Tank back to the Chiller's oil sump.
10. When the manifold gauge indicates 2 psig pressure in the Distillation Tank, enough oil has been transferred. Be sure to stop at 2 psig to prevent nitrogen from entering the Chiller.
11. Remove manifold gauge set from purger.
12. Turn power to purger back **OFF** again.
13. Flip **SW2, dip switch 3** back to the **OFF** position. ***(See Figure 7, on page 33 for location of SW2.)***
14. Use vacuum pump to evacuate the OAM Purger.
15. Place cover back on electrical panel.
16. **OPEN ALL** valves to purger.
17. Turn power to purger back **ON**. The OAM Purger should now function properly.

Using Switch SW2 Dip Switches as a diagnostic aid

Switch SW2 Dip Switches can be used to test the solenoid valves and distillation heater for proper operation. This can be very helpful when diagnosing certain operational problems. By switching the appropriate DIP Switch to the **ON** position, the corresponding valve or heater and filter alert electrical circuit will energize.

1. **SW2** switching **Dip Switch 2 ON**…energizes **Equalization Solenoid (SOL-1), Green D2 LED** will be on solid.
2. **SW2** switching **Dip Switch 3 ON**…energizes **Oil Return Solenoid (SOL-2), Green D3 LED** will be on solid.
3. **SW2** switching **Dip Switch 4 ON**…energizes the **Distillation Heater** and the **Green D4 LED** will be on solid. **Also,** the filter alert electrical circuit is tested and filter alert indicator light will be on.

WARNING: Be sure DIP Switches 2, 3 and 4 on Switch SW2 are returned to the OFF position when finished. If any of these DIP Switches are left in the ON position, the OAM Purger will not function. (See Fig. 7, page 33 for location of Switch SW2.)

Using Switch SW2 Dip Switches 2 and 3 during leak testing procedure

WARNING: During the leak testing procedure, ALL VALVES TO THE CHILLER MUST BE CLOSED, to avoid pressurizing the Chiller. This includes the Chiller Charging Valve, the Oil Charging Valve AND the Evaporator Gauge Stop Valve where the vapor return line is connected.

Switch SW2 Dip-Switches 2 and 3 must be used during the leak testing procedure. Switching these DIP Switches to the **ON** position opens the equalization solenoid and the oil transfer Solenoid to their respective connecting lines so the line connections to the Chiller can be tested for leaks.

1. **SW2** switching **Dip Switch 2 ON**…energizes **Equalization Solenoid (SOL-1)** and opens OAM Purger tank and line up to the Angle Valve on the evaporator. **(See Warning Above.)** (Green D2 LED on solid.)
2. **SW2** switching **Dip Switch 3 ON**…energizes **Oil Return Solenoid (SOL-2)** and opens OAM Purger tank and line up to the Angle Valve on the oil sump. **(See Warning Above.)** (Green D3 LED on solid.)

WARNING: Be sure DIP Switches 2 and 3 on SW2 are returned to the OFF position when finished. If either of these DIP Switches are left in the ON position, the OAM Purger will not function. (See Fig. 7, page 33 for location of Switch SW2.)

Trouble Shooting

Should an operational difficulty or malfunction occur, the diagnostic chart and checkout procedures on the following pages should help to quickly determine the cause and corrective action. The Troubleshooting Chart has a "Symptom" column which describes what the unit is doing; a "Possible Cause" column which identifies possible sources of the problem; and a "Solution" column which describes what must be done to correct the problem.

NOTE: Should the OAM Purger shut down on a FAULT condition, DO NOT POWER OFF THE PURGER until you have first removed the electrical panel cover and recorded the status of the indicator LED's D1 through D5 located on the Logic Board. Knowing the particular LED(s) that are lighted will help you diagnose the cause of the problem. Once the unit is powered off, this information will be lost. Retain the record of the LED readings. Examine the purger for any apparent problems, check the troubleshooting section for possible causes of the fault. Check to see if all appropriate Dip Switches on SW1 & SW2 are off (see pages 23, 33 and 40), then if there is no readily apparent problem, you should *reset one time (and only one time)* to see if the fault repeats.

Trouble-shooting Chart

Symptom	Possible Cause	Solution
Power switch ON but switch Light is Off.	Main power to unit Off. Switch light defective.	Restore main power. Replace Switch.
Power switch ON and lighted but Logic Board LED's are all OFF.	Logic Board fuse blown. Logic Board defective.	Replace fuse. Replace Logic Board.
Red Fault LED **D6** ON and flashing with Green LED **D1** ON solid.	Indicates distillation temperature did not drop below 145 degrees F during the first 14 minutes of the fill phase.	Distillation heater stuck on. RLY-1 contacts stuck. Replace Logic Board. Temperature Sensor TS-1 defective. Replace sensor. Chiller's charging valve closed. Open valve. Oil Return Solenoid Valve SOL-2 defective and the purger has become oil logged. (See clearing oil logging procedure page 39.) Replace solenoid coil or valve. Or, RLY-4 relay defective. Replace Logic Board. Chiller's oil sump charging valve closed causing purger to become oil logged. Open Valve and see page 39 for clearing Oil logging.

Trouble-shooting Chart (continued)

Symptom	Possible Cause	Solution
Red Fault LED **D6** flashing with Green LED **D2** ON solid.	Indicates distillation temperature failed to reach 145 Degrees F within 4 hours after entering Primary Distillation Phase.	Distillation heater defective. Replace heater (see Maintenance Using Switch SW2 dip switch 4 as a diagnostic aid See page 40). Heater relay RLY-1 on Logic Board defective. Replace Logic Board. Temperature Sensor TS-1 defective. Replace Sensor.
Red Fault LED **D6** flashing with Green LED **D3** ON solid.	Indicates the purger Logic Board **did not see any activations** of Equalization Solenoid Valve SOL-1 during distillation phases. Dip Switches on Switches SW1 or SW2 may be set improperly. (See page 23, 33 and 40 for SW1 and SW2 information.) Refer to "Distillation Tank will not fill" Symptom below in troubleshooting section. Purger may be mounted to high. Fill Check Valve CK-2 stuck in open position. Refrigerant Charge low.	Distillation heater may be defective. (See Heater section under Symptoms below.) Oil Return Solenoid Valve Sol-2 failed open or closed. Replace valve. Or, relay RLY-4 contacts failed open or closed. Replace Logic Board. Pressure Equalization Solenoid Valve SOL-1 failed open or closed. Replace Valve. Or relay RLY-3 failed open or closed. Replace Logic Board. Differential Pressure Switch DPS-1 defective. Replace Switch. See Mounting Section Page 13, 14. Replace Check Valve CK-2. Correct Refrigerant Charge.
Red Fault LED **D6** flashing with Green LED **D4** ON solid.	Indicates the Logic Board **did not see at least 2 activations** of Equalization Solenoid Valve SOL-1 during the distillation Phases. Dip Switches on Switches SW1 or SW2 may be set improperly. (See page 23, 33 and 40 for SW1 and SW2 information.) Refer to "Distillation Tank will not fill" Symptom below in troubleshooting section. Purger may be mounted to high. Fill Check Valve CK-2 stuck in open position. Refrigerant Charge low.	Distillation Heater may be defective. (See Heater section under Symptoms.) Oil Return Solenoid Valve SOL-2 failed open. Replace Valve. Or, relay RLY-4 Contacts stuck. Replace Logic Board. Pressure Equalization Solenoid Valve SOL-1 failed open or closed. Replace Valve. Or RLY-3 contacts failed open or closed. Replace Logic Board. Differential Pressure Switch defective. Replace switch. See Mounting Section Page 13, 14. Replace Check Valve CK-2. Correct Refrigerant Charge.

Trouble-shooting Chart (continued)

Symptom	Possible Cause	Solution
Distillation Heater doesn't get hot.	Defective Heater.	Replace heater (See Maintenance Section on Using Switch SW2 DIP switch 4 as a diagnostic aid.)
	RLY-1 relay defective.	Replace Logic Board.
	Disconnected lead.	Reconnect lead.
	Defective Temperature Sensor TS-1. Contacts stuck closed.	Replace Sensor.
	Defective Logic Board.	Replace Logic Board.
Equalization Solenoid Valve SOL-1 fails to open or close.	Solenoid coil defective.	Replace coil.
	SOL-1 Solenoid Valve defective.	Replace valve.
	RLY-3 relay defective.	Replace Logic Board.
	Disconnected lead.	Reconnect lead.
	Differential Pressure Switch DPS-1 defective.	Replace switch.
Oil Return Solenoid Valve SOL-2 fails to open or close.	Solenoid coil defective.	Replace coil.
	SOL-2 Solenoid Valve defective.	Replace valve.
	RLY-4 relay defective.	Replace Logic Board.
	Disconnected lead.	Reconnect lead.
Distillation Tank will not fill.	Chiller's refrigerant charging valve closed.	Open Valve.
	Vapor return line isolation valve closed.	Open Valve.
	Distillation Heater stuck ON during Fill Phase.	Defective TS-1, Replace. Or RLY-1 contacts stuck. Replace Logic Board.
	Distillation Tank oil logged.	(See "Maintenance" section for procedure to clear oil logged distillation tank.
	Fill line kinked or obstructed.	Correct as needed.
	Fill line strainer clogged.	Replace Fill line Strainer.
	Fill Check valve CK-2 fails to open.	Replace Check Valve CK-2.
	Equalization Solenoid Sol-1 failed to energize.	Replace Equalization Solenoid Sol-1.
	Purger may be mounted to high.	See Mounting Section Page 13, 14.
	Fill line and connecting piping up to evaporator shell may not be insulated causing vapor lock.	Insulate, (see page 17 for warning information on insulating.)
	Refrigerant Charge low.	Correct Refrigerant Charge.

Trouble-shooting Chart (continued)

Symptom	Possible Cause	Solution
Oil will not transfer from Distillation Tank to oil sump.	Oil Return Solenoid Valve SOL-2 Solenoid coil defective.	Replace coil.
	SOL-2 Solenoid Valve defective.	Replace valve.
	Oil Sump valve closed.	Open Valve.
	Oil return line kinked or blocked.	Correct as necessary.
	Oil Filter blocked.	Replace oil filter.
	RLY-4 relay defective.	Replace Logic Board.
	NO PRESSURE IN DISTILLATION TANK TO PUSH OIL to oil sump:	
	Equalization Solenoid Valve SOL-1 stuck open or leaking past valve seat..	Replace valve.
	RLY-3 relay contacts welded closed.	Replace Logic Board.
	Differential Pressure Switch DPS-1 defective.	Replace DPS-1.
	Fill Check Valve CK-2 stuck open.	Replace Fill Check Valve CK-2.

FOR INFORMATION ABOUT FACTORY REPAIR AND CALIBRATION SERVICE
CALL 317-865-4130

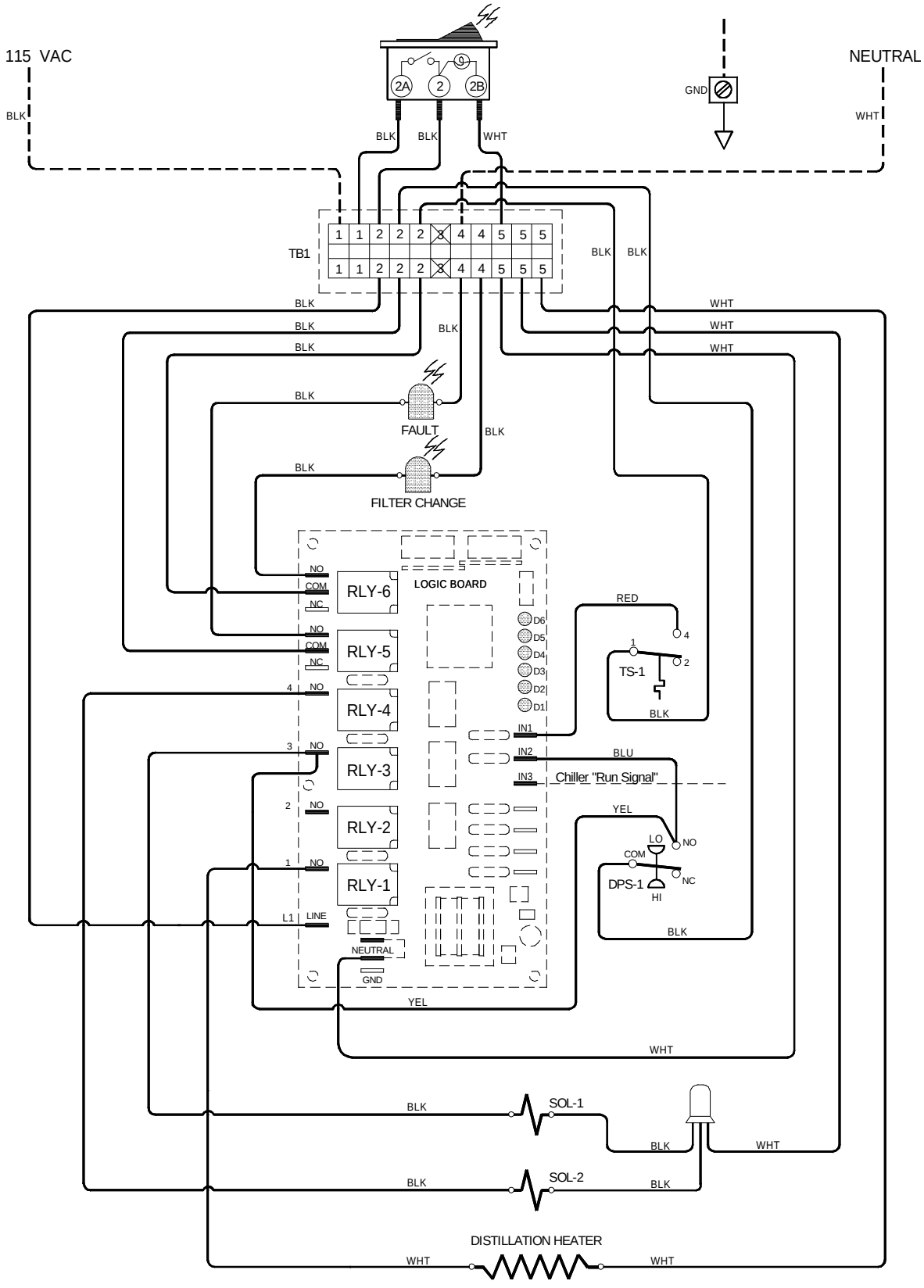


Figure 9. - ***Electrical wiring diagram***

Equipment Warranty

Subject to the terms below, **REDI CONTROLS** will, within one year after date of purchase, repair any **REDI CONTROLS'** product being used by the original purchaser, which is defective due to faulty materials or workmanship. **REDI CONTROLS** has the right to repair or replace a defective part or replace the entire product.

To file a Warranty claim on any system or component, return the defective unit to the address below, or other location as REDI CONTROLS directs, freight prepaid.

This Warranty <u>does not</u> apply to or cover:

- Damages beyond **REDI CONTROLS'** control.
- Malfunctions that result from failure to properly install, operate or maintain a product in accordance with instructions provided by **REDI CONTROLS**.
- Failures of equipment due to abuse, accident or negligence.
- Damages from, or part failures due to equipment not being installed per **REDI CONTROLS'** instructions, per applicable codes or ordinances, or in accordance with good trade practices.
- Labor or other charges incurred in removing or reinstalling any **REDI CONTROLS** product or part.
- Damages resulting from use of a **REDI CONTROLS** product for any purpose other than for which it was designed and manufactured.
- Any implied warranty of merchantability or fitness for any particular purpose, occurring after the Warranty Period.
- Loss of use, loss of time, inconvenience, rental for substitute products, loss of business, loss of income, or any other consequential damages resulting from use or failure of any **REDI CONTROLS** product.

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