Liebert
Keeping Business in Business™

Challenger 2/3
Level 0 Control

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SYSTEM DESCRIPTIONS

There are several available configurations of environmental control systems. Each configuration uses the level 00 control processor. A brief overview of each, which describes the operational differences, is listed below.

1. Compressorized Systems (Self Contained)

These systems may be air, water or glycol cooled – depending on the heat rejection method selected.

Cooling – Two stages of mechanical refrigeration (split evaporator coil)
Heating – Two stages of electric reheat standard
Humidification – Infrared standard; steam generating optional
Dehumidification – Utilizes the compressor

2. Compressorized Systems (Split Systems)

These systems may be air, water or glycol cooled – depending on the remote heat rejection method selected.

Cooling – Two stages of mechanical refrigeration (split evaporator coil)
Heating – Two stages of electric reheat standard
Humidification – Infrared standard; steam generating optional
Dehumidification – Utilizes the compressor

2. Chilled Water Systems

These systems utilize a central chiller and control cooling by modulating a control valve in the chilled water line.

Cooling – Proportional in response to room needs
Heating – Two stages of electric reheat standard
Humidification – Infrared standard; steam generating optional
Dehumidification – Chilled water valve opens proportionally in response to room needs

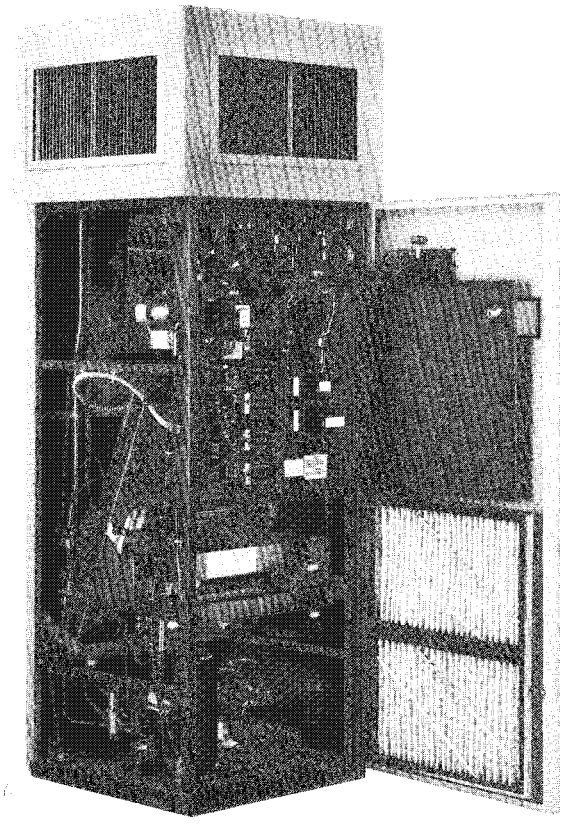


Figure 1. Challenger3 Upflow

START-UP PROCEDURE

Before beginning start-up, make certain that unit was installed according to the instructions in the Installation Manual. All exterior panels must be in place with the front panel open.

WARNING

POTENTIALLY LETHAL VOLTAGES EXIST WITHIN THIS EQUIPMENT DURING OPERATION. OBSERVE ALL CAUTIONS AND WARNINGS IN THIS MANUAL. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH. ONLY QUALIFIED SERVICE AND MAINTENANCE PERSONNEL SHOULD WORK WITH THIS EQUIPMENT.

1. Disconnect all power to the environmental control unit.
2. Tighten all electrical wiring connections which may have loosened during shipping.
3. Remove all line voltage fuses except the main fan fuses and the Control Voltage fuses on the electric panel.
4. If the computer room has a fire suppression system, turn off or bypass the system during the start-up procedure. Dust may have collected on the reheat elements during storage, shipping or on the job site. When this dust burns, it can trigger the smoke or fire detectors and set off the fire suppression system.
5. Turn on the main breaker and check the line voltage at the main unit disconnect switch. The line voltage must be within 10% of the nameplate voltage.
6. Turn ON the main unit disconnect switch and check the secondary voltage at transformers T5 and T115. Voltage at T5 must be 24v ±2.5v; T115 must be 115v ±12v.
7. Push the ON button. The blower will start and the ON lamp will light.
8. Air movement will cause the fan safety switch to energize relay R1 and power transformers T2 and T4. Check the secondary voltage at each transformer. It should be 24v ±2.5v.
9. Set temperature and humidity setpoints and sensitivity, alarm parameters and other control functions.
10. Turn OFF the main unit disconnect and the main breaker. The unit ON button should be OFF.
11. Replace all fuses (which you removed above).
12. Restore power to the unit; turn ON the main unit disconnect switch.
13. Push the ON button – putting the unit into operation.
14. Check the current draw on all high voltage components and match with the serial tag.
15. Reset the fire suppression system after the unit has been running for approximately ½ hour or after the room has cleared.

CONTROLS OPERATION

FRONT MONITOR PANEL

The front monitor displays the operating status and alarm conditions of the unit. The panel is located on the front of the unit. It provides monitoring and control of the system. Behind the panel are the numeric display and control buttons.

STATUS LEDs

The current operating mode of the unit is indicated by the LEDs in the STATUS section. Cooling, reheat, humidification and/or dehumidification are indicated.

ALARM LEDs

Alarm conditions activate an audible and a visual alarm. The audible alarm may be silenced by pressing the ALARMS PRESENT/SILENCE button. However, the LED indicating the problem and the ALARMS PRESENT lamp remains lit until the problem is corrected.

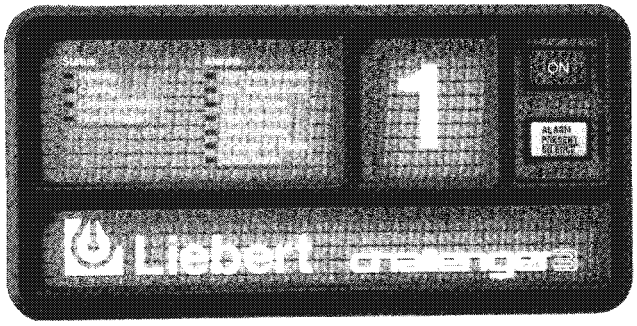


Figure 2. Front Monitor Panel

NUMERIC DISPLAY

The numeric display on the microprocessor board indicates: current room temperature, temperature setpoint, temperature sensitivity, current room humidity, humidity setpoint, humidity sensitivity and humidifier water rate. The number indicated (whether it is the current temperature or the temperature setpoint etc.) corresponds to the appropriate LED below the display. For example, when the Temperature Setpoint LED is lit and the numeric display shows 72, then the temperature setpoint is 72°F.

Advance Button

Pressing the ADV button will step the numeric display through the seven LED indicators.

Control Buttons

Two control buttons are used to change the setpoint numbers shown in the numeric display. The ▲ button increases the value and the ▼ button decreases the value.

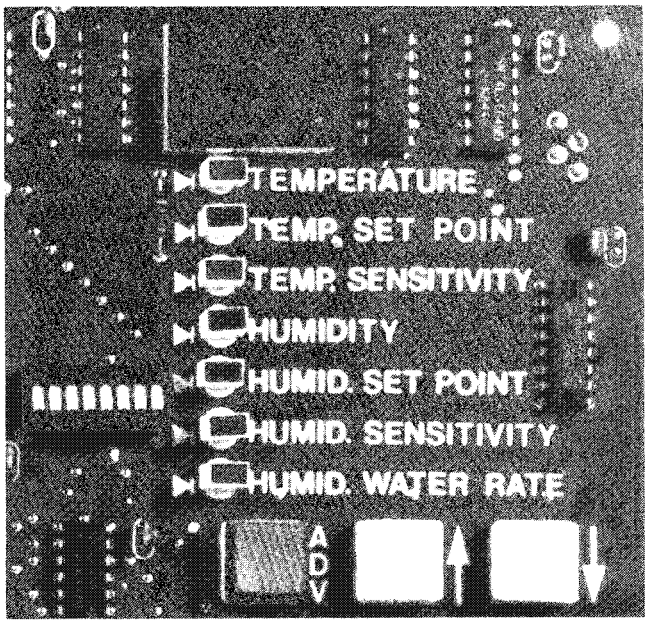


Figure 3. Numeric Display, LEDs and Buttons

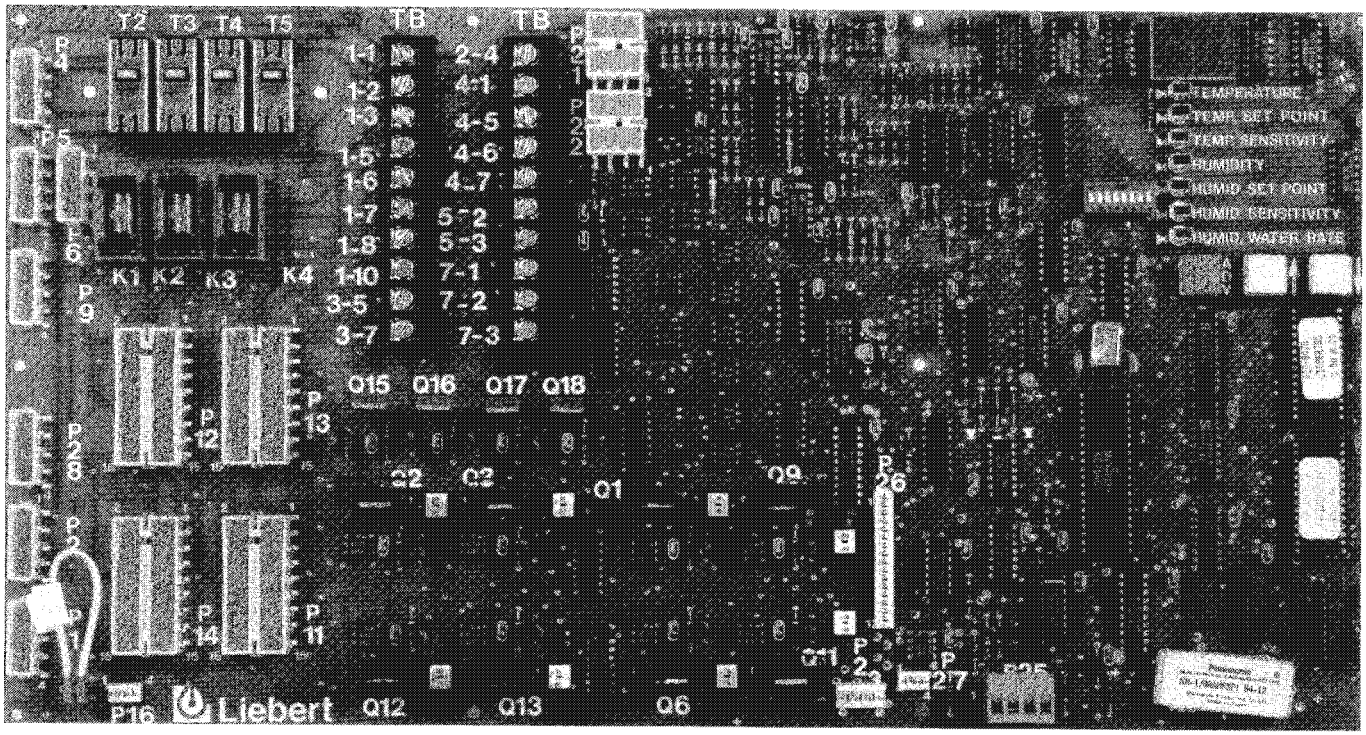


Figure 4. Microprocessor Board

TEMPERATURE/HUMIDITY SETPOINTS AND SENSITIVITY

The control buttons on the microprocessor board are used to adjust temperature and humidity setpoints and sensitivities. The board is located behind the front panel and is separated from all high voltage components.

TEMPERATURE SETPOINT

Use the ADV button to select Temperature Setpoint. The numeric display will indicate the current setpoint. Use the ▲ or the ▼ button to select the desired setpoint (40–85°F/4–29°C).

TEMPERATURE SENSITIVITY

The range of temperature change that must occur before action is taken by the environmental control system is the temperature sensitivity. This range may be set from ±1 to ±5°F (±1 to ±3°C) in 1° increments.

Use the ADV button to select Temperature Sensitivity. The numeric display will indicate the current sensitivity. Use the ▲ or the ▼ button to select the desired sensitivity.

HUMIDITY SETPOINT

Use the ADV button to select Humidity Setpoint. The numeric display will indicate the current setpoint. Use the ▲ or the ▼ button to select the desired setpoint (40–60% RH in 1% increments).

HUMIDITY SENSITIVITY

The range of humidity change that must occur before action is taken by the environmental control system is the humidity sensitivity. This range may be set from ±1% to ±10% RH in 1% increments.

Use the ADV button to select Humidity Sensitivity. The numeric display will indicate the current sensitivity. Use the ▲ or the ▼ button to select the desired sensitivity.

NOTE

The selection of temperature and humidity setpoints and sensitivities will determine high and low temperature and humidity alarm parameters. Refer to the ALARM section.

ALARM SYSTEM

TEMPERATURE AND HUMIDITY ALARMS

Temperature and humidity sensors, located in the return air section of the system, constantly monitor room conditions. If room conditions ever exceed the selected parameters, an audible and visual alarm is activated and the common alarm relay closes. The audible alarm may be silenced by pressing the ALARMS PRESENT/SILENCE button on the front monitor but the LED indicating the nature of the alarm remains lit and the common alarm relay remains closed until the problem is corrected.

PROGRAMMING TEMPERATURE AND HUMIDITY ALARMS

The temperature and humidity alarms are programmable using the ADVANCE and CONTROL buttons on the microprocessor board.

At the unit, the first step is to access SET MODE 2. This adds a second level of functions to the LED indicators on the microprocessor board (below the numeric display).

To access SET MODE 2:

1. Use the ADVANCE button to select TEMPERATURE.
2. Simultaneously press and hold the ▲ and ▼ buttons for 5 seconds. The TEMPERATURE LED will blink, indicating SET MODE 2 functions. Release the ▲ and ▼ buttons.

Normal Functions	SET MODE 2 Functions
TEMPERATURE	NOT USED
TEMPERATURE SET POINT	HIGH TEMPERATURE ALARM (from 1° above setpoint to maximum of 90°F/32°C)
TEMPERATURE SENSITIVITY	LOW TEMPERATURE ALARM (from 1° below setpoint to minimum of 35°F/2°C)
HUMIDITY	NOT USED
HUMIDITY SET POINT	HIGH HUMIDITY ALARM (from 1% above setpoint to a maximum of 65%)
HUMIDITY SENSITIVITY	LOW HUMIDITY ALARM (from 1% below setpoint to a minimum of 35%)
HUMIDIFIER WATER RATE	NOT USED

To set Temperature and Humidity alarms:

1. Use the ADVANCE button to select the desired function.
2. Use the ▲ and the ▼ button to increase or decrease the value shown on the numeric display.

To return to Normal Set Mode:

The microprocessor automatically returns to Normal Set Mode 30 seconds after the last activity.

SYSTEM ALARMS

Change Filters

The filter change switch senses a pressure drop across the air filters and activates the Change Filter LED and audible alarm when the pressure drop reaches a customer preset level. (See COMPONENT OPERATION AND MAINTENANCE – FILTERS for setting instructions.)

Loss of Air Flow

The fan safety switch is located on the low voltage panel and consists of a diaphragm switch and interconnecting tubing to the blower scroll. The normally open contacts of the switch will close at a factory preset air velocity and energize the Control Voltage Relay (see schematic on unit). Upon loss of airflow, the normally closed contacts on the switch will activate the Loss of Air Flow LED and audible alarm.

High Head Pressure – Compressor

The high head pressure cut–out switch activates the ALARMS PRESENT light and the audible alarm at the cut–out setting of the compressor pressure switch. (No other LEDs will accompany the ALARMS PRESENT lamp.)

Water Under Floor

The Liqui–tect/Water Detection Sensor (optional) consists of a solid–state switch that closes when water (or other conductive liquid) is detected by two sensor probes. The sensor may be mounted wherever water problems may occur. When water is detected, a visual and an audible alarm are activated. (See Liqui–tect/Water Detection Sensor for details.)

The Liqui–tect/Water Detection Sensor should not be used near flammable liquids or for flammable liquid detection. During operation, the detection probes may arc.

COMMON ALARM RELAY

On any alarm indication, the common alarm relay is energized – closing the contacts to a remote customer alarm. This relay remains energized until all alarm conditions are corrected. (See the electrical schematic on the unit for connection information.)

TEMPERATURE SENSING ALARM

Indicates failure of temperature sensing function (loss of signal).

Indication: Simultaneous Hi & Lo temperature alarms, accompanied by dashes on the numeric readout for temperature.

System Response: Activates 100% cooling.

HUMIDITY SENSING ALARM

Indicates failure of humidity sensing function (loss of signal).

Indication: Simultaneous Hi & Lo humidity alarms, accompanied by dashes on the numeric readout for humidity.

System Response: Deactivates humidification and dehumidification.

HUMIDIFIER PROBLEM ALARM (Optional – for Steam Generating Humidifier)

Indication: High canister water level.

Action Taken: Change canister.

Contact your sales/service representative for parts and service.

CONTROL FEATURES

COMPRESSOR POSITIVE START FEATURE

All models containing a compressor are equipped with a positive start feature. This electronically bypasses the compressor low pressure switch for three minutes following the opening of the liquid line solenoid valve (a call for cooling or dehumidification). After three minutes, the bypass contacts are opened and compressor operation is then controlled by the low pressure switch.

The three minute time delay is factory set and is not adjustable.

MANUAL OVERRIDE

It is possible to manually override the microprocessor and activate cooling, reheat 1 and 2, humidification and dehumidification. This is accomplished by placing a factory–supplied jumper across the desired set of contacts. Use the photo below to identify sets of jumper contacts. To return control of the unit to the microprocessor, replace the jumper on its holding contacts (these contacts are not connected to the microprocessor but only retain the jumper).

NOTE

Manual Override of cooling and dehumidification cannot be performed on chilled water units.

Connection Point	Manually Overrides
Q2	Reheat 2
Q3	Reheat 1
Q6	Liquid Line Solenoid Valve (DX Only)
Q11	Humidification
Q12	Humidification Water Valve
Q13	Common Alarm Relay

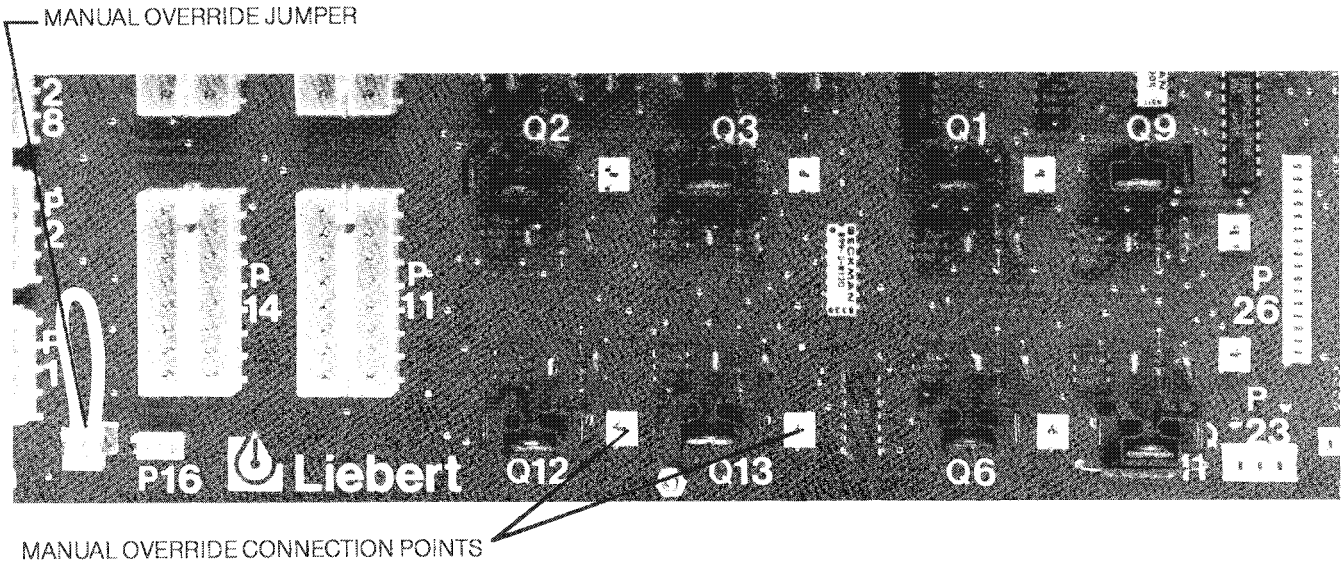


Figure 5. Manual Override Jumper and Connection Points

CONTROL SWITCHES

A set of 8 control switches is provided on the microprocessor board near the Numeric Display. These allow the operator to select options and operating modes.

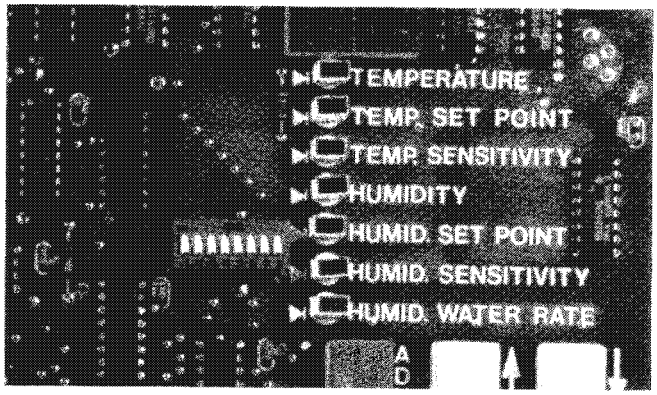


Figure 6. Control Switches

NOTE

The control switches are set in the correct position for each model. Do not change them without consulting the factory.

To change control switch settings, first turn unit off at control panel then turn off power at disconnect switch (after compressor shuts off). Restore power after setting switches.

Switch No.	ON Position	OFF Position
1	Load Control On[1]	Load Control Off
2	Reheat Available	No Reheat
3	2-Staged Cooling	Proportional Cooling
4	Humidification Available	No Humidification[2] Available
5	Low & High Humidity Alarm Available	Low Humidity Alarm Only
6	Dehumidification Available	No Dehumidification[3] Available
7	Sitemaster Interface	Local Monitor Interface
8	Fahrenheit Readout	Celsius Readout

[1] With Switch 1 ON: Load Control feature is enabled. This causes full coil operation when room conditions may cause the unit to cycle due to low coil temperature during part coil mode.

[2] With Switch 4 OFF: Humidifier Water Rate LED and numeric display will be disabled.

[3] With Switch 6 OFF (and 4 OFF): all four Humidity LEDs and numeric displays will be disabled.

BATTERY PROTECTED SETPOINTS

The battery back-up in the microprocessor will maintain the programmed values during power failures. If the length of the power failure exceeds the capacity of the batteries (about three months) the system will default to factory pre-set values listed.

Temperature Setpoint	75°F
Temperature Sensitivity	3°F
Humidity Setpoint	50% RH
Humidity Sensitivity	3% RH
Humidifier Water Rate	15 (150% water fill)

SEQUENTIAL AUTO RESTART RELAY (Optional)

The Sequential Auto Restart Relay will delay the start-up of the unit after a power failure. The time delay is field adjustable so that multiple units may be restarted at different time intervals to reduce total rush of current to the room.

The relay is located on the high voltage electric panel behind the front panel.

Turn the adjustment wheel clockwise to increase the time delay. Adjustment range: 1 to 120 seconds.

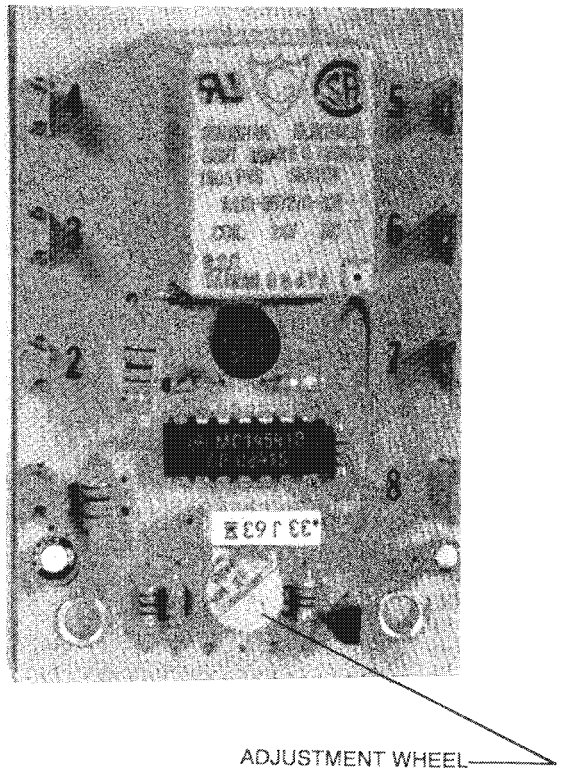


Figure 7. Sequential Auto Restart Relay

COMPONENT OPERATION AND MAINTENANCE

TRANSFORMER CIRCUIT BREAKERS

The control voltage circuit is protected by manual reset circuit breakers for each transformer. If the reset button is in the up (or extended) position, eliminate possible shorts in that circuit. After all shorts have been eliminated, press the reset button.

FAN SAFETY SWITCH

The Fan Safety Switch is located in the high voltage compartment and consists of a diaphragm switch and interconnecting tubing to the blower scroll. The normally–open contacts close at a preset velocity closing relay R1 which applies power to the cooling and humidifier circuits. The normally closed contacts activate the alarm system if air flow should be interrupted. In this event relay R1 would be de–energized.

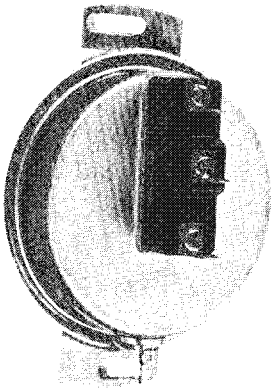


Figure 8. Fan Safety Switch

FIRESTAT (Optional)

The Firestat is a bimetal operated sensing device with a normally closed switch. This device will shut down the entire unit when the inlet air temperature exceeds a preset point. It is connected between terminals 1 and 3 at terminal strip #7.

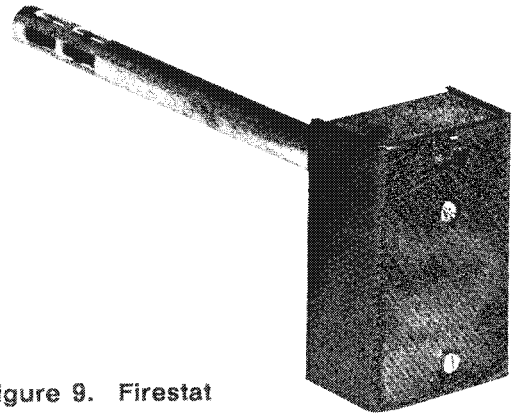


Figure 9. Firestat

LIQUI–TECT/WATER DETECTION SENSOR (Optional)

Do not use near flammable liquids or for flammable liquid detection.

The Liqui–tect/Water Detection Sensor consists of a solid state switch that closes when water (or other conductive liquid) is detected by the twin sensor probes. The sensor is hermetically sealed in all thread PVC nipple and is to be mounted where water problems may occur.

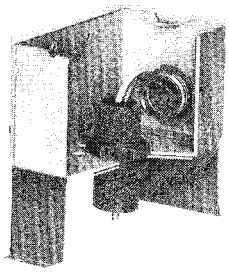


Figure 10. Liqui–Tect/Water Detection Sensor

Installation

The sensor should be located 6–8 feet (2 to 2.5 meters) from the environmental control unit in a wet trap or near a floor drain. It should not be mounted directly under the unit. Wire the sensor to unit using NEC Class 2, 24 volt wiring. Run wires to the terminal strip on the wire raceway in the compressor compartment and connect them to terminals 24 and 50.

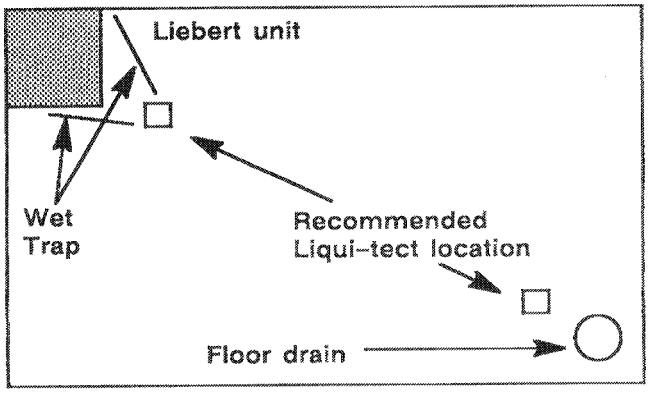


Figure 11. Recommended Location

REMOTE SHUTDOWN

A connection point is provided for customer supplied remote shutdown devices. This terminal strip is located on the left side of the unit behind the panel. Terminals 37 and 38 on the terminal strip are jumpered when no remote shutdown device is installed.

PROPORTIONAL COOLING/DEHUMIDIFICATION

On Chilled Water models, the microprocessor is capable of responding to changes in room conditions. These systems utilize either a two or three-way valve activated by a proportioning motor.

Upon an increase in room temperature or humidity the microprocessor will respond by positioning the chilled water valve proportionally to match the needs of the room. Full travel of the valve takes place within the range of the sensitivity setting. During dehumidification, full travel of the valve takes place within 2% RH.

FILTERS

Filters are usually the most neglected item in an environmental control system. To maintain efficient operation, they should be checked monthly and changed as required. Because replacement intervals vary with environmental condition and filter type, each unit is equipped with a filter clog switch. This warns of restricted air flow through the filter compartment by activating the CHANGE FILTER alarm.

Filters can be replaced by opening the doors. Power should be OFF while replacing the filters.

After replacing the filters, test the operation of the filter clog switch. Turning the adjusting screw counter clockwise will energize the change filter alarm. To adjust the switch proceed as follows: With clean filters installed and with the fan running, adjust the switch to energize the alarm. Note that the left panel must be securely attached on all units, and on upflow units the front panel must also be closed. Then turn the adjusting knob 2 1/2 turns clockwise, or to the desired filter change point.

INFRARED HUMIDIFIER

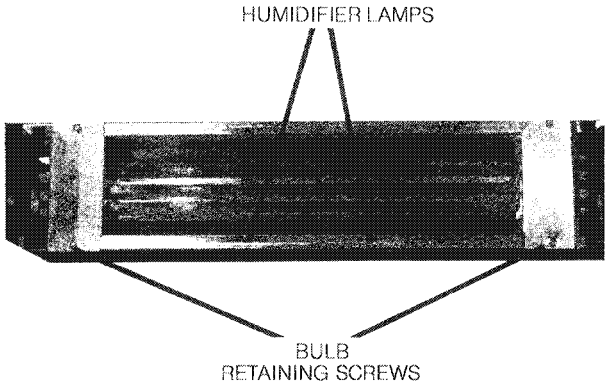


Figure 12. Infrared Humidifier Lamps

During the course of normal humidifier operation, deposits of mineral solids will collect on the sides and bottom of the humidifier pan. This should be cleaned out periodically to insure efficient humidifier operation. Each city and locality has different water characteristics, making it difficult to establish any definite time intervals between cleanings. However, on a monthly basis, check the buildup of deposits and if necessary clean the pan.

The humidifier pan is easily removed by disconnecting the drain coupling and removing the retaining screw at the right end of the humidifier.

NOTE

Before removing pan, be sure power to unit is disconnected and water in humidifier pan is no hotter than lukewarm.

Scale on the side and bottom can be loosened with a stiff brush. Flush with water and replace pan in humidifier.

An autoflush system (see next page) can greatly increase the time between cleanings, but does not eliminate the need for periodic checks and maintenance.

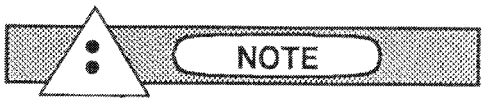
CHANGING HUMIDIFIER LAMPS

1. Open disconnect switch.
2. Remove left exterior panel.
3. Remove humidifier pan.
4. Remove lamp brackets (2) under lamps.
5. Remove high voltage compartment cover.
6. In high voltage compartment, locate burned-out bulb with continuity meter.
7. Loosen two screws securing bulb wires to junction block.
8. Pull bulb straight down.
9. Replace bulb making sure lamp wires are secure in junction block.

IMPORTANT: Do not touch the quartz lamps with your bare hands; any oily deposits (fingerprints) will severely shorten bulb life. Use clean cotton gloves at all times.

10. Reverse steps 1–5.

AUTOFLUSH HUMIDIFIER CLEANING SYSTEM (Infrared Only)



To operate properly, the Autoflush Humidifier requires a water source that can deliver at least ½ gpm (0.03 l/s) with a minimum pressure of 20 psig (138 kPa).

The autoflush system will periodically flush the humidifier pan with water to prevent the buildup of water minerals due to saturation. Because water conditions vary, the amount of water flushing through the system may be programmed to match local needs.

Water amounts between 110% and 250% of the amount needed for humidification may be selected. Operation of the flushing system is then automatic and no further adjustments need to be made.

Operation

The operation of the autoflush is divided into four steps beginning with a call for humidification.

1. If the humidifier has not been activated for over 30 hours, the autoflush will flow water into the pan for 30 seconds. This will provide a minimum amount of water in the pan and prevent heat damage to the humidifier pan. Humidifier lamps are OFF.
2. If the humidifier has been activated within the last 30 hours, Step 1 is bypassed. The autoflush will flow water into the pan for 4 minutes (based on the length of time between humidifier activations). The humidifier lamps are on and the humidifier is operational during this period. When the pan is filled (the fill cycle has timed out), the water make-up valve is closed.
3. The water make-up valve remains OFF and the humidifier lamps are on for a maximum of 8 minutes.
4. After the 8 minute cycle, the autoflush adds water to the pan to replenish the water used in humidification and flush the pan of mineral solids. This amount of water is adjustable from 110% to 250% in increments of 10%. At the end of this cycle, the make-up valve is closed. Steps 3 and 4 repeat as long as humidification is required.

Controls

The autoflush is programmed using the numeric display and the control buttons just as the temperature and humidity setpoints are programmed.

Use the ADV button to select Humid Water Rate. The numeric display will indicate the current Humidifier Water rate. Use the ▲ and ▼ and the buttons to select the desired flush rate.

Flush rates are displayed as 11 to 25 in increments of 1. Selecting 15 would program the microprocessor for 150% of the amount of water needed for humidification.

STEAM GENERATING HUMIDIFIER

Introduction

Steam generating humidifiers are designed to operate in voltage ranges from 200 to 575 volts and generate 11 pounds (5 kg) of steam per hour. These humidifiers operate efficiently over a wide range of water quality conditions and automatically adjust to changes in the conductivity of water. The humidifiers drain and refill to maintain an amperage setpoint and alert the operator when the humidifier canister needs to be replaced.

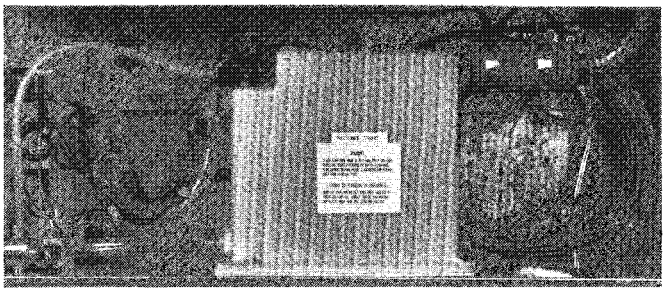


Figure 13. Steam Generating Humidifier

Operation

1. During start-up, when the humidity control calls for humidification, the fill valve opens and allows water to enter the canister. When the water level reaches the electrodes, current flows and the water begins to warm. The canister fills until the amperage reaches the setpoint and the fill valve closes. As the water warms, its conductivity increases and the current flow, in turn, rises. If the amperage reaches 115% of the normal operating amperage, the drain valve opens and flushes some of the water out of the canister. This reduces electrode contact with the water and lowers the current flow to the amperage setpoint. Boiling soon commences, and the canister operates normally.
2. If the conductivity of the water is low, the canister fills and the water level reaches the canister full electrode before the amperage setpoint is reached. The humidifier stops filling to prevent overflow. Boiling should commence in time. As water is boiled off, the mineral concentration in the canister increases and current flow also increases. The canister eventually reaches full output and goes to normal operation. No drain is permitted until then.
3. When full output is reached the circuit board starts a time cycle which is factory set at 60 seconds. During this repeating time cycle, the fill valve will open periodically to replenish the water being boiled off and maintain a "steady state" output at the set point. The amperage variance will depend on the conductivity of the water.
4. After a period of time, the mineral concentration in the canister becomes too high. When this occurs, the water boils too quickly. As the water quickly boils off and less of the electrode is exposed, the current flow decreases. When the current crosses the low threshold point (factory set at 70%) before the end of the time cycle, the drain valve opens, draining the mineral laden water out and replacing it with fresh water. This lowers the mineral concentration and returns the canister to "steady state" operation and prolongs canister life. The frequency of drains depends on water conductivity.
5. Over a period of time, the electrode surface will become coated with a layer of insulating material, which causes a drop in current flow. As this happens, the water level in the canister will slowly rise exposing new electrode surface to the water to maintain normal output. Eventually, the steady state water level will reach the canister full electrode and indicate so by activating the canister full alarm. At this point, all of electrode surface has been used up and the canister should be replaced.
6. After the entire electrode surface has been coated, the output will slowly begin to fall off. This usually occurs in the last several hours of electrode life and should allow enough time to schedule maintenance. During these last hours, the mineral concentration can increase. If the mineral concentration is too high, arcing can occur. If the electrodes start to arc, turn off the humidifier immediately and replace the canister with the identical part. (See **REPLACING THE CANISTER** on the next page.)

Controls

The humidifier RUN/DRAIN switch is located behind the front panel in the control section of the unit. This switch should be in the RUN position when the humidifier is in normal operation, and in the DRAIN position when a manual drain sequence is required. The electronic control board for the humidifier is also located in the control section of the unit. When the main unit is energized, power is available to the humidifier circuits. See the main unit operating manual for more specific information.

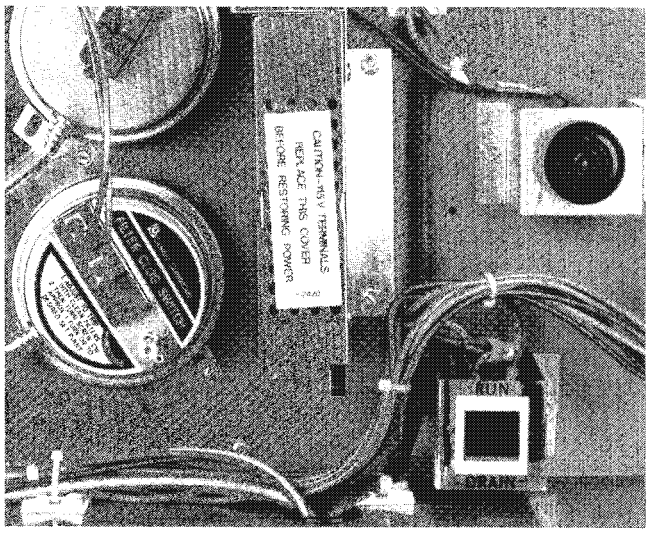


Figure 14. Run/Drain Switch

REPLACING THE CANISTER

Over a period of operation, the humidifier electrodes become coated with mineral solids. This coating insulates the electrodes and decreases the current flow. To maintain humidifier capacity, the water level slowly rises to expose fresh electrode. Eventually, the entire electrode becomes coated and the water level reaches the top. At this point, the canister full alarm is activated and the output begins to fall. When this happens, it is necessary to replace the full canister.

To replace the canister:

1. Turn off the humidifier by lowering the humidity setpoint below the ambient humidity level. Record the original setpoint.
2. Place the RUN/DRAIN switch in the DRAIN position to drain the water from the canister.
3. Return the RUN/DRAIN switch to the RUN position after the canister has drained.

WARNING

TO AVOID A SHOCK HAZARD, ALL POWER TO THE UNIT MUST BE DISCONNECTED BEFORE PROCEEDING WITH THE CANISTER REPLACEMENT PROCEDURE.

4. Turn OFF the power at the main unit.
5. Remove the cover from the humidifier cabinet.
6. Locate the power wires to the steam canister. They are connected to the canister with 1/4" quick connects. Make note of the wiring configuration before removing any wires. Refer to schematic on unit. Slide the rubber boot back to expose the connections. Remove the three power wires and the canister full wire at terminals 1, 2 and 3. Do not loosen the screws that secure the electrodes.
7. Use a screwdriver to remove the hose clamps that secure the drain and overflow hoses from the canister ports.
8. Loosen the fill line compression fitting and remove the tube from the input canister port.
9. Loosen the steam outlet hose clamps and slide the steam hose away from the canister fitting. Release the canister clamp along the base of the canister.
10. The canister is now ready to be removed.

    On the downflow chilled water units: Slide the humidifier cabinet bottom straight out toward you and drop the canister through the bottom of the cabinet.

    On all other units: Pull the canister straight out of the cabinet toward you.
11. Replace the canister with the part indicated below.

HUMIDIFIER CANISTER PART NUMBERS

Part Number	Voltage	Capacity (lbs/hr)	Capacity (kg/hr)
121795P1	200–230	11	5
121795P2	380–575	11	5

(Continued on the next page.)

12. Replace the canister by reversing the above procedure. Make special note of the following:

NOTE

When replacing the power wiring, wire #2 must be connected to the electrode closest to the steam outlet. The red canister full wire must be connected to the electrode marked with red and farthest from the steam outlet.

NOTE

When replacing the canister, always check the fill and drain solenoids for proper operation.

CIRCUIT BOARD ADJUSTMENTS

WARNING

CIRCUIT BOARD ADJUSTMENT SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY. HAZARDOUS VOLTAGES ARE PRESENT IN THE EQUIPMENT THROUGHOUT THE PROCEDURE. USE EXTREME CAUTION. IF DESIRED, POWER MAY BE DISCONNECTED PRIOR TO THE PROCEDURE.

Humidifier operation is governed by the humidifier control board. This board is located behind the dead front panel in the high voltage section of the unit. See the figure to the right for a picture of the board. There are two potentiometers mounted on the board. These pots can be used to adjust for extreme water conductivity conditions.

The % pot controls the amperage at which the drain will energize. The pot is clearly marked in percentages. This adjustment is factory set at 70%, which indicates that the unit will drain when the amperage falls off to 70% of the capacity setpoint. Raising the value increases the frequency of drain cycles. Lowering the value decreases the frequency of drain cycles. The frequency should be increased for highly conductive water and decreased for less conductive water. If adjustment is necessary, and a change of three to four percent in either direction does not permit normal operation of the unit, consult the customer service department.

The pot marked "sec" controls the duration of the drain cycle. The pot is clearly marked in seconds. This adjustment is factory set at 60 seconds and should not be re-adjusted without consulting customer service.

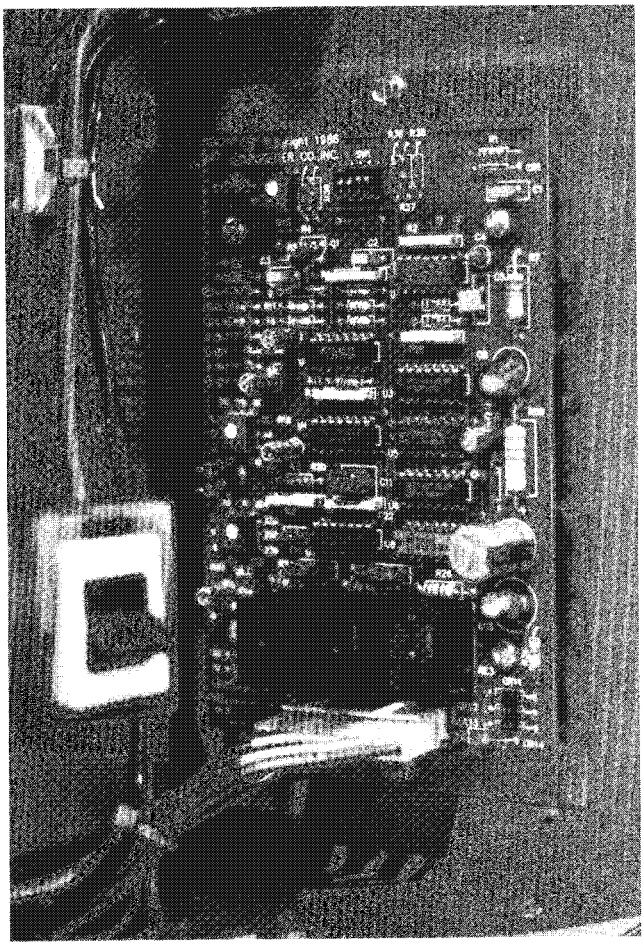


Figure 15. Steam Generating Humidifier Control Board

The auxiliary setpoint board is located above the control board in the control section of the unit. The dip switch adjustment on the auxiliary setpoint board is used to set the capacity of the humidifier. These are preset at the factory and should not be changed. Set the four dip switches in accordance with the values in the table below. The potentiometer on the auxiliary setpoint board is used to regulate the capacity of the humidifier. This adjustment is factory set fully clockwise to 100%. It can be used to reduce humidifier capacity, but should never be used to raise the capacity above the capacity for your model. Turn the adjustment counterclockwise to reduce your capacity. The minimum setting is approximately 50% of the dip switch setting.

The dip switches must be set exactly as indicated in the chart below. Failure to correctly set the dip switches may result in an electrical or water hazard.

TABLE 1. DIP SWITCH SETTINGS FOR CAPACITY AND VOLTAGE REQUIREMENTS

UNIT RATED VOLTAGE	CAPACITY lbs (kg)	SW1	SW2	SW3	SW4	RATED VALUES	
						VOLTAGE	AMP SET POINT
200/208	11 (5)	0	0	1	1	208	12.55
230	11 (5)	1	1	0	1	240	10.51
380/400/415	11 (5)	0	1	1	0	400	6.28
460	11 (5)	1	0	1	0	480	5.46
575	11 (5)	0	0	0	0	575	4.19

BLOWER PACKAGE

Periodic checks of the blower package include: belts, motor mounts, fan bearings and impellers.

FAN IMPELLERS AND BEARINGS

Fan impellers should be periodically inspected and any debris removed. Check to see if they are tightly mounted on the fan shaft. Rotate the impellers and make sure they do not rub against the fan housing.

Bearings used on the units are permanently sealed and self-lubricating. They should be inspected for signs of wear when belts are adjusted. Shake the pulley and look for movement in the fan shaft. If any excessive movement is noticed, bearings should be replaced. However, the cause of the wear must be determined and corrected before returning the unit to operation.

DRIVE BELT

The drive belt should be checked monthly for signs of wear and proper tension. Pressing in on the belt midway between the sheave and pulley should produce from ½" to 1" (12 to 25 mm) of movement. A belt that is too tight can cause excessive bearing wear.

Belt tension can be adjusted by raising or lowering the fan motor. If the belt appears cracked or worn, it should be replaced with an identically sized belt. With proper care, the belt should last several years.

After adjusting or changing the belt, always be certain that motor mounts are tight. Loose mounts will produce vibration that may damage the unit.

AIR DISTRIBUTION

All unit models are designed for constant volume air delivery. Therefore any unusual restrictions within the air circuit must be avoided.

Recommended Free Area for Grilles or Perforated Panels

Unit Size (Ton)	550 FPM (2.79 m/s) ft^2	(m^2)	600 FPM (3.05 m/s) ft^2	(m^2)
3	5.0	(.46)	4.6	(.43)
5	6.8	(.63)	6.3	(.59)

Grilles used in raised floors vary in size, the largest being 18" x 6" (46 cm x 15 cm). This type of grille has approximately 56 in.^{2} (361 cm^2) of free area. Perforated panels are usually 2' x 2' (61 x 61 cm) and have a nominal free area of approximately 108 to 144 inches^2 (697 to 929 cm^2).

Absolutely avoid any under floor restrictions such as clusters of cables or piping. Whenever possible, cables and piping should be run parallel to the air flow. Never stack cables or piping.

ELECTRIC PANEL

The electric panel should be inspected for any loose electrical connections.

Be sure that power to the unit is shut down before attempting to tighten any fittings or connections. The functioning of all control circuits can be tested by actuating each of the main functions. This is done by setting the set points.

The following checks can be performed to verify that all electrical components are functioning properly:

To test the **Cooling** function, set the set points for a temperature of 10°F (5°C)below room temperature. A call for cooling should be seen, the liquid line solenoid valves should open, the compressor contactor should energize, and the equipment should begin to cool. A high temperature alarm may come on. Disregard it. Return the set points to the desired temperature.

Reheat may be tested by setting the set point for 10°F (5°C) above room temperature. A call for heating should be seen, both heating contactors should energize, and the heating coils should begin to heat. Disregard the temperature alarm and return the set points to the desired temperature.

To check **Humidification**, set the humidification for an R.H. 10% above the room humidity reading. For infrared humidifiers, the solenoid valve and contactor should energize and the infrared element should come on. For steam generating humidifiers, you will immediately hear the clicks as it energizes. After a short delay, the canister will fill with water. The water will heat and steam will be produced. Return humidity setting to room relative humidity setting.

Dehumidification is checked by setting the humidification for a level 10% below room relative humidity. Make sure temperature setpoint is at or above room temperature. Return humidity setting to desired humidity. The liquid line solenoid valve should open, the compressor contactor should energize and the system should begin to cool/dehumidify.

REFRIGERATION SYSTEM

Each month the components of the refrigeration system should be inspected for proper function and signs of wear. Since in most cases evidence of malfunction is present prior to component failure, periodic inspections can be a major factor in the prevention of most system failures.

REFRIGERANT LINES

Refrigerant lines must be properly supported and not allowed to vibrate against ceilings, floors or the unit frame. Inspect all refrigerant lines every six months for signs of wear and proper support. Also inspect capillary and equalizer lines from the expansion valve and support as necessary.

LIQUID LINE SIGHT GLASS

The liquid line has a sight glass that indicates liquid refrigerant flow and the presence of moisture. Bubbles in the sight glass indicate a shortage of refrigerant or a restriction in the liquid line.

The moisture indicator changes from green to yellow when moisture is present in the system.

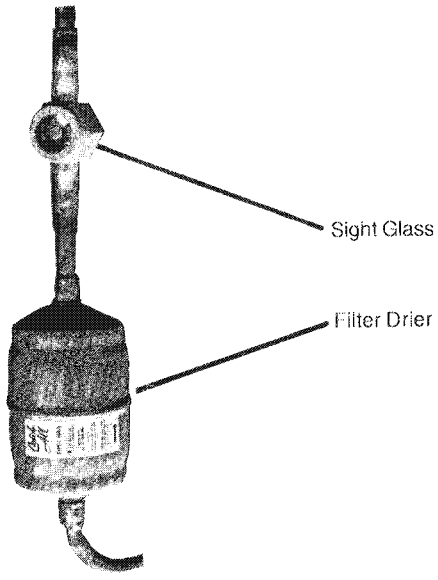


Figure 16. Liquid Line Sight Glass

SUCTION PRESSURE

Suction pressure will vary with load conditions. The low pressure switch in self contained air cooled units will shut the compressor down if suction pressure falls below the cut–out setting. High suction pressure reduces the ability of the refrigerant (R–22) to cool compressor components and can result in compressor damage. Minimum and maximum suction pressures are in the chart below.

Air Cooled System	Suction Pressures (R–22) Minimum PSIG	(kPa)	Maximum PSIG	(kPa)
FSC	15	(103)	92	(634)
Flood Back Head Pressure Control	20	(138)	92	(634)

During First Stage Cooling and Dehumidification mode, the unit operates with only part of the evaporator coil active. This results in lower suction pressures. However, the suction pressure should not drop below 50 PSIG (345 kPa) during operation in any mode. The Load Control feature switches the control to full coil operation when the room conditions could result in the unit cycling on the freezestat during part coil operation.

DISCHARGE PRESSURE

Discharge pressure can be increased or decreased by load conditions or condenser efficiency. The high pressure switch will shut the compressor down at its cut–out setting. The discharge pressure cut–out setting for all models is 360 PSIG (2480 kPa).

RECOMMENDED REFRIGERANT PRESSURES	PSIG	(kPa)
Suction	**50 TO 92**	**(345–634)**
Discharge		
Air Cooled	**260**	**(1793)**
Water Cooled		
65°F to 75°F water	**210**	**(1448)**
85°F water	**225**	**(1551)**
Glycol Cooled	**295**	**(2034)**
Maximum	**330**	**(2275)**

SUPERHEAT

Superheat can be adjusted by the Thermostatic Expansion Value (TEV).

To determine superheat:

1. Measure the temperature of the suction line at the point the TEV bulb is clamped.
2. Obtain the gauge pressure at the compressor suction valve.
3. Add the estimated pressure drop between bulb location and suction valve.
4. Convert the sum of the two pressures to the equivalent temperature.
5. Subtract this temperature from the actual suction line temperature. The difference is superheat.

NOTE

For superheat adjustment procedure see **REFRIGERATION SYSTEMS – THERMOSTATIC EXPANSION VALVE.**

HOT GAS BYPASS VALVE (Self Contained Units Only)

Operation

The hot gas bypass is installed between the compressor discharge line and the leaving side of the expansion valve through the side outlet distributor.

The system, with normal operation when the evaporator is under full load, will maintain enough pressure on the leaving side of the hot gas valve to keep the valve port closed.

If the load on the evaporator decreases, the evaporator will get colder. When the coil is too cold, the internal pressure in the evaporator drops and allows the hot gas bypass valve to open. Hot gas then mixes with the liquid coolant on the discharge side of the expansion valve raising the temperature and pressure in the evaporator. The net result is a reduction in the cooling capacity of the unit to match the load.

Adjustment

Upon deciding what evaporator temperature is desired, the following procedure should be used to adjust the hot gas bypass valve:

1. Install the suction and discharge pressure gauge.
2. Turn thermostat to call for cooling so that the refrigeration compressor will run.
3. Remove the TOP adjusting nut from the valve.
4. Insert an Allen wrench in the brass hole at top of valve in adjusting port, and turn CLOCKWISE if a higher evaporator temperature is required.
5. After obtaining the suction pressure required, reinstall cap tightly making sure there are no leaks.
6. Let the evaporator operate for approximately 10 to 15 minutes to make sure the suction pressure is within the range desired.
7. There will be a fluctuation of approximately 3 to 6 PSIG (21 to 41 kPa) on the evaporator due to the differential on the hot gas bypass.

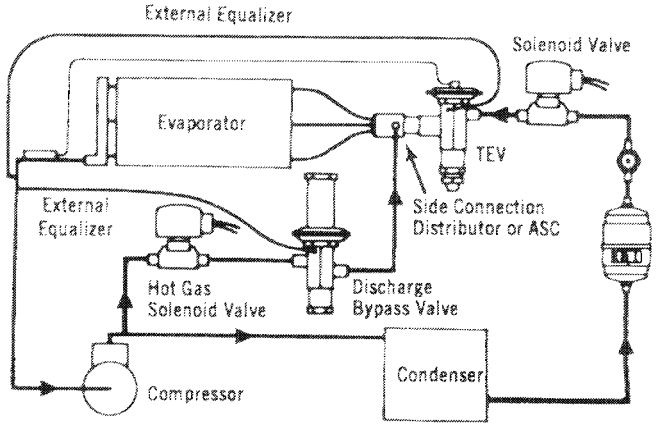


Figure 17. Hot Gas Bypass

THERMOSTATIC EXPANSION VALVE

Operation

The thermostatic expansion valve performs one function. It keeps the evaporator supplied with enough refrigerant to satisfy load conditions. It does not effect compressor operation.

Proper valve operation can be determined by measuring superheat (see **SUPERHEAT**). If too little refrigerant is being fed to the evaporator, the superheat will be high; if too much refrigerant is being supplied, the superheat will be low. The correct superheat setting is between 10 and 15°F (5 and 8°C).

Adjustment

To adjust the superheat setting, proceed as follows:

1. Remove the valve cap at the bottom of the valve.
2. Turn the adjusting stem counter-clockwise to lower the super-heat.
3. Turn the adjusting stem clockwise to increase the superheat.

NOTE

Make no more than ¼ turn of the stem at a time. As long as thirty minutes may be required for the new balance to take place.

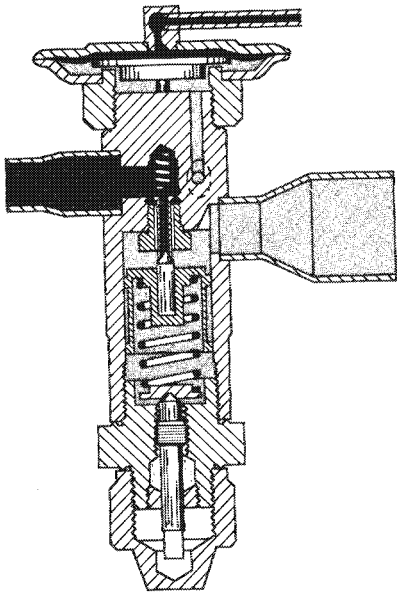


Figure 18. Typical Valve Cross Section

AIR COOLED CONDENSER

Restricted airflow through the condenser coil will reduce the operating efficiency of the unit and can result in high compressor head pressure and loss of cooling.

Clean the condenser coil of all debris that will inhibit air flow. This can be done with compressed air or commercial coil cleaner. Check for bent or damaged coil fins and repair as necessary. In winter, do not permit snow to accumulate around the sides or underneath the condenser.

Check all refrigerant lines and capillaries for vibration isolation. Support as necessary. Visually inspect all refrigerant lines for signs of oil leaks.

Checking Refrigerant Charge (Lee Temp/ Flood Back Head Pressure Control)

The system refrigerant level must be periodically checked. This is easily done by following the procedure below.

1. Set thermostatic control in the unit so that the compressor will run continuously.

2. The refrigerant level is visible through two sight glasses on the receiver, and will vary with ambient temperature.

REFRIGERANT LEVELS

40°F (4.5°C) and lower.	40 to 60°F (4.5 to 15.5°C)	60°F (15.6°C) and above.
Midway on the bottom sight glass.	Bottom sight glass should be clear with liquid.	Midway on the top sight glass.

NOTE

Also refer to recommended discharge pressures on page 20.

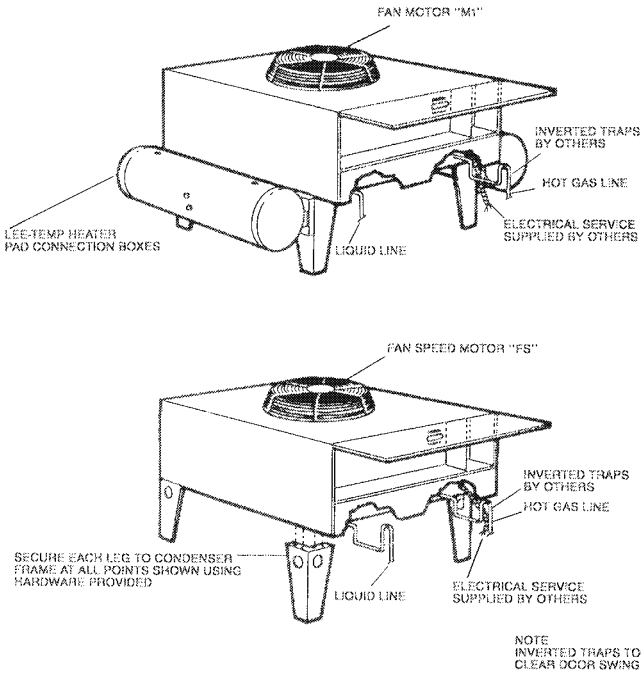


Figure 19. Outside Fan/Condenser Configuration

Regulating Valves

The water regulating valve automatically regulates the amount of fluid necessary to remove the heat from the refrigeration system, permitting more fluid to flow when load conditions are high and less fluid to flow when load conditions are low. The valve consists of a brass body, balance spring, valve seat, valve disc holders, capillary tube to refrigeration's discharge pressure and an adjusting screw.

Adjustment

The valve may be adjusted with a standard refrigeration service valve wrench or screw driver.

To lower the head pressure setting, turn the square adjusting screw clockwise until the high pressure gauge indicates the desired setting.

To raise the head pressure setting, turn the adjusting screw counterclockwise until the desired setting is obtained.

For optimum efficiency, the valve should be set for 105 to 110°F (40.6 to 43.3°C) condensing temperature.

Manual Flushing

The valve may be flushed by inserting a screw driver or similar tool under the two sides of the main spring and lifting. This action will open the valve seat and flush any dirt particles from the seat. If this fails, it will be necessary to dismantle the valve and clean the seat.

To dismantle the valve, proceed as follows:

1. Shut off the water supply.
2. Relieve the tension on the main spring by turning the adjusting screw clockwise as far as it will go. (Provide a means of catching water below the valve.)
3. Remove four round head screws extending through the main spring housing from the end of the valve opposite the bellows.
4. Remove the center assembly screws which allows access to all internal parts.
5. Clean the seat if possible. If the seat is pitted or damaged, replace the valve rubber disc and valve seat.
6. After the valve is reassembled check for leaks.
7. Re–adjust the head pressure.

Testing Function of Valve

When the refrigeration system has been off for approximately 10 to 15 minutes, the water flow should stop.

Should the water continue to flow, the valve is either improperly adjusted with too low of head pressure or the pressure sensing capillary is not connected properly to the condenser.

Glycol Solution Maintenance

It is difficult to establish a specific schedule of inhibitor maintenance since the rate of inhibitor depletion depends upon local water conditions. Analysis of water samples at time of installation and every six months should help to establish a pattern of depletion. A visual inspection of the solution and filter residue is often helpful in judging whether or not active corrosion is occurring.

The complexity of water caused problems and their correction makes it important to obtain the advice of a water treatment specialist and follow a regularly scheduled maintenance program. It is important to note that the improper use of water treatment chemicals can result in problems more serious than using no chemicals at all.

A chemical treatment such as "Betz Inhibitor 590" or "Betz Entec" equivalent should be used as recommended and manufactured by Betz Laboratories, Trevose, Pennsylvania.

COMPRESSOR FAILURE

Infrequently a fault in the motor insulation may result in a motor burn, but in a properly installed system burnouts rarely occur. Of those that do, most are the effects of mechanical or lubrication failures, resulting in the burnout as a secondary consequence.

If problems that can cause compressor failures are detected and corrected early, a large percentage can be prevented. Periodic maintenance inspections by alert service personnel on the lookout for abnormal operation can be a major factor in reducing maintenance costs. It is easier and less costly for all parties involved to take the few simple steps necessary to insure proper system operation than it is to allow a compressor failure to take place and then restore the system.

If a burnout does transpire, correct the problem that caused the burnout and clean the system. It is important to note that successive burnouts of the same system can usually be attributed to improper cleaning.

DAMAGE TO A REPLACEMENT COMPRESSOR CAUSED BY IMPROPER SYSTEM CLEANING CONSTITUTES ABUSE UNDER THE TERMS OF THE WARRANTY.

Before proceeding with a suspected burnout, a preliminary check of all electrical components should be made.

1. Check all fuses.

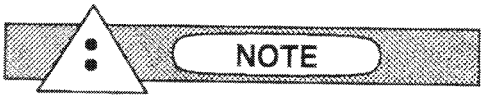
2. Check Hi–Lo Pressure switch operation. If a compressor failure has occurred, determine whether it is an electrical or mechanical failure.

ELECTRICAL – An electrical failure will be indicated by the distinct pungent odor when some refrigerant is released through the service port. If a severe burnout has occurred, the oil will be black and acidic.

MECHANICAL – No burned odor from gas released at service port. Motor attempts to run.

ELECTRICAL FAILURE

In the event that there is an electrical failure and a complete burnout of the refrigeration compressor motor, the proper procedures must be performed in order to clean the system to remove any acids that would cause a future failure.



Failure to properly clean the system after a compressor motor burnout will VOID THE COMPRESSOR WARRANTY.

Avoid touching or contacting the gas and oils with exposed skin. Severe burns will result. Use long rubber gloves in handling contaminated parts.

CLEAN-UP PROCEDURE FOR A COMPRESSOR MOTOR BURNOUT

When a compressor motor burns out, the stator winding decomposes forming carbon, water and acid which may contaminate refrigeration systems. These impurities must be removed from the system to prevent repeated motor failures. There is a variety of clean-up kits commercially available that can be used to clean contaminated refrigerant. Be sure to follow the manufacturer's instructions and precautions.

To ensure a clean system after a motor burnout or as a routine for harmful acid or moisture levels, use a reliable manufacturer's acid test kit. A few test kits provide for testing while the system is operating.

BEFORE SERVICING THE COMPRESSOR, READ THE SAFETY PRECAUTIONS LISTED BELOW AND ON THE TERMINAL BOX COVER. FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN SERIOUS INJURY.

1. Follow recognized safety practices and wear protective goggles.
2. Do not operate the compressor or provide any electric power to this unit unless the terminal box cover is in place and unless the suction and discharge valves are open.
3. Do not remove the compressor terminal box cover until all electrical sources have been disconnected.
4. If there is a refrigerant leak around the terminals, shut off the suction and discharge service valves to isolate the compressor and slowly release all of the refrigerant in the compressor. Do not disturb the terminals or wiring at the terminals or perform any disassembly until the compressor has been isolated and discharged.

Compressor Replacement Procedure

1. Determine the cause of the burnout and make the necessary corrections so that there won't be a repeat burnout with the new compressor. Check the control box for blown fuses, welded starter contacts, welded overload contacts and burned out heater elements. Check the compressor terminal plate for burned or damaged terminals or insulation and check for shorted or grounded wires. Check the unit wiring for loose power connections. Check for high and low voltages.
2. Disconnect all electrical wiring to the compressor.
3. Close the compressor suction and discharge service valves (isolating the compressor) and bleed all refrigerant from the compressor. Save the remaining refrigerant in the system.
4. Remove the suction and discharge shut-off valve bolts and all other connections to the failed compressor. Remove the damaged compressor and replace it with a new one. For severe burnouts, be sure that the suction and discharge shut-off valves are not contaminated. They must be thoroughly cleaned or replaced before they can be reconnected.
5. Install a new liquid line filter-direr (severe burnouts require installing a suction filter-drier also).
6. Evacuate and dehydrate the new compressor and check the compressor oil level.
7. Start-up the compressor by putting the system in operation. After 2-4 hours check the compressor oil for any sign of discoloration or acidity with a commercial refrigerant acid test kit. If the oil is dirty, discolored, acidic or has a pungent odor, replace the oil and filter-drier(s) and clean the compressor suction strainer.
8. Repeat step 7 as needed.
9. Check the oil daily (for about 2 weeks) for discoloration and acidity. If it stays clean and acid-free, the system is clean. Whenever the oil shows any sign of contamination, repeat step 7 until the system stays clean.

MECHANICAL FAILURE

If it has been determined that a mechanical failure has occurred, other than suction on discharge valve plates, the compressor must be replaced using the following procedure:

1. Disconnect power.
2. Attach suction and discharge gauges to the compressor service ports.
3. Front seat service valves, venting charge from compressor.

Do not loosen any refrigeration or electrical connections before relieving pressure.

4. Remove service valves, pressure switch capillaries and all electrical connections; remove the compressor.
5. Replace compressor and all connections.
6. Crack the suction valve and flow refrigerant through the compressor and out the charging hose.
7. Backseat both service valves and turn the disconnect switch to ON.
8. Close the liquid line hand valve and pump the compressor down.
9. When system is completely pumped down, open the liquid line hand valve and start the unit.
10. Check the refrigerant charge and leak test the system.

COMPRESSOR REPLACEMENT

Replacement compressors are available from the vendor. They will be shipped in a permanent crate to the job site as required by the service contractor.

Upon shipping a replacement compressor, the service contractor will be billed in full for the compressor until the replacement has been returned to the factory.

The compressor should be returned in the same container used for shipping to the job. The possible damage causes or conditions that were found should be recorded by marking the compressor return tag.

The compressor should be returned to the vendor. Contact the vendor regarding replacement parts.

TROUBLESHOOTING – ALL SYSTEMS

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
BLOWER		
Blower will not start	No main power	Check L1, L2 and L3 for rated voltage.
	Blown fuse	Check fuses to main fan. Check control voltage fuses.
	Overloads tripped (if applicable)	Push reset button on main fan overload. Check amp draw.
	No output voltage from T5 transformer	Check for 24 VAC between P4–4 and P6–4. If no voltage, check primary voltage.
	Circuit breaker T5 tripped	Check for 24 VAC between P1–4 and P6–4. If no voltage, check for short and reset breaker T5.
	Start switch S1 not making contact	Jumper P9–1 to P9–2 momentarily. If unit continues to run after jumper is removed, replace S1.
Blower runs but controls will not operate	Relay R1 not making contact	Check for 24 VAC between P4–3 and P6–3. If voltage is not present, R1 may be open.
		Check air switch. Jumper P14–4 to P14–7. If R1 closes, air switch is not closing. (Check blower rotation and for loose wires.)
	Transformer T115 bad	Check for 24 VAC at R1 coil. If the voltage is present and R1 is not pulling, replace R1.
CHILLED WATER		
Chilled water valve not opening	Motor operates but valve won't open	Check linkage for adjustment and be sure that it is tight on the valve. Make sure that the valve stem is still attached to the actuator motor.
	No. 24 VAC power to motor	Check limit switch reset button. Check for 24 VAC between terminals "R" and "W" (open) and "R" and "B" (closed).
	24 VAC to motor is OK, but the shaft is stalled.	Shaft travel is stopped by the limit switches at both ends. Limit switches have been tampered with or damaged. Repetitive stalling results in premature failure. Replace the limit switches. If the valve still doesn't work, replace it.

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
COMPRESSOR		
Compressor contact pulled in but compressor will not operate	Blown fuses (self contained only)	Check for line voltage after fuses and after contactors.
	Low Voltage Interconnect Not Connected (evaporator only)	See schematic and installation instructions for correct connections.
Compressor will not operate, contactor not pulling in	No call for cooling or dehumidification	Check to see if cooling or dehumidification LED is ON (front monitor).
	Solenoid valve not energizing	Hold screwdriver over solenoid and check for magnetic field. This indicates solenoid is energized.
	Low pressure switch not making contact (air cooled self contained only)	Check gas pressure – manually energize low pressure switch.
	High pressure switch open	Reset switch – See **TROUBLESHOOTING – REFRIGERATION.**
	Out on overload or compressor status	Check voltage between P12–1 and P12–3 for compressor No. 1 and check P12–2 to P12–4 for compressor No. 2. If this is 24 VAC, safety is open.
Compressor runs for three minutes then stops; contactor drops out	Low pressure switch not closing (air cooled self contained)	Check for low gas pressure. Compressor is running on winter start kit.
	Solenoid not opening	Check magnetic field to see if energized.
GLYCOL PUMPS		
Suddenly stops pumping	Clogged strainer or impeller	Clean out debris.
Suddenly slows pumping	Clogged impeller, diffuser or line	Clean out debris and use strainer.
Excessive leakage around the pump shaft while operating	Worn seal or packing	Replace seal or packing.

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
GLYCOL PUMPS (Continued)		
Poor performance	Worn impeller or seal	Replace with new impeller or seal.
	Suction lift too high	Relocate pump closer to supply.
	Motor not up to speed; low voltage	Larger lead wires required.
	Worn bearings	Replace.
Noisy operation	Worn motor bearings	Replace.
	Low discharge head	Throttle discharge – improve suction conditions.
	Debris logged in impeller	Remove cover and clean out.
HUMIDIFIER – INFRARED		
No humidification	Humidifier pan not filling	Check water supply. Check for clogged water–line filter. Check the manual reset on the bottom of the pan.
	Control not calling for humidity	Check humidifier LED.
	Humidity contactor not pulling in	Check visually. If contactor is made, check line voltage after contactor and fuses.
	Humidifier bulb burned out	Check the manual reset on the bottom of the pan. Check the amp draw at L1, L2 and L3. All three legs should be fairly even. If they are not the same or close, check the resistance of each lamp. Replace lamps that are technically open.

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
HUMIDIFIER - STEAM GENERATING		
False canister full indication	Foaming	Check drain valve to ensure that it drains freely. Check and replace if defective.
		Check water supply. If commercially softened, reconnect to raw water supply. If connected to hot water, reconnect to cold water.
Main 24 volt circuit breaker trips	Shorts or loose connections	Check the wiring connections on the 24 volt circuit.
	Faulty circuit board	Replace the circuit board.
Main fuses blow approximately 15 seconds after unit is activated	Faulty solenoid	Measure resistance. Replace solenoid if resistance varies greatly from 23.5 Ohms.
	Conductivity too high	Check amp draw of humidifier on start-up. If it exceeds rated amps, increase setting of the % pot on the circuit board.
	DIP switches set incorrectly	Check that dip switches are set in accordance with table under Circuit Board Adjustments in this manual.
Main fuses blow when drain valve is activated	Mineral deposits obstruct drain valve	Check drain valve for obstructions and clean if necessary.
	Improper resistance of drain valve coil	Measure resistance of drain valve coil. Replace if it varies greatly from 8.5 Ohms.
	Faulty circuit board	Replace circuit board.
Unit ON, humidifier will not operate	Humidifier not receiving power	Verify that RUN/DRAIN switch is in the RUN position.
		Check fuses and replace if necessary.
		Make sure molex connector is securely plugged into circuit board and that no wires are loose.

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
	HUMIDIFIER – STEAM GENERATING (Continued)	
Contactor pulled in but no water enters canister	No water available to unit	Check external shut–off valves.
	Clogged fill line strainer	Clean or replace fill line strainer.
	Improper solenoid resistance	Measure resistance of fill solenoid coil. Replace if resistance varies greatly from 23.5 Ohms.
	Wiring breaks or loose connections	Check for faulty wiring and loose connections.
	Faulty circuit board	Replace circuit board.
Water enters canister but canister full circuit activates at a low water level	Foaming	Check drain valve and water supply.
	Canister full interface connections incorrect	Check connection on component plate in humidifier cabinet. Terminal #1 on the square block interface device must be connected to L2 of the power terminal block. L2 must also be connected to the electrode closest to the steam outlet port. Verify that the red wire from terminal #2 on the interface connects to the red top terminal on the canister (the one farthest from the steam outlet port). This is the high water sensor probe.
	Full isolation has broken down	Remove red canister full wire from canister. If normal operation resumes, canister must be replaced. Remove the wire from terminal #3 on the interface. If normal operation resumes, canister full interface must be replaced.
	Drain assembly not operating freely	Check and replace coil or valve if necessary.
	Faulty circuit board	Replace circuit board.
Canister fills but overflows	Canister full circuit does not activate.	Check wiring of canister full interface. Replace circuit board.

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
	HUMIDIFIER – STEAM GENERATING (Continued)	
Excessive arcing in the canister	Drain valve clogged or defective	Verify that drain valve operates freely when activated. Clean valve and replace coil or valve if defective. Flush canister several times and replace if arcing persists.
	Improper water supply	If water is commercially softened, reconnect humidifier to raw water supply, drain canister and restart. If connected to hot supply, reconnect to cold water.
	Insufficient drain rate	Increase drain rate by adjusting % pot on circuit board above the preset 70% to roughly 80%.
	Excessive iron content in water	Analyze iron content of water. If it exceeds 0.1 mg/l, install a filter to remove iron from water supply.
On cold start–up, canister fills, high water alarm activates and humidifier fails to reach full amperage	Conductivity of water too low	Drain the canister. Add one Alka–Seltzer tablet to the canister and refill it. Turn the % pot to roughly 60%. Restart humidifier. If amperage rises rapidly, it may be necessary to dilute the water to prevent blown fuses. If it rises too slowly, add another Alka–Seltzer tablet.
	Fill solenoid not closing tightly	If humidifier returns to canister full condition, verify that the fill solenoid closes tightly.
	REFRIGERATION SYSTEM	
Low Suction Pressure; High Superheat	Moisture, dirt or wax in system	Drier – liquid indicator.
	High superheat adjustment	Reset TEV.
	Dead thermostatic adjustment element in TEV	Replace TEV sensor element.
	Restricted external equalizer	Liquid indicator.
	Low refrigerant charge	Check refrigerant level.
	Clogged drier	Check liquid indicator.

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
	REFRIGERATION SYSTEM (Continued)	
High Suction Pressure; Low Superheat	TEV seat leak	Check valve for leaks.
	Low superheat adjustment	Reset TEV.
	Moisture, dirt or wax in system	Filter Drier – liquid indicator.
	Restricted external equalizer	Liquid indicator.
Low Suction Pressure; Low Superheat	Dirty filters	Check filters
	Poor air distribution	Check air distribution
	Evaporator oil logged	Check oil level
High Discharge Pressure	Dirty condenser or drycooler fins	Clean coil.
	Condenser equipment not operating	Check operation.
	High refrigerant charge	Check refrigerant charge.
	Hot gas bypass valve adjusted improperly	Adjust properly.
	Water regulating valve adjusted improperly	Adjust properly.
	REHEAT	
Reheat will not operate; contactor not pulling in	Control not calling for heat	Check control to see if status LED is lit.
	Reheat safety stat open	Jumper between terminals P11-6 and P11-11. If reheat operates, safety is open.
Reheat not operating; contactor pulling in	Heater burned out	Turn off power and check heater continuity with Ohm meter.

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Computer Support Systems

MONTHLY MAINTENANCE INSPECTION CHECKLIST

DATE: _____ PREPARED BY: _____

MODEL #: _____ SERIAL #: _____

Filters

- ☐ Restricted air flow
- ☐ Check filter switch
- ☐ Wipe section clean

Blower Section

- ☐ Impellers free of debris and move freely
- ☐ Check belt tension and condition
- ☐ Bearings in good condition
- ☐ Check fan safety switch operation
- ☐ Check pulleys and motor mounts

Compressor

- ☐ Check for leaks

Air Cooled Condenser (if applicable)

- ☐ Condenser coil clean
- ☐ Motor mounts tight
- ☐ Bearings in good condition
- ☐ Refrigerant lines properly supported

Steam Generating Humidifier

- ☐ Check canister for deposits
- ☐ Check condition of steam hoses
- ☐ Check water make–up valve for leaks

Infrared Humidifier

- ☐ Check pan drain for clogs
- ☐ Check humidifier lamps
- ☐ Check pan for mineral deposits

Refrigeration Cycle/Section

- ☐ Check refrigerant lines
- ☐ Check for moisture (sight glass)
- ☐ Check suction pressure
- ☐ Check head pressure
- ☐ Check discharge pressure
- ☐ Check hot gas bypass valve
- ☐ Check thermostatic exp valve

Air Distribution Section

- ☐ Restriction in grille free area

Refrigerant Charge

- ☐ Check refrigerant level

NOTES: _____

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Computer Support Systems

SEMI-ANNUAL MAINTENANCE INSPECTION CHECKLIST

DATE: _____ PREPARED BY: _____

MODEL #: _____ SERIAL #: _____

Filters

- ☐ Restricted air flow
- ☐ Check filter switch
- ☐ Wipe section clean

Blower Section

- ☐ Impellers free of debris and move freely
- ☐ Check belt tension and condition
- ☐ Bearings in good condition
- ☐ Check fan safety switch operation
- ☐ Check pulleys and motor mounts

Compressor

- ☐ Check for leaks

Air Cooled Condenser (if applicable)

- ☐ Condenser coil clean
- ☐ Motor mounts tight
- ☐ Bearings in good condition
- ☐ Refrigerant lines properly supported

Water/Glycol Condenser (if applicable)

- ☐ Copper tube clean
- ☐ Water regulating valves function
- ☐ Glycol solution
- ☐ Check for water/glycol leaks

Glycol Pump

- ☐ Glycol leaks
- ☐ Pump operation

Steam Generating Humidifier

- ☐ Check canister for deposits
- ☐ Check condition of steam hoses
- ☐ Check water make-up valve for leaks

Infrared Humidifier

- ☐ Check pan drain for clogs
- ☐ Check humidifier lamps
- ☐ Check pan for mineral deposits

Refrigeration Cycle/Section

- ☐ Check refrigerant lines
- ☐ Check for moisture (sight glass)
- ☐ Check suction pressure
- ☐ Check head pressure
- ☐ Check discharge pressure
- ☐ Check hot gas bypass valve
- ☐ Check thermostatic exp valve
- ☐ Check superheat

Air Distribution Section

- ☐ Restriction in grille free area

Refrigerant Charge

- ☐ Check refrigerant level

Electrical Panel

- ☐ Check fuses
- ☐ Check electrical connections
- ☐ Check operation sequence

NOTES: _____

_____

_____

SIGNATURE _____

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A World Leader in Computer Support Systems

Environmental Control
Power Protection
Site Monitoring
Control

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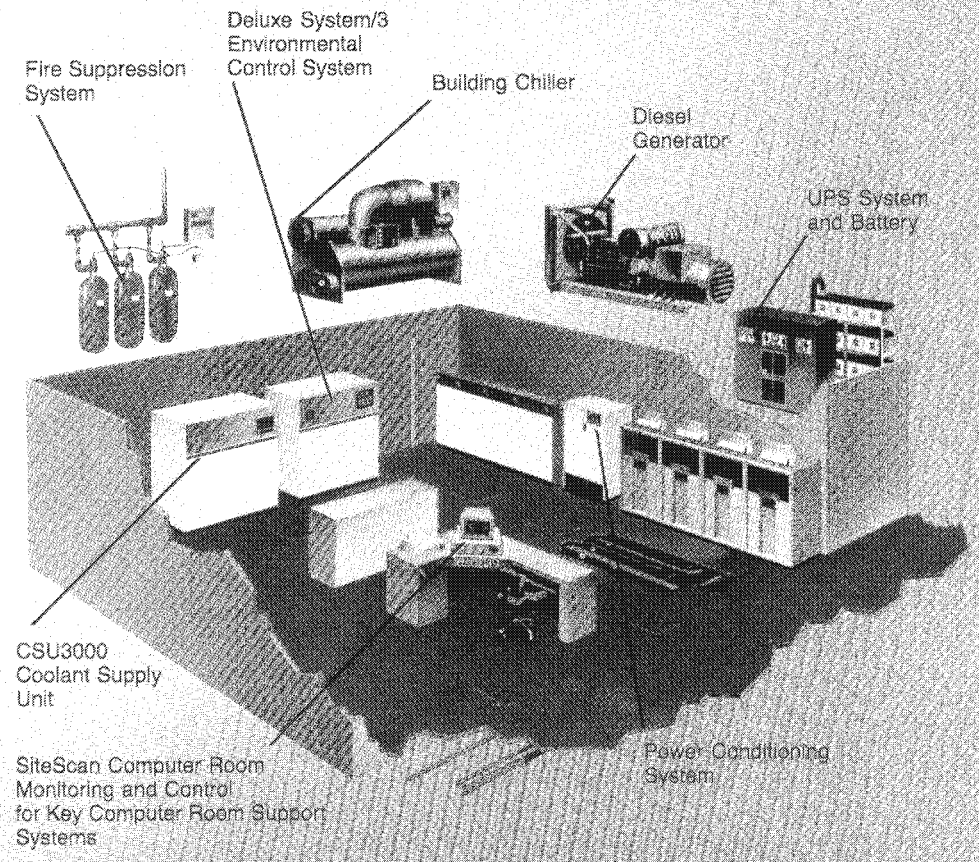

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