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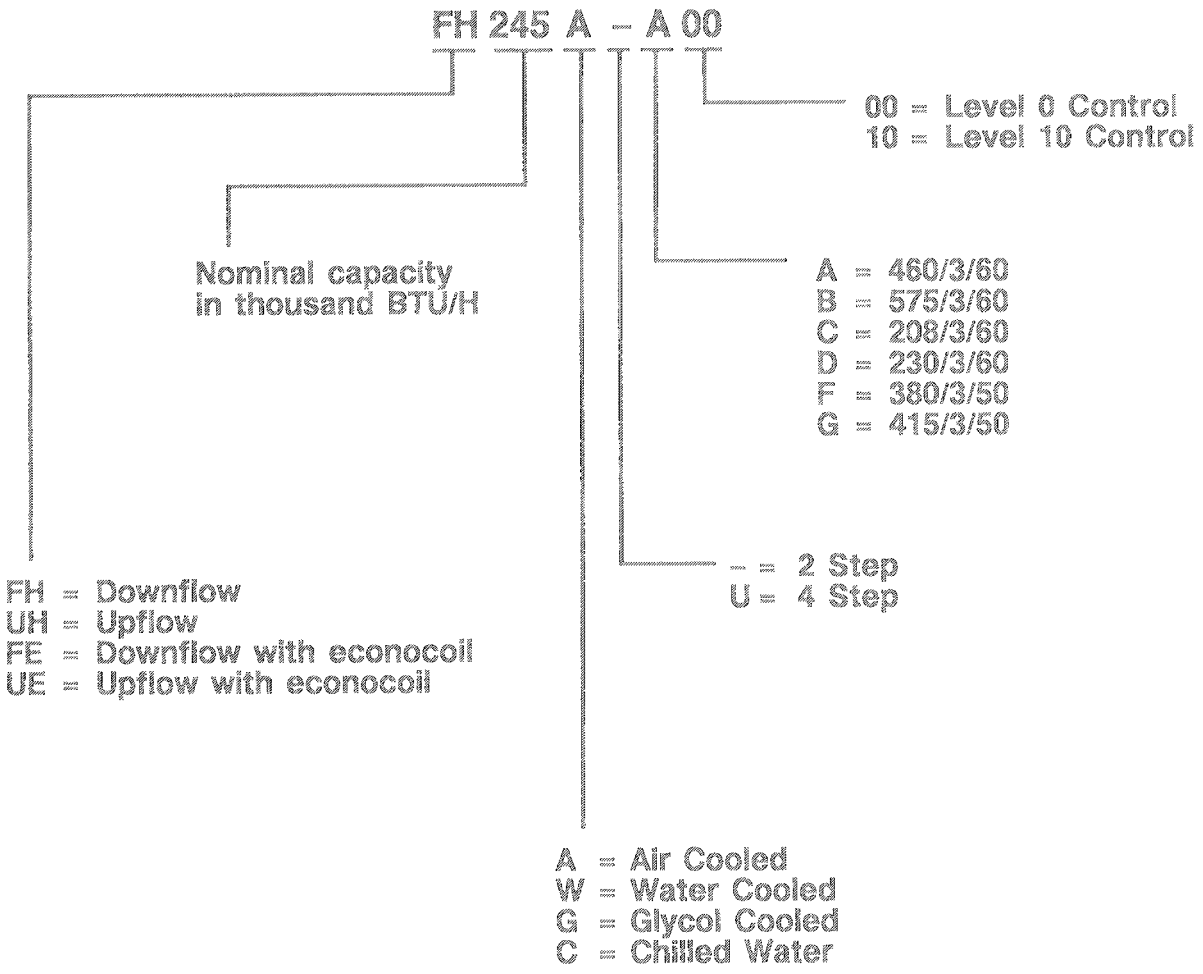
Deluxe System 3 Level 0-10 Controls

MODEL NUMBER DESIGNATIONS



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SYSTEM DESCRIPTIONS

There are five configurations of environmental control systems. Each configuration can operate on either level 00 or level 10 of the control processors. A brief overview of each, which describes the operational differences, is listed below.

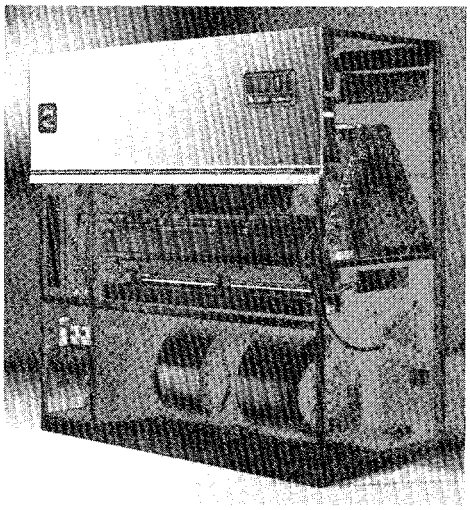


Figure 1. Compressorized/Multiple Stage System

1. Compressorized Systems

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

Cooling – Two stages of mechanical refrigeration
Heating – Three stages of electric reheat standard; steam/hot water, hot gas on water and glycol cooled systems optional
Humidification – Infrared standard; steam generating optional
Dehumidification – Utilizes the lag compressor

2. Four–Step Systems

The multiple stage systems have all the features of a compressorized system plus cylinder unloaders on one head of each compressor. This permits the compressors to operate at a reduced level and increases energy efficiency during low–load conditions. The system responds to an increasing room load with either a two step or a four step process of increasing the unit's cooling.

Cooling – proportional to room load.
4 step
(Step 1) Lead compressor at reduced capacity.
(Step 2) Lead and lag compressors at reduced capacity.
(Step 3) Lead compressor at full capacity; lag compressor at reduced capacity.
(Step 4) Lead and lag compressors at full capacity.
Heating – Three stages of electric reheat standard; hot water/steam optional
Humidification – Infrared standard; steam generating optional
Dehumidification – Utilizes the lag compressor

Multiple stage systems operate with the standard control processor only.

3. 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 – Three stages of electric reheat standard; steam/hot water optional
Humidification – Infrared standard; steam generating optional
Dehumidification – Chilled water valve opens proportionally in response to room needs

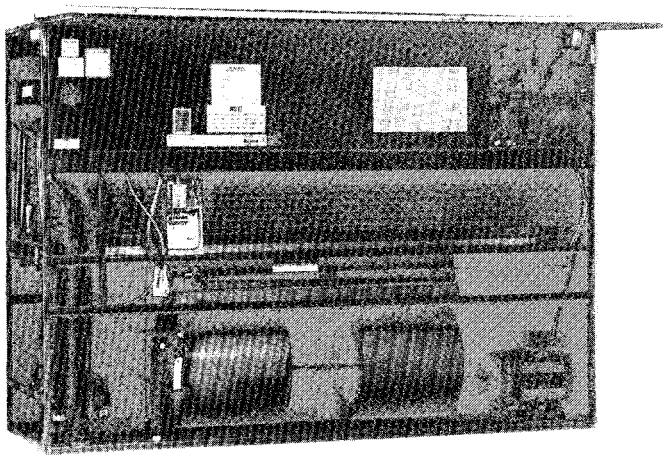


Figure 2. Chilled Water System

4. GLYCOOL (chilled glycol cooling) Systems

GLYCOOL systems have all of the features of a compressorized water or glycol system, plus a second cooling coil that is connected into the water circuit. When fluid temperature is sufficiently low (below room temperature), cooling is provided by circulating the fluid through the second cooling coil. (Flow is controlled by a motorized valve.) This is then the primary cooling source and it greatly reduces the compressor operation.

Cooling – Modulated cooling valve opens proportionally to match room needs (primary), two or four stages of mechanical refrigeration (secondary)
Heating – Three stages of electric reheat standard
Humidification – Infrared standard; steam generating optional
Dehumidification – Utilizes the lag compressor

5. Dual Source Cooling Systems

This system has all the features of a compressorized system but adds a second cooling coil that is connected to a source of chilled water. This second coil is controlled by a modulating control valve. It is the primary source of cooling and dehumidification so compressor operation is reduced.

Cooling – Second coil opens proportionally in response the room needs (primary), two or four stages of mechanical refrigeration (secondary)
Heating – Three stages of electric reheat standard
Humidification – Infrared standard; steam generating optional
Dehumidification – (Level 00) Utilizes the lag compressor (Level 10) FE coil opens proportionally to match the room needs.

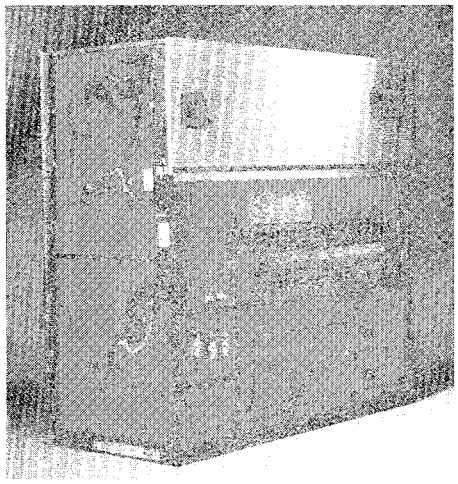


Figure 3. Glycool/Dual Source System

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 two front panels 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 at the far right of the electric panel and the Control Voltage fuses at the far left of the electric panel.
4. Install temperature and humidity sensors in mating sockets on top of the electric panel compartment (humidity sensor toward front) (GLYCOOL model only).
5. Turn on main breaker and check line voltage on main unit disconnect switch. Line voltage must be within 10% of nameplate voltage.
6. Turn ON main unit disconnect switch and check secondary voltage at transformers T5 and T115. Voltage at T5 must be 24v ±2.5v; T115 must be 115v ±12v.
7. Push ON button. Blower will start and ON lamp will light.
8. Air movement will cause the fan safety switch, (Level 00 only), to energize relay R1 and power transformers T2, T3 & T4. Check secondary voltage at each transformer. Voltage should be 24v ±2.5v.
9. Set temperature and humidity setpoints and sensitivity, alarm parameters and other control functions.
10. Turn OFF main unit disconnect and main breaker. Unit ON button should be OFF.
11. Replace all fuses (which you removed above).
12. Restore power to unit; turn ON the main unit disconnect switch.
13. Check the current draw on all high voltage components and match with serial tag.
14. Push ON button – putting the unit into operation.

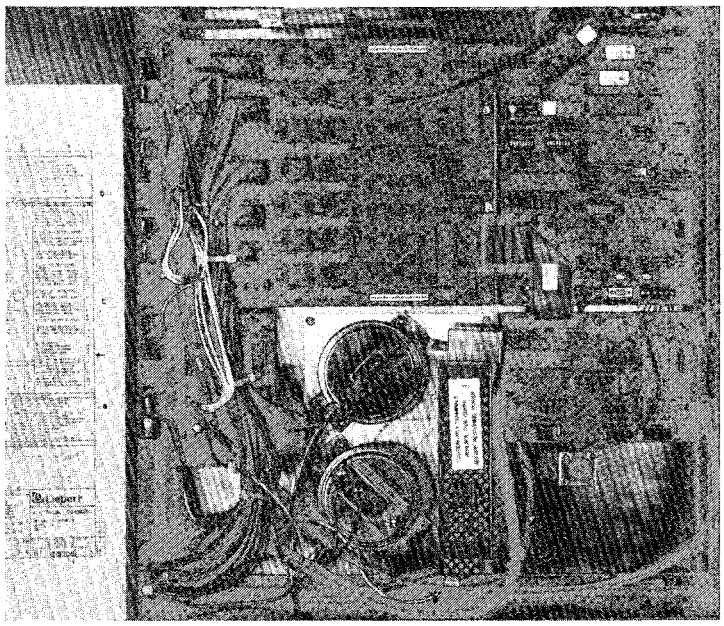


Figure 4. Electric Panel.

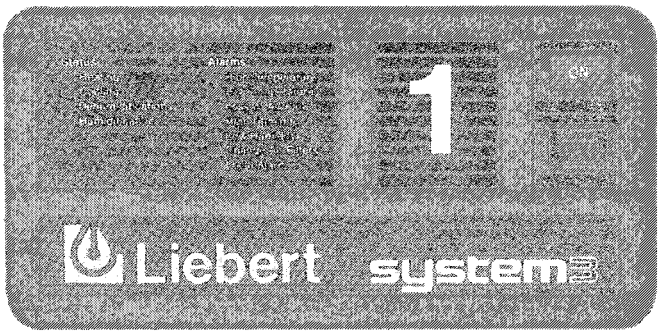


Figure 5. Level 00 Front Monitor Panel.

Standard Control Processor (Level 00)

- Monitoring, Alarms at Front Panel
- Control on Circuit Board
- Communication with Sitemaster Monitor

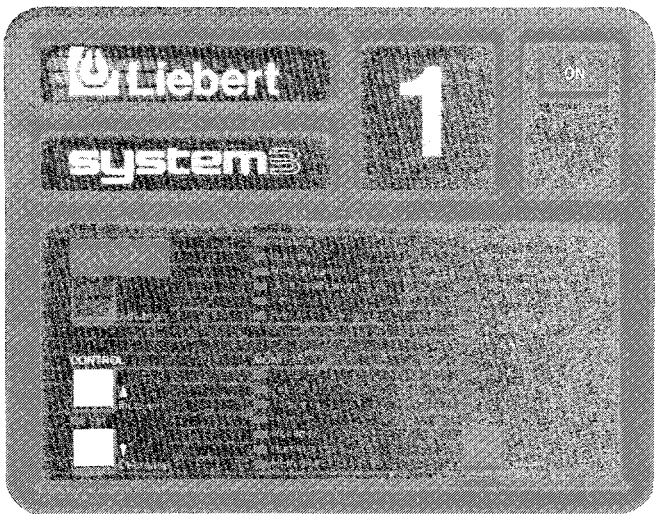


Figure 6. Level 10 Front Monitor Panel.

Optional Control Processor (Level 10)

- Monitoring, Control and Alarms at Front Panel
- Communication with Sitemaster Monitor

CONTROLS OPERATION – STANDARD CONTROL PROCESSOR (LEVEL 00)

FRONT MONITOR PANEL

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

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.

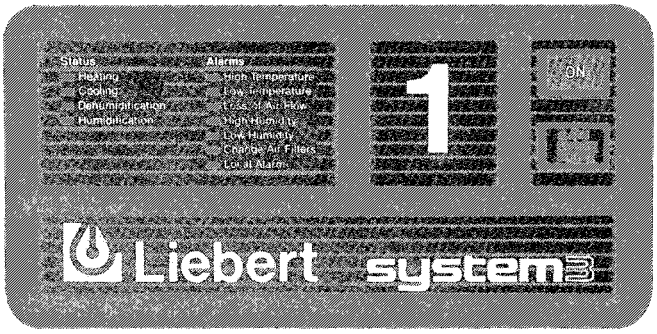


Figure 7. Front Monitor Panel.

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.

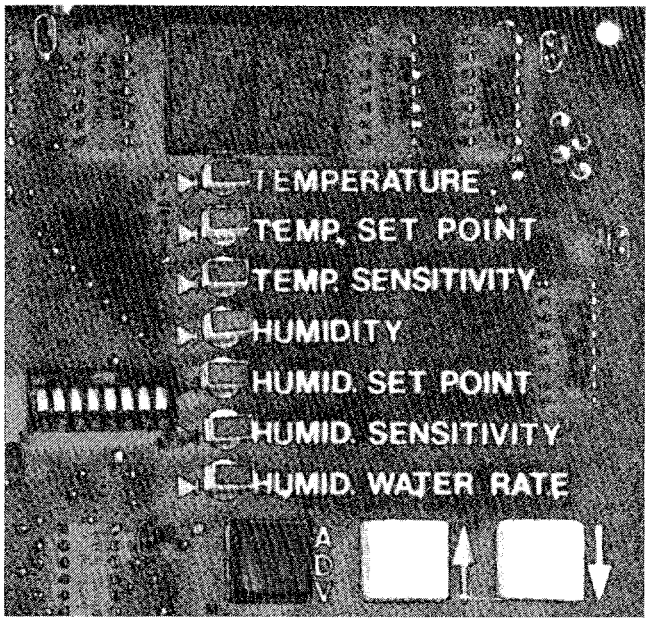


Figure 8. Numeric Display, LEDs and Buttons.

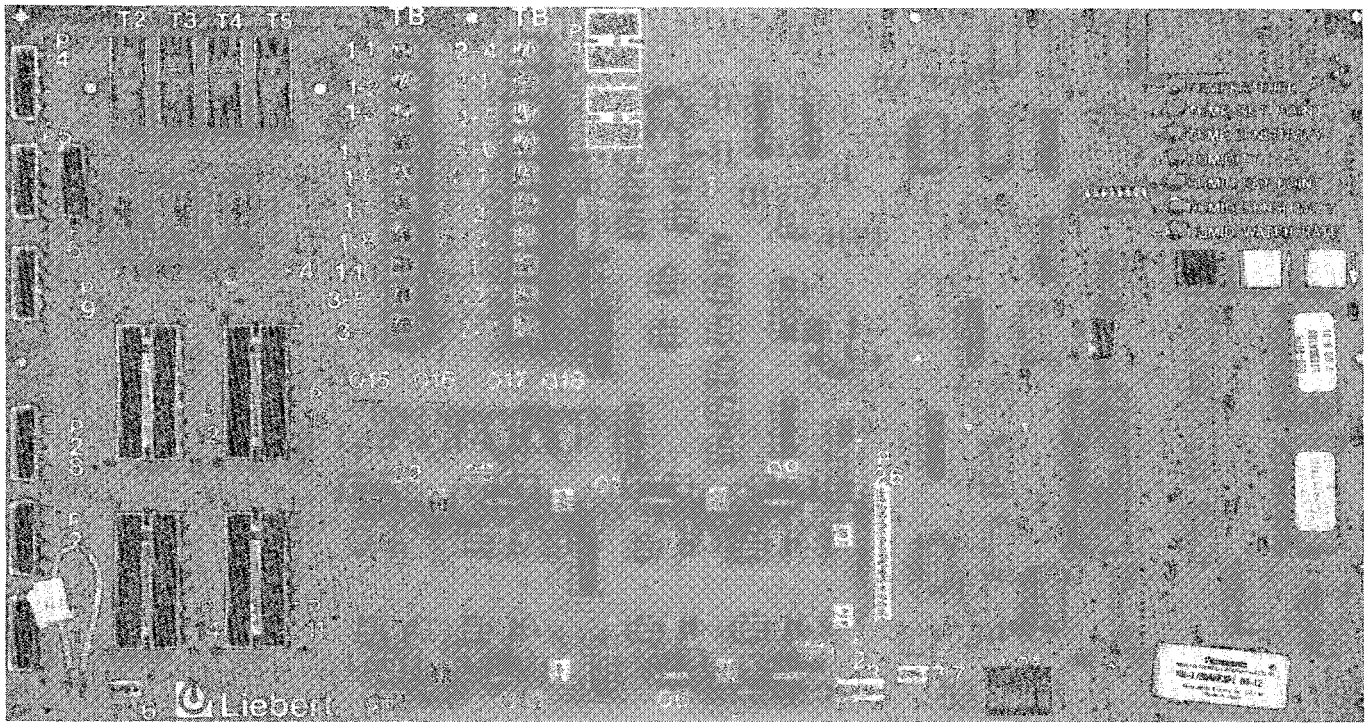


Figure 8. Level 00 Microprocessor Board.

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.

FOUR STAGE/MULTIPLE STAGE COOLING SYSTEM

On units equipped with the multiple stage cooling system, the unit will respond to changing load conditions in the computer room by energizing the two compressors in 4 steps. This is accomplished by cylinder unloaders on one head of each compressor that reduces its cooling capacity. These four steps are (in order):

1) Compressor #1 unloaded,

2) Compressor #1 and #2 both unloaded,

3) Compressor #1 fully loaded and Compressor #2 unloaded,

4) Compressor #1 and #2 fully loaded.

Drycooler and Pump operate when either compressor is energized.

If a GLYCOOLing Coil is provided, it is activated prior to any compressor steps. Dehumidification is accomplished by energizing the lag compressor, fully loaded. Drycooler and Glycol Pump operate continuously.

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	COMPRESSOR SEQUENCE SELECTION
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 last activity.

SYSTEM ALARMS

Change Filters

The filter change switch senses a pressure drop across the air filters and activates the Change Filter 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 and audible alarm.

High Head Pressure – Compressor 1 (& 2)

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 switches.

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 get hot and 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 air cooled models 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 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 1 & 2, reheat 1, 2 & 3, 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
Q1	Reheat 3
Q2	Reheat 2
Q3	Reheat 1
Q6	Liquid Line Solenoid Valve 1 (DX Only)
Q11	Humidification
Q12	Humidification Water Valve
Q13	Common Alarm Relay

COMPRESSOR SEQUENCE

The lead/lag sequence of the compressors may be changed to equalize the run time of each. This is accomplished using the NUMERIC DISPLAY located on the printed circuit board behind the main unit accent panel.

Use the ADV button to step the display to TEMPERATURE LED. Press the ▲ and ▼ buttons simultaneously. 1 on the display readout indicates that compressor no. 1 is the lead compressor; 2 indicates that no. 2 is the lead compressor. Use the ▲ or the ▼ to select either compressor no. 1 or no. 2 as the lead compressor.

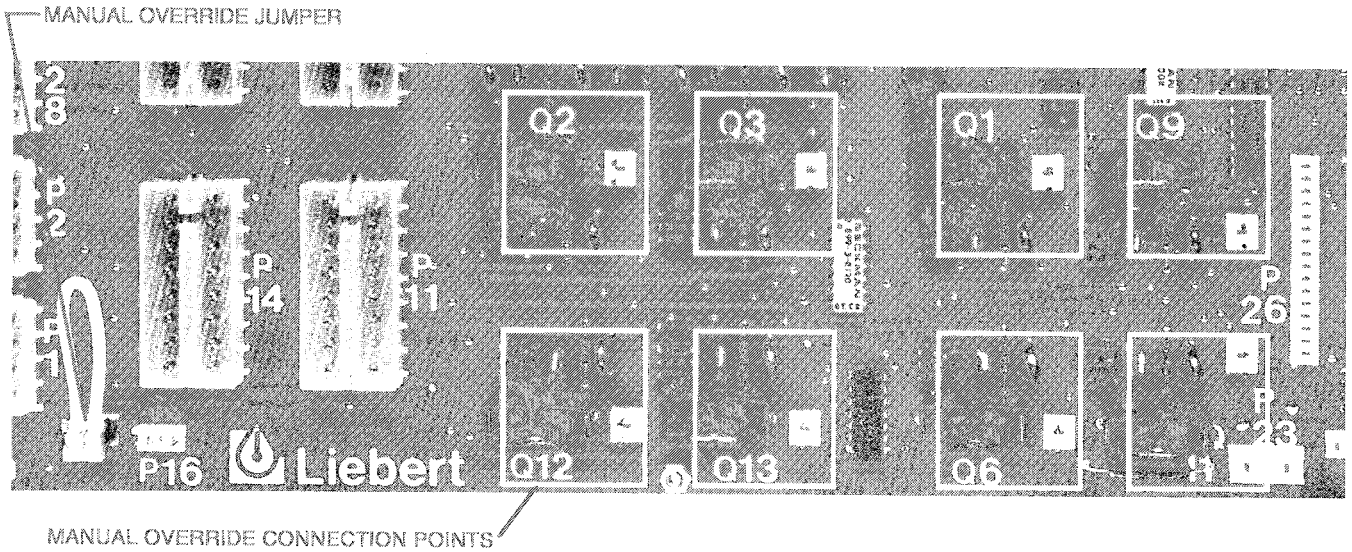


Figure 10. Manual Override Jumper and Connection Points.

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.

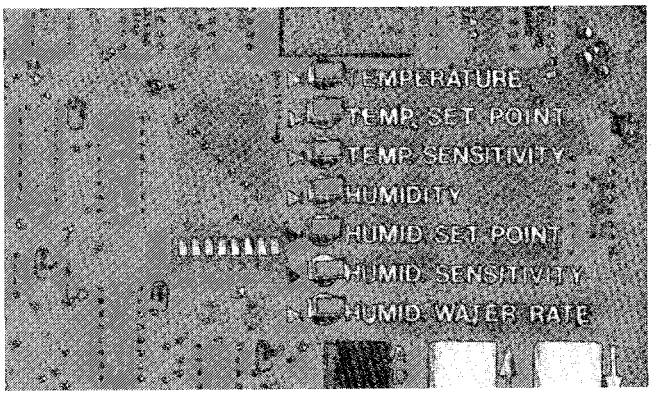


Figure 11. Level 00 Control Switches.

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. After compressor shuts off, turn off power at disconnect switch. Restore power after setting switches.

Switch Position	ON Position	OFF Position
1	Staged Reheat	Proportional Reheat
2	Reheat Available	No Reheat
3*	2-Step Cooling	4-Step Cooling
4	Humidification Available	No Humidification[1] Available
5	Low & High Humidity Alarm Available	No Low & High Humidity Alarm
6	Dehumidification Available	No Dehumidification[2] Available
7	Sitemaster 100	SiteScan or Sitemaster 200
8	Fahrenheit Readout	Celsius Readout

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

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

* Not used on Chilled Water Models.

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)
Humidifier Pan Size	Large (2)*

*(For infrared humidifiers), if a unit is a chilled water model UH/FH 147C, 200C, or 248C or if the unit is a 50 Hz model UH/FH 75A, 86W or 72G, the microprocessor will have to be reprogrammed for the small humidifier pan. This is done by using the numeric display and the control buttons on the microprocessor board behind the unit accent panel.

1. Use the ADV button to select "Humidity".
2. Simultaneously depress the ▲ and ▼ buttons and hold for 5 seconds.
3. The numeric display will show "2" (large pan).
4. Use the ▼ to decrease from 2 to 1.
5. After 15 seconds, the control will revert to the normal operating mode.

SEQUENTIAL AUTO RESTART RELAY

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 12. Sequential Auto Restart Relay.

CONTROLS OPERATION – OPTIONAL CONTROL PROCESSOR (LEVEL 10)

FRONT MONITOR PANEL

The front monitor panel is used to monitor room conditions, operational status, and alarm conditions.

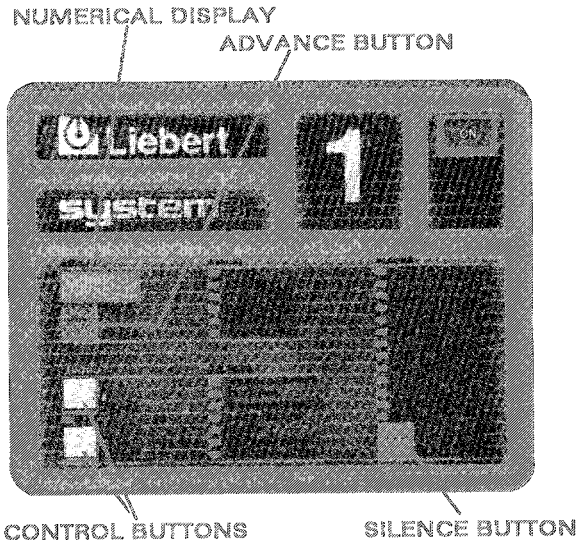


Figure 13. Front Monitor Panel.

NUMERIC DISPLAY

A 3 digit numeric display indicates the following: room temperature, room humidity, temperature setpoint, temperature sensitivity, humidity setpoint, humidity sensitivity, humidifier flush rate, and percent of capacity. The value being displayed is indicated by one of the seven LEDs located in the monitor section.

ADVANCE BUTTON

Pressing the advance button will step the numeric display through the seven monitoring parameters and the percent capacity sequence (in the status section).

CONTROL BUTTONS

The two control buttons are used to change programmable settings while in one of two set modes. The increase button will raise the value selected in the display, the decrease button will lower the value. These control buttons are not functional until one of the set modes is activated.

SILENCE BUTTON

The silence button is used to silence the audible alarm and acknowledge an alarm condition. The alarm status LED will stop flashing, but remain lit until the problem is corrected. Once the alarm is acknowledged, the alarm will clear when the condition no longer exists.

NOTE

Alarms can also be silenced and acknowledged from the service terminal (Sitemaster/Local Monitor).

ON BUTTON

Depressing the ON button places the environmental unit into the operational mode and lights the indicator lamp. The electronics remain powered when the unit is off and all monitor and programming functions can still be used, however the unit is non–operational.

STATUS SECTION

The current operating mode of the unit is indicated by LEDs in the status section: heating, cooling, humidification, dehumidification and GLYCOOLing Cycle (GLYCOOLing/Dual Cooling source).

Percent Capacity

While the percent capacity indicator is on, each status function can be sequenced using the ADVANCE BUTTON. The value shown on the display will represent the percent of total capacity of that selected function.

ALARM SECTION

The following alarms are displayed at the front monitor panel:

Humidifier Problem;

High Head Pressure 1, High Compressor head pressure, Compressor 1;

High Head Pressure 2, High Compressor head pressure, Compressor 2;

Change Air Filters, Restricted air flow through air filters;

Loss of Air Flow, No air flow; heating, cooling and humidification will not be operational;

Local Alarm 1–4, Customer alarms – Water Detected, High Temperature, Low Temperature, High Humidity, Low Humidity.

Control and Alarm Programming

The level 10 control has two set modes for programming temperature, humidity and alarm setpoints. All setpoints are maintained in memory by a battery back–up for protection during power outages.

SET MODE 1

Temperature setpoint
Temperature sensitivity
Humidity setpoint
Humidity sensitivity
Humidifier flush rate
High temperature alarm trippoint
Low temperature alarm trippoint
High humidity alarm trippoint
Low humidity alarm trippoint

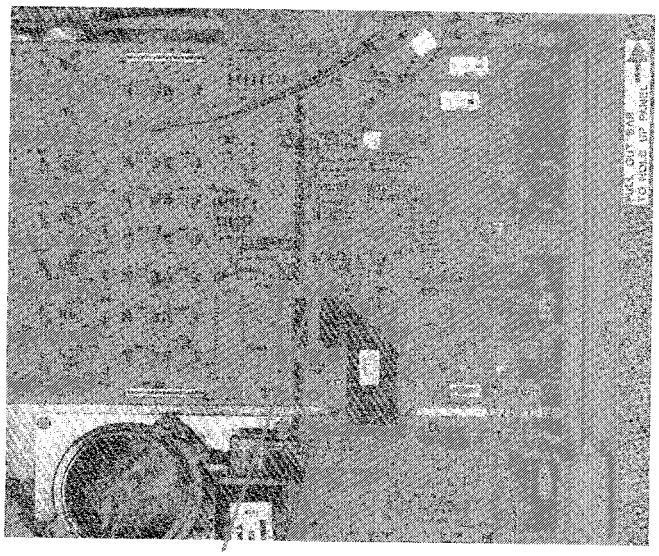


Figure 14. Set Button.

To enter set mode 1, press the set button located on the microprocessor board behind the front panel once. The set indicator on the front monitor panel lights indicating that set mode 1 is activated and that setpoints can be changed.

TEMPERATURE SETPOINT

Use the advance button on the monitor panel to select temperature setpoint. The numeric display will show the current setting. Use the increase or decrease buttons to select the desired setpoint (40–85°F/18–30°C in 1° increments).

TEMPERATURE SENSITIVITY

Use the advance button on the monitor panel to select temperature sensitivity. The numeric display will show the current setting. Use the increase or decrease buttons to select the desired sensitivity (1–5°F/1–3°C in 0.1°F increments).

HUMIDITY SETPOINT

Use the advance button on the monitor panel to select humidity setpoint. The numeric display will show the current setting. Use the increase or decrease buttons to select the desired setpoint (40–60% RH in 1% increments).

HUMIDITY SENSITIVITY

Use the advance button on the monitor panel to select humidity sensitivity. The numeric display will show the current setting. Use the increase or decrease buttons to select the desired sensitivity (1–10% RH in 0.1% increments).

ALARM SETPOINTS

Alarm setpoints, once programmed, will automatically adjust as temperature and humidity setpoints are adjusted.

HIGH TEMPERATURE

Use the advance button on the monitor panel to select High Temperature in the alarm section. The numeric display will show the current setting. Use the increase or decrease buttons to select desired trippoint (from 1° above the setpoint to maximum of 90°F/32°C).

LOW TEMPERATURE

Use the advance button on the monitor panel to select Low Temperature in the alarm section. The numeric display will show the current setting. Use the increase or decrease buttons to select desired trippoint (from 1° below the setpoint to a minimum of 35°F/2°C).

HIGH HUMIDITY

Use the advance button on the monitor panel to select High Humidity in the alarm section. The numeric display will show the current setting. Use the increase or decrease buttons to select desired trippoint (from 1% above the setpoint to a maximum of 65%).

LOW HUMIDITY

Use the advance button on the monitor panel to select Low Humidity in the alarm section. The numeric display will show the current setting. Use the increase or decrease button to select desired trippoint (from 1% below the setpoint to minimum of 35%).

The set mode will automatically deactivate 1 minute after the last control action.

SET MODE 2

Temperature/Humidity calibration (Steps 1 & 2)
Front monitor LED test
Audible alarm tone adjustment
Common alarm on/off
Alarm enable/disable
Local–Alarm time delays

To enter set mode 2 press the set button twice. The set indicator at the front monitor panel will flash to indicate that set mode 2 has been activated. The set mode will automatically deactivate 1 minute after the last control action.

TEMPERATURE CALIBRATION

Use the advance button on the monitor panel to select Temperature. The numeric display will show the current return air temperature. Use the increase or decrease buttons to select desired return air temperature (±5.0° in tenth of degree increments).

HUMIDITY CALIBRATION

Use the advance button on the monitor panel to select Humidity. The numeric display will show the current relative humidity. Use the increase or decrease buttons to select desired humidity reading (±5.0%RH in tenth of percent increments).

The factory setting will be calibrated to our sensor manufacturer ±1°F/1%RH. Calibration is not necessary unless other measurement devices are being used as reference. Pressing the increase and decrease buttons at the same time will reset the control to factory settings.

AUDIBLE ALARM VOLUME CONTROL

Use the advance button on the monitor panel to select VOL on the numeric display. This indicates volume control. Using the increase or decrease, select the desired volume for the audible alarm signal.

The factory setting is maximum volume.

LED TEST

Use the advance button on the monitor panel to activate all LED indicators including the seven segment display. This allows a visual inspection of all LEDs. Pressing the advance button again will turn all indicators off.

COMMON ALARM PROGRAMMING

All alarms on the front monitor panel have two programming options: ON/OFF which programs the common alarm to be activated upon occurrence of the selected alarm and ENABLE/DISABLE which programs whether that selected alarm will be activated in the system.

In addition, the four local alarms can be programmed for a time delay before alarm activation.

NOTE

All internal alarms (such as low suction pressure) cannot be programmed for time delays.

These alarm programs are selected on two separate sequences through the ALARM section LEDs.

COMMON ALARM ON/OFF

Using the advance button on the monitor panel, sequence the LED indicators to the ALARM section. The numeric display will read ON or OFF. Use the silence button to change the current setting. All alarms in the ALARM section can be turned ON or OFF as desired. Use the ADVANCE button to sequence through all the alarm indicators.

ALARM ENABLE/DISABLE

Using the advance button on the monitor panel, sequence the LED indicators to the ALARM section. The numeric display will read EN or DIS. Use the silence button to change the current setting. All alarms in the ALARM section can be ENABLED or DISABLED as desired. Use the ADVANCE button to sequence through all the alarm indicators.

LOCAL ALARM TIME DELAYS

Use the advance button to select any local alarm. The numeric display will read (0–900). By using the increase and decrease buttons, a time delay can be entered for each local alarm in seconds from 0 to 900 in 2 second increments. This allows customer programming for each local alarm to avoid nuisance alarm activation.

CONTROL SWITCHES

Two sets of control switches are used to select the control features of the microprocessor. Both are dip switch types and are located on the microprocessor board. Their functions are listed below.

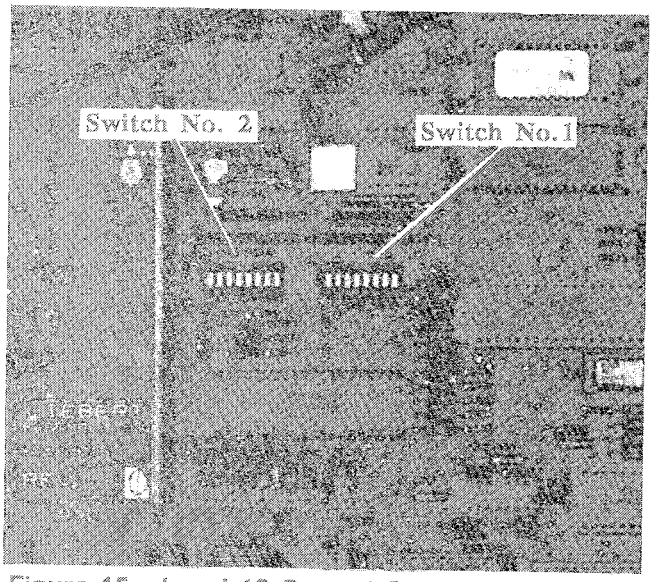


Figure 15. Level 10 Control Switches.

Switch No. 1

	ON Position	OFF Position
1.1	Enable Beeper	Disable Beeper
1.2	Disable Pos. Start Kit	Enable PSK (air only)
1.3	Not Used	Site Monitor
1.4	Fahrenheit	Centigrade
1.5	Four Step	Two Step
1.6	Valve Actuator	Modulating Motor
1.7	GLYCOOL ON	GLYCOOL OFF
1.8	Small Humidifier Pan	Large Humidifier Pan

Switch No. 2

	ON Position	OFF Position
2.1	Disable Setmode	Enable Setmode
2.2 [1]	Disable Reheats	Enable Reheats
2.3	Disable Humidifier	Enable Humidifier
2.4	Disable Dehumidifier	Enable Dehumidifer
2.5 *	2 Compressor Dehumidification with Normal Reheats	2 Compressor Dehumidification with Controlled Cycling of Reheats
2.6	Dual Cooling Source	Disable Dual Cooling Source
2.7 [1]	Hot Water Reheat	Electric Reheat
2.8	Chilled Water	Compressor System

* Unit wire size must be increased if 2.5 is ON. Contact Liebert Applications Engineering for revised unit amperage requirement.

[1] For hot gas reheat option, place switches 2.2 and 2.7 in the ON position.

NOTE

Switch 1.1 and Switch Position 2.1 can be changed during normal operation. All other switches are read by the microprocessor only on main power reset (from the disconnect switch).

SYSTEM ALARMS

Humidifier Problem

This alarm is activated by the high water sensor switch in the humidifier canister. This condition must be present for 1 second before the alarm sounds.

Loss of Air Flow

To indicate loss of airflow in the unit, a differential air pressure switch is used. This single pull–double throw switch (SPDT) is connected to the 24 VAC control circuitry and to the Level 10 control. Airflow must stop for 1 second to activate the alarm.

Change Air Filters

Periodically, the air filters in the environmental units must be changed. To notify the user that maintenance is necessary, a "Change Filters" alarm is provided. A differential air pressure switch closes when the pressure drop across the filters becomes excessive. The switch is connected to the 24 VAC control circuitry and to the Level 10 control. The condition must be present for 4 seconds before the alarm sounds.

High Head Pressure

Compressor head pressure is monitored with a pressure sensing switch to protect the compressor against excess head pressure and to provide an indication of this condition to the user. One SPDT pressure switch is used for each compressor in the unit. This switch is connected to the 24 VAC control circuitry and to the Level 10 control. If head pressure exceeds 360 PSIG (2480 kPa), the switch turns off the compressor contactor and provides an input signal to the control. When a high head pressure condition arises, a one second time delay lapses before the alarm sounds. No delay occurs when the condition is corrected within one second. However, the pressure switch must be manually reset.

Manual Override

This alarm indicates that the manual override mode has been activated. Manual override switches (located on the interface board) allow the user to override the control by turning on compressors 1 and/or 2. In a chilled water system a switch is provided on the valve interface board, allowing the user to fully open the valve. The manual override alarm is indicated as follows:

1. The audible alarm is activated (if enabled).
2. The message BYP (Bypass Mode) will be displayed on the 3 digit numeric display until the alarm is acknowledged. The message "MANUAL OVERRIDE" will also be displayed at the service terminal (SiteScan/Local Monitor).

Main Fan Overload (Optional)

The tri–block overload, which may be in addition to the internal motor overload, is located next to the main fan contactor in the high voltage section. The alarm sounds when the overload is tripped. The main fan overload alarm is indicated as follows:

1. The audible alarm is activated (if enabled).
2. The message FAN–OL (Main fan overload) will be displayed on the 3 digit display until alarm is acknowledged. The message main fan overload will also be displayed at the service terminal (SiteScan/Local Monitor).

Compressor Overload (Optional)

The compressor safety stats will trip if an overload condition exists. The compressor overload alarm is indicated as follows:

1. The audible alarm is activated if enabled.
2. The message C1–OL or C2–OL (Compressor 1 or 2 overload) will be displayed on the 3 digit numeric display until alarm is acknowledged. The message compressor number 1 overload or compressor number 2 overload will be displayed at the service terminal (SiteScan/Local Monitor).

TEMPERATURE AND HUMIDITY ALARMS

Temperature and humidity sensors, located in the return air section of the system, constantly monitor room conditions. Should room conditions exceed the selected parameters, a visual and audible alarm will activate. The audible alarm may be silenced by pressing the SILENCE button, but the visual indicator remains lit and the common alarm relay remains closed until correction of the problem is complete.

Temperature Sensing Alarm

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: The control system will activate 100% cooling.

Humidity Sensing Alarm

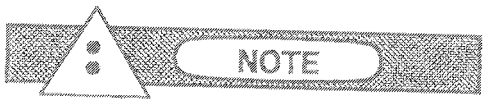
Humidity sensing alarms indicate failure of humidity sensing function (loss of signal). Alarms will also be displayed at service terminal (Sitemaster/Local Monitor).

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

System Response: The control system will deactivate humidification and dehumidification.

OPTIONAL ALARMS

These alarms are displayed at the front monitor panel using local alarms 1–4. The alarms are customer specified at the time of order. Labels are provided with unit for customer to identify alarms selected. Alarm messages will be displayed at the service terminal (SiteScan/Local Monitor) when activated.



Consult factory for additional hardware that may be required for these alarms.

Stand–By GLYCOOL Pump ON

Indicates that the primary glycol pump has failed and the stand–by pump has been activated (GLYCOOL cooled units only).

Water Under Floor

Water has been detected by the optional Liqui–tect/ Water Detection Sensor.

Smoke Detected

The presence of smoke has been detected by an optional Smoke Detector.

Loss of Water Flow

No water flow is detected in the Chilled Water supply line. Chilled water units only.

Stand–By Unit ON

Indicates that the primary environmental control system has failed and the stand–by system has been activated.

Low Suction Pressure

A pressure switch monitors the suction pressure at the compressor inlet and will indicate when pressure drops below a factory pre–set point for at least 30 seconds past the Positive Start Kit time delay (three minutes – on air cooled systems only).

Short Cycle

This alarm indicates that the compressor has run through a cycle of on/off/on in a six minute period.

Loss of Power

The service terminal (SiteScan/Local Monitor) will indicate Loss of Power if a unit was operating at the time of the power loss.

COMPRESSOR POSITIVE START FEATURE

All air cooled models are factory pre–set 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 controlled by the low pressure switch.

The three minute time delay is factory set and is not adjustable. The Positive Start Kit is enabled by control switch 1.2 and should be enabled for all air cooled systems. This feature should be disabled for all other systems.

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, heating 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.

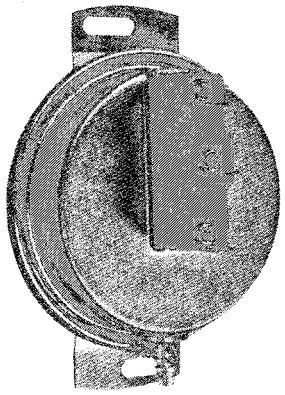


Figure 16. Fan Safety Switch.

FIRESTAT

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.

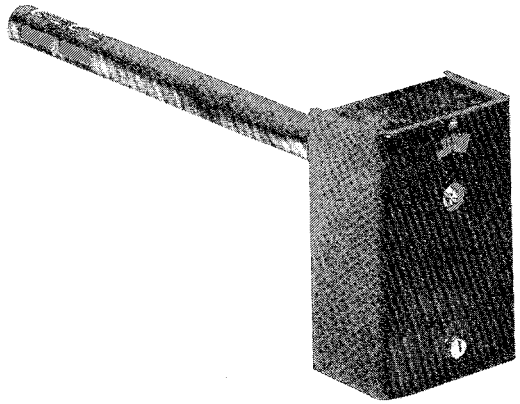


Figure 17. Firestat.

LIQUI–TECT/WATER DETECTION SENSOR

CAUTION

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.

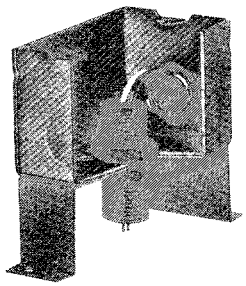


Figure 18. Liqui–Tect/Water Detection Sensor.

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 50–56.

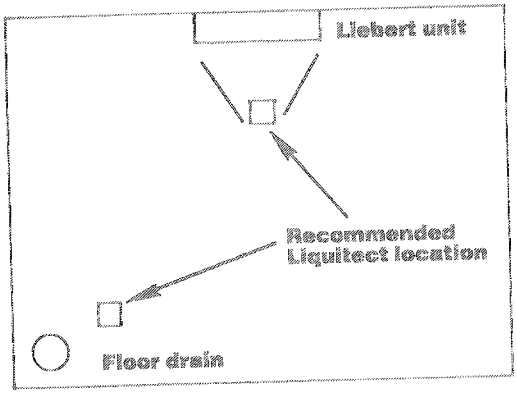


Figure 19. Recommended Location.

REMOTE SHUTDOWN

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

PROPORTIONAL HEATING/COOLING/ DEHUMIDIFICATION

On Chilled Water, GLYCOOL (Econ–o–cycle, Free Cool, GLYCOOLING cycle) models and models with hot water reheat, 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.

Chilled Water Systems

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.

Hot Water Reheat

Upon a decrease in room temperature, the microprocessor will respond by positioning the hot water valve proportionally to match the needs of the room. Full travel of the valve takes place within 1°F with each 0.1°F resulting in 10% valve travel.

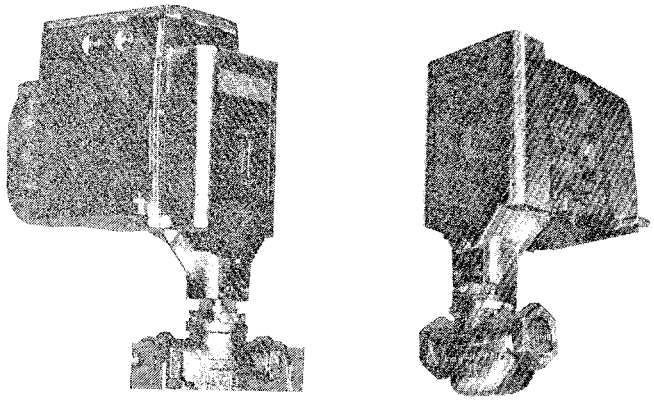


Figure 20. Hot Water Reheat/Chilled Water Valves.

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 from either end by opening the end doors. It is recommended that the power is OFF while replacing the filters.

After replacing the filters, test the operation of the filter clog switch. Turn the adjusting screw counter clockwise to trip the switch – this will energize the change filter alarm. To adjust the switch proceed as follows: With the fan running, set the switch to energize the light with clean filters. The unit panels must all be in place and closed to accurately find this point. Then turn the adjusting knob 2 1/2 turns clockwise, or to the desired filter change point.

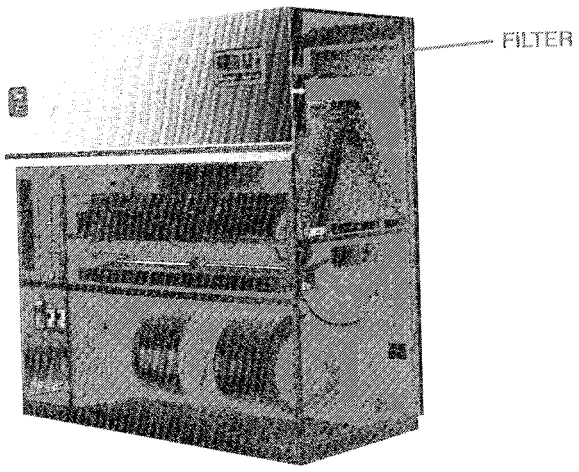


Figure 21. Filter Location.

INFRARED HUMIDIFIER

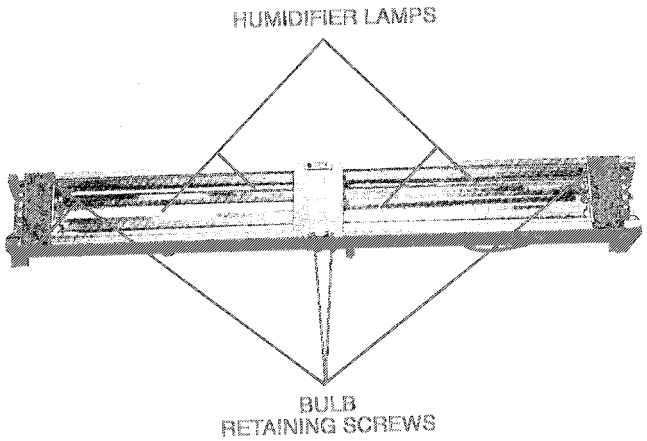


Figure 22. Infrared Humidifier Lamps.

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. On chilled water units – loosen the wing nuts at the left end and lower the pan out of the brackets.

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 middle front exterior panel.
3. Remove (7) screws securing humidifier high voltage access panel.
4. Remove humidifier pan.
5. Remove lamp brackets (3) under lamps.
6. Remove high voltage compartment cover.
7. In high voltage compartment, locate burned–out bulb with continuity meter.
8. Loosen two screws securing bulb wires to junction block.
9. Pull bulb straight down.
10. 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.

11. Reverse steps 1–6.

AUTOFLUSH HUMIDIFIER CLEANING SYSTEM (Infrared Only)

NOTE

To operate properly, the Autoflush Humidifier requires a water source that can deliver at least 1 gpm (0.063 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 or 60 seconds (based on the size of the pan). 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 or 7 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 to 10 minutes (based on the size of the pan).
4. After the 8 to 10 minute time delay, 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 either 11 or 22 pounds (5 or 10 kg) of steam per hour depending on model. 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.

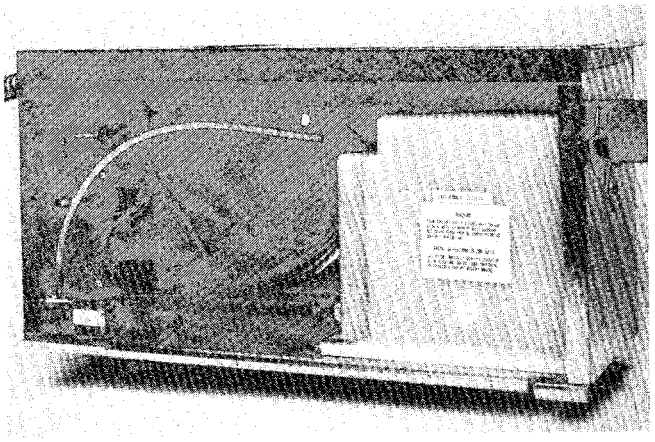


Figure 23. Steam Generating Humidifier

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.

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.

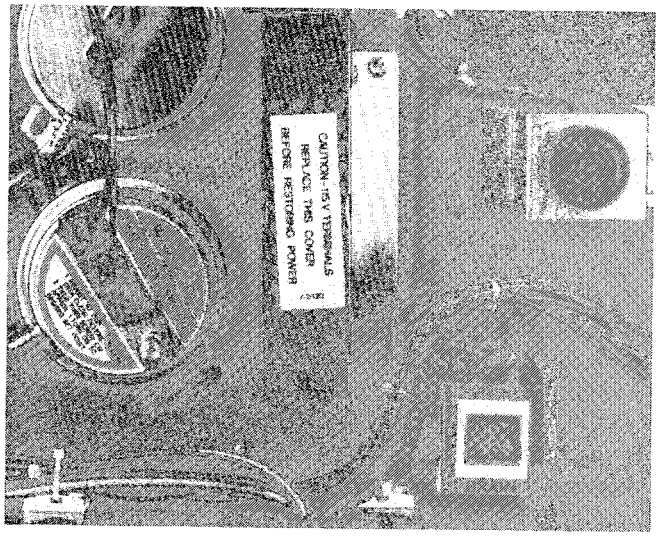


Figure 24. Run/Drain Switch.

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 or 22	5 or 10
121795P2	380–575	11 or 22	5 or 10

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 electric panel in the control section of the unit. See the figure below for a diagram 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 readjusted without consulting customer service.

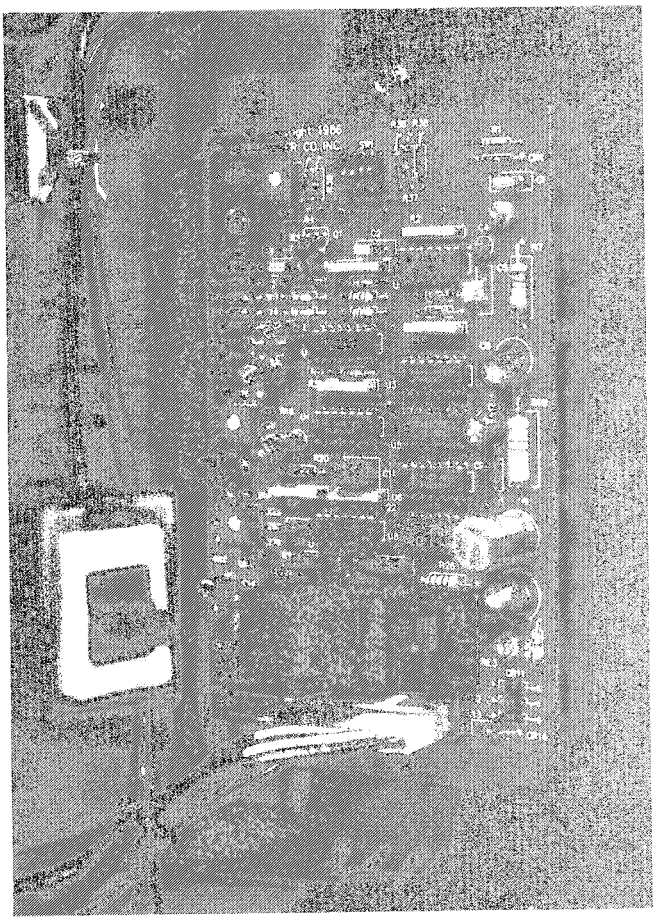


Figure 25. Steam Generating Humidifier Control Board.

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. Consult Table 1 on the following page for the capacity of your unit. Compare this capacity with the voltage of your unit as listed in Table 2. Set the four dip switches in accordance with the values in Table 2. 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.

Table 1 – STEAM GENERATING HUMIDIFIER CAPACITY

60 Hz MODELS	50 Hz MODELS	CAPACITY lbs/hr	CAPACITY kg/hr
75A, 72G, 86W 114A,110G,127W 125A,116G,138W 147C,200C,248C	75A, 72G, 86W 147C,200C,248C	11	5
199A,192G,219W 245A,240G,267W 290A,265G,315W 380A,363G,412W 302C,376C 422C,529C	115A,111G,128W 130A,121G,143W 199A,192G,219W 245A,240G,267W 290A,265G,315W 380A,363G,412W 302C,376C 422C,529C	22	10

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 2 – DIP SWITCH SETTINGS FOR CAPACITY AND VOLTAGE REQUIREMENTS

UNIT RATED VOLTAGE	CAPACITY	SW1	SW2	SW3	SW4	RATED VALUES VOLTAGE	RATED VALUES AMP SET PT
200/208	11	0	0	1	1	208	12.55
200/208	22	1	1	1	1	208	23.81
230	11	1	1	0	1	240	10.51
230	22	0	1	1	1	240	20.25
380/400/415	11	0	1	1	0	400	6.28
380/400/415	22	0	0	1	1	400	12.55
460	11	1	0	1	0	480	5.46
460	22	1	1	0	1	480	10.51
575	11	0	0	0	0	575	4.19
575	22	0	1	0	1	575	9.83

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.

BELTS

Drive belts should be checked monthly for signs of wear and proper tension. Pressing in on belts midway between the sheave and pulley should produce from 1/2" to 1" (12 to 25 mm) of movement. Belts that are too tight can cause excessive bearing wear.

Belt tension can be adjusted by raising or lowering the fan motor. If belts appear cracked or worn, they should be replaced with matched belts (identically sized). Both belts should be replaced at the same time. With proper care, belts should last several years.

After adjusting or changing belts, 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) ft²	(m²)	600 FPM (3.05 m/s) ft²	(m²)
6	4.6	(.43)	4.2	(.39)
8	6.3	(.59)	5.8	(.54)
10	7.7	(.72)	7.4	(.69)
15	11.5	(1.07)	10.5	(.98)
20	13.9	(1.29)	12.8	(1.19)
22	16.4	(1.52)	15.0	(1.39)
30	20.4	(1.90)	18.8	(1.75)

Grilles used in raised floors vary in size, the largest being 18"x6" (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'x2' (61 cm 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.

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 and the equipment should begin to cool. A high temperature alarm may come on. Disregard it. Return set points to room 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 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 infrared element should come on. For steam generating humidifiers, you will immediately hear the clicks as it energizes. After a short delay, the pan or 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. The lag compressor should come on. Return humidity setting to desired humidity.

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.

COMPRESSOR OIL LEVEL

There is a glass "bull's eye" provided on each compressor (clearly visible when the end door is open) that permits viewing the oil level.

Normally, the oil level should be 1/2 to 3/4 up from the bottom of the sight glass. However, this level may vary during operation due to the action of the moving parts. When idle, the oil level may be higher due to the absorption of the refrigerant.

After a compressor has been idle for an extended length of time, foaming will generally be viewed when the compressor first starts. In order to accurately check the oil level, it will be necessary to have the compressor operating five to ten minutes before viewing the oil level.

Refrigeration oil does not deteriorate with normal usage and need not be changed unless discolored or acidic. Periodically inspect the compressor compartment for signs of oil leakage. If a leak is present, it must be corrected and the oil level returned to its proper level using Sunisco 3GS refrigerant oil. It is recommended that oil be taken from sealed containers opened at time of use. Oil exposed to the air will absorb moisture.

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

Each 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.

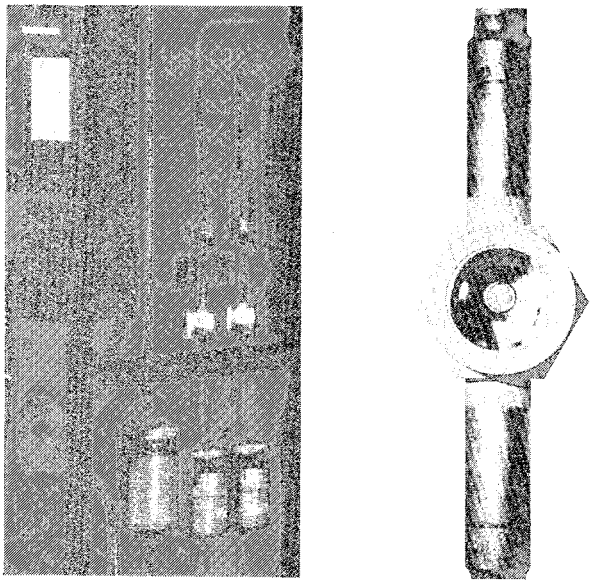


Figure 26. Liquid Line Sight Glass

SUCTION PRESSURE

Suction pressure will vary with load conditions. The low pressure switch will shut the compressor down if suction pressure falls below the cut-out setting. High suction pressure reduces the ability of the refrigerant to cool compressor components and can result in compressor damage. Minimum (pressure switch cut-out setting) and maximum (design operating) pressures are in the chart below.

System	Minimum PSIG (kPa) R-22		Maximum PSIG (kPa) R-22	
Air FSC	15	(103)	90	(620)
Flood Back Head Pressure Control	35	(240)	90	(620)
Water Cooled	35	(240)	90	(620)
Glycol Cooled	35	(240)	90	(620)

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.

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.

	R–22	
Air	360 psig	(2480 kPa)
Water	360 psig	(2480 kPa)
Glycol	360 psig	(2480 kPa)

HOT GAS BYPASS VALVE

Operation

The hot gas bypass is inserted 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.

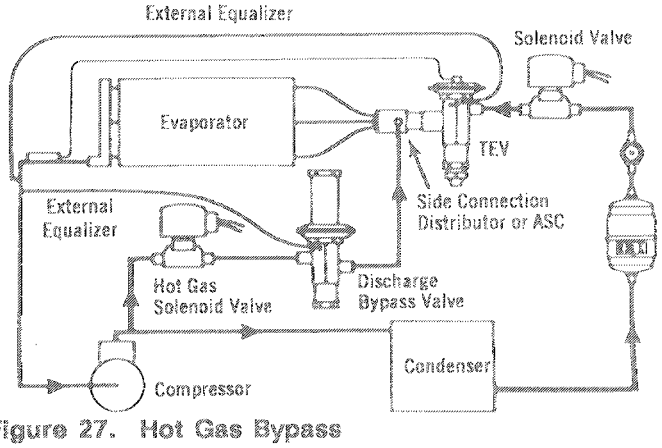


Figure 27. Hot Gas Bypass

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 8 and 10°F (4.4 and 5.5°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 one turn of the stem at a time. As long as thirty minutes may be required for the new balance to take place.

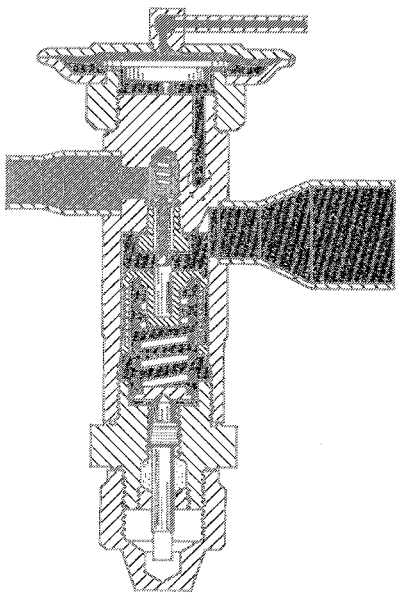


Figure 28. Typical Valve Cross Section

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 compressors will run continuously.
2. The refrigerant level is visible through two sight glasses on the receiver, and will vary with ambient temperature.
   a. 40°F (4.4°C) and lower — Midway on the bottom sight glass.
   b. 40°F–60°F (4.4°C – 15.6°C) — Bottom sight glass should be clear with liquid.
   c. 60°F (15.6°C) and above — Midway on the top sight glass.

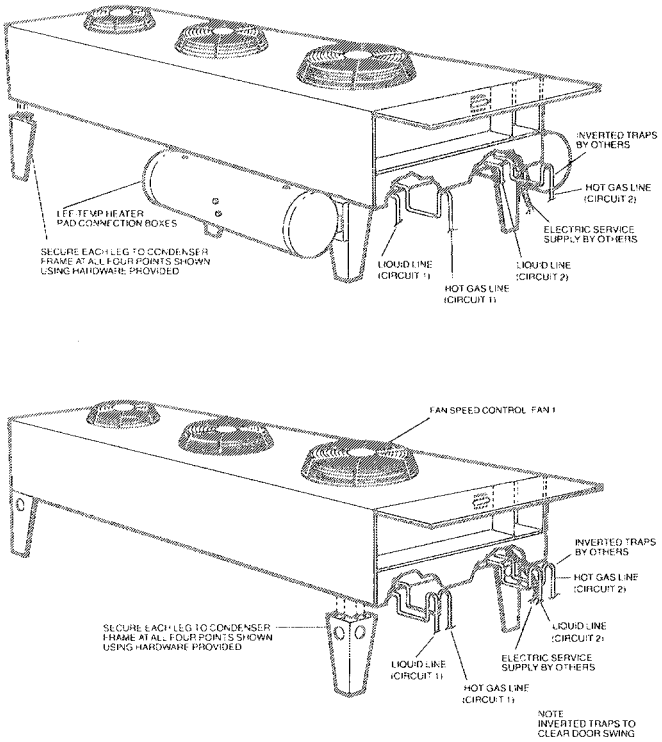


Figure 29. Outside Fan/Condenser Configuration

WATER/GLYCOL COOLED CONDENSERS

Shell and Tube Condensers

Each water or glycol cooled module has a shell and tube condenser which consists of a shell, removable heads, gaskets and cleanable copper tubes.

It may be necessary to clean the copper tubing periodically to remove any scale or lime that should collect. (Periods between cleanings will vary with local water conditions.) As deposits build up, a cleaning tool, available at any refrigeration supply house, should be used to clean the heat exchanger tubes.

1. Stop the unit (using start/stop switch), and allow compressor to pump down.
2. Open the disconnect switch.
3. Shut off the water supply to the condenser.
4. Drain the water from condensers and piping.
5. Remove the bolts securing each head and slowly pry them free.

NOTE

Do not damage head gaskets.

6. Swab the condenser tubes with a tube cleaning tool.
7. When the tubes are clean reinstall the gaskets and heads.
8. Reconnect piping, open water supply, vent the system and check for leaks.

Regulating Valves

The water regulating valves automatically regulate 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 adjusting screw.

Adjustment

The valves 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.

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 by using isolating ball valves within the unit cabinet.
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 valve is reassembled check for leaks.
7. Readjust head pressure control.

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

If a compressor motor burns out, the stator wiring insulation decomposes, forming carbon, water and acid. Not only must the compressor be replaced, but the entire refrigeration circuit must be cleaned of the harmful contaminants left by the burnout. Successive burnouts of the same system can usually be attributed to improper system 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.

NOTE

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

There are two kits that can be used with a complete compressor burnout – Sporlan System Cleaner and Alco Dri–Kleener.

CAUTION

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

NOTE

Release of refrigerant to the atmosphere is harmful to the environment. Refrigerant must be recycled or discarded in accordance with federal, state, and local regulations.

Recover refrigerant using standard recovery procedures and equipment. Use a filter–drier when charging the system with recovered refrigerant.

BURN OUT KITS

Sporlan System Cleaner Method

This method of cleaning is thoroughly described in Sporlan's Bulletin No. 40–15 and 40–10.

This bulletin describes the following procedure:

1. Close the compressor service valves and remove the burned out compressor.
2. Install the new compressor and System Cleaner. Always use the same hose between the System Cleaner and the compressor to make sure it is clean.
3. Evacuate the compressor and the System Cleaner with a good vacuum pump, break the vacuum with a refrigerant and re–evacuate. Only the compressor and system cleaner need to be evacuated, since the service valves have been closed, isolating the refrigerant in the system.
4. Open the compressor service valves, close the liquid line valve and pump down the system. Install an oversized Catch–All (at lease one size larger than the normal selection size) in the liquid line, removing the old filter–drier if one exists.
5. Place the system into operation by opening the liquid valves, installing the fuses, and setting the thermostat to the low position. Check the pressure drop across the system cleaner during the first half hour of operation and change the cores if it becomes excessive.
6. In the next 8 to 24 hours, take an oil sample. Observe the color, and test with Sporlan Acid Kit. If the oil is clean and free of acid, remove the system cleaner. If the oil is either dirty or acidic, change the cores and leave the system cleaner in for an additional day or two before checking another oil sample.
7. When the system cleaner is removed, replace the liquid line Catch–All and install a See–All in the liquid line.
8. In the next two weeks, recheck the color and acidity of the oil to see if another liquid line Catch–All is necessary. (This step requires that a means be available to obtain an oil sample.) Before the job is completed, it is essential that the oil be clean and acid free. The See–All will indicate if the Catch–All must be changed or reduced to the moisture content of the system.

Alco Dri-Kleaner Method

With this method of cleaning, the refrigerant is reclaimed into a separate drive and recharged to the system through a dehydrator. If this method is used, the following procedure should be used.

1. Save the refrigerant charge. If necessary transfer it to a clean refrigerant cylinder.
2. Thoroughly inspect all system controls such as expansion valves, solenoid valves, check valves, reversing valves, etc. Clean or replace if required. Remove any liquid line strainers or Filter–Driers.
3. Install the replacement compressor. Complete the installation of the new parts as quickly as possible so the system is exposed to the atmosphere as little as possible.
4. Install an Alco ADK Filter–Drier in the suction line. (Refer to Alco's Instruction Pamphlet.)
5. Install a new oversize ADK Filter–Drier in the liquid line.
6. Pressurize and leak test the system at approximately 150 PSIG (1034 kPa) pressure.
7. Triple evacuate the system, using the following procedure. Evacuate the system twice to 1,500 microns and the third time to 500 microns, breaking the vacuum each time with clean, dry refrigerant to 2 PSIG (13.8 kPa). While evacuating the system, make a complete and thorough electrical check, cleaning or replacing components as necessary.
8. Charge the system through an ADK Filter–Drier with the same refrigerant that was originally installed.
9. Start the compressor and put the system into operation. As the contaminants in the system are absorbed or filtered out by the porous block ADK Alco Filter, the pressure drop across the Filter–Drier will increase. This proves that the Filter–Dryer is doing the job of cleaning the system. Observe the system operation during the first four hours.

   If the pressure drop across the Filter–Driers should increase to an objectionable amount, replace the drier or install new blocks of desiccant. Change the Filter–Driers as often as required until no further pressure drop is observed.
10. After completion of the above step, allow the unit to operate 48 hours and check the odor and color of the oil. It should be clean, but if it is still discolored or has an acid odor, replace both the liquid and suction line Filter–Driers. The compressor oil may be changed if the discoloration is too extreme. Repeat this procedure every two weeks until the oil remains clean and odor free.
11. If the oil is clean and odor free and if the pressure drop across the Filter–Drier is not excessive, the clean–up is complete and the system can be operated normally.

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

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	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 switch and 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 or hot water/steam valve not opening	Motor operates but valve won't open	Check linkage for adjustment and be sure that it is tight on the valve.
	No. 24 VAC power to motor	Check TR to TR on motor for 24 VAC.
	No signal from control	Check DC voltage on printed circuit board in motor. Terminal No. 1 is ground and No. 3 is positive. DC voltage should vary from 0.8 to 2.0 VDC or above as temperature control is varied below room temperature on cooling valve or above room temperature on heating valve.
	Motor not working	Remove wires on terminal No. 1 and No. 3 from the motor (do not short). With 24 VAC power from TR to TR, jumper terminal 1 and 2 on motor to drive open. Remove jumper to drive closed. If motor fails to work, replace it.

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
COMPRESSOR		
Compressor contact pulled in but compressor will not operate	Blown fuses	Check for line voltage after fuses and after contactors.
Compressor will not operate, contactor not pulling in	No call for cooling	Check to see if pilot light is on.
	Solenoid valve not energizing	Hold screwdriver over solenoid and check for magnetic field. This indicates solenoid is energized.
	Low pressure switch not making contact	Check gas pressure – manually energize low pressure switch.
		Reset switch – See Troubleshooting – Refrigeration.
	High pressure switch open	
	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	Check for low gas pressure. Compressor is running on Positive Start Kit (air cooled systems only).
	Solenoid not opening	Check magnetic field to see if energized.
DEHUMIDIFICATION		
No dehumidification	Control not calling for dehumidification	Check control pilot light.
	Compressor contactor not pulling in	See Compressor Section.
	Compressor won't run. Fuses blown	See Compressor Section. Check fuses and contacts. Check line voltage.
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		
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.
Performance poor	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 auto–flush adjustment.
		Check drain stand pipe adjustment.
		Check for clogged waterline filter.
	Control not calling for humidity	Check control pilot light.
	Humidity contactor not pulling in	Check visually. If contactor is made, check line voltage after contactor and fuses.
		Check for open humidifier safety stat. Jumper between terminals P11–16 and P11–15.
	Humidifier bulb burned out	Replace.

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.
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.

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
	HUMIDIFIER – STEAM GENERATING (Continued)	
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. This is the one farthest from the steam outlet port and 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.
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 canister and add one Alka–Seltzer tablet to canister. Refill. 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.

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
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.
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.

SYMPTOM	POSSIBLE CAUSE	CHECK OR REMEDY
REHEAT		
Reheat will not operate; contactor not pulling in	Control not calling for heat	Check control to see if pilot light 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 oil levels
- ☐ 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
- ☐ Check water make-up valve for leaks

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: _____

SIGNATURE _____

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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 oil levels
- ☐ 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
- ☐ Check water make-up valve for leaks

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

Electrical Panel

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

NOTES: _____

SIGNATURE _____

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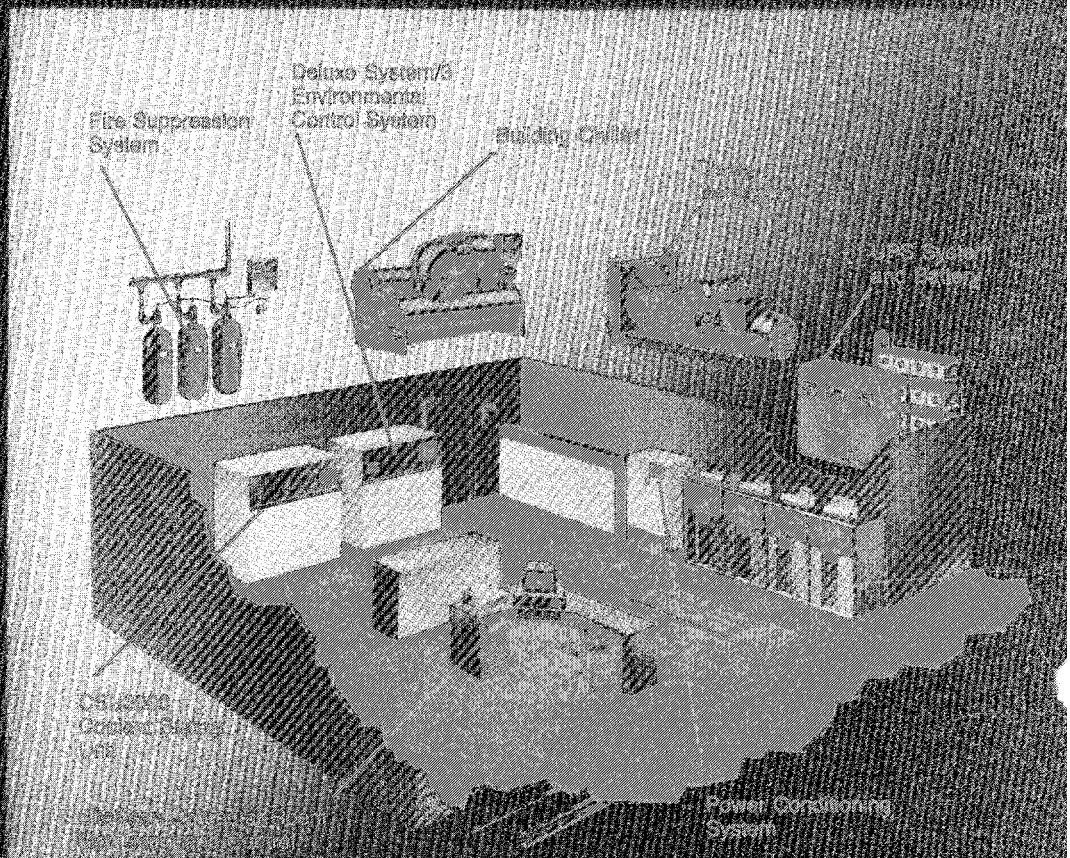

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