



**MODEL PFR-571-Z2**  
CONTAINER REFRIGERATION UNIT



**OPERATION, SERVICE AND PARTS MANUAL**

MANUFACTURED BY KLINGE CORPORATION

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## REVISION RECORD

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## Use of this Manual

**This manual describes operation, service and parts of the PFR-571 refrigeration unit. For information regarding ATEX certification and compliance of the PFR-571 Z2 system please see Klinge manual K35-PFR571-Z2.**

The use of this manual is intended for the safe operation of the equipment described. It is therefore reasoned that persons who have the occasion to use this manual have a knowledge of mechanical and electrical systems and components addressed by its' contents. However, efforts have been made to enable persons less familiar with these systems to use this manual.

The equipment may be installed in a number of configurations. Each may have optional items and differing external details provided by third parties. The specific electrical circuit and pipe diagram are posted on the unit as decals.

Most external and internal pipework parts are standard commercially available pipe fittings and not covered here. For external pipe fitting, replace like for like, taking care to replace stainless steel with stainless steel.

Suggestions as to improvement in content and format are welcome and should be addressed to [engineering@klingscorp.com](mailto:engineering@klingscorp.com). Corrections and improvements will be included on dated revisions – the latest of which will be available upon request.

## Service Request

Requests for Service should be directed to the Klinge Service Team. The below link should be used to place all requests for service and will afford the quickest response time.

<https://klingscorp.com/request-service/>

This form will help us determine model and age of the equipment, location, basic details about the issue, who to contact and how to best handle the issues with the equipment. A service ticket number will be provided in a response email once the form is received and processed. If the equipment is out of warranty, charges may apply for extensive technical support.

Additionally, our Service Department can be reached via email at [technical@klingscorp.com](mailto:technical@klingscorp.com).

## Spare Parts Request

Requests for Spare Parts should be directed to our Parts Department via email at [spares@klingscorp.com](mailto:spares@klingscorp.com). Please have available at the time of the request the Serial Number of the equipment to ensure that the proper part is provided.

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# SECTION ONE

## GENERAL DESCRIPTION

### 1.1 Refrigeration Unit

The Klinge Model PFR-571-Z2 refrigeration unit is designed specifically for operating in Zone 2 Hazardous Locations. It handles fresh and frozen loads in world-wide ambient temperatures.

The unit is charged with R-404A, R-452A, R-134a or R-513A refrigerant.  
See the unit's Data Plate to identify the refrigerant.

The unit, of lightweight aluminum frame construction, is an all-electric, all-in-one cooling and heating unit. The unit is designed to fit into the front of a container and to serve as the container front wall. Forklift pockets are provided for the installation and removal of the unit.

The cargo space temperature is controlled by a microprocessor thermostat. Once the temperature is set at a desired container temperature, the unit will operate automatically to maintain the desired temperature within a narrow range.

### WARNING

**The control box can only be opened in a hazardous location when the flow of power has been cut using the Main Power Disconnect Switch.**

This unit is designed to maintain temperatures from -20°C (-4°F) to +29°C (84°F) automatically, utilizing cooling and heating cycles.

The unit is designed to operate on 400/480 volt AC +/-10%, 3 phase 50/60 Hz +/-2.5%.

Control System power is provided by a single-phase transformer which steps down the high voltage power source to 230 volt, 24 volt and 12 volt AC single phase.

A self-diagnostic function test checks the condition of the refrigeration unit automatically and is performed by the microprocessor thermostat. This saves labor costs and makes pre-trip inspections reliable.

A phase sequence sensing and control system is installed in the electrical control section; this system will automatically reverse two of the phases if required to correct component rotation, regardless of the incoming phase sequence of the power.

All motors, including the compressor, are equipped with automatic reset internal thermal overload protection.

Air is discharged from the bottom of the unit and returns to the unit at the top of the container. The evaporator fans run continuously, except on the defrost cycle.

Heating and defrost is provided by the use of a hot gas solenoid valve. When this valve is activated

the hot gas from the high-pressure side of the compressor goes directly to the evaporator coil.

Defrost is automatically activated by the microprocessor thermostat when the temperatures of the return air probe and the defrost probe reach a determined difference, or it can be started manually from the control panel. The termination is automatic in either case, when the temperature of the defrost probe rises to a preset temperature (approximately 35°C / 95°F).

The unit is delivered complete with a charge of refrigerant, compressor lubricating oil, mode-indicating LEDs, and microprocessor thermostat, factory tested and ready for operation upon installation.

A fresh air make-up vent is located at the upper left corner of the unit. The purpose of the vent is to provide ventilation for commodities that require fresh air circulation and must be closed when transporting frozen goods.



## **SECTION TWO**

### **REFRIGERATION SYSTEM**

#### **2.1 Refrigeration Theory**

Refer to the refrigeration-piping diagram (Sect. 2.3). This is a schematic piping diagram of a typical refrigeration circuit and will be referred to in the following explanation of refrigeration theory.

The method used to transfer heat from a place where it is not wanted to a place where it is not objectionable is the changing of a liquid to a vapor and changing of the vapor back to a liquid. See the schematic piping diagram (See section 2.3). The following steps take place to produce cooling.

1. Starting at the receiver, where there is a supply of liquid refrigerant, liquid flows to the expansion valve. This liquid is at a high temperature and under high pressure.
2. As the liquid passes through the expansion valve the temperature and the pressure of the liquid drop to the temperature and pressure found in the evaporator coil.
3. The cold liquid refrigerant in the evaporator coil absorbs heat from the refrigerated space and changes into a vapor state.
4. The low pressure and low temperature vapor then goes from the evaporator coil to the compressor and is compressed to a high pressure, high temperature vapor.
5. Vapor then goes from the compressor to the condenser coil, where the condenser fan moves the air over the coil and removes heat from the vapor. This reduces the temperature to the point of condensation and the vapor changes into liquid.
6. The liquid then flows to the receiver to provide a supply for repeating the cycle.

#### **2.2 Refrigerant**

This unit is charged with either R-404A, R-452A, R-134a or R-513A.

R-404A is a blend of HFC refrigerants R-134a, R-125 and R-143a.

R-452A is a blend of HFC refrigerants R-32, R-125 and HFO refrigerant R-1234yf.

R-513A is an HFO based replacement for R-134a.

Refrigerants R-404A, R-452A and R-513A have an ozone depletion potential (ODP) of zero.

When using R-404A, R-452A or R-513A, the compressor oil must be polyolester synthetic oil (POE).

A moisture indicator is installed in the liquid line immediately after the filter drier to indicate if there is moisture in the refrigerant charge.

The element, which is located in the center of the indicator, will change color on contact with moisture in the refrigerant passing over it.

A dry system will be indicated by a dark green color; a wet system will show from a yellowish green to bright yellow, depending on the amount of moisture in the system. A colored leak detecting agent, added to the refrigerant, will permanently discolor the indicator and should therefore not be used. It will also become discolored if a compressor motor burn-out occurs and should be replaced after the compressor has been changed.

The following is a brief explanation of a few of the components in the system and their functions.

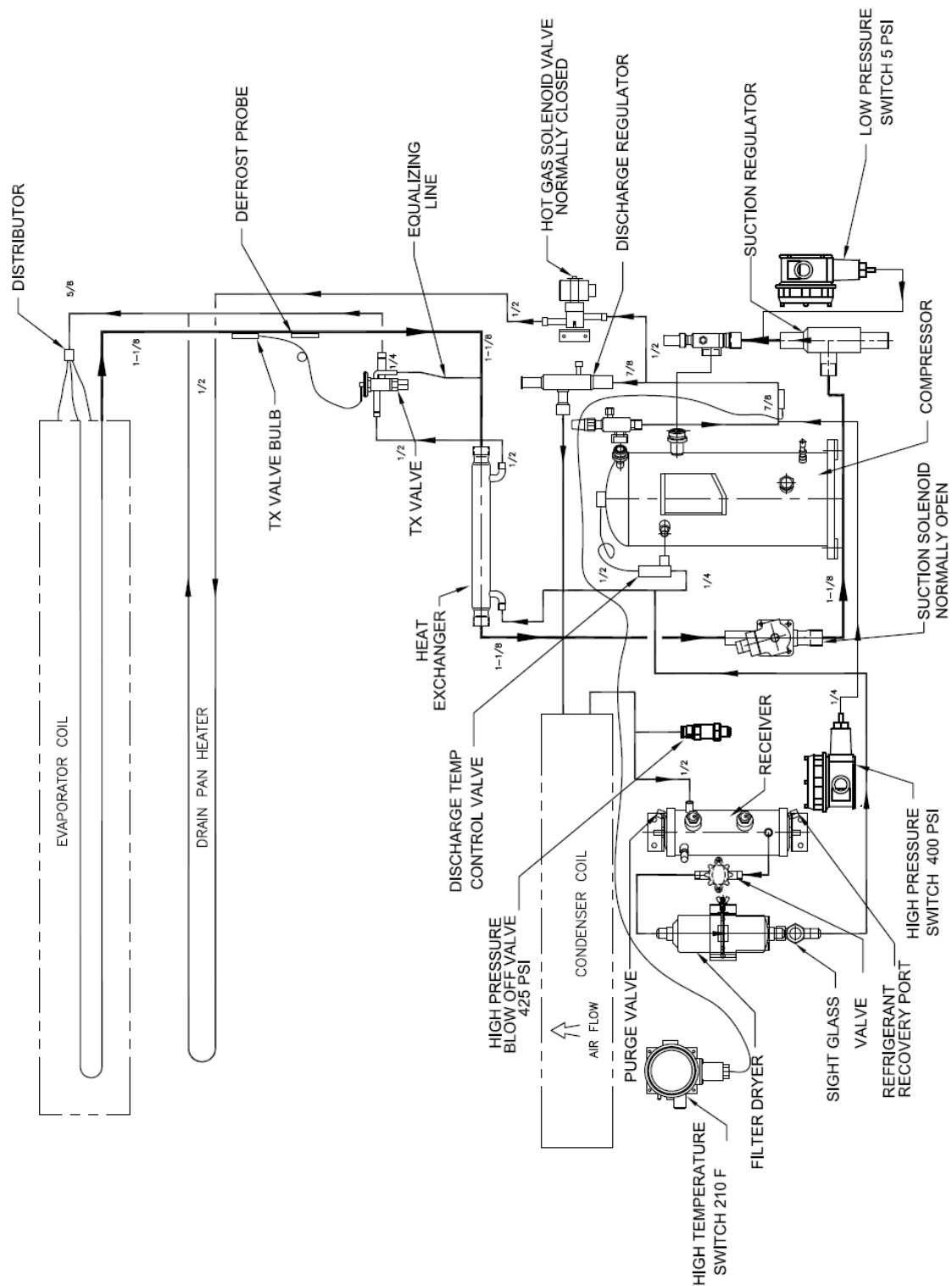
The condenser fan and the evaporator fans move air across the heat exchange surface (coils) for the purpose of either supplying heat (the evaporator fan) or removing heat (the condenser fan).

The purpose of the compressor is to provide a high temperature, high-pressure vapor to the condenser coil so that heat can be removed with the ambient temperature air. At the same time this causes a pressure differential between parts of the system and causes the refrigerant to repeatedly flow through the system.

### **2.3 Unit Piping Diagram (see next page)**

The expansion valve is a device which provides liquid to the evaporator coil as required. It is important to remember the parts of the system which are subject to high pressure and low-pressure refrigerant. The high pressures will be accompanied by high temperatures, and the low pressures will be accompanied by low temperatures.

The common terminology used for these parts of the system is "the high side" and "the low side". The area from the discharge side of the compressor to the inlet side of the expansion valve is referred to as the high side. The area from the outlet side of the expansion valve to the suction side of the compressor is referred to as the low side.



REFRIGERANT PIPING

## SECTION THREE

### OPERATION

**Do not open the control box in a hazardous location.**

**Do not remove condenser grill or open evaporator door before turning power OFF at the Main Power Disconnect Switch.**

It is important that a Pre-Trip Inspection (PTI) be completed after any significant period of non-use.

The PFR-571 PTI form can be found on Klinge's website at: <http://www.klingecorp.com/pti/>

#### 3.1 Pre-starting check

The following inspection should be made before the container is loaded as part of a pre-trip inspection.

- a. Visually check unit for physical damage.
- b. Visually check major hold-down bolts of the machine in the container and the fasteners of the major components in the machine.
- c. Open control box cover and check that all electric components are secure and that terminal connections are tight.
- d. Check gasket on control box and make sure that the cover is safely closed.
- e. Check cleanliness of condenser coil and clean if necessary.
- f. Thoroughly check all refrigerant joints and connections for traces of oil, which could be caused by a small refrigerant leak.

#### 3.2 Main power connection

The following instructions must be carried out by a qualified lead person, reference drawing 360-17668-02 below.

- a. Ensure Main Power Disconnect Switch (K25-26760-02) is set to “OFF”.
- b. Remove cover to Main Power Disconnect Switch.
- c. Install power cable into connector on the bottom, left side of the Main Power Disconnect Switch (see drawing 360-17668-02).
  - a. Incoming power cable to be at least 10/4 SO heavy duty.
  - b. Outer sheath diameter must be in the range of 19 to 28 mm to fit provided cable gland.
- d. Tighten cable gland nut to secure main power cable in gland.
- e. Connect incoming main power wires properly to terminals 1, 3 & 5 on the bottom side of the switch.
- f. Connect incoming main power ground to PE (ground) terminal of switch.
- g. Replace Main Power Disconnect Switch cover securely.

UNCONTROLLED IF PRINTED

### 3.3 Starting check

- a. Connect **MAIN POWER DISCONNECT SWITCH** to supply power source. Turn to the ON position.
- b. Be sure CB1, CB2 and CB3 circuit breakers are closed in the ON position.
- c. Initiate Function Test – Press and hold defrost test switch closed and press unit **ON-OFF** switch to the **ON** position. Hold for 10 seconds or until all LED's on controller face flash. Unit will now begin the function test automatically. (See 3.5 Function Test).
- d. After completion of the function test, check amperage of the compressor motor, condenser fan motor, evaporator fan motors. Check the measured value against the maximum value on the electrical schematic in this manual – check all three phases and look for any major disparity phase to phase.  
At the same time check all indicating lights and the direction of fan rotation.

### 3.4 Running Unit

#### Suction capacity reduction

The suction capacity reduction solenoid valve is controlled by the microprocessor thermostat. When the microprocessor thermostat calls for capacity reduction (compressor unload), the suction solenoid valve will be energized.

#### Fresh air circulation

The unit is equipped with a fresh air vent, which, if opened, will supply fresh air to the cargo space when needed for the purpose of creating a more suitable atmosphere for fresh fruit and vegetables. The fresh air supply must only be used in the "chilled" range. When fresh air is not needed, the fresh air vent must be closed.

#### Phase selection

At power on, the evaporator fan is started to detect the phase direction, if there is no power use at the evaporator fan, then the condenser fan is started.

When phase direction is detected after roughly 5 sec. then LED3 is turned on and evaporator and condenser fan are stopped.

If the phase direction is wrong, then relay 1 on the controller will be activated. This will turn off PS1 and turn on PS2.

If phase direction can't be detected, then LED 2 and LED 3 will flash. After 5 minutes the controller will try to find the phase direction again. This will continue until the phase direction is detected.

## Temperature Controlling

The actual temperature control point is determined by the setting of the operator control panel. The sequence of events or cycles of the unit are governed by the controller in conjunction with the return air temperature probe and the set point selected on the operator panel.

When the cargo space temperature is such that maximum cooling is required, the compressor, the evaporator fans, and the condenser fan will all operate.

When the return air temperature starts falling and approaches the set point, cooling capacity reduction will occur at 2°C (3.6°F) above set point; this is referred to as unloading.

When the return air temperature falls to the set point, the compressor and condenser will stop.

If the temperature falls to 1°C (1.8°F) below the set point, heat will be energized.

As the temperature rises to the set point, heat will de-energize.

If the return air temperature rises to 0.5°C (0.9°F) above the set point, the compressor will come back on with capacity reduction.

If the return air temperature rises to 3°C (5.4°F) above the set point, capacity reduction will be eliminated, and maximum cooling will resume.

When the set point is set at -7°C (19°F) or below, the heat and unload cycle will be locked out.

These functions and steps are explained in more detail in Section 3.5.

## Defrost Cycle

1. If a predetermined manufacturer setting temperature difference between the return air and defrost probes has been detected continuously for 3 minutes a defrost cycle is automatically initiated. A defrost cycle cannot be initiated less than 1-1/2 hours from last defrost. If the system attempts to initiate a defrost cycle within ½ hour of a defrost cycle the alarm light will flash and an alarm code will be displayed (see Section 0).
2. Evaporator fans are OFF, and the hot gas solenoid valve and compressor are activated during defrost.
3. Defrost cycle terminates when the temperature of the defrost probe rises to a preset temperature, approximately 18°C (64.4°F) plus 5 minutes, or when the defrost probe reads 38°C (100°F).

4. If compressor runs for 18 accumulated hours without defrost cycle, defrost will be initiated automatically, or if the set point has not been reached after 6 hours of continuous compressor run time without a defrost cycle.
5. If defrost probe is out of range (open or shorted) defrost will occur automatically after compressor has run for 18 accumulated hours. The alarm LED will be flashing. An alarm code will be displayed (see Section 0). The 18 hour defrost timer is locked out if the temperature is above 10°C (50°F).
6. If defrost is not terminated by probe, the thermostat will terminate it after (1) hour, and the alarm LED will flash and an alarm code will be displayed (see Section 0).
7. Defrost can be manually initiated by depressing the MANUAL DEFROST/FUNCTIONAL TEST button (for 5 seconds). Defrost is terminated as indicated above.
8. A manual defrost can be initiated at any time.
9. In heat mode there is no defrost function.

### **3.5 Function Test (Label on right side of thermostat)**

#### **NOTE**

Steps of the Function Test are listed on the right side label of the thermostat and are also on the electrical schematic.

To start the Function Test program, press the MANUAL DEFROST/FUNCTION TEST button. Press the ON/OFF button. Display will show the software version and then the current set point. After roughly 10 sec. all LED will flash, then release the MANUAL DEFROST/FUNCTION TEST button and the function test will run.

#### **Step 1: Phase sensing test.**

If the power is sensed coming into the unit as L1-L2-L3 then the controller will test PS2 for proper functionality.

If the power is sensed coming into the unit L1-L3-L2 then functionality was already tested as part of the start up process.

LED 3 will flash

The controller will deactivate PS1 and will activate PS2.

After one second the controller will activate the evaporator fan relay.

After four seconds the controller will test that there is a minimum of 0.4 amps at each phase.

If PS1 and PS2 function properly the function test will continue to Step 2, and LED 3 will be turned ON.



The display will show the actual amps used.

**Step 2: Evaporator fan on.**

LED 4 will flash

Controller checks if amps are within limits.

(If amps are lower than 0.5A or higher than 2.0A, then test failed)

The controller also checks the highest and lowest amps measured, if the highest amps measured is twice the lowest, there will be an alarm.

The display will show the actual amps used by the evaporator fan.

**Step 3: Condenser fan on.**

LED 5 will flash

Controller checks if amps are within limits.

(If amps are lower than 0.5A or higher than 3.0A, then test failed)

The controller also checks the highest and lowest amps measured, if the highest amps measured is twice the lowest, there will be an alarm.

The display will show the actual amps used by the condenser fan.

**Step 4: Condenser fan on, and compressor is on.**

LED 6 will flash

Controller checks if amps are within limits.

(If amps are lower than 5 A or higher than 13 A, then test failed)

The controller also checks the highest and lowest amps measured, if the highest amps measured is twice the lowest, there will be an alarm.

The display will show the actual amps used by the condenser fan.

**Step 5: Condenser fan on, compressor is on and unload is on.**

LED 7 will flash

The display will show the actual amps used by the condenser fan.

**Step 6: Compressor is on and hot gas is on.**

LED 8 will flash

The display will show the actual amps used by the compressor.

**Step 7: Alarm relay is de-energized.**

LED 9 will flash

If the external alarm monitor is connected, it will trigger external alarm monitor.

If the Manual Defrost button is activated, then the horn will stop sounding, and the controller will jump to the next test step.

**Step 8:** Temperature sensor test.

LED 10 will flash

Display will toggle between defrost probe temperature and return air probe temperature

If the difference between the probes is less than 5°C the test passes

If the difference between the two probes is greater than 5°C the evaporator fan will turn on for up to 8 minutes in an attempt to bring the sensed temperatures to within 5°C.

If after 8 minutes the temperatures are still not inside the 5°C range, the temperature sensor test will fail

**NOTE**

If all steps of the function test are passed, all LEDs will be on for 10 seconds and after that the controller will return to normal operation.

If there has been any alarm, the LED for that step will flash for ½ hour and the alarm code is shown in display and will remain in the display for ½ hour. After this ½ hour delay the controller will return to normal operation.

## **SECTION FOUR**

### **ELECTRICAL AND ELECTRONIC FUNCTIONS**

#### **WARNING**

Beware of high voltage in various parts of the unit, especially when the disconnect switch or CB1 is in the **ON** position. It is recommended that a thorough study of the wiring schematic be made to determine where high voltage will be encountered when electric power is being fed to the unit.

The micro-processor thermostat is designed to maintain the temperature. The microprocessor thermostat compares the temperature of the probe with the set point and calls for heating, cooling, or defrosts as required.

#### **WARNING**

**Do not open the control box in a hazardous location unless the Main Power Disconnect Switch is turned OFF and locked out with a padlock.**

#### ***4.1 General Information***

When high voltage power is being fed to the unit and CB1 is in the **ON** position, power will pass along L1, L2 and L3 to the transformer T1, the current sensor and phase contactors. When the current sensor is energized, C, PC1 or PC2 and CF will be energized, and allow power of the correct phase rotation to the compressor, evaporator fans and the condenser fan.

All wires are marked for identification and can be referenced in the electrical schematic.

#### ***4.2 Electrical Box***

##### **Circuit Breakers**

- a. Circuit breaker (CB1)  
The 25-amp circuit breaker is reset manually and protects the entire unit against overload.
- b. Circuit breaker (CB2)  
A 4-amp circuit breaker protects the 24 volt and 12 volt control circuit in case of possible short circuits.
- c. Circuit breaker (CB3)  
A 1 amp circuit breaker protects the 230v lighting circuit in case of possible short circuit or over amperage.

##### **Contactors**

- a. Compressor motor contactor (C)  
This is a 3-pole 480-volt direct-on-line contactor with a 24 volt operating coil. It operates the compressor motor and is energized by the microprocessor thermostat. The 24-volt coil circuit can be interrupted by the high-pressure switch or temperature switch.

- b. Condenser fan contactor (CF)  
This is a 3-pole 480-volt direct-on-line contactor with 24 volt operating coil. It operates the condenser fan and is energized by the microprocessor thermostat.
- c. Evaporator blower contactor (EB)  
This is a 3-pole 480-volt direct-on-line contactor with 24 volt operating coil. It operates the evaporator blowers and is energized by the microprocessor thermostat.

### **Transformers**

- a. Transformer 480-24V, -12V, -230V (T1)  
The primary coil is tied into the line between the 25-amp circuit breaker and the line starters. The secondary coil supplies 24 volt and 12 volt AC for the control circuit and 230 volt for compressor control and the lighting circuit.

### **Current Sensor (CS)**

When the unit is receiving proper voltage and frequency L1-L2-L3, the CS automatically changes to correct phase rotation. By putting the unit **ON/Off** switch to the **ON** position, 24 volts will pass to energize PC1 or PC2.

The current sensors also monitor the amperes of all motors and trigger the thermostat into alarm if out of range. (See Section 0 Alarm Code Trouble Shooting Chart)

### **Phase contactors (PC1 or PC2)**

There are two 3-pole 480-volt direct-on-line contactors with 24 volt operating coils. These connect the power to the compressor, condenser fan and evaporator fans. The contactor (PC1 or PC2) is energized by the current sensor.

### **Discharge Temperature Switch (DTS)**

This explosion proof switch will remove power to the compressor contactor coil if the discharge temperature rises to  $104.4 \pm 2.8$  °C ( $220 \pm 5$ °F). As the discharge temperature drops the switch will close, allowing the compressor contactor to re-energize and start the compressor.

### **High Pressure Switch (HPS)**

This explosion proof switch will remove power to the compressor contactor coil if the discharge pressure rises to 26.5 bar (385 psi). As the discharge pressure falls the switch will close, allowing the compressor contactor to re-energize and start the compressor.

## SECTION FIVE

### MICROPROCESSOR THERMOSTAT

#### 5.1 General Information

The microprocessor thermostat is an electronic solid-state device consisting of three parts:

1. The display panel.
2. The temperature probes.
3. The microprocessor thermostat.

All parts are mounted in the control box except the temperature probes and the compressor control module. The return air probe is mounted in the return air stream and the defrost probe is mounted to the suction line at the same location as the TX valve bulb.

It is recommended that a multi-meter or ohmmeter is used for trouble shooting the system, as a severe short circuit is likely to cause damage to the electronic circuits. Because control is related to resistance, an ohmmeter is required to check components.

Accuracy is  $\pm 0.1^{\circ}\text{C}$  ( $0.2^{\circ}\text{F}$ ). Checking of temperatures should be done with equal or better accuracy, and the components cannot be re-calibrated.

The display shows the temperature of the controlling probe. Indicator LEDs are provided to determine correct functions and as an aid to servicing the unit. The LEDs are mounted on the thermostat and are visible from the front of the unit. The LED indicator will indicate which function is being called for by the microprocessor thermostat.

The defrost system is controlled automatically by the microprocessor thermostat but can also be activated manually from the switch panel by pressing and holding the function test/manual defrost switch in for 5 seconds.

When the unit **ON/OFF** switch is in the **ON** position, the display will show return air probe temperature.

The defrost probe temperature can be shown by momentarily pressing the function test/manual defrost switch in.

When the operator buttons have not been operated within 5 seconds, the display automatically switches to normal mode, displaying the return air probe temperature.

The temperature setting (set point) is stored in a nonvolatile memory and will always be intact - even in case of power failure.

In order to prevent false entry or changes of set point values, both selector buttons must be depressed simultaneously for new settings to be entered into the memory (see section **5.2**).

#### 5.2 Display Panel

## General Description

The touch pad/display panel consists of three switches and a three character alpha-numeric LED display. The touch pad is operated using the C/F Button (red) and the Temperature Selector Buttons (red) mounted on the face of the electronic control box. The display normally shows return air temperature as derived from the return air temperature probe. Temperature is indicated in 0.1 degree increments for temperatures between -9.9 and +99.9; and in whole degree increments for values below -10 and values above +100.



### NOTE

Pressing the MANUAL DEFROST/FUNCTION TEST button for approximately ½ second while in cooling or heating mode will change the display to show the defrost sensor temperature reading.

Releasing the button will return the display to the return air sensor temperature reading.

Pressing the MANUAL DEFROST/FUNCTION TEST button for more than 5 seconds will start a defrost cycle.

### NOTE

Pressing the Manual Defrost /Function Test button during a defrost cycle will show the current defrost probe temperature. This will show how close the system is to terminating the defrost cycle by reaching 18°C (64.4°F).

## Creating a Temperature Set Point:

### NOTE

External **TEMP UP** (↑) and **TEMP DOWN** (↓) buttons are located on the face of the control box door.

1. Pressing the **TEMP UP** (↑) or **TEMP DOWN** (↓) button causes the display to show the current set point.
2. Each pressing of one of these buttons will increment or decrement the set point by one whole degree.
3. Pressing a button and holding it will cause the display to change one degree each half second.
4. Simultaneously pressing the **TEMP UP** (↑) and **TEMP DOWN** (↓) buttons causes the current set point to be saved. The green LED and display will flash to show successful set point entry. This set point will be used until another set point is entered even if power is removed from the thermostat.
4. The display automatically returns to normal mode approximately five seconds after the last button press.

**NOTE:** The equipment can be protected from accidental or unauthorized changing of the set point by using a PIN Code. If a PIN Code is in use, contact the equipment owner for the code, then use the below step by step process for entering the PIN Code to allow you to change the Set Point.

1. When the unit is in operation the current Set Point will be displayed by pressing either the UP or DOWN button. This will display the current Set Point.
2. When you press either the UP or DOWN button again the word “Pin” will be displayed.
3. When the word “Pin” is displayed you then press the C/F Key one time.
4. The display will now show 0 as the first digit, at this time you will need to enter the first digit of the PIN Code.
5. Once the first digit has been entered press the C/F key to move to the second digit.
6. The display will now show 0 as the second digit, at this time you will need to enter the second digit of the PIN Code.
7. Once the second digit has been entered press the C/F key to move to the third digit.
8. The display will now show 0 as the third digit, at this time you will need to enter the third digit of the PIN Code.
9. Once the third digit has been entered press the C/F key to confirm the PIN CODE that you have entered.

10. If the PIN Code that has been entered is not correct the Temperature Display will read "Pin".
11. If the code that has been entered is correct the Temperature Display will show the Return Air Temperature. At this point the Set Point can be set through the normal process. It should be noted that the Set Point will remain unlocked for 3 minutes after the PIN Code has been entered. After 3 minutes the PIN Code will need to be entered again.

### **Changing Temperature Mode:**

1. The thermostat can operate either in degrees Centigrade (C) or Fahrenheit (F).
2. Pressing the C/F button causes the display to indicate the current mode. This is indicated by a C or F in the right character of the display. The decimal point of the right most character is also lit when in F mode.
3. Pressing the C/F button causes the current unit of temperature to appear. Pushing the button while the mode is displayed, will change the units.
4. Pressing either the up or down button will cause the currently selected mode to be saved and the display immediately returned to normal mode.
5. The display automatically returns to normal mode approximately five seconds after the last button press.

### **5.3 Temperature Sensor**

The temperature sensing probe is a thermistor placed in a sealed metal tube.

The temperature signal from the probe is connected via cable to the control box. One probe (defrost probe) is mounted on the suction line to the compressor. The second probe (return air probe) is mounted in the return air duct, measuring the temperature of the air coming back from the container.



**WARNING**

It is important that the sensor is properly mounted. Use an ohmmeter to check probes. A short circuit indicates 0 Ohms resistance. An open circuit indicates infinite Ohms resistance.

Good readings should agree with the chart below:

PROBE RESISTANCE CHART		
Probe at Ambient Temperature		Ohms
Celsius	Fahrenheit	
125	257	340.8
120	248	388.6
115	239	444.5
110	230	510.1
105	221	587.3
100	212	678.6
95	203	787.1
90	194	916.1
85	185	1070.6
80	176	1256.2
75	167	1480.1
70	158	1751.6
65	149	2082.3
60	140	2487.1
55	131	2985.1
50	122	3601.1
45	113	4366.9
40	104	5324.9
35	95	6530.1
30	86	8056.1
25	77	10000
20	68	12493.7
15	59	15714
10	50	19903.5
5	41	25395.5
0	32	32650.8
-5	23	42314.6
-10	14	55298
-15	5	72895
-20	-4	96974
-25	-13	130243
-30	-22	176683
-35	-31	242195
-40	-40	335671

## 5.4 Microprocessor Thermostat

### General Description

This device contains all circuits necessary to select those functions required to maintain an accurate temperature. The selection is based on signals received from the probes, and the display panel. It is designed to operate in ambient temperatures of -20°C (-4°F) to 50°C (122°F). At these temperatures it will control temperature settings (set point) of -20°C (-4°F) to 29°C (84°F), to an accuracy of 0.1°C (0.2°F).

At ambient temperatures below freezing the heating capability is however limited to 20°C above ambient.

The system will not be adversely affected by storing at temperatures from -40°C (-40°F) to 70°C (185°F).

### LED Indicators

LED 1 = Power on

LED 2 = Alarm.

LED is off when there is no alarm.

LED flash when there is an alarm.

LED 3 = Phase OK.

LED is on when the phase direction is detected.

LED flash if the controller cannot find the phase direction.

Used in function test as step 1.

LED 4 = Not used.

Used in function test as step 2.

Evaporator fan on.

LED 5 = High pressure fault

LED is off when there is no alarm.

If the compressor experiences high pressure the LED will light and stay on for 2 minutes, after the 2 minute delay the compressor will start again, if it again trips with high pressure the LED will come on for another 2 minute delay. The compressor will attempt to start and run 3 times. If after the third attempt the compressor experiences a high pressure fault the LED will flash.

Used in function test as step 3.

Condenser fan on.

LED 6 = Temp. fault.

LED is off when there is no alarm.

LED on when there is an alarm.

Used in function test as step 4.

Condenser fan on, and compressor is on.

LED 7= Defrost.

LED on when unit is in defrost mode.  
Used in function test as step 5.  
Condenser fan on, compressor is on and unload is on.

LED 8 = Cooling.  
LED on when unit is in cool mode.  
Used in function test as step 6.  
Compressor is on and hot gas is on.

LED 9 = Heat  
LED on when unit is in heat mode.  
Used in function test as step 7.  
The alarm relay (AR) will be turned off.

LED10 = Unload valve.  
LED on when the unload valve is on  
Used in function test as step 8.  
Temperature sensor test.

## **INPUTS**

Input signals to the device consist of:

1. Return air temperature probe.
2. Defrost temperature probe.
3. Set point, temperature setting from display panel and control box buttons
4. Signal to initiate manual defrost or function test from SW2.
5. Pressure transducer
6. Current transformers

## **OUTPUTS**

Output signals from the device are by means of 8 relays. 4 relays are single pole, single throw, normally-open and 4 are single-pole, double-throw. Outputs used in this system are:

RL 8 = Hot Gas  
RL 7 = Evaporator fan  
RL 6 = Compressor  
RL 5 = Condenser fan  
RL 4 = Unload valve  
RL 3 = Not used  
RL 2 = Alarm  
Energize when no alarm.

De-Energize when there is an alarm.

RL 1 = Phase relay.

De-energize when phase is L1-L2-L3.

Energize when phase is L3-L2-L1.

Each output relay has a corresponding small red LED mounted on the circuit board adjacent to the relay to indicate the relay is energized. These **LEDs** are visible only from the side of the device and are for diagnostic purposes only.

## **MICROPROCESSOR THERMOSTAT FUNCTIONS**

### **Chill mode.**

Set point - 7°C and higher.

### **Start up cool.**

Evaporator fan on,

After 10 seconds the compressor will turn on, and unload if return air is within 2°C of the set point.

After 2 seconds, the condenser fan will turn on.

### **On set point.**

Compressor and unload off.

After 8 seconds, the condenser fan will turn off.

### **Start up heat.**

Evaporator fan on,

After 10 seconds, the compressor and hot gas will turn on.

### **On heat set point.**

Compressor and hot gas will turn off.

### **NOTE**

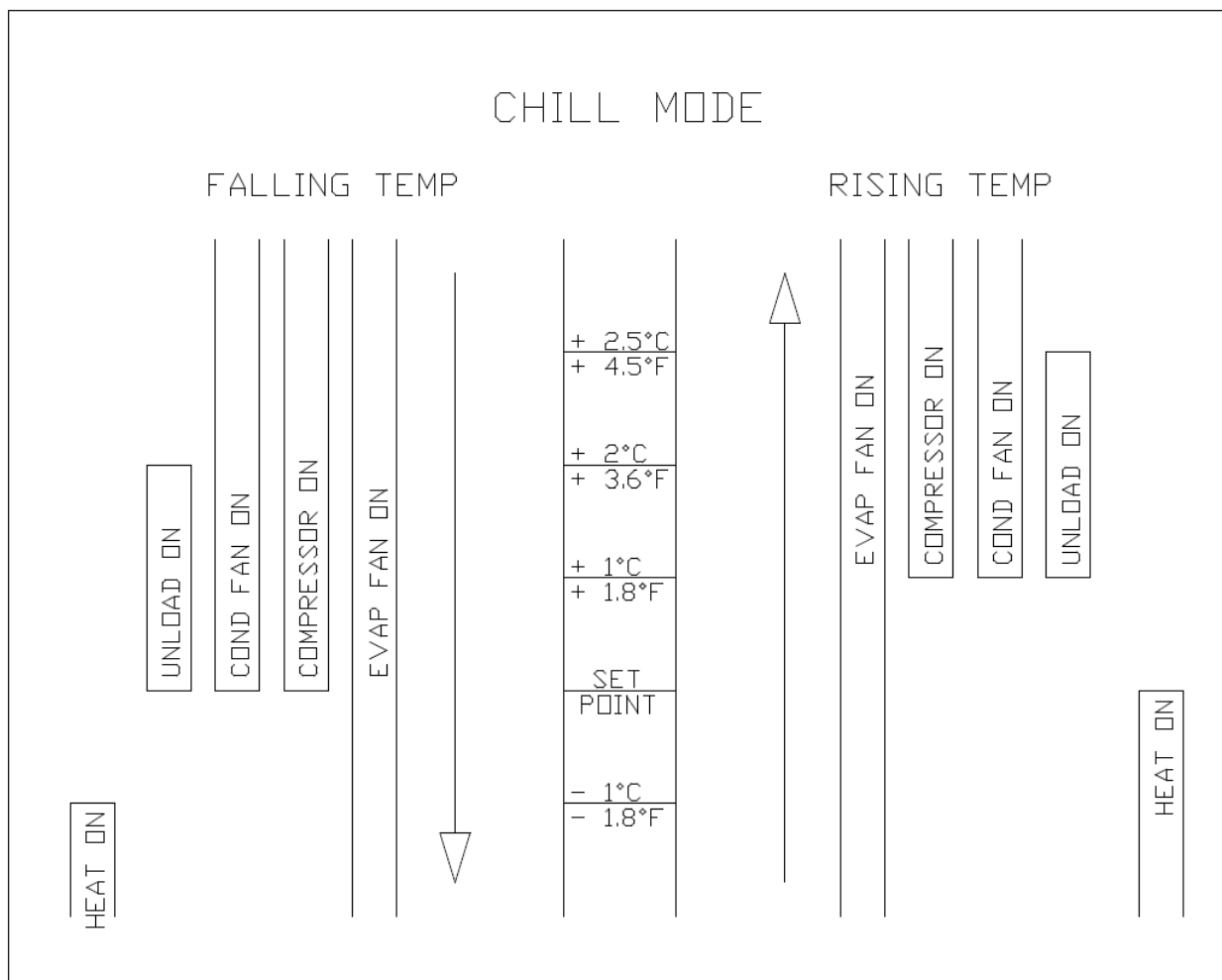
If the unit has stopped cooling due to having reached the set point but the residual cooling lowers the temperature slightly below set point (thereby calling for heating) there is a delay of 5 minutes before heating can be engaged in order to not introduce unnecessary and repeated heating/cooling cycles.

If the unit has stopped heating due to having reached the set point but the residual heating raises the temperature slightly above set point (thereby calling for cooling) there is a delay of 5 minutes before cooling can be engaged in order to not introduce unnecessary and repeated heating/cooling cycles.

If the unit has stopped cooling, there will be a 1-minute delay before it starts cooling again (even if the temperature rises to slightly higher than the set point).

If the unit has stopped heating, there will be a 1-minute delay before it starts heating again (even if the temperature falls to slightly lower than the set point).

If set point has been changed, there is no delay.



### Freeze mode.

Set point below - 7°C.

### Start up cool.

Evaporator fan on,

After 10 seconds, the compressor will turn on.

After 2 seconds, the condenser fan will turn on.

### On set point.

The compressor will turn off.

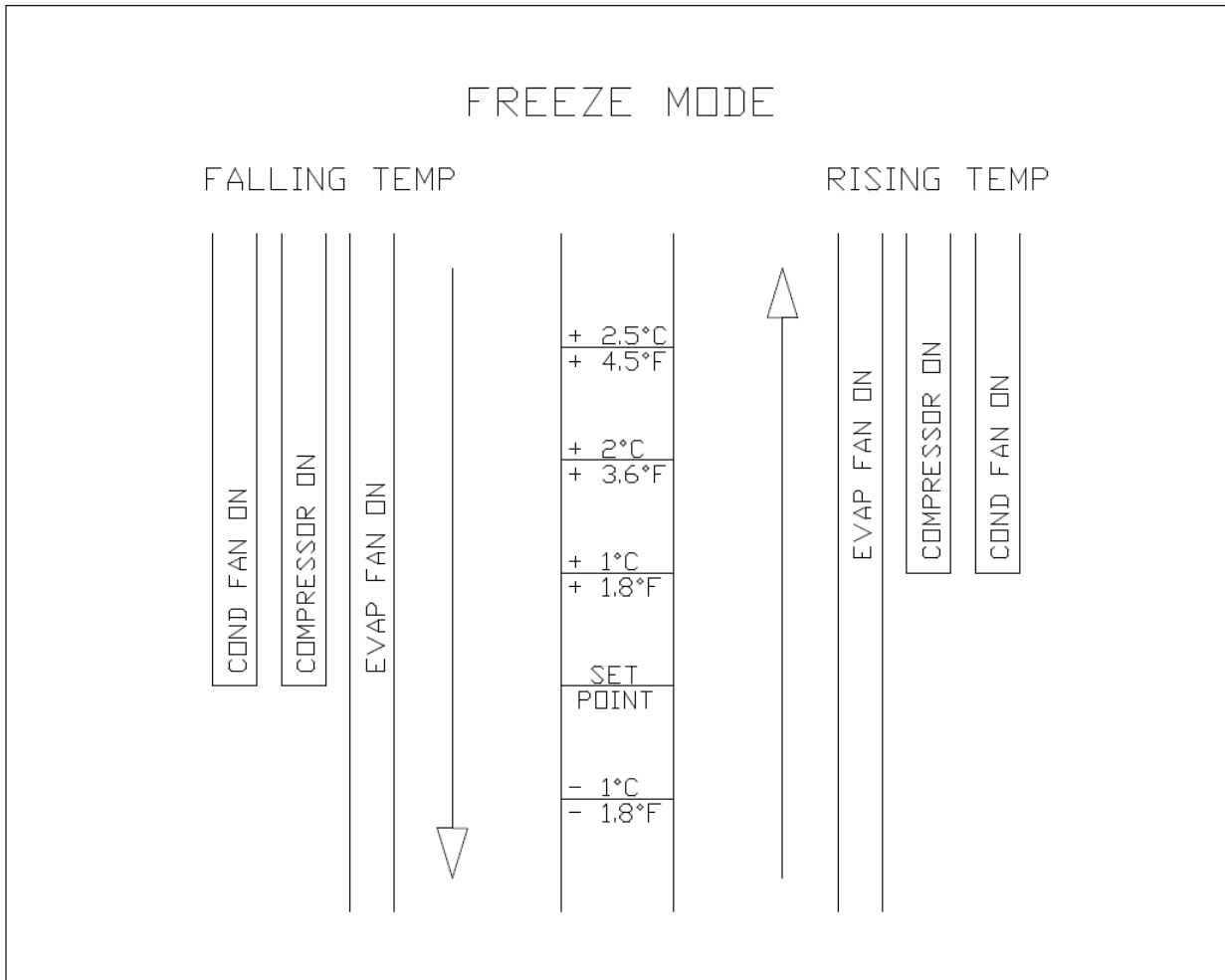
After 8 seconds, the condenser fan will turn off.

**There is no heat when set point is below -7°C.**

### NOTE

If the unit has stopped cooling, there will be a 1-minute delay before it starts cooling again (even if the temperature rises to slightly higher than the set point).

If set point has been changed, there is no delay.



**COOLING** – refer to Section 3 for cooling operation  
**HEATING** – refer to Section 3 for heating operation  
**DEFROST** – refer to Section 3 for defrost operation

## **SECTION SIX**

### **MAINTENANCE AND SERVICE INSTRUCTION**

This section provides procedures for establishing preventative maintenance and systematic servicing schedules, which are the keys to successful operation.

**ALL SERVICE AND MAINTENANCE PROCEDURES SHOULD BE PERFORMED IN ACCORDANCE WITH SECTION 608 OF THE CLEAN AIR ACT (CAA), PROHIBITING THE VENTING OF REFRIGERANTS INTO THE ATMOSPHERE AND PROVIDING FOR THE USE OF REFRIGERANT RECYCLING AND RECOVERING EQUIPMENT TO BE USED WHENEVER A SYSTEM IS OPENED.**

#### **6.1 Safety**

- a. When any work is to be done on the components of the refrigeration system, always make sure that the equipment cannot be started automatically or accidentally. If valves are closed and/or circuits interrupted during service procedures, the control switches should be suitably tagged with such notations.
- b. Use proper tools and correct size of wrenches.
- c. Do not exert excessive pressure when tightening flare nuts, as it may result in a rupture of the flare or stripped threads.
- d. Always wear approved goggles or eye shields when working with refrigerant to prevent eye injury if refrigerant is accidentally discharged into the face of the service engineer.
- e. Never under any circumstances apply heat to a refrigerant cylinder by using a naked flame. Should it be considered necessary to apply heat to a cylinder to create a refrigerant flow when recharging a system, place the cylinder in a container of hot or warm water to a point about 3/4 of the height of the cylinder.

Even this method requires that a pressure gauge is in use in the charging line to indicate the pressure in the cylinder at all times.

Also, never close the shut off valve on the cylinder while the cylinder is being heated.

The use of a manifold gauge set will permit compliance with having a gauge in the line and a shut off valve on the manifold to stop the flow of refrigerant into the system and allow the gauge to read cylinder pressure.

- f. Always replace refrigerant cylinder valve and connection caps after using the cylinder, and do not permit a cylinder to be dropped or hit severely by another object.
- g. Due to the height at which the refrigeration unit is placed in the container always use safe and secure means to service the unit and to allow a platform for tools and a refrigerant cylinder.
- h. Never loosen a refrigerant line rapidly if there is positive pressure in the line because:
  - 1. It is illegal to vent refrigerant into the atmosphere per the (CAA).
  - 2. Liquid refrigerant may give you a severe cold burn or other injury.
  - 3. Gas refrigerant may also cause oil to discharge, leaving the compressor short of oil, and creating an oily mess over the unit and service engineer.

### **CAUTION:**

A gauge manifold should always be used when charging unit with refrigerant.

### **Warning:**

**Refrigerant is heavier than air, therefore it settles in the lowest places and will expel air (oxygen) from a small confined space, resulting in dizziness or suffocation to an occupant.**

## **6.2 Checking Refrigerant Charge**

The receiver sight glasses are equipped with a ball which floats when the liquid level is in the sight glass or above. It should be noted and remembered that the only requirement of liquid level is that a seal be maintained at the outlet of the receiver. At low refrigerant flow rate the liquid refrigerant may not accumulate in the receiver to a point where a liquid level will show on the sight glass. In cold ambient temperatures the liquid will hang up in the condenser; therefore, caution should be taken before adding refrigerant. If the ball is not floating, it is recommended that the pressure be checked according to the suction and discharge pressures noted on the graphs provided before determining that the charge is low. It is just as possible to do harm to the system by overcharging as it is to run it under charged.

It is important to have the correct amount of refrigerant in the system. If there is too little, the expansion valve will pass vapor and reduce the capacity of the evaporator. Too much refrigerant will result in higher head pressures and oil dilution.

**Check the refrigerant level at 0°C (32°F) container temperature with unit fully loaded.**



**Caution:**

It should be understood that an air-cooled system will operate at many different ambient temperatures and the performance of the system will vary accordingly. Therefore, before adding any refrigerant (or making any other adjustments), it should be taken into consideration whether the unit is running with a low temperature load or a high temperature load, running in a cold ambient or a hot ambient load and most important whether the suction and the discharge pressures are in line for existing conditions.

**Note:**

**Unit capacity will be greatly reduced when high ambient temperatures are experienced; therefore, a careful check should be made of unit performance before making any adjustments or adding refrigerant to the system.**

**Before adding refrigerant, always determine the reason for the low charge and remedy the cause. Test for leaks thoroughly with an electronic leak detector and check also for traces of oil.**

**Caution:**

**When the refrigerant charge is added, it is important initially to purge the air from the transfer tubes of the manifold gauge set.**

**For the full charge weight of refrigerant for the system; see Section 8.6.**

**6.3 Procedure for adding refrigerant.**

To add small quantities of refrigerant to the system, it is preferable to add gas to the low or suction side of the system. This will allow the system to operate with little or no disturbance of the refrigeration cycle, while the refrigerant is being added.

**Check the refrigerant level at 0°C (32°F) container temperature.**

**Note:**

Care should be taken to ensure that only gas is extracted from the refrigerant cylinder, when charging into the low side.

- a. Remove the compressor suction service valve cap and backseat the valve. This closes the charging port. Remove the cap from the port and loosely attach the suction gauge line of a manifold set. Connect the center charging line to refrigerant cylinder and tighten the connection.
- b. Crack open the cylinder valve and the manifold suction gauge valve and allow the entire line to purge the air, and then tighten the connections at the compressor.

- c. With the system still operating and the suction pressure being 1.4 bar (20 psig) or below, and the cylinder pressure at 4.8 bar (70 psig) (dependent upon room temperature), open the refrigerant cylinder valve completely and the manifold suction valve and crack open the compressor suction service valve, 1 to 2 turns.
- d. Allow refrigerant into the system and observe the receiver sight glass (20-30 seconds bursts with a 5 minute interval).
- e. If the pressure in the refrigerant cylinder equalizes the suction pressure of the system, charging will cease until the cylinder pressure is raised by heating it. To speed this, a container of hot water or an electric blanket (made for this purpose) can safely be used; if care is taken, a metal shielded heat lamp can be used as well.
- f. If the pressures equalize and no heating is available, partially 'frontseat' the compressor suction service valve and allow the system to pump down to a pressure slightly below the one of the cylinder pressure. This will create a pressure difference between the system and the cylinder, allowing refrigerant to flow again. However, remember to close the cylinder or manifold valve before opening the compressor service valve or refrigerant will be forced back into the cylinder. Also, the system should be allowed to cycle for at least 5 minutes after each shot of refrigerant, to allow it to settle down so that an accurate reading can be taken at the receiver sight glass.
- g. When it is determined that the system has an adequate refrigerant charge, close the refrigerant cylinder valve (if not already closed) and the manifold suction gauge valve, and backseat the suction service valve, in that order. Remove the manifold lines and replace caps securely.

#### **6.4 Non-condensable gases**

Air and non-condensable gases in any system gather in the receiver above the liquid. These can be removed during operation by purging through the valve provided for this purpose at the receiver. To purge, use recycling equipment and open inlet a small amount. Note any significant difference from the initial pressure when the valve is again closed. Repeat the operation until the pressure is approximately equal to the refrigerant vapor pressure corresponding to the temperature of the receiver.

#### **6.5 Opening the System**

Whenever it is necessary to open a charged or functioning system to make repairs or replacements, it is necessary to comply with (CAA) by using recovery and recycling equipment.

The use of "EASY FLOW" silver solder and flux, or equivalent, is recommended in the refrigerant system piping. Do not use soft solder.

Prior to disturbing any connections, the type of solder originally used should first be verified - then continue. By taking this precaution, the contamination of the joint will be avoided.

## 6.6 Testing for Leaks

The preferred method for finding leaks is by use of an electronic leak detector. There are several different makes available and they all use the same method of detecting a leak through an exploring tube, which will detect from large to extremely small leaks depending on the setting used on the detector.

Leak testing with soapsuds will reveal only the large leaks and is therefore ineffective in determining the tightness of a system.

To provide the best possible condition for leak checking the system, it is recommended that the system pressure of the refrigerant be increased by adding dry nitrogen to create a pressure suitable for checking.

**CAUTION: NEVER USE AIR.**

## 6.7 Evacuating the System

### **Caution:**

Do not use the compressor as a vacuum pump or as an air compressor. It is not designed to handle air and will not pull down to as low a vacuum as a pump designed for that purpose. Similarly, if used to compress air, serious overheating and consequent damage may be the result.

Connect a pump capable of drawing a vacuum of 0.15 mm HG or better to that part of the system which has been opened. Continue until all air and moisture has been removed.

The final evacuation may be accelerated, however, by manifolding the connections to the vacuum pump and evacuating simultaneously the high and the low sides of the system, the vacuum should be broken by introducing pure refrigerant.

Too much emphasis cannot be placed on the importance of keeping the system free of moisture. Slight amounts of water in the system will inevitably lead to trouble in the following forms:

- a. Corrosion of steel parts.
- b. Copper plating of the shaft and bearing.
- c. Slugging or gumming of the oil.
- d. Plugging of the strainers and driers.
- e. Freezing and plugging of expansion valve.

Whenever it is necessary to open the system for any reason, always take precautions to prevent the entrance of air into the system, as air always contains some water vapor. Isolate as much of the system as possible from the portion to be opened by closing suitable valves.

## 6.8 Control Box Drain

The electrical control box has a drain at the bottom (see section 9.5) This drain **must** be open at pre-trip to be sure the vent is open to allow for drainage of condensation / moisture from the control box.

## **SECTION SEVEN**

### **SERVICING COMPONENTS**

#### **7.1 Compressor Assembly**

This scroll compressor is designed around two intermeshed and offset scrolls. One of these scrolls is orbital and the other one is fixed. The center of the orbiting scroll travels a circular path around the fixed scroll. This movement creates crescent shaped pockets between the two scroll elements. Low-pressure suction gas is trapped as each pocket is formed. Continued motion of the orbital scroll moves the gas pocket towards the center where maximum compression is reached, and the discharge port is located.

The scroll compressor is hard-mounted to the frame. This is to prevent excessive external vibration in our 'transport' application, reducing maintenance of the system piping end connections.

#### **Compressor Motor Protection**

The Compressor motor of the PFR-571 is equipped with an internal overload device. This device will break the star-point and stop the compressor if a problem arises, which causes the motor to overheat. When the motor cools sufficiently the overload will reset automatically.

If the overload stops the compressor due to overheating the cause for the over-heating must be determined and corrected before the unit is put into service again.

#### **Discharge Temperature Control Valve (DTC valve)**

A liquid injection system has been added to provide cooling to the compressor. An injection port is internally connected to an inner pocket of the scroll mechanism for liquid refrigerant injection. This pocket is separated from the suction inlet, so no loss of capacity or mass flow results from injecting at this point.

The DTC valve monitors the flow of liquid refrigerant into the injection port, based on the temperature of the thermal element located in the top cap thermal well of the compressor.

#### **Internal Pressure Relief Valve (IPR valve)**

The scroll compressor is also equipped with an IPR valve, which opens when the differential pressure from suction to outlet reaches an unacceptable limit. Opening this valve causes the motor protection to open and stop the compressor. This IPR valve prevents compressor over pressurization.

#### **Compressor Lubrication**

The compressor used in the PFR-571 has an internal design which facilitates circulation of lubricant within the compressor.

The oil level in the scroll compressor should be maintained at the midpoint of the sight glass. Immediately after start-up of the compressor the oil level in the reservoir will fluctuate. It is advisable to monitor the oil level a few minutes after start-up to ensure that there is enough oil in the compressor. If the oil level is low, below the center of the sight glass, it will be necessary to add oil to the compressor. Normal oil level should be maintained at the mid-level of the sight glass.

## **Adding Oil**

**CAUTION: The PFR-571 uses R-404A, R-452A, R-134a or R-513A refrigerant. Mineral oil lubricant cannot be used.**

The only oil approved by the compressor manufacturer is Polyester (POE) lubricant, Klinge part # K11-00416-00, Copeland Ultra 22 CC, Mobil EAL Arctic 22 CC, or ICI EMKARATE RL 32CF. Use of any lubricant not recommended will render the warranty void. The initial oil charge is 1.92L (64 oz.) and the recharge is 1.8L (60 oz.).

If the compressor is charged and the system can be run, oil should be added through the suction service valve.

Although this procedure is relatively simple, some preparations and care **MUST** be taken as follows:

- a. Connect manifold gauge to suction service valve port and start unit. Frontseat suction service valve partially until a suction pressure of approximately 0.1 bar (1.45 psi) is maintained.
- b. With a can of oil opened, measured, and ready, carefully open the manifold suction gauge valve until a positive pressure can be felt at the outlet of the center charging hose.
- c. Now place the end of the charging hose into the can of oil and control the bubbling with the manifold valve. Continue adjusting the manifold valve, producing a mild vacuum (10" water vacuum -0.5Bar) and pull the oil into the crankcase. By opening the manifold valve a little more, the oil can be sucked into the crankcase faster.
- d. As soon as enough oil has been transferred to the compressor, shut off the manifold valve. If the can being used is almost empty, be careful that air is not sucked in with the oil.
- e. Backseat the compressor suction service valve. Remove gauge, manifold hoses, and replace caps securely. Allow the unit to run 30 minutes before rechecking the oil level in the compressor sight glass, immediately after the compressor has been shut off.

### **Note:**

Always keep commercial oil stored in sealed containers. Oil exposed to the atmosphere will absorb moisture, which can cause trouble when introduced into the system. Use only the grades of oil, which are suitable and recommended for compressor lubrication and have been especially processed to have the necessary low moisture content.

## Compressor Motor Burn-Out

When a hermetic motor burnout occurs, the stator winding insulation decomposes forming carbon, water, and acid. To prevent contamination of the refrigerant system and a repetition of motor failures, definite steps **MUST** be taken to ensure that the refrigerant circuit is kept clean from contamination.

### **Important:**

The acid, most of which concentrates in the compressor oil, **MUST** be removed to prevent failure of the replacement compressor.

Damage to a compressor caused by failure to clean the system properly after burnout constitutes abuse and is not covered by the terms of the warranty.

### **If Hermetic Motor Burnout occurs:**

Flushing of the system is necessary. Klinge part # K11-00428-00, Burnout Flush kit, is recommended in case of motor burnout. Follow the kit instructions to flush the system.

## 7.2 Condenser and Evaporator Fan Motors

These hazardous location motors are equipped with shielded ball bearings, which require no lubrication under normal service conditions. The motors are designed to operate satisfactorily with line voltages which are within 10% of nameplate values, and are protected by an automatically reset Klixon, which is normally closed. In case of overheating, the Klixon will open and the motor will stop. If the internal overload opens the cause of the overheating **MUST** be determined and corrected before the unit is put into service again.

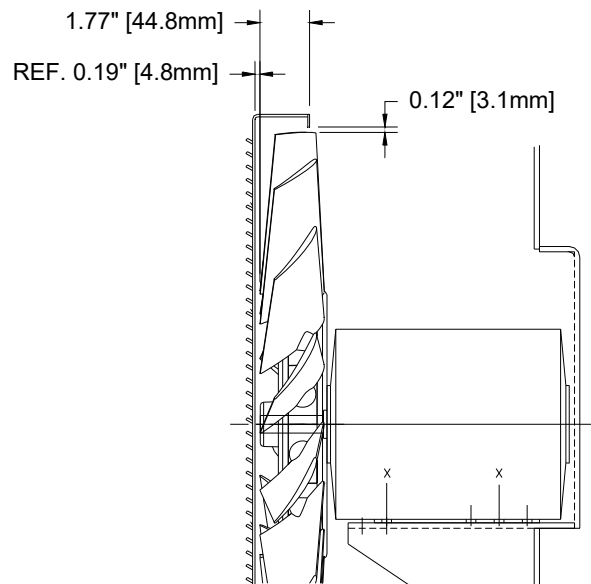
## 7.3 Condenser and Evaporator Fan

### **CAUTION:**

**REPLACEMENT FAN MOTORS MAY BE MANUFACTURED FOR OPPOSITE ROTATION FROM WHAT IS REQUIRED. ALWAYS CHECK FOR PROPER ROTATION AND IF REQUIRED, REVERSE 2 LEADS.**

## Condenser Fan

If a motor fan has to be removed from the motor shaft for any reason, be sure that the fan dimensions for relocating the fan are used in accordance with the fan positioning sketch.



**CONDENSER FAN LOCATION**

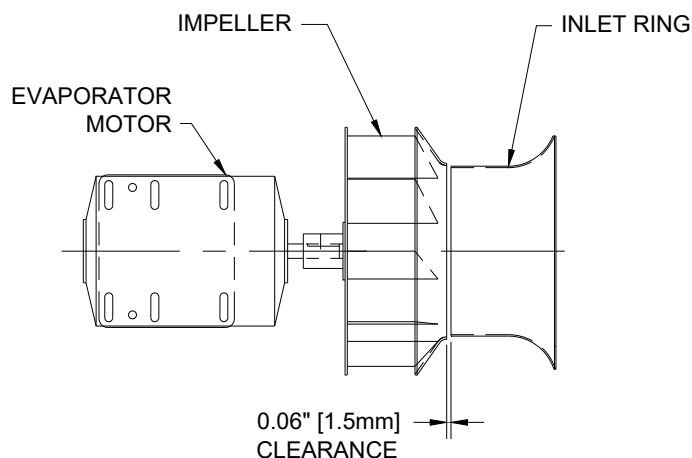
## Evaporator Fan

Opening of the upper access door will permit the removal of the evaporator fan and motor assembly if it becomes necessary to replace a defective fan wheel or motor.

Before replacement of the assembly, the fan wheel **MUST** be positioned and secured to the motor shaft as indicated on the sketch.

Install assembly in the unit but do not tighten the cap screws holding the motor to the mount.

Extreme care **MUST** be taken to align the fan wheel and the inlet ring to be concentric and spaced with 1.5mm (1/16") clearance as shown on the sketch.



**EVAPORATOR IMPELLER CLEARANCE**

## 7.4 Filter Drier Assembly

### **Note:**

A replaceable type of filter-drier is installed in the liquid line.

### **To replace a drier:**

1. Close the liquid line shut-off valve and pump down the system until the suction pressure stabilizes between 0 and 0.1 bar (1.5 psig). Remove all power to the unit, then frontseat the suction service valve.
2. Loose flare nuts on drier slowly to release any refrigerant that may be left in the lines. Remove drier from clamp.
3. Remove caps from new drier and install immediately. If the changeover of driers is accomplished quickly enough, there will be no need to purge air from the lines.
4. Connect the liquid line correctly to the drier (See arrow on the drier).
5. Tighten flare nuts and clamp on new drier cartridge securely. Open shut-off valve and suction service valve, and the unit is ready to run again.

## 7.5 High Pressure Switch

The high-pressure switch functions automatically to open or close the compressor contactor coil circuit upon increase or decrease in discharge pressure.

To replace the high-pressure switch, which is connected to the compressor discharge, the compressor refrigerant pressure **MUST** be reduced to 0 to 0.1 bar (1.5 psi).

1. To do this, close the suction service valve and run the compressor until the pressure is stabilized at 0 to 0.1 bar (1.5 psi).
2. Switch OFF unit. Close compressor discharge service valve.
3. Release any remaining pressure in the compressor by slowly loosening the gauge port caps on the service valve.
4. Replace defective switch.
5. If the switch exchange is completed within 5 minutes, purging the compressor for air will not be necessary as the refrigerant mixed in the compressor oil will continue to boil off and create a positive pressure in the compressor, which will prevent air from entering.
6. Close and tighten all gauge port caps. Open suction and discharge service valves and replace stem caps.
7. Reconnect wires.



## 7.6 Thermal Expansion Valve

The thermal expansion valve automatically maintains constant superheat of the refrigerant gas leaving the evaporator coil. The only maintenance that the valve may require is to check that the bulb is making good contact with the suction line. The thermal bulb is secured to a pre-selected point on the suction line positioned at 4 or 8 o'clock, by a perforated metal strap. If, for any reason, these bulbs are removed from the suction line, care **MUST** be taken to be sure that the bulbs are correctly replaced and insulated.

### **NOTE:**

If the body has to be changed for any reason, it is not necessary to disassemble the new TX-valve, but use extreme care to prevent warping of the new valve body due to excess heat applied during brazing. To prevent warping, it is necessary to use wet rags to reduce heat buildup of the valve body. Maximum heat is 100°C (212°F) for the element, and 150°C (302°F) for the body.

### **Replacement of Defective Thermal Element (Bulb)**

1. Before disassembling the valve, be sure the refrigerant pressure in the valve area of the system has been reduced to atmospheric pressure / zero pressure.
2. Remove the seal cap and turn the adjustment stem counter clockwise to relieve the spring force. Count and record the number of turns so adjustment can be returned to its original position.
3. When installing the new element, the sealing surfaces should be free of any foreign material or nicks that might prevent a leak tight joint. A few drops of refrigerant oil on the element threads will help assembly and removal.
4. Return the superheat spring adjustment to its original position. Replace the seal cap tightly.

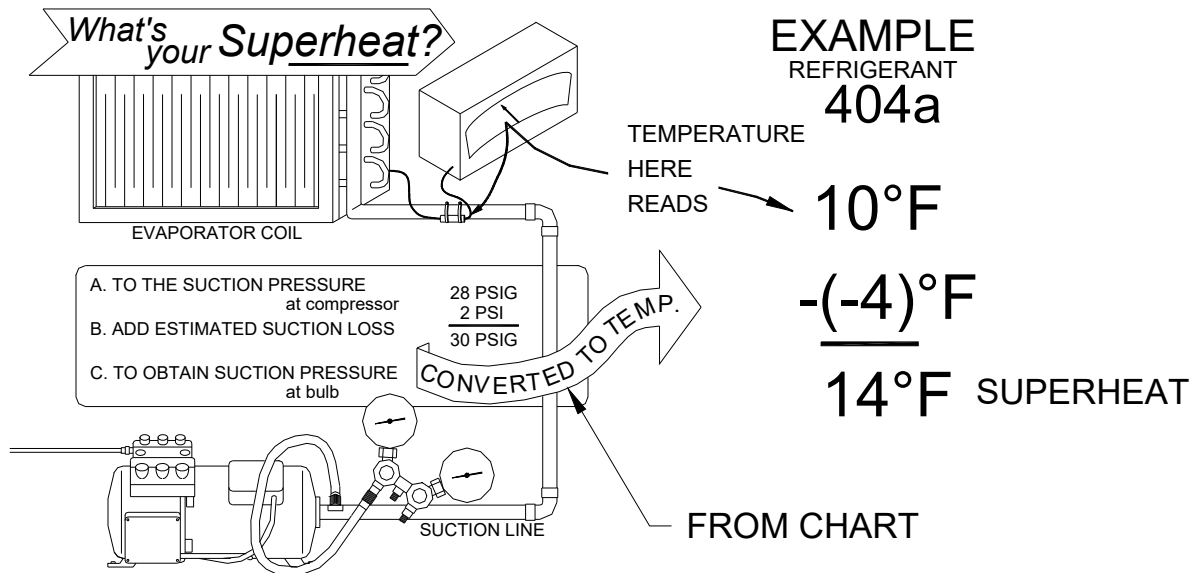
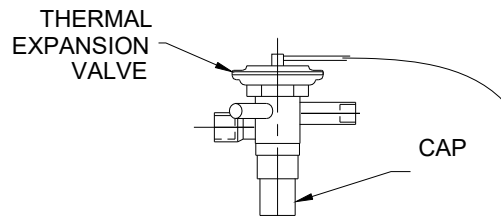
## TXV Adjustment

The expansion valve is set and tested at the factory before shipping. Klinge DOES NOT recommend adjusting the super heat setting of the TVX. However, in very rare situations when the TXV is faulty, the super heat can be adjusted.

The expansion valve adjustment is capped for protection. Remove the protective cap. To reduce the superheat, turn the adjustment stem counter clockwise or to the left. To increase, turn the adjustment stem clockwise or to the right.

Only make one full turn at a time, it may take approximately 30 minutes after each adjustment before a new balance can be acquired.

To properly check the super heat, set the thermostat to -10°F. After waiting 5 minutes observe the suction line, it should be frosted back to the suction service valve without frost on the valve. The bottom of the compressor should be warm to the touch.



## Measuring the Superheat

**Note:** Refer to the temperature / pressure chart at the end of this manual, when calculating the superheat.

1. Measure the temperature of suction line at the point the bulb is clamped.
2. Obtain the suction pressure that exists in the suction line at the bulb by either of the following methods.
  - a. If the valve is externally equalized, a gauge in the external equalizer line will indicate the desired pressure directly and accurately.
  - b. Read the gauge at the suction valve of the compressor. To the pressure add the estimated pressure drop through the suction line between bulb location and compressor suction valve. The sum of the gauge reading and the estimated pressure drop will equal the approximate suction line pressure at the bulb.
3. Convert the pressure obtained in 2a and 2b to saturated evaporator by using the temperature /pressure chart provided at the end of this manual.
4. Subtract the two temperatures obtained in 1 and 3 – The difference is the superheat.

### 7.7 Suction Solenoid Valve

The valve is a normally open solenoid valve, which is mounted, in the suction line. If the body (or base) of a valve is damaged to the extent that it **MUST** be replaced, remove all other parts from the body before applying heat to unbrazed the body. Use extreme care to prevent warpage of the new valve body due to excess heat applied during brazing. To prevent warpage, it is suggested that wet rags be used to reduce heat buildup of the valve body.

Do not attempt to reassemble the solenoid valve until the body has cooled down after brazing.

One hole is drilled in the valve body, which permits a small amount of refrigerant to pass to the compressor.

### 7.8 Hot Gas Solenoid Valve

This is a normally closed solenoid valve mounted in the discharge line. If the body (or base) of a valve is damaged to the extent that it **MUST** be replaced, remove all other parts from the body before applying heat to un-braze the body. Use extreme care to prevent warpage of the new valve body due to excess heat applied during brazing. To prevent warpage, it is suggested that wet rags be used to reduce heat buildup of the valve body.

This valve is activated when the thermostat calls for heat or defrosts, directing hot gas from the high-pressure side of the compressor directly to the evaporator coil.

## SECTION EIGHT

### TROUBLE SHOOTING

#### 8.1 General Information

Several components are incorporated into the unit to assist the serviceman in finding the cause of problems concerning the operation and efficiency of the unit.

LED indicators on the thermostat edge indicate which cycle the microprocessor thermostat is calling for, these lights should be used in conjunction with the pressure gauges to determine if certain cycles are operating.

#### 8.2 Service Components

- a. Sight glasses are mounted in the liquid receiver to determine if the refrigerant charge is correct. Check the container at 0°C (32°F) container temperature.
- b. The sight glass moisture indicator mounted in the liquid line will show if the refrigerant system is dry or wet.

#### 8.3 Microprocessor Thermostat

During normal operation the microprocessor thermostat will indicate faults by illuminating the LEDs. (See Section 5.5)

Alarm indicators are reset when power is removed from the thermostat.

During the function test, LEDs correspond to the side label of the thermostat and will indicate a fault within the thermostat **only**.

The service technician will need to listen for each function to occur or use an amp probe to detect current draw in the case of heater or unload solenoids.

The thermostat output relays each have a small red LED located at the base of the relay and visible only from the side of the thermostat. When these LEDs are lit, the corresponding relay should be energized, and an output signal should occur.

## 8.4 Trouble Shooting Chart

The following trouble shooting chart is by no means complete, but covers the more general type of problems, which would be most likely if a breakdown is experienced.

PROBLEM	POSSIBLE CAUSE	CORRECT ACTION SUGGESTED
Power to unit but unit will not start	CB2 Tripped	Reset
	CB1 Tripped	Reset
	No control circuit voltage at T1	Check primary side for 480 volts @ T1
		Check for proper connections at T1
		Replace T1 if defective
	No control circuit voltage at TH Term 27, 26 (12V), Term 20, 26 (24V)	Faulty SW1, Toggle switch, Replace SW1
Thermostat will not do a function test	No voltage (12V) between Term 27, 32 when SW2 is depressed	Faulty SW2, Replace SW2
Compressor will not run	Compressor contactor "C" coil faulty or mechanical failure of contactor	Replace contactor
	High Pressure Switch (HPS) open Discharge pressure too high	Remedy reason for high Discharge pressure
	Defective HPS	Replace
	Open compressor windings due to thermal protection switch being open	Remedy cause of overheating
	Open compressor windings when compressor is cool	Replace compressor
	Compressor trips CB1 but does not run due to mechanical restriction	Replace compressor
"U" Unloader valve will not operate	Unloader valve coil open	Replace valve coil
Heat fails to come on	Hot Gas valve coil open	Replace valve coil
	Mechanical fault in valve body	Replace valve
	Compressor not running	See-Compressor will not run

continued

## 8.4 CONTINUED

PROBLEM	POSSIBLE CAUSE	CORRECT ACTION SUGGESTED
Evaporator fans do not run	Faulty current sensor "CS"	Replace
	"PC1" or "PC2" phase changing contactor faulty	Replace contactor
One evaporator fan will not run	Motor internal overload protection open or windings open	Replace motor
Condenser fan and evaporator fans do not run Condenser fan only will not run	See - Evaporator fans Do Not Run	-----
	"CF" Condenser fan contactor faulty	Replace
	Motor internal overload protection open or motor windings open	Replace motor
One of the 3 fans runs backwards	Motor or condenser fan, "CF" contactors may be wired incorrectly	Correct wiring
3 fans run backwards	Current Sensor "CS" faulty Does not change phase Check with test button	Replace "CS"
	Circuits from CS to PC1 & PC2 cross-wired	Correct wiring
	Faulty 230V plug or Faulty 480V connector	Replace or repair
Box temperature too high	Return air probe circuit open	Check wiring. Replace probe
	Faulty thermostat	Replace
Box temperature too low	Return air probe circuit shorted	Check wiring. Replace probe
	Faulty thermostat	Replace
Defrost too often	Airflow too low or no airflow	Check evaporator fans for operation and rotation
	Coil probe circuit open	Check wiring. Replace probe
	Return air probe circuit shorted	Check wiring. Replace probe
	Faulty thermostat	Replace
	Faulty coils probe	Check & replace

continued

#### 8.4 CONTINUED

PROBLEM	POSSIBLE CAUSE	CORRECT ACTION SUGGESTED
Cooling capacity problem	"U" Unload capacity reduction valve stuck closed	Check & replace if defective
	Refrigerant level too low	Check & add refrigerant if required
	Partially or completely blocked filter drier	Check & replace
	Low airflow, fans not running or not running in the proper direction	Check & correct
	Non-condensables (air) in refrigerant system running in the proper direction	Purge condenser coil and receiver
	Faulty TXV	Replace
	Air vent improperly set	Readjust
	Severe lubrication oil overcharge	Remove excess oil. Check oil level (allow oil level to be within sight glass when compressor is hot and has been running for 10 to 15 minutes)
	Compressor mechanical problem reducing pumping capacity	Replace defective compressor
Heating capacity problem	Faulty Hot Gas solenoid valve	Replace
	Low or no air flow	Check evaporator fans for operation and proper direction of rotation

## 8.5 Alarm Code Trouble Shooting Chart

Alarm **LED** indicators are reset if control system power is turned **OFF**.

### Remote Power and Alarm Monitoring (optional)

If you have purchased the option for remotely monitoring power and alarm signals, please contact Klinge Corporation's Electrical Engineering department for connection instructions.

ALARM CODE	ALARM NAME	ALARM CONDITION	ALARM ACTION	ALARM CLEAR	Suggestion for repair.
A01	Defrost sensor short	The sensor or the wire to the sensor is shorted.	Run defrost mode 30 min. for every 18 accumulated compressor run hours. LED 2 should flash. AR 2 will de-energize.	If there has not been an alarm for 60 min. then the alarm is cleared by the controller. Or by C/F key.	Replace sensor. Check wire for damage.
A02	Defrost sensor open	The sensor or the wire to the sensor is open.	Run defrost mode 30 min. for every 18 accumulated compressor run hours. LED 2 should flash. AR 2 will de-energize.	If there has not been an alarm for 60 min. then the alarm is cleared by the controller. Or by C/F key.	Replace sensor. Check wire for damage.
A03	Return sensor short	The sensor or the wire to the sensor is shorted.	1: Controller switches over and uses Defrost sensor to read container temperature. 2: If Defrost sensor is open or shorted then; if set point is $> -7^{\circ}\text{C}$ then unit stops. if set point $\leq -7^{\circ}\text{C}$ then unit runs 100% cool all time. LED 2 should flash. AR 2 will de-energize.	If there has not been an alarm for 60 min. then the alarm is cleared by the controller. Or by C/F key.	Replace sensor. Check wire for damage.
A04	Return sensor open	The sensor or the wire to the sensor is shorted.	1: Controller switches over and uses Defrost sensor to read container temperature. 2: If Defrost sensor is open or short then; if set point is $> -7^{\circ}\text{C}$ then unit stop. if set point $\leq -7^{\circ}\text{C}$ then unit run 100% cool all time. LED 2 should flash.	If there has not been an alarm for 60 min. then the alarm is cleared by the controller, or by C/F key.	Replace sensor. Check wire for damage.



			AR 2 will de-energize.		
A05	Supply sensor short	The sensor or the wire to the sensor is shorted.	LED 2 should flash. AR 2 will de-energize.	If there has not been an alarm for 60 minutes, then the alarm is cleared by the controller. Or by C/F key.	Replace sensor Check wire for damage.
A06	Supply sensor open	The sensor or the wire to the sensor is open.	No action.	No action.	Replace sensor Check wire for damage.
A07	Compressor sensor short	The sensor or the wire to the sensor is shorted.	Compressor runs without any safety at the compressor discharge temperature. LED 2 should flash. AR 2 will de-energize.	If there has not been an alarm for 60 minutes, then the alarm is cleared by the controller. Or by C/F key.	Replace sensor Check wire for damage.
A08	Compressor sensor open	The sensor or the wire to the sensor is open.	No action.	No action.	Replace sensor Check wire for damage.
A09	Pressure transmitter out of range.	The sensor or the wire to the sensor is defective.	No action.	If there is a pressure transmitter on the unit, then the alarm is cleared by display C/F key. Else no action.	Replace sensor Check wire for damage.
A11	Phase sensor fail	The sensor cannot find the 3 phases at the main power. (Test is performed at unit start up)	The unit will stop and for every 5 minutes the controller will test the sensor to see if the sensor is OK. LED 2 should flash AR 2 will de-energize.	If the sensor passes a new test, then the alarm is cleared by the controller, or by C/F key.	Check main power. Check evaporator fan motor. Check sensor. Check wire for damage.
A14	Low current on evaporator fan	The Evap. fan is using too little power. (Test is performed at Function Test program)	LED 2 should flash. AR 2 will de-energize.	The alarm is cleared by display C/F key	Check if relay is switched on. Check output from controller. Check that both evaporator motors are running.
A15	High current on evaporator fan	The evaporator fan is using too much power. (Test is performed at Function Test program)	LED 2 should flash. AR 2 will de-energize.	The alarm is cleared by display C/F key	Check amperage at evaporator motor. Check that both evaporator fans are running.
A16	Low current on condenser fan	The condenser fan is using too little power. (Test is performed at Function Test program)	LED 2 should flash. AR 2 will de-energize.	The alarm is cleared by display C/F key	Check if relay is switched on. Check output from controller.

A17	High current on condenser fan	The condenser fan is using too much power. (Test is performed at Function Test program)	LED 2 should flash. AR 2 will de-energize.	The alarm is cleared by display C/F key	Check amps at condenser motor.
A18	Low current on compressor	The compressor is using too little power. (Test is performed at Function Test program.)	LED 2 should flash. AR 2 will de-energize.	The alarm is cleared by display C/F key	Check if compressor motor protection module is tripped. Check if relay is switched-on. Check output from controller. Check gas at the ref. System.
A19	High current on compressor	The compressor is using too much power. (Test is performed at Function Test program.)	LED 2 should flash. AR 2 will de-energize.	The alarm is cleared by display C/F key	Check amps At compressor motor check amps At condenser motor.
A21	Different current on evaporator fan	There is a difference between the phases. (Test is performed at Function Test program.)	LED 2 should flash. AR 2 will de-energize.	The alarm is cleared by display C/F key	Check if relay is missing a phase. Check if voltage is too low. Check the motor element for defect with a clamp ammeter
A22	Different current on condenser fan	There is a difference between the phases. (Test is performed at Function Test program.)	LED 2 should flash. AR 2 will de-energize.	The alarm is cleared by display C/F key	Check if relay is missing a phase. Check if voltage is too low. Check the motor element for defect with a clamp ammeter
A23	Different current on compressor	There is a difference between the phases. (Test is performed at Function Test program.)	LED 2 should flash. AR 2 will de-energize.	The alarm is cleared by display C/F key	Check if relay is missing a phase. Check if voltage is too low. Check the motor element for defect with a clamp ammeter

A29	Difference between return and defrost sensor too big.	There is too big of difference between the return and defrost sensors after 8 minutes evaporator fan run. (Test is performed at Function Test program.)	LED 2 should flash. AR2 will de-energize.	The alarm is cleared by display C/F key.	Check if sensor is defective. Check air flow in container. Check if there is ice on evaporator coil.
A30	Container temperature too low	<p>If the rate of temperature change is too slow, less than 0.17 °C / hour, (ie. not heating fast enough) and the return probe temperature is outside of a 2°C window of the set point there is an alarm.</p> <p>OR if the return probe temperature has been inside a 2 °C window of set point at some time since power up or since the set point was changed, and if the return air temp is outside a 2°C window of set point for 2 hours or more, there is an alarm.</p>	LED 6 should flash and LED 2 should flash. Also AR 2 will de-energize.	<p>If the return air is inside the 2°C window of the set point. Then the alarm is cleared by the controller. Or by C/F key.</p>	<p>Check hot gas valve. Check compressor. Check refrigerant gas. Check evaporator fan motor Check airflow. Check door to container is closed.</p>
A31	Container temperature too high	<p>If the rate of temperature change is too slow, less than 0.17 °C / hour, (ie. not cooling fast enough) and the return probe temperature is outside of a 2°C window of the set point there is an alarm.</p> <p>OR if the return</p>	LED 6 should flash and LED 2 should flash. Also AR 2 will de-energize.	<p>If the return air is inside the 2°C window of the set point. Then the alarm is cleared by the controller. Or by C/F key.</p>	<p>Check refrigerant gas. Check TX valve. Check evaporator fan motor. Check airflow. Check compressor. Check if condenser is dirty. Check condenser fan motor. Check unload valve is open. Check door to</p>

		probe temperature has been inside a 2 °C window of set point at some time since power up or since the set point was changed, and if the return air temp is outside a 2°C window of set point for 2 hours or more, there is an alarm.			container is closed.
A32	Defrost time too long.	The defrost cycle lasts longer than one hour	The defrost will stop, and the unit will go back to normal operation. LED 2 should flash. Also AR 2 will de-energize.	The alarm is clear by display C/F key	Check hot gas valve. Check refrigerant gas. Check Compressor.
A33	Evaporator temp too low (defrost too often)	If there controller call for a defrost less than 30 min. after last defrost end.( the delta T between the return air and the defrost probe is to large)	Unit will run cooling mode until 90 min. after last defrost end. LED 2 should flash. Also AR 2 will de-energize.	The alarm is clear by display C/F key	Check evaporator fan motor. Check airflow. Check if fin at evaporator coil is bent. Check door to container is closed. Check defrost and return sensor for correct reading.
A34	Compressor temperature too high	If the compressor sensor is above 120°C	Unit will stop until compressor sensor is below 90°C, or the alarm is reset.	If there has not been an alarm for 60 minutes, then the alarm is cleared by the controller. Or by C/F key.	Check refrigerant gas. Check if there is air in the refrigeration system. Check if condenser is dirty. Check condenser fan motor.
A35	External temperature fail	These conditions will produce an open at terminal 31. If terminal 31 has been open in 60 minutes, then the alarm is set.	LED 6 should flash and LED 2 should flash. AR 2 will de-energize.	The alarm is cleared by display C/F key	Check setting of temperature alarm recorder. Check evaporator fan motor. Check gas on system. Check TX valve. Check hot gas system.

					Check container door is closed.
A36	High pressure cut out. Cool mode	If there has been 3 HP cut out in an hour when the unit is in cool mode, then the alarm will be set to on.	LED 2 and LED 4 should flash. AR 2 will de-energize.	The alarm is cleared by display C/F key	Check condenser fan motor is running. Check if condenser needs cleaning. Check if there is air in the gas system. Check adjustment of suction regulator valve. Check HP switch for fault.
A37	High pressure cut out. Hot gas mode	If there has been 3 HP cut out in an hour when the unit is in hot gas mode, then the alarm will be set to on.	LED 2 should flash. AR2 will de-energize.	The alarm is cleared by display C/F key	Check refrigerant level
A49	Set point error flash bank error	Unit will display alarm if set point is not loaded in controller	Control will not start up before a set point is put into the controller.	The alarm is cleared by putting set point in controller.	This is normally if new software is uploaded to the controller.

## 8.6 UNIT INFORMATION ELECTRICAL

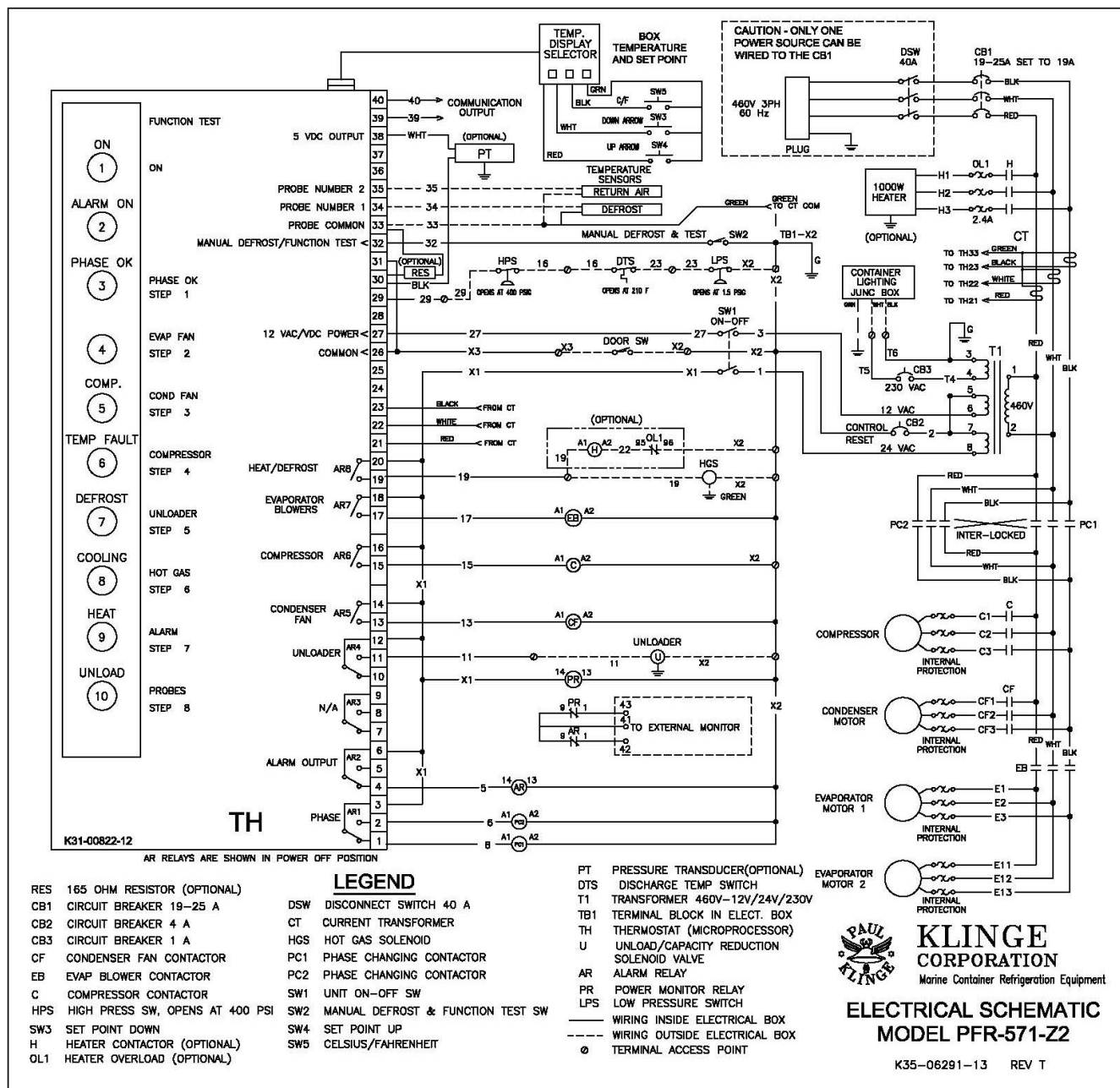
Input power	3 x 380/480V +/- 10% 50/60 Hz +/- 2.5%
Compressor full load at 2.4 bar (35 psig) suction and 24.1 bar (350 psig) discharge	9 Amps
Condenser fan motor 1.5 HP 1750 RPM	2.5 Amps
Evaporator fan motor 1/3 HP 1750 RPM	1.5 Amps
Full load current	14.5 Amps
Total power consumption	9 kW

## 8.7 UNIT INFORMATION REFRIGERATION

System refrigerant charge Check at 0°C (32°F) container temperature	3.86 kg (8.5 lbs.)
Compressor Oil Charge	64 oz. (1.92L) Polyol ester Oil Only
High pressure switch Open approximate Close approximate	385 psig (26.5 bar) on rise 385 psig (26.5 bar) on fall

Discharge temperature switch	
Open approximate	104.4°C (220°F)
Close approximate	104.4°C (220°F)
Fusible plug in receiver blows at the approximate temperature	99°C (210°F)
Unit weight	635 kg (1400 lbs)

## 8.8 Electrical Schematic



ELECTRICAL SCHEMATIC  
MODEL PFR-571 ZII-II

## 8.9 Temperature – Pressure Chart

FOR USE WHEN CONVERTING PRESSURE TO TEMPERATURE WHEN CALCULATING THE SUPERHEAT. R-12 ADDED FOR REFERENCE ONLY.

DEGREES FAHRENHEIT	DEGREES CENTIGRADE	R-12 PSIG	R-22 PSIG	R-502 PSIG	R-134A PSIG	R-404A (HP-62) PSIG
-50	-45.6	15.4	6.2	0.2	18.4	0
-48	-44.4	14.6	4.8	0.7	17.7	0.8
-46	-43.3	13.8	3.4	1.5	17	1.6
-44	-42.2	12.9	2	2.3	16.2	2.5
-42	-41.1	11.9	0.5	3.2	15.4	3.4
-40	-40.0	11	0.5	4.1	14.5	5.5
-38	-38.9	10	1.3	5	13.7	6.5
-36	-37.8	8.9	2.2	6	12.8	7.5
-34	-36.7	7.8	3	7	11.8	8.6
-32	-35.6	6.7	4	8.1	10.8	9.7
-30	-34.4	5.5	4.9	9.2	9.7	10.8
-28	-33.3	4.3	5.9	10.3	8.6	12
-26	-32.2	3	6.9	11.5	7.7	13.2
-24	-31.1	1.6	7.9	12.7	6.2	14.5
-22	-30.0	0.3	9	14	4.9	15.8
-20	-28.9	0.6	10.1	15.3	3.6	17.1
-18	-27.8	1.3	11.3	16.7	2.3	18.5
-16	-26.7	2.1	12.5	18.1	0.8	20
-14	-25.6	2.8	13.8	19.5	0.3	21.5
-12	-24.4	3.7	15.1	21	1.1	23
-10	-23.3	4.5	16.5	22.6	1.9	24.6
-8	-22.2	5.4	17.9	24.2	2.8	26.3
-6	-21.1	6.3	19.3	25.8	3.6	28
-4	-20.0	7.2	20.8	27.5	4.5	29.8
-2	-18.9	8.2	22.4	29.3	5.5	31.6
0	-17.8	9.2	24	31.1	6.5	33.5
2	-16.7	10.2	25.6	32.9	7.5	34.8
4	-15.6	11.2	27.3	34.9	8.5	37.4
6	-14.4	12.3	29.1	36.9	9.6	39.4
8	-13.3	13.5	30.9	38.9	10.8	41.6
10	-12.2	14.6	32.8	41	12	43.7
12	-11.1	15.8	34.7	43.2	13.1	46
14	-10.0	17.1	36.7	45.4	14.4	48.3
16	-8.9	18.4	38.7	47.7	15.7	50.7
18	-7.8	19.7	40.9	50	17	53.1
20	-6.7	21	43	52.5	18.4	55.6
22	-5.6	22.4	45.3	54.9	19.9	58.2
24	-4.4	23.9	47.6	57.5	21.4	60.9
26	-3.3	25.4	49.9	60.1	22.9	63.6
28	-2.2	26.9	52.4	62.8	24.5	66.5
30	-1.1	28.5	54.9	65.6	26.1	69.4
32	0.0	30.1	57.5	68.4	27.8	72.3
34	1.1	31.7	60.1	71.3	29.5	75.4
36	2.2	33.4	62.8	74.3	31.3	78.5
38	3.3	35.2	65.6	77.4	33.2	81.8
40	4.4	36.9	68.4	80.5	35.1	85.1
42	5.6	38.8	71.3	83.8	37	88.5
44	6.7	40.7	74.5	87	39.1	91.9
46	7.8	42.7	77.6	90.4	41.1	95.5
48	8.9	44.7	80.7	93.9	43.3	99.2
50	10.0	46.7	84	97.4	45.5	102.9



DEGREES FAHRENHEIT	DEGREES CENTIGRADE	R-12 PSIG	R-22 PSIG	R-502 PSIG	R-134A PSIG	R-404A (HP-62) PSIG
52	11.1	48.8	87.3	101	47.7	109
54	12.2	51	90.8	104.8	50.1	113
56	13.3	53.2	94.3	108.6	52.3	117
58	14.4	55.4	97.9	112.4	55	121
60	15.6	57.7	101.6	116.4	57.5	125
62	16.7	60.1	105.4	120.4	60.1	130
64	17.8	62.5	109.3	124.6	62.7	134
66	18.9	65	113.2	128.8	65.5	139
72	22.2	72.9	125.7	142.2	74.2	153
74	23.3	75.6	130	146.8	77.2	158
76	24.4	78.4	134.5	151.5	80.3	164
78	25.6	81.3	139	156.3	83.5	169
80	26.7	84.2	143.6	161.2	86.8	174
82	27.8	87.2	148.4	166.2	90.2	180
84	28.9	90.2	153.2	171.4	93.6	185
86	30.0	93.3	158.2	176.6	97.1	191
88	31.1	96.5	163.2	181.9	100.7	197
90	32.2	99.8	168.4	187.4	104.4	203
92	33.3	103.1	173.7	192.9	108.2	209.9
94	34.4	106.5	179.1	198.6	112.1	215
96	35.6	110	184.6	204.3	116.1	222
98	36.7	113.5	190.2	210.2	120.1	229
100	37.8	117.2	195.9	216.2	124.3	235
102	38.9	120.9	201.8	222.3	128.5	242
104	40.0	124.7	207.7	228.5	132.9	249
106	41.1	128.5	213.8	234.9	137.3	256
108	42.2	132.4	220	241.3	142.8	264
110	43.3	136.4	226.4	247.9	146.5	271
112	44.4	140.5	232.8	254.6	151.3	279
114	45.6	144.7	239.4	261.5	156.1	286
116	46.7	148.9	246.1	268.4	161.1	294
118	47.8	153.2	252.9	275.5	166.1	302
120	48.9	157.7	259.9	282.7	171.3	311
122	50.0	162.2	267	290.1	176.6	319
124	51.1	166.7	274.3	297.6	182	328
126	52.2	171.4	281.6	305.2	187.5	336
128	53.3	176.2	289.1	312.9	193.1	345
130	54.4	181	296.8	320.8	198.9	354
132	55.6	185.9	304.6	328.9	204.7	364
134	56.7	191	312.5	337.1	210.7	373
136	57.8	196.1	320.6	345.4	216.8	383
138	58.9	201.3	328.9	353.9	223	392
140	60.0	206.6	337.3	362.6	229.4	402
142	61.1	212	345.8	371.4	235.8	413
144	62.2	217.5	354.5	380.4	242.4	423
146	63.3	223.1	363.3	389.5	249.2	434
148	64.4	228.8	372.3	398.9	256	444
150	65.6	234.6	381.5	408.4	263	449

**NOTE: THE USE OF ANY REFRIGERANT NOT SPECIFICALLY DESIGNATED BY THE  
MANUFACTURER MAY VOID THE WARRANTY.**

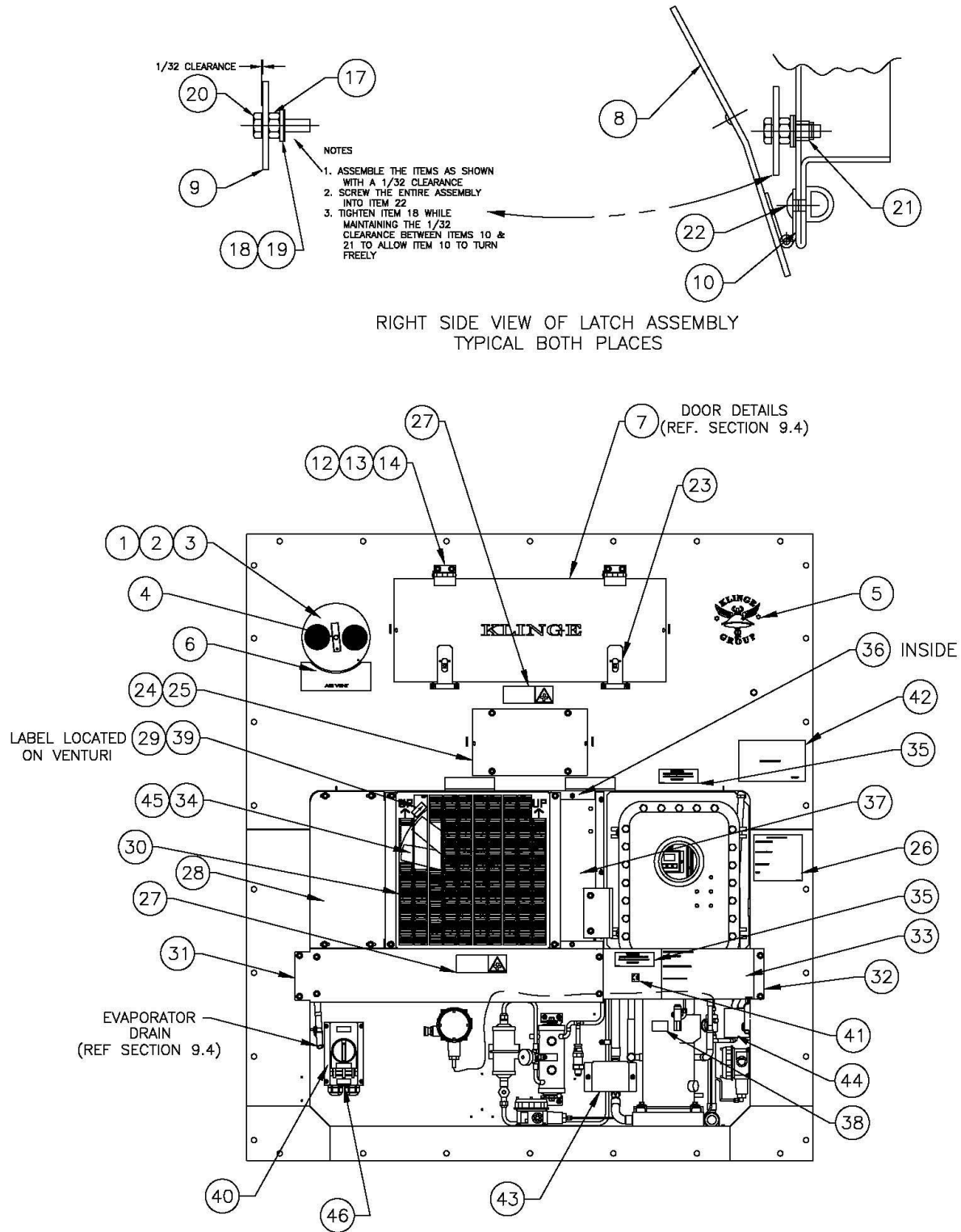
# SECTION NINE



## SERVICE PARTS PFR-571 Z2

- Section 9.1 Unit Front View
- Section 9.2 Unit Rear View
- Section 9.3 Piping Components
- Section 9.4 Evaporator Section
- Section 9.5 Electrical Box
- Section 9.6 Electrical Box Components
- Section 9.7 Spare Parts Kit

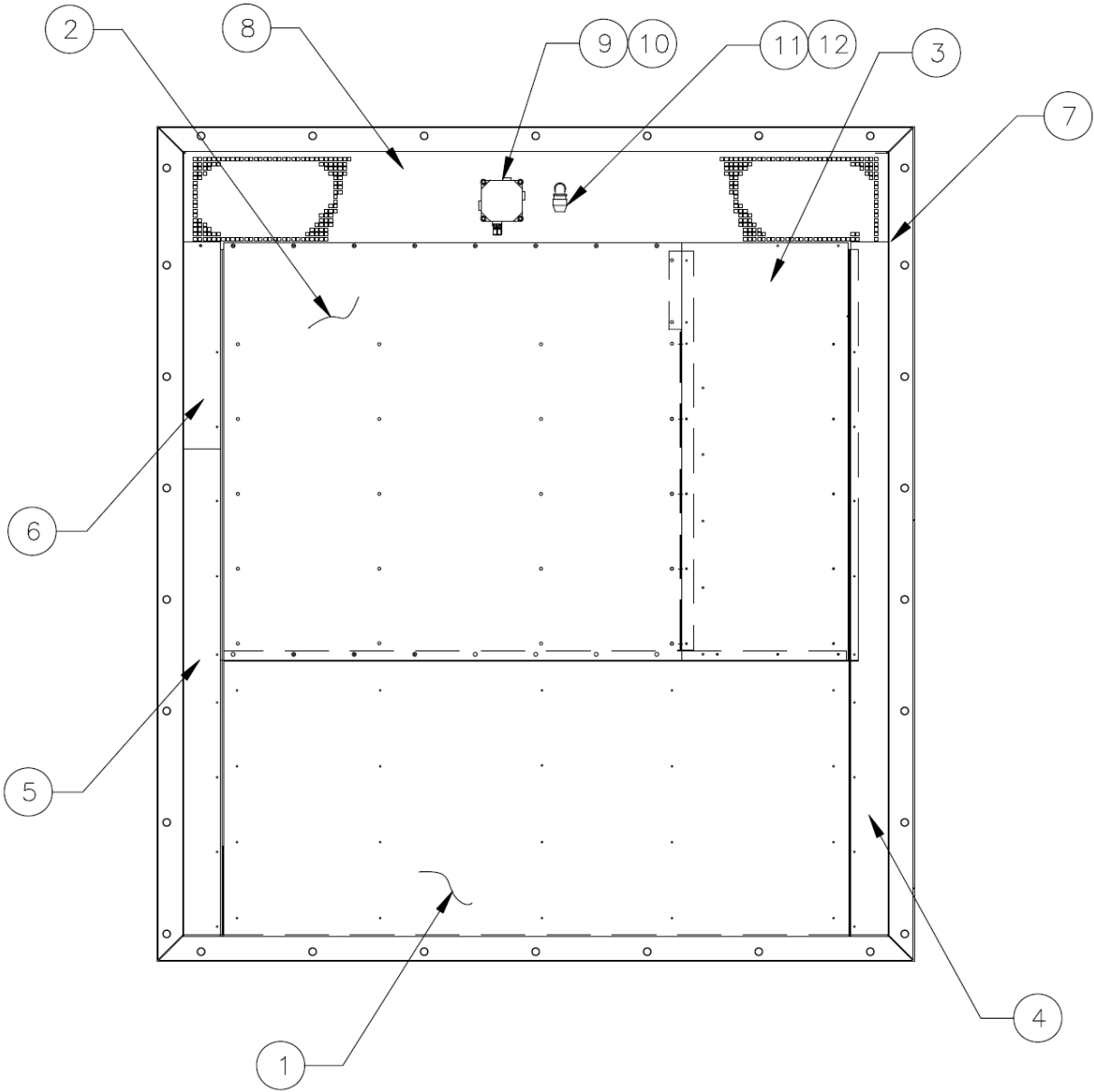
## 9.1 Unit Front View



ITEM	PART NO.	DESCRIPTION	QTY.
1	360 11106 00	PLATE AIR VENT ASSEMBLY	1
		(CONSISTS OF ITEMS 2 & 3)	
2	060 53100 00	PLATE VENT	1
3	K28 10863 00	GASKET AIR VENT	1
4	360 07913 00	HANDLE VENT LOCKING	1
5	K35 51577 00	LABEL LOGO PAUL KLINGE DARK BLUE	1
6	K35 05770 00	LABEL AIR VENT ADJUSTING	1
7	360 11105 00	DOOR EVAPORATOR COMPLETE	1
		(CONSISTS OF ITEMS 9 THRU 23)	
8	360 07969 00	LATCH WELDED EVAPORATOR DOOR	2
9	060 07971 00	KNOB EVAPORATOR DOOR LATCH	2
10	K28 10873 00	INSULATOR EVAPORATOR DOOR LATCH	2
11	K28 10860 00	GASKET DOOR EVAP. FAN OUTSIDE (SECT. 9.4)	1
12	K29 18539 01	HINGE ALUMINUM BUTT W/.38 HOLES	2
13	360 10929 00	PIN HINGE NYLON WITH SCREW	2
14	K21 16286 03	HAIRPIN COTTER SS ¼-5/16 SHAFT	2
15	K28 10691 00	STRAP 15 INCHES LG WITH OUT HOOKS (SECT. 9.4)	2
16	K29 18490 00	HOOK STRAP SS .125 DIA WIRE (SECT. 9.4)	2
17	K21 14065 00	NUT HEX SS ¼-20	2
18	K21 50492 03	WASHER INSULATED ¼	2
19	K21 10189 00	WASHER FLAT SS ¼	2
20	K21 14769 00	SCREW HEX SS ¼-20 X 1	2
21	K21 16186 06	NUT INSERT CBRS ¼-20	2
22	K21 15910 05	RIVET SS 3/16 (25-38)	2
23	060 07964 00	KEEPER DOOR LATCH ASSEMBLY	2
24	360 11103 00	DOOR HEATER ASSEMBLY (INCLUDES ITEM 25)	1
25	K28 10861 00	GASKET DOOR HEATERS OUTSIDE	1
26	K35 06299 00	LABEL OPERATING INSTRUCTIONS PFR-571	1
27	K35 04602 00	LABEL – CAUTION FAN STARTS AUTOMATICALLY	2
28	060 10963 00	COVER TRANSFORMER PAINT	1
29	060 10955 35	VENTURI CONDENSER FAN (PAINTED)	1
30	060 10954 00	GRILL CONDENSER FAN	1
31	360 10969 10	COVER FRONT CONDENSER COVER	1

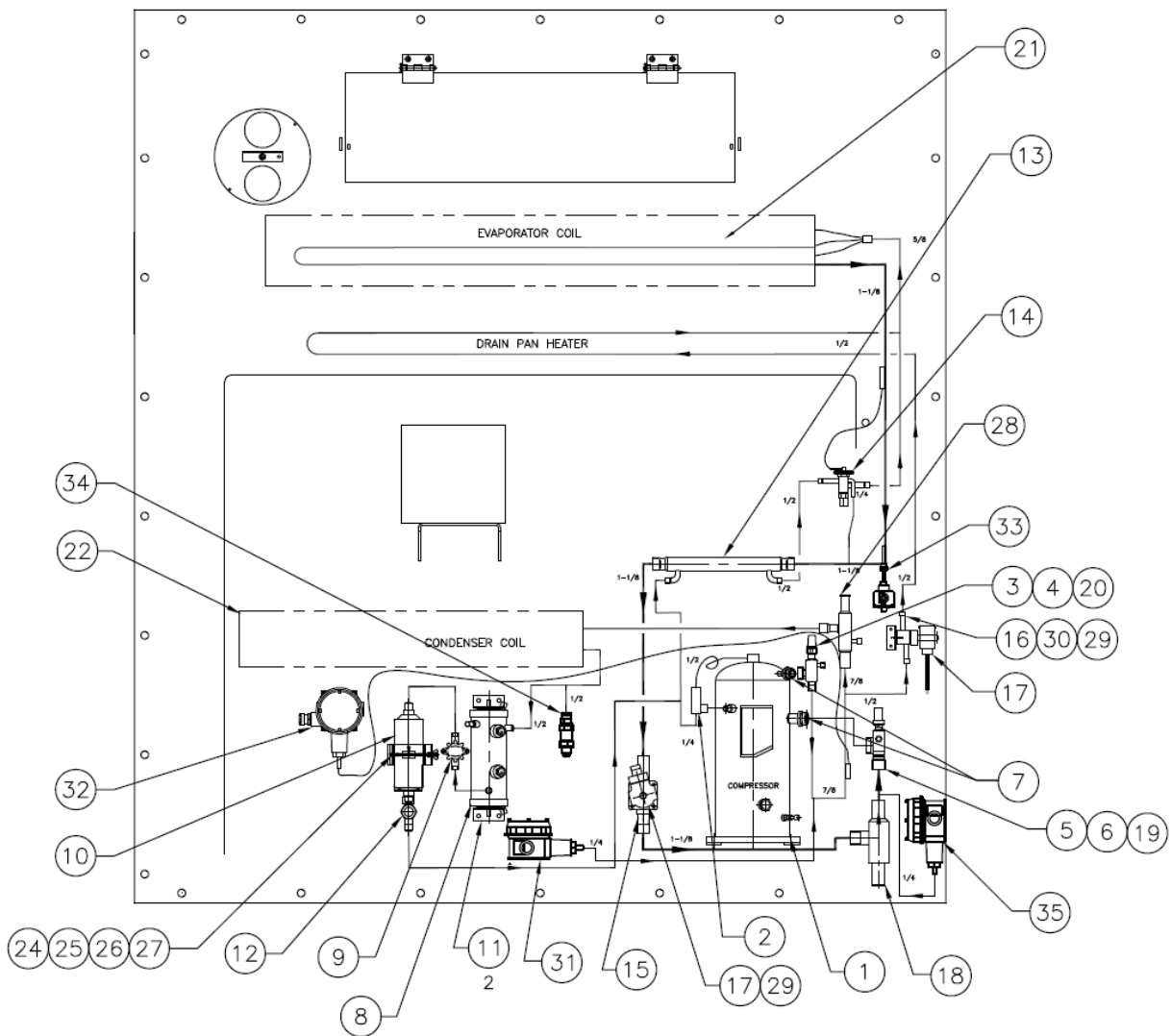
ITEM	PART NO.	DESCRIPTION	QTY.
32	360 10962 10	COVER COMPRESSOR SILKSCREEN (MODIFIED)	1
33	K35 05822 01	LABEL – OPERATION OF TEMPERATURE SELECT	1
34	K26 25147 00	FAN 20.75 DIA .62 BORE 14 BLADE PLASTIC	1
35	K35 06297 00	LABEL – DO NOT OPEN IN A HAZARDOUS LOCATION	2
36	360 10968 10	ANGLE TOP CONDENSER SECTION COMPLETE	1
37	360 10961 10	SUPPORT CONDENSER COIL ASSEMBLY	1
38	K35 05782 00	LABEL – R-404A (HP 62)	1
39	K35 05606 00	LABEL – ARROW 1" X 2"	1
40	K25 26760 02	SWITCH MAIN POWER DISCONNECT ATEX	1
41	K35 06541 00	LABEL CE MARKING	1
42	K35 06292 13	LABEL COMPONENT LAYOUT	1
43	060 17660 01	COVER SUCTION SOLENOID	1
44	060 17661 01	COVER HOT GAS SOLENOID	1
45	K24 22453 00	MOTOR XP 1-1/2HP 1750 RPM 230/460V 3 PH ATEX	1
46	K25-26840-25	PLUG STOPPING FLAMEPROOF ATEX M25 BRASS	1

**9.2 Unit Rear View**



ITEM	PART NO.	DESCRIPTION	QTY.
1	060 11137 00	PANEL REAR BOTTOM	1
2	060 12322 00	PANEL TOP LEFT (PART OF 2 PIECE BACK)	1
3	060 12323 00	PANEL TOP RIGHT PROBE ACCESS	1
4	060 11134 00	PANEL SIDE LEFT HAND	1
5	060 11135 01	PANEL SIDE RIGHT HAND – PANEL ASSY	1
6	360 11135 02	PANEL SIDE RIGHT HAND ACCESS	1
7	K28 10858 00	GASKET UNIT 3 SEALS	1
8	360 11394 00	FRAME EVAPORATOR BLOWER WELDMENT	1
9	K25 26764 01	BOX ELECTRICAL FOR LIGHTING ATEX PFR-581	1
10	K25 26570 20	GLAND CABLE METRIC ATEX M20X1.5	1
11	K25 19613 04	CONNECTOR 90 ¾	1
12	K25 26340 03	NUT LK CONDUIT ¾	1

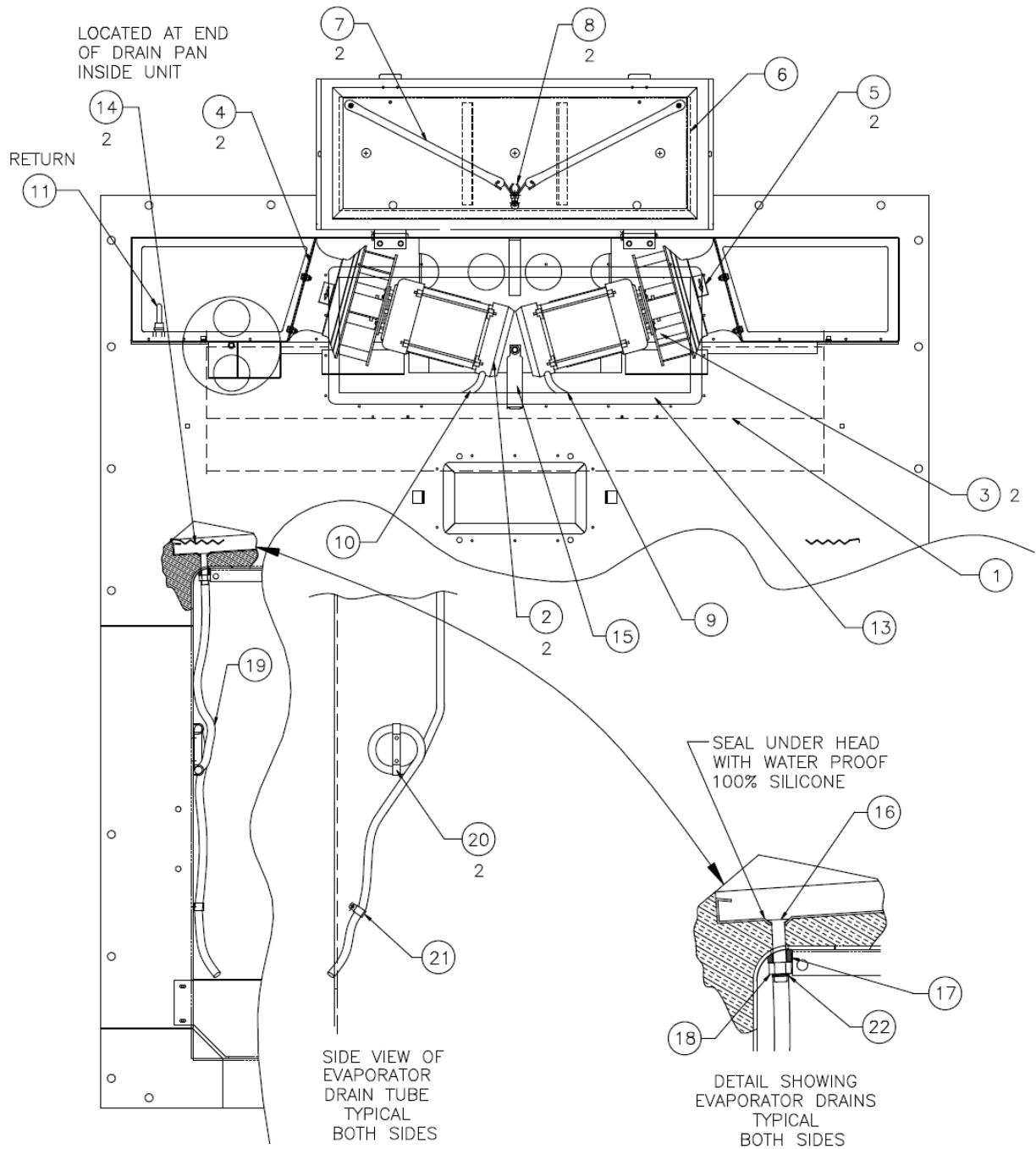
# **9.3 Piping Components**





ITEM	PART NO.	DESCRIPTION	QTY.
1	360 16375 00	ASSY COMPR W/JUNCTION BOX MOD PFR 571-Z2	1
2	K15 00042 04	KIT VALVE COMPR HIGH DISCH TEMP CONTROL	1
3	K22 06970 00	VALVE ROTALOCK 1"-14 X 5/8 CUP	1
4	K28 08249 00	SEAL TEFLON ¾" OD	1
5	K22 04984 00	VALVE ROTALOCK 1-1/4"-12 X 1-1/8 CUP	1
6	K28 04836 00	SEAL TEFLON 1" OD	1
7	K15 00042 09	SPUD ROTALOCK 1"-14 AND 1-1/4"-12	1
8	360 11112 00	RECEIVER W/VALVE ASSEMBLY	1
9	K22 01672 00	VALVE HAND SHUT OFF ½ CUP BRASS	1
10	K26 24906 00	FILTER DRIER ½ MALE FLARE HIGH CAPACITY	1
11	060 06700 02	BRACKET RECEIVER MOUNTING	2
12	K26 22196 00	INDICATOR MOISTURE ½ MFL X ½ FFL	1
13	K26 17451 00	HEAT EXCHANGER 1-1/8 CUP X ½ CUP	1
14	K25 26093 00	VALVE TX ½ CUP X 1/2 CUP 2.5-3 TON (MODIFIED)	1
15	K25 26117 00	VALVE SOLENOID 1-1/8 CUP NORM OPEN	1
16	K25 26836 00	VALVE SOLENOID ½C NC LESS COIL HOT GAS	1
17	K25 26722 00	COIL SOLENOID EX NC 24VAC	1
18	K22 06875 02	VALVE SUCTION REGULATOR 15 PSI	1
19	K22 06915 00	CAP SUCTION VALVE 1 1/16-18 UNF BLACK PLASTIC	1
20	K22 06972 00	CAP DISCHARGE VALVE ¾-16 UNF BLACK PLASTIC	1
21	K26 24902 00	COIL EVAPORATOR PFR-561	1
22	K26 25026 00	COIL CONDENSER COPPER	1
23	K11 00416 00	OIL COMPRESSOR REFRIG POE (SEE SECTION 7)	½ GAL
24	060 06902 00	BRACKET - FILTER DRIER PASSIVATED SS	1
25	360 06903 00	BOLT DRIER MOUNTING ¾-20 PASSIVATED	1
26	K21 00642 00	NUT WING BRASS ¾-20	1
27	K21 10189 00	WASHER FLAT SS ¾ .63 OD .065 TH	1
28	K22 06911 10	VALVE DISCHARGE PRESSURE REG 7/8C 145 PSIG	1
29	K21 16606 01	EXT. RETAINING RING .75 SHAFT X 0.58 GROOVE	1
30	060 16352 00	BRACKET	1
31	K25 26723 01	SWITCH HIGH PRESSURE ATEX ZONE 1	1
32	K25 26724 01	SWITCH TEMP ATEX ZONE 1	1
33	K25 26841 00	DEFROST TEMPERATURE PROBE (PART OF 360 17665 00)	1
34	K22 07028 03	HIGH PRESSURE BLOW OFF VALVE	1
35	K25 26927 00	SWITCH LOW PRESSURE 5 PSI ATEX	1

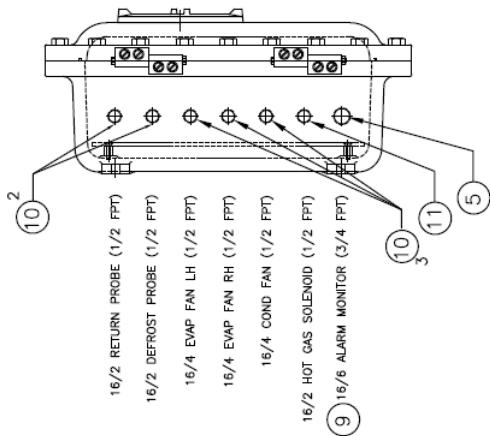
## 9.4 Evaporator Section



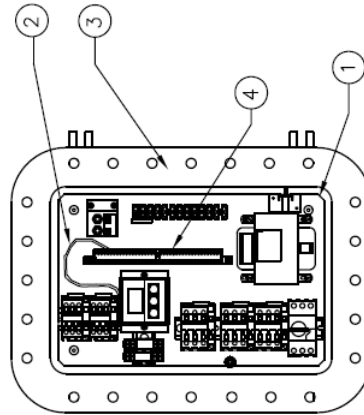
ITEM	PART NO.	DESCRIPTION	QTY.
1	K26 24902 00	COIL EVAPORATOR	1
2	K24 22468 01	MOTOR XP 1/3 HP 1750 RPM 56 FRAME 3 PH 230/460	2
3	K26 25139 00	WHEEL BLOWER 11.00 DIA. 5/8 BORE	2
4	360 16630 00	ASSY DAMPER EVAPORATOR	2
5	K35 05606 00	LABEL ARROW 1" X 2"	2
6	K28 10860 00	GASKET DOOR EVAPORATOR FAN OUTSIDE	1
7	K28 10691 00	STRAP 15 INCHES LONG NO HOOKS	2
8	K29 18490 00	HOOK STRAP SS .125 DIA WIRE	2
9	360 15599 00	POWER CABLE (RIGHT HAND)	1
10	360 15598 00	POWER CABLE (LEFT HAND)	1
11	K25 26841 00	PROBE RETURN ATEX PFR-571	1
12	K25 26841 00	PROBE DEFROST ATEX PRF-571, 581 (NOT SHOWN – PART OF 360 17665 00)	1
13	K28 10859 00	GASKET DOOR EVAPORATOR FAN INSIDE	1
14	060 11012 00	BAFFLE DRAIN PAN	2
15	060 11060 00	BRACE EVAP MOTOR BASE	1
16	060 11027 00	FITTING EVAPORATOR DRAIN 5/8-11 UNC	2
17	K28 10888 00	SPACER EVAPORATOR DRAIN	2
18	K21 16265 08	NUT HEX NYLON 5/8-11	2
19	K25 26128 04	TUBE DRAIN	2
20	060 53363 00	BRACKET DRAIN TUBE WHITE	2
21	K21 15649 08	CLAMP CUSHION SS 3/4" ID .28 MOUNTING HOLE	2
22	K25 23765 02	STRAP CABLE BLACK .19" WIDE 7.4" LONG 1.7" DIA	2

9.5 Electrical Box

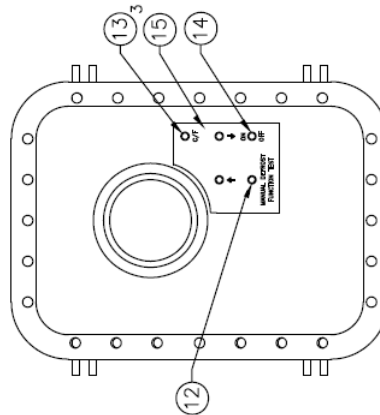
ITEM	PART NO.	DESCRIPTION	QTY
1	360-16441-13	ASSY ELECTRICAL SUBPANEL	1
2	360-12540-05	CABLE RIBBON SHIELD 13"	1
3	360-17662-00	BOX CONTROL EXPLOSION PROOF PAINTED	1
4	K31-00822-12	THERMOSTAT PFR 581	1
5	K25-26840-02	PLUG EX 3/4 NPT	2
6	K25-26570-03	GLAND EX NPT 1/2 .43-.56	5
7	K25-26574-01	DRAIN ELEC BOX EX NPT 1/2	1
8	K25-26570-05	GLAND EX NPT 3/4 .51-.80	2
9	360-16394-00	CABLE ALARM MONITOR PFR 581	1
10	K25-26570-02	GLAND EX NPT 1/2 .30-.47	5
11	K25-26570-01	GLAND EX NPT 1/2 .12-.32	2
12	K24-22471-00	MINI PUSHBUTTON SPDT (BLACK)	1
13	K24-22470-00	MINI PUSHBUTTON SPDT (RED)	3
14	K24-22472-00	MINI PUSHBUTTON DPDT (BLACK)	1
15	K35-06461-02	LABEL FRONT COVER SWITCHES LABEL	1



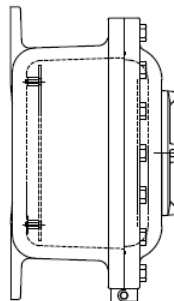
LEFT SIDE VIEW



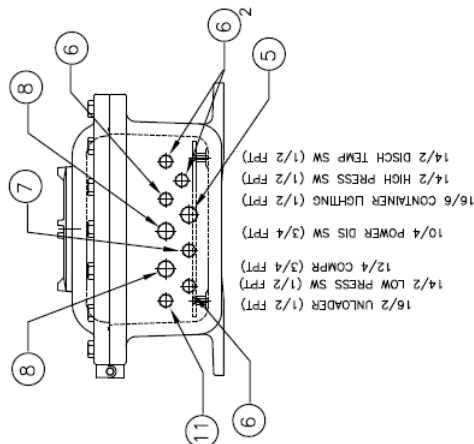
FRONT VIEW  
COVER REMOVED



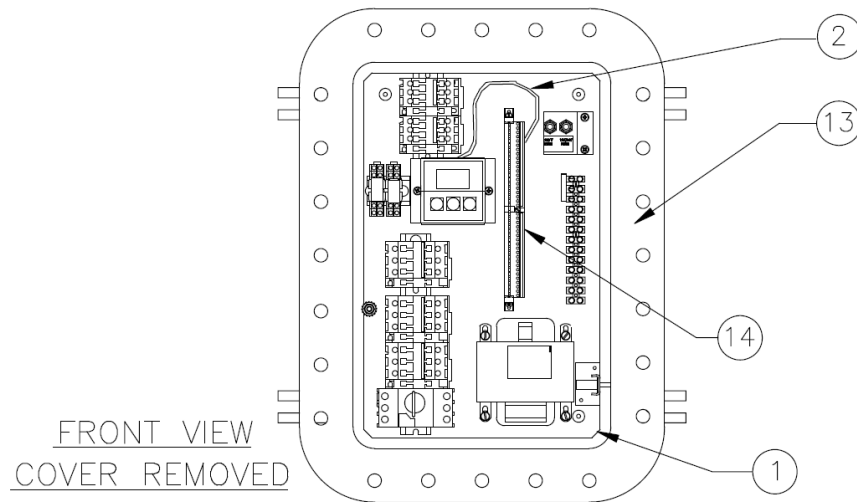
FRONT VIEW



TOP VIEW

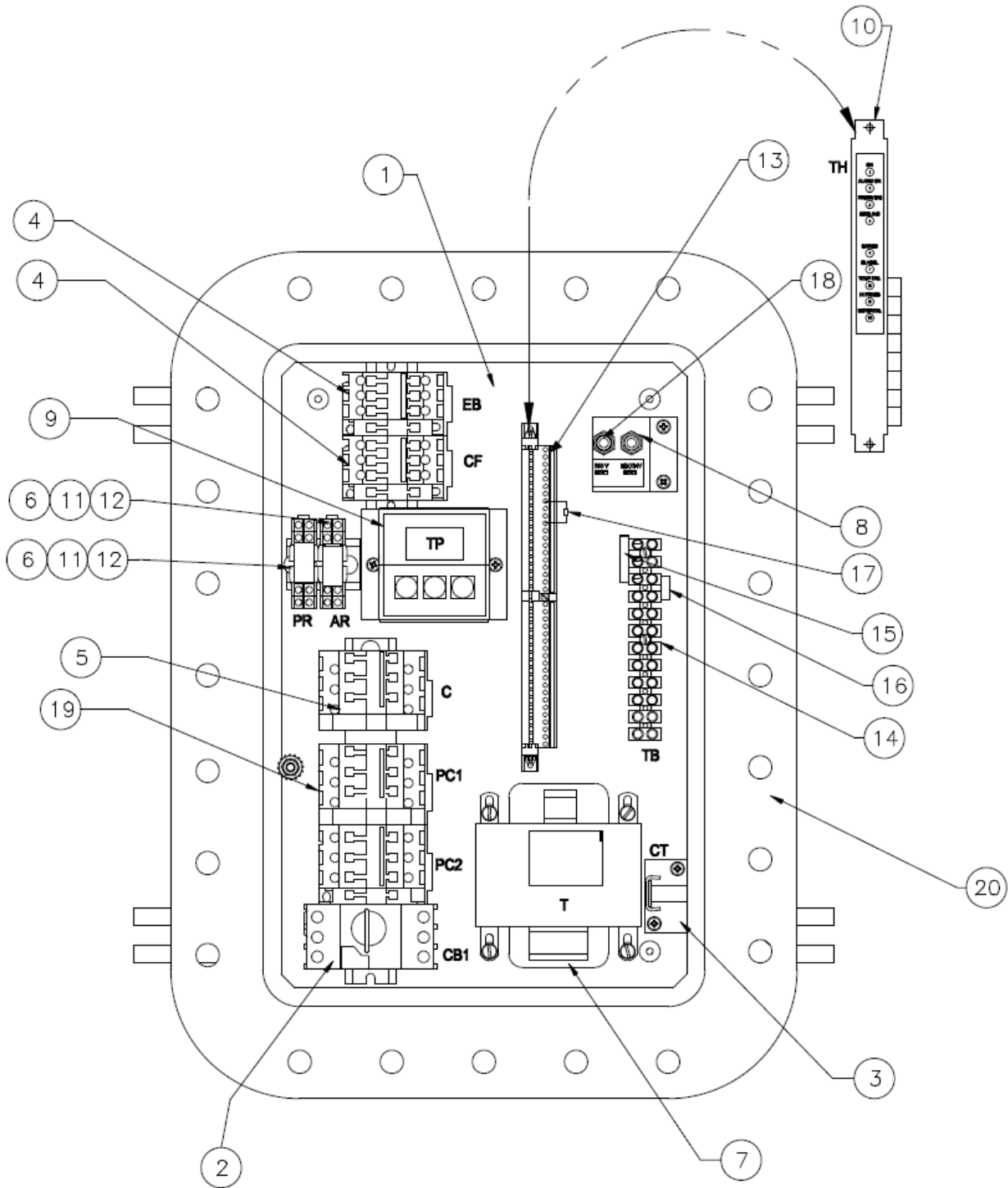


BOTTOM VIEW



ITEM	PART NO.	DESCRIPTION	QTY.
1	360 16441 12	ASSY ELECTRICAL SUBPANEL	1
2	360 12540 05	CABLE RIBBON SHIELD 13"	1
12	360 16394 00	CABLE ALARM MONITOR PFR-581	1
13	360 17662 00	BOX CONTROL EXPLOSION PROOF PAINTED	1
14	K31 00822 12	THERMOSTAT PFR-581	1
16	K25 26570 03	GLAND EX NPT ½ .43-.56	1
17	K25 26574 01	DRAIN ELEC BOX EX NPT ½	1
18	K25 26570 05	GLAND EX NPT ¾ .51 - .80	3
20	K25 26570 02	GLAND EX NPT ½ .30 - .47	7
21	K25 26570 01	GLAND EX NPT ½ .12 - .32	2
22	K24 22471 00	MINI PUSHBUTTON SPDT (BLACK)	1
23	K24 22470 00	MINI PUSHBUTTON SPDT (RED)	3
24	K24 22472 00	MINI PUSHBUTTON DPDT (BLACK)	1
25	K35 06461 02	LABEL – FRONT COVER SWITCHES LABEL	1

## 9.6 Electrical Box Components



ITEM	PART NO.	DESCRIPTION	QTY.
1	360 16441 12	ASSEMBLY – ELECTRICAL PANEL PFR581-Z1	1
2	K24-22361-12	CIRCUIT BREAKER OVERLOAD 18-25 AMP	1
3	360 16398 00	CURRENT TRANSFORMER ASSEMBLY (INCLUDES ITEM 8)	1
4	K24 22155 00	CONTACTOR 9 AMP 3 POLE 24 VAC 50/60 HZ	2
5	K24 22156 00	CONTACTOR 16 AMP 3 POLE 24 VAC	1
6	K24 22264 03	RELAY 24 VAC MINI DPDT 3 AMP	2
7	K25 26762 00	TRANS 480V PRI 230V/24V/12V SEC 50/60 HZ	1
8	K24 16964 00	CIRCUIT BREAKER 1 AMP 1 POLE	1
9	360 17501 01	DISPLAY TOUCH PAD COMPLETE (CONSISTS OF)	1
	K31 00811 00	DISPLAY TEMP AND SELECTOR F/C W/CUSTOMFILTER SOFTWARE	1
	360 17900 01	CABLE TOUCH PAD TO DOOR (NOT SHOWN)	1
10	K31 00822 12	THERMOSTAT COOL AND HEAT WITH LABELS	1
11	K25 26265 02	SOCKET RELAY DPDT 1/8 DIN RAIL MOUNTING	2
12	K25 26266 02	SPRING RELAY HOLD DOWN 2 POLE	2
13	360 10829 00	BASE THERMOSTAT	1
14	K25 26488 12	TERMINAL BLOCK 12 POLE	1
15	K25 26550 03	JUMPER TERMINAL STRIP 3 POLE	1
16	K25 26550 02	JUMPER TERMINAL STRIP 2 POLE	1
17	K25 22682 00	RESISTOR 165 OHM ¼ W (NEEDED FOR UNITS W/PRESS TRANS)	1
18	K24 22330 00	CIRCUIT BREAKER 4 AMP 1 POLE 250 VAC	1
19	K24 22169 00	CONTACTOR REVERSING 16A 6P 24V	1
20	360 17662 00	ELECTRICAL BOX EXPLOSION PROOF	1

## 9.7 Spare Parts Kit

<b>ATEX PFR 571 Spare Parts Kit - 360 12014 50 Extended List</b>		
<b>Part Number</b>	<b>Description</b>	<b>Qty</b>
K24-22363-25	CKT BKR IEC 3POLE 19-25AMP 45MM W/HANDLE THERMAL-MAGNETIC	1
K24-22155-00	CONTR 9A 3P 24/V 60/50 HZ COIL	1
K24-22169-00	CONTR REVERSING 16A 6P 24V	1
K24-22156-00	CONTR 16A 3P 24V 50/60 Hz COIL	1
K25-26762-00	TRANSFORMER 480V PRI 230V/24V/12V SEC 50/60 HZ	1
360-10829-00	BASE THERMO GREEN 5 PIECE WITH LABELS	1
360-12540-05	CABLE RIBBON SHLD 13`` 10 WIRES 13LG	1
K25-26841-00	PROBE ATEX	1
K24-22470-00	SW PUSHBUTTON MINI MOMENTARY SPDT RED EX PROOF	1
K24-22471-00	SW PUSHBUTTON MINI MOMENTARY SPDT BLACK EX PROOF	1
K24-22472-00	SW PUSHBUTTON MINI MAINTAINED DPDT BLACK EX PROOF	1
360-17501-01	DISPLAY TEMPERATURE W/SELECTOR F/C and cable	1
K31-00822-12	THERMOSTAT W/LABELS PFR 571/581 ATEX COOL & HEAT	1
K24-22264-03	RELAY 24 VAC MINI DPDT 3AMPS GOLD PLATED SILVER CONTACTS	1
360-16398-00	CURRENT SENSING TRANSFORMER 20A 3PH VERTICAL	1
K24-22330-00	CKT BKR 4 A 1P 1/4PO PANEL MT	1
K24-16964-00	CIRCUIT BREAKER, 1 AMP 1 POLE (NEEDS TO BE ADDED TO KIT)	1