Large Systems

iCOM Microprocessor

Environmental Training and Service Manual

TM-10098: Rev. 05/27/08

EMERSON
Network Power

iCOM
Training & Service Manual

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Chapter 1

Temperature and Humidity Control Programs

This section provides details on how your Liebert i*COM* control responds to the user programmed inputs values and room conditions. Refer to this section when you need specific information on the controls operation. This section provides details on the four (4) user selectable temperature control programs and the three (3) user selectable humidity control programs.

Cooling and/or Heating Required, in Percent (%)

The temperature control programs for the i*COM* microprocessor are based on a calculated percent (%) requirement for cooling and/ or heating. This percent (%) requirement is determined by the control type (algorithm) selected by the user.

The four (4) user selectable temperature control programs are:

- Proportional (P)
- Proportional + Integral (PI)
- Proportional + Integral + Derivate (PID)
- Intelligent

Temperature Control Types

Proportional (P) Control

The proportional control is the standard control method that maintains the room at a temperature proportional to the load. The temperature maintained increases as the room load increases. At full load the room would be controlled at a temperature equal to the temperature set point (TSP) plus ½ of the temperature proportional band (PB). The operator programmed inputs are the temperature set point (TSP) and temperature proportional band (PB) adjustments. The operator may also program a temperature dead band (DB) adjustment which will provide an offset when the cooling or heating is activated or deactivated.

Proportional + Integral (PI) Control

The PI control combines two (2) individual terms to determine the control output for a given set of conditions.

The proportional (P) term is determined by the difference between the current temperature and the control set point. This term is expressed in % cooling (heating) desired for each degree above (below) the set point. It is adjustable from 0% to 100% per degree. The purpose of this term is to adjust the control output for any deviation between the current temperature and the control set point.

The integral (I) term is determined by two things: the difference between the return air temperature and control set point and the amount of time this difference has existed. This term is expressed in % cooling (heating) desired for each minute and degree above (below) the set point. It is adjustable from 0% - 100% per degree/minute. The purpose of this term is to force the control to maintain the temperature around the set point by slowly but continuously adding (subtracting) a small amount of cooling (heating) to the total control output until the temperature is at the set point.

Proportional + Integral + Derivate (PID) Control

The PID control combines three individual terms to determine the control output for a given set of conditions. Note that PID control is used only for temperature. If PID control is selected, humidity will continue to use proportional control.

The proportional (P) term is determined by the difference between the current temperature and the control set point. This term is expressed in % cooling (heating desired for each degree above (below) the set point. It is adjustable from 0% to 100% per degree. The purpose of this term is to adjust the control output for any deviation between the current temperature and the control set point.

The integral (I) term is determined by two things: the difference between the return air temperature and control set point and the amount of time this difference has existed. This term is expressed in % cooling (heating) desired for each minute and degree above (below) the set point. It is adjustable from 0% - 100% per degree/minute. The purpose of this term is to force the control to maintain the temperature around the set point by slowly but continuously adding (subtracting) a small amount of cooling (heating) to the total control output until the temperature is at the set point.

The derivative (D) term is determined by the rate of change of temperature. This term is expressed in % cooling (heating) desired for each degree per minute rise (fall) in temperature. It is adjustable from 0% to 100% per degree/minute. The purpose of this term is to adjust the control output for quickly changing temperatures, thus providing an anticipation control.

Intelligent Control

The Intelligent Control operates from a set of general rules that define how the control output should be adjusted for different system conditions. The rules are designed to duplicate the actions that an experienced human operator would take if manually controlling the system.

Basically, this is done in a three-function process that differs from earlier mathematical defined strict type data, hence, fuzzy logic. The on and off, true or untrue type of statement is not used. The consideration now is how to set the input value into a membership set, qualify this membership with rules, then decide on the output consequence for action. It is not really that simple, but it is basically how it works.

Temperature Control Operations and Charts

The temperature proportional control band value is divided into two parts: the temperature set point plus ½ of the temperature proportional band for cooling operation and the temperature set point minus ½ of the temperature proportional band for heating operation.

A temperature dead band can also be programmed into the control to shift the cooling and/ or heating on/ off operations away from the temperature set point. This programmed temperature dead band value is divided into two parts: the temperature set point plus ½ of the dead band – no cooling operation and the temperature set point minus ½ of the band – no heating operation.

The temperature set point range is adjustable from 41 - 104°F in increments of 1°F. The temperature proportional band range is adjustable from 2 - 54°F in increments of 1°F. The temperature dead band range is adjustable from 0 - 36°F in increments of 1°F.

Standard 2 Stage Compressorized Cooling

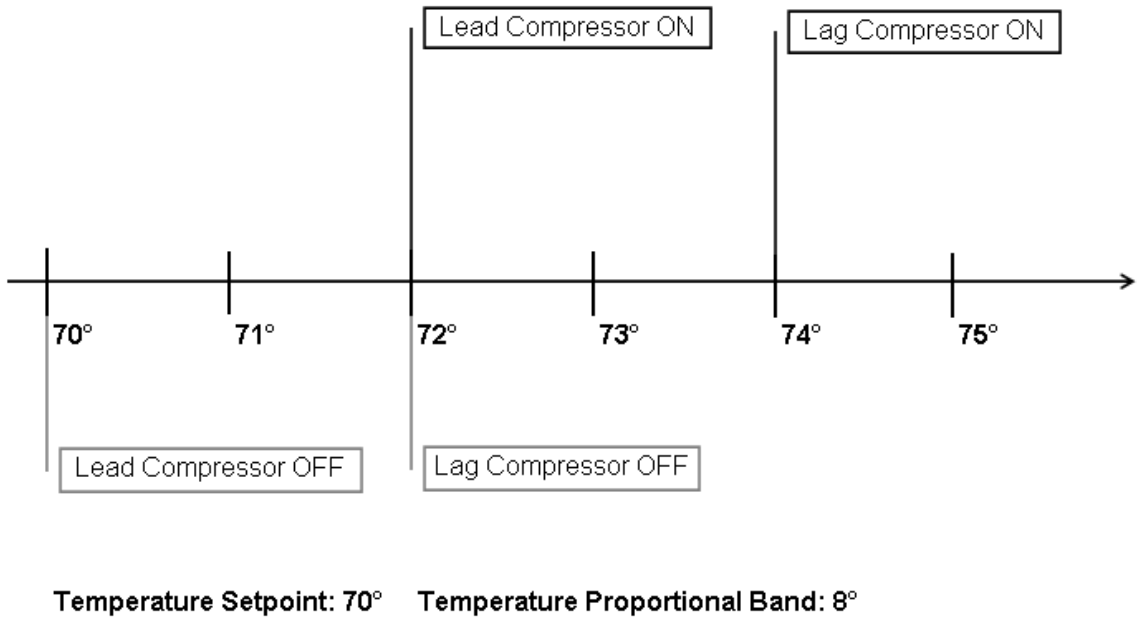
The basic temperature cooling control band is established at the temperature set point with the length equal to ½ of the programmed temperature proportional band divided by the number of cooling stages.

Liebert DS units are supplied with two (2) compressorized cooling circuits. Each compressor circuit is rated at ½ of the unit total cooling capacity. The two (2) compressors can be either semi-hermetic or scroll type and will operate in an on/off configuration to cool the space.

The temperature controller activates the first cooling stage (lead compressor) when the return air temperature increases to 50% of the cooling proportional band and the second cooling stage (lag compressor) at 100% of the cooling proportional band.

The temperature controller deactivates the second stage of cooling (lag compressor) when the return air temperature decreases to 50% of the cooling proportional control band value. The first cooling stage (lead compressor) is deactivated when the return air temperature decreases to the temperature set point value or 0% of the cooling proportional control band value.

2 Stage Compressorized Cooling – No Dead Band



In the above example the control band begins at the 70°F temperature set point and has a length of 4°F, which is ½ of the programmed temperature proportional band value.

As the return air temperature increases, Cooling 1 (lead compressor) is activated at 72°F or 50% of the cooling control band. If the return air temperature continues to increase, Cooling 2 (lag compressor) will activate at 74°F or 100% of the cooling control band.

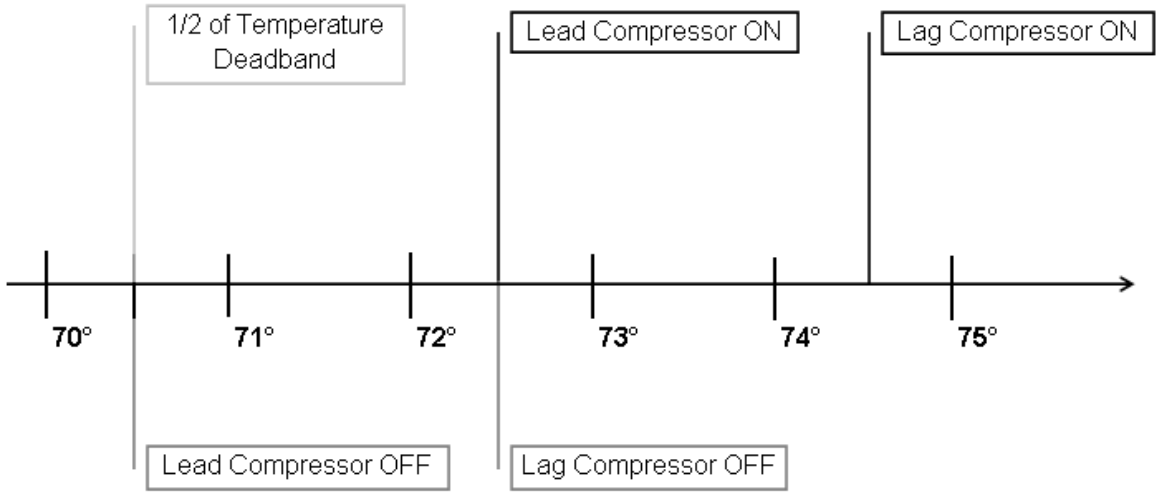
When the return air temperature starts to decrease, Cooling 2 (lag compressor) is deactivated at 72°F or 50% of the cooling control band and Cooling 1 (lead compressor) is deactivated at the temperature set point of 70°F or 0% of the cooling control band.

In the example below the control band begins at the 70°F temperature set point and has a length of 4.5°F, which is ½ of the programmed temperature dead band value plus ½ of the programmed temperature proportional band value.

As the return air temperature increases, Cooling 1 (lead compressor) is activated at 72.5°F or ½ of the dead band value plus 50% of the cooling control band. If the return air temperature continues to increase, Cooling 2 (lag compressor) will activate at 74.5°F or ½ of the dead band value plus 100% of the cooling control band.

When the return air temperature starts to decrease, Cooling 2 (lag compressor) is deactivated at 72.5°F or ½ of the dead band value plus 50% of the cooling control band and Cooling 1 (lead compressor) is deactivated at 70.5°F or ½ of the dead band value plus 0% of the cooling control band.

2 Stage Compressorized Cooling – With Dead Band



Temperature Setpoint: 70°
Temperature Proportional Band: 8°
Temperature Deadband 1°

Remember the temperature dead band value is used by the control to shift the cooling on/off operations away from the temperature set point.

Optional 4 - Step Cooling, Two (2) Compressors with Unloaders

The basic temperature cooling control band is established at the temperature set point with the length equal to ½ of the programmed temperature proportional band divided by the number of cooling stages.

Liebert DS units are supplied with two (2) compressorized cooling circuits. Each compressor circuit is rated at ½ of the unit total cooling capacity. The two (2) semi-hermetic type compressors are each supplied with an electrically controlled suction cut-off cylinder unloader valve. The electrical solenoid valve is used to unload or reduce the cooling capacity of the compressor. The compressors will operate in an on/off - loaded/unloaded configuration method to cool the space. Hot gas bypass option is not available on 4-stage cooling units.

Stage Activation on Temperature Increase

The temperature controller activates the first cooling step (lead compressor unloaded) when the return air temperature increases to 33% of the cooling proportional band. The second cooling step (lag compressor unloaded) is activated when the return air temperature increases to 63% of the cooling proportional band.

The temperature controller deactivates the unloader for the third cooling step (lead compressor loaded) when the return air temperature increases to 80% of the cooling proportional band. The temperature controller deactivates the unloader for the fourth cooling step (lag compressor loaded) when the return air temperature increases to 100% of the cooling proportional band.

Stage Deactivation on Temperature Decrease

The temperature controller activates the unloader on the lag compressor when the return air temperature decreases to 90% of the cooling proportional control band value. The unloader on the lead compressor activates when the return air temperature decreases to 70% of the cooling proportional control band value.

The temperature controller deactivates the unloaded lag compressor when the return air temperature decreases to 47% of the cooling proportional control band value. The unloaded lead compressor is deactivated when the return air temperature decreases to the temperature set point value of 17% of the cooling proportional control band value.

The table below shows the sequence of device operation by each of the four (4) cooling stages.

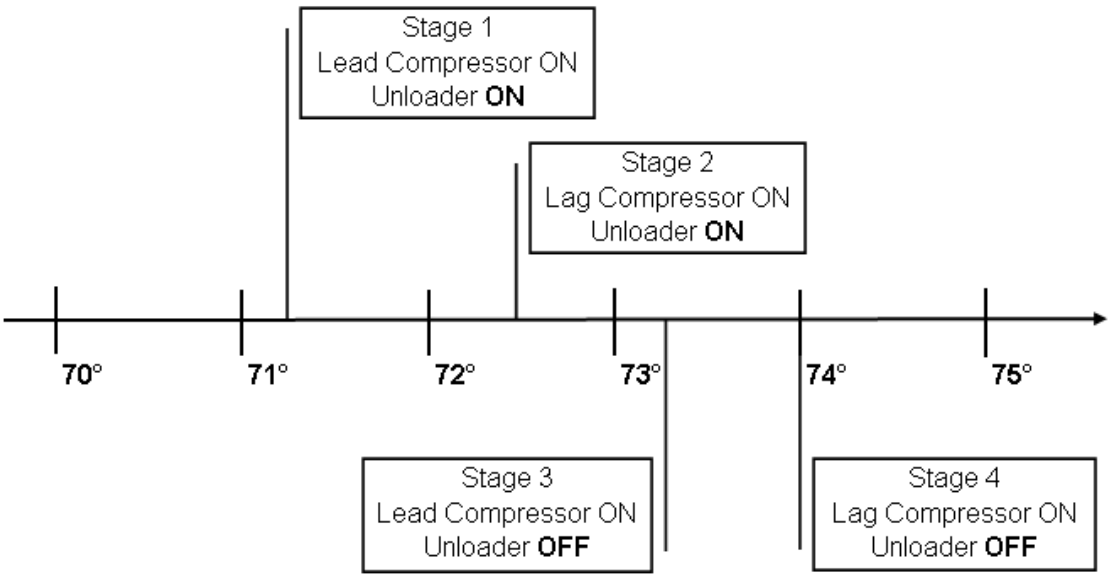
STAGE	COMPRESSORS, UNLOADER STATE
1	Compressor 1 On, Unloader On (Energized) Compressor 2 Off, Unloader Off (De-Energized)
2	Compressor 1 On, Unloader On (Energized) Compressor 2 On, Unloader On (Energized)
3	Compressor 1 On, Unloader Off (De-Energized) Compressor 2 On, Unloader On (Energized)
4	Compressor 1 On, Unloader Off (De-Energized) Compressor 2 On, Unloader Off (De-Energized)

The table below is based on a temperature set point of 70°F with a control band length of 4°F, which is ½ of the programmed temperature proportional band value. This example does not include a dead band value. The temperatures displayed are approximate values as calculated by the microprocessor control.

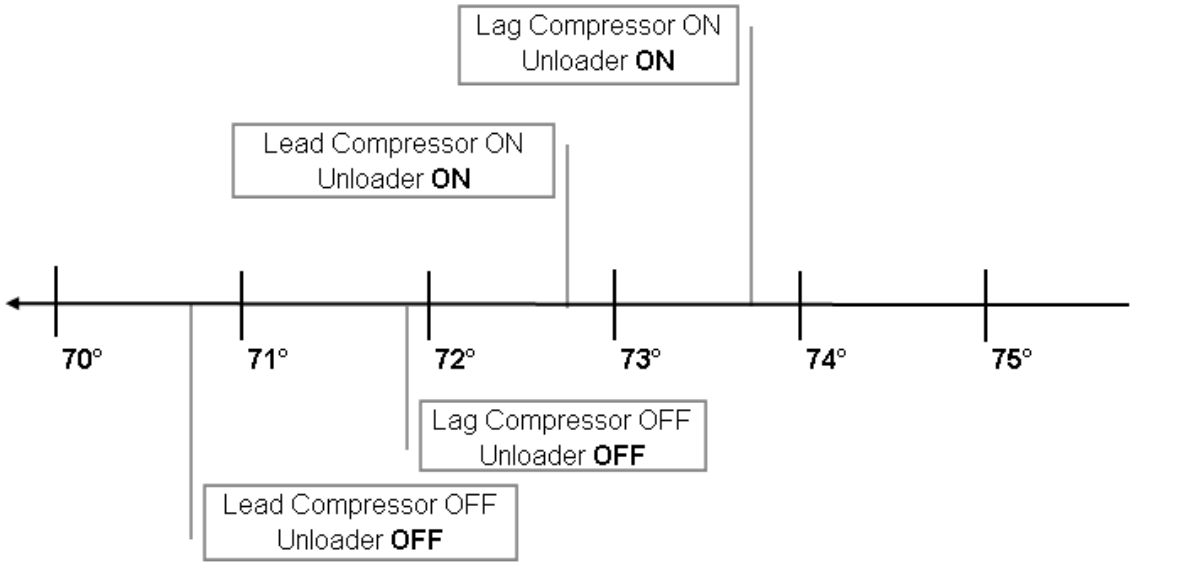
STAGE	TEMPERATURE
Cool 1 ON	Set point plus 1.3°F = 71.3°F
Cool 2 ON	Set point plus 2.5°F = 72.5°F
Cool 3 ON	Set point plus 3.2°F = 73.2°F
Cool 4 ON	Set point plus 4.0°F = 74.0°F
Cool 4 OFF	Set point plus 3.6°F = 73.6°F
Cool 3 OFF	Set point plus 2.8°F = 72.8°F
Cool 2 OFF	Set point plus 1.9°F = 71.9°F
Cool 1 OFF	Set point plus 0.7°F = 70.7°F

The example below is based on a temperature set point of 70°F with a control band length of 4°F, which is ½ of the programmed temperature proportional band value.

4-Step Compressorized Cooling w/No Dead Band



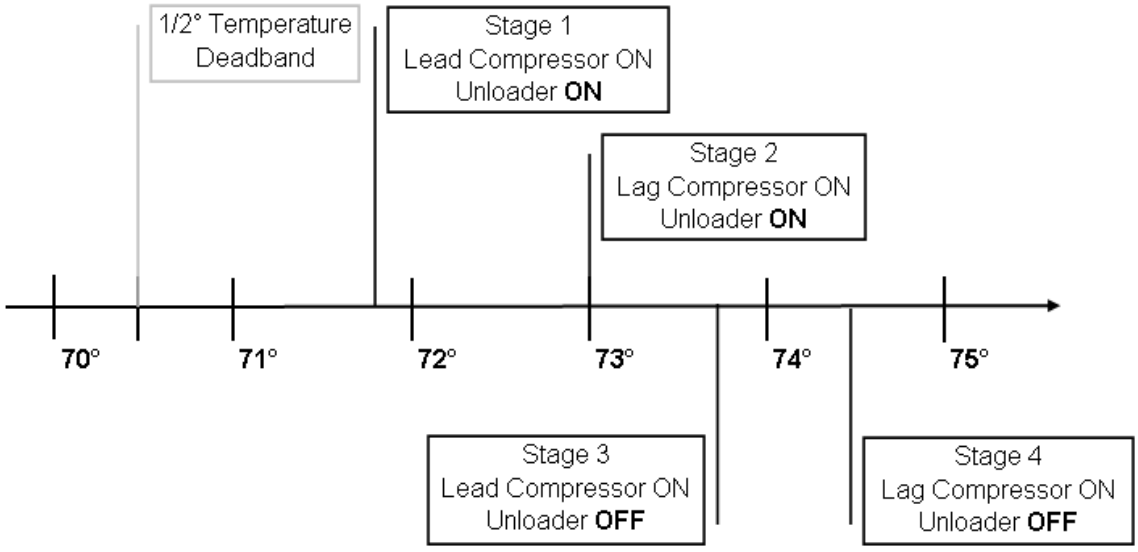
Temperature Setpoint: 70°
Temperature Proportional Band: 8°



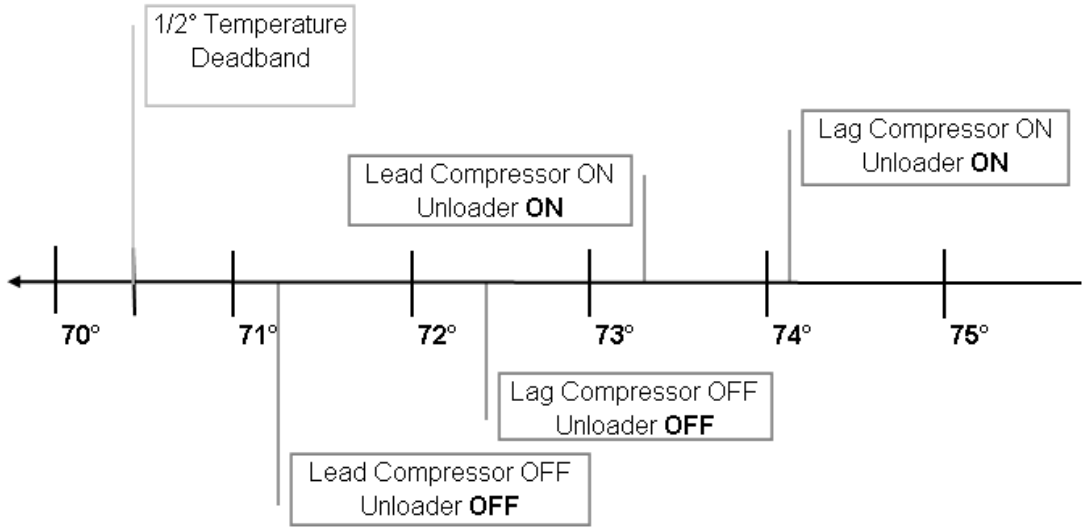
Temperature Setpoint: 70°
Temperature Proportional Band: 8°

The example below is based on a temperature set point of 70°F with a control band length of 4°F, which is ½ of the programmed temperature proportional band value, plus a ½ °F Deadband, which is ½ the programmed temperature deadband.

4 Stage Compressorized Cooling – With Dead Band



Temperature Setpoint: 70°
Temperature Deadband 1°
Temperature Proportional Band: 8°



Temperature Setpoint: 70°
Temperature Deadband 1°
Temperature Proportional Band: 8°

In the above example that the control band begins at the 70°F temperature set point and has a length of 5°F, which is ½ of the programmed temperature dead band value plus ½ of the programmed temperature proportional band value. As the return air temperature increases Cooling 1 (lead compressor unloaded) is activated at 71.8°F or ½ of the dead band value plus 33% of the cooling control band. If the return air temperature continues to increase Cooling 2 (lag compressor unloaded) will activate at 73.0°F or ½ of the dead band value plus 63% of the cooling control band. If the return air temperature continues to increase Cooling 3 (lead compressor unloaded) is activated at 73.7°F or ½ of the dead band value plus 80% of the cooling control band. If the return air temperature continues to increase Cooling 4 (lag compressor loaded) will activate at 74.5°F or ½ of the dead band value plus 100% of the cooling control band.

When the return air temperature starts to decrease, Cooling 4 is deactivated at 74.1°F or ½ of the dead band value plus 90% of the cooling control band. If the return air temperature continues to decrease, Cooling 3 will be deactivated at 73.3°F or ½ of the dead band value plus 70% of the cooling control band. If the return air temperature continues to decrease, Cooling 2 will be deactivate at 72.4°F or ½ of the dead band value plus 47% of the cooling control band and Cooling 1 is deactivated at 71.2°F or 1/2 the dead band value plus 17% of the cooling control band.

Remember the temperature dead band value is used by the control to shift the cooling on/off operations away from the temperature set point.

Optional Dual Compressor Digital Scroll Operation

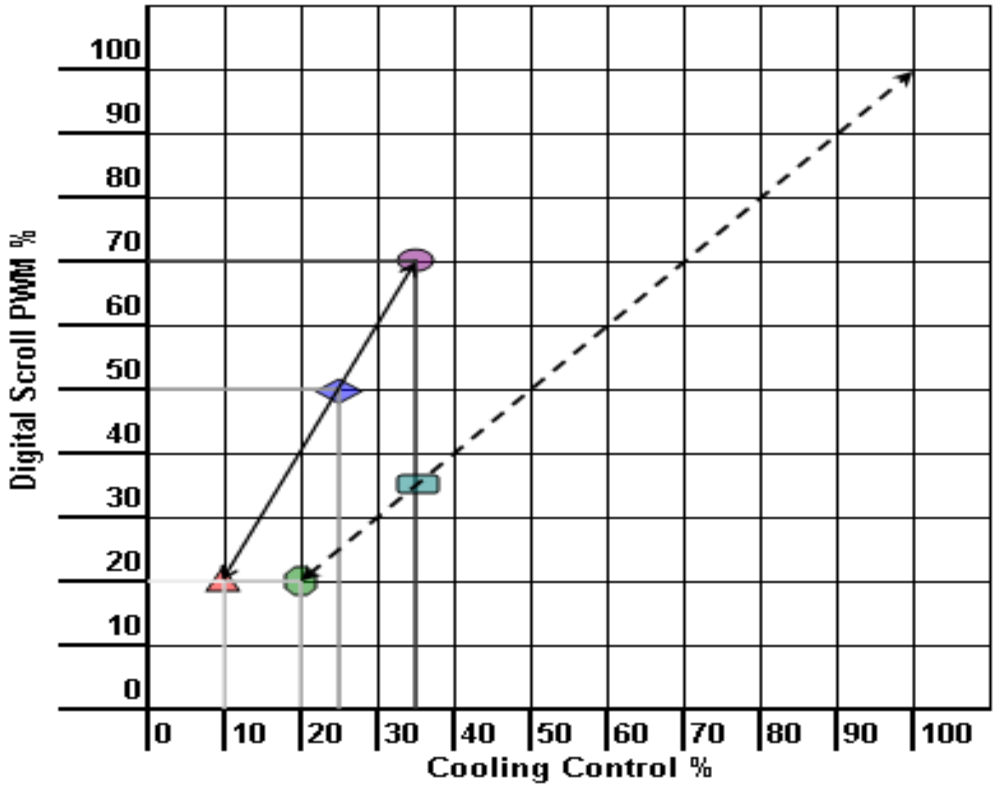
The optional Digital Scroll compressors operate in two stages, the “loaded state” and the unloaded state”. During the loaded state the solenoid valve is de-energized (closed) and the compressor operates like a standard scroll and delivers full capacity. During the unloaded state the solenoid valve is energized (opened) and the scroll plates are separated so there is no capacity through the compressor.

Capacity modulation is achieved by energizing and de-energizing the solenoid valve. Therefore, the cooling capacity achieved is the time average capacity which is a variable from 10 – 100%. Example: If you have a 15 second cycle and the solenoid is de-energized for 10 seconds, and then energized for 5 seconds, the resulting capacity will be 66%. The factory default Digital Scroll Cycle time is programmed at 15 seconds.

In the chart below we are defining the Digital Compressor start and stop at the sensible cooling capacity and how the compressors load and unload with the PWM (Pulse Width Modulation) from the controller and the unit setting for temperature control.

Note: The Digital Scroll will run continuously while the scroll plate is raised and lowered as the need for cooling is required from 10% to 100% and vise versa.

Digital Scroll PWM Cooling Control



First Compressor **ON** at 25% Cooling and 50% PWM.
Second Compressor **ON** at 35% Cooling and 70% PWM.
Once the second compressor is turned **ON**, the PWM% switches from 70% to 35%
First and Second Compressor run between 20% and 100% Cooling and 20% to 100% PWM
Second compressor **OFF** and 20% Cooling and 20% PWM
First Compressor OFF at 10% Cooling and 20% PWM.

Optional Glycool (Econ-O-Cycle) Cooling

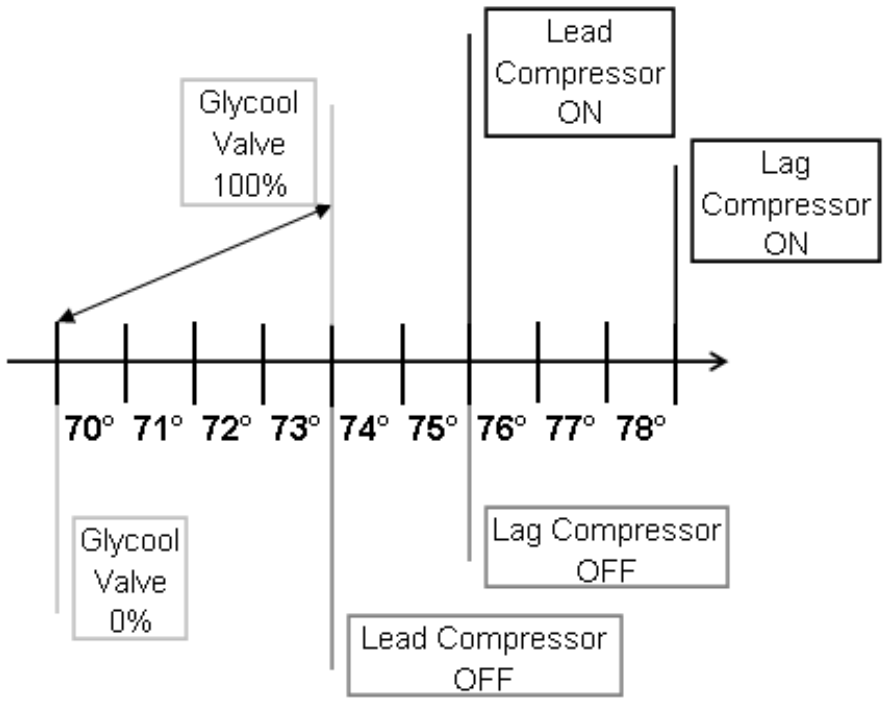
When Liebert DS units are supplied with the Glycool option, the basic unit is supplied with an additional coil, piping, valve and an Aquastat Sensor (AQ) which measures the glycol fluid temperature. The sensor is mounted to the unit supply fluid line and serves as the control interface in determining the system operation. Selection between glycool or compressorized operation is controlled by the microprocessor using this aquastat to sense the glycol temperature.

The Glycool Cooling program establishes two distinct control bands for cooling control operation. The first band controls the operation of the chilled glycol valve and the second controls the operation of the compressors, 2 stages, 4 stages or digital scroll.

The microprocessor checks the return air temperature and the entering glycol fluid temperature to determine a cooling capacity. In order to reduce compressor cycling and to prevent chilled glycol valve hunting, Glycool cooling capacity does not become available until the entering chilled glycol fluid temperature is at least 8°F below the return air temperature or 3°F lower than the return air temperature for two (2) consecutive hours.

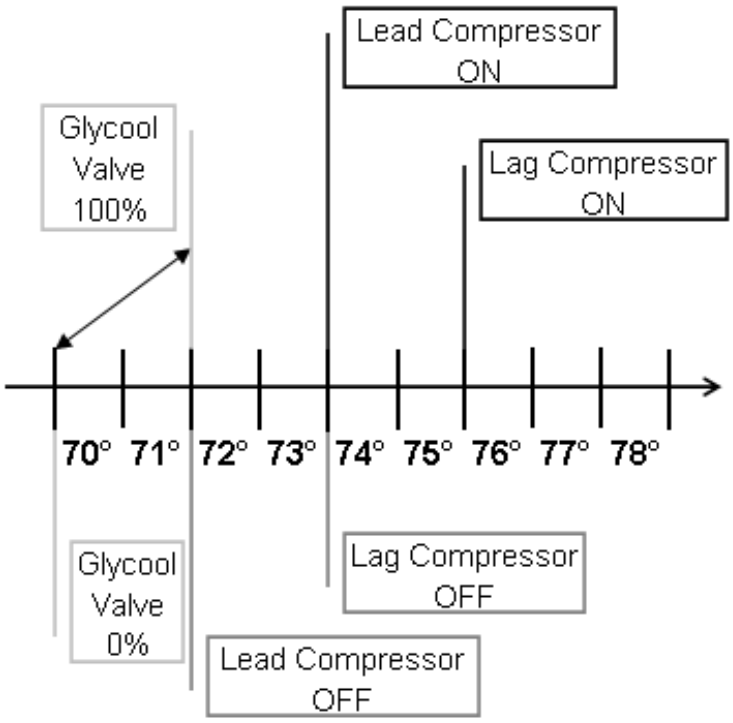
When the microprocessor decides that the return glycol fluid temperature is cold enough the first cooling band is modulating valve control. A second band is added to the first band for the compressors as in the normal 2 stage, 4 stage or digital scroll control method. If the chilled glycol fluid temperature is not cold enough the valve control band is replaced by the compressor band. If the chilled glycol cooling capacity is reduced by a rise in the glycol fluid temperature, the control band shrinks proportionally. This allows the compressor band to move down as well. The following charts on the next two pages show the Glycool operation at 100% capacity and the Glycool at 50% capacity.

Glycool at 100% Capacity – No Dead Band



Temperature Setpoint: 70°
Temperature Proportional Band: 8°

Glycool at 50% Capacity – No Dead Band



Temperature Setpoint: 70°
Temperature Proportional Band: 8°

Optional Dual Source Cooling

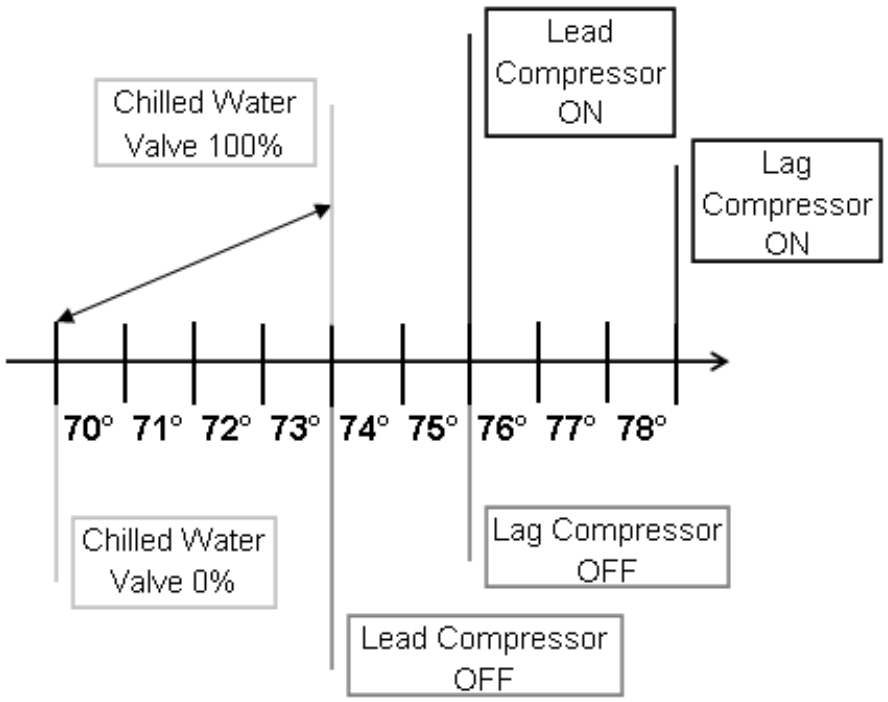
When Liebert DS units are supplied with the Dual Cooling option, the basic unit is supplied with an additional coil, piping, valve and an Aquastat Sensor (AQ) which measures the chilled water fluid temperature. The sensor is mounted to the unit supply fluid line and serves as the control interface in determining the system operation. Selection between chilled water or compressorized operation is controlled by the microprocessor using this aquastat to sense the chilled water temperature.

The Dual Source Cooling program establishes two distinct control bands for cooling control operation in the same method as Glycool. The first band controls the operation of the chilled water valve and the second controls the operation of the compressors, either 2-stages, 4-stage or digital scroll.

The microprocessor checks the return air temperature and the entering chilled water fluid temperature to determine a cooling capacity. The chilled water cooling capacity is considered to be 100% if the entering Chilled Water fluid temperature is 8°F lower than the return air temperature.

When the microprocessor decides that the return chilled water temperature is cold enough the first cooling band is the modulating valve control. A second band is added to the first band for the compressors as in the normal 2 stage, 4 stage or digital scroll control method. If the chilled water temperature is not cold enough the valve control band is replaced by the compressor band. See the chart on the next page.

Dual Cooling at 100% Capacity – No Dead Band



Temperature Setpoint: 70°
Temperature Proportional Band: 8°

An addition program is available with the Dual Cooling option. The program is called Minimum Chilled Water Temperature. This program allows the end user to select a Minimum Chilled Water Temperature setpoint that will not permit simultaneous operation of the chilled water valve and compressors. When the supply chilled water temperature decreases to the programmed value, the chilled water valve control is operational and the compressors are NOT permitted to operate. If the chilled water temperature increases 2°F above the setpoint, then the compressors are permitted to operate again if needed.

Optional Staged Electric Reheat

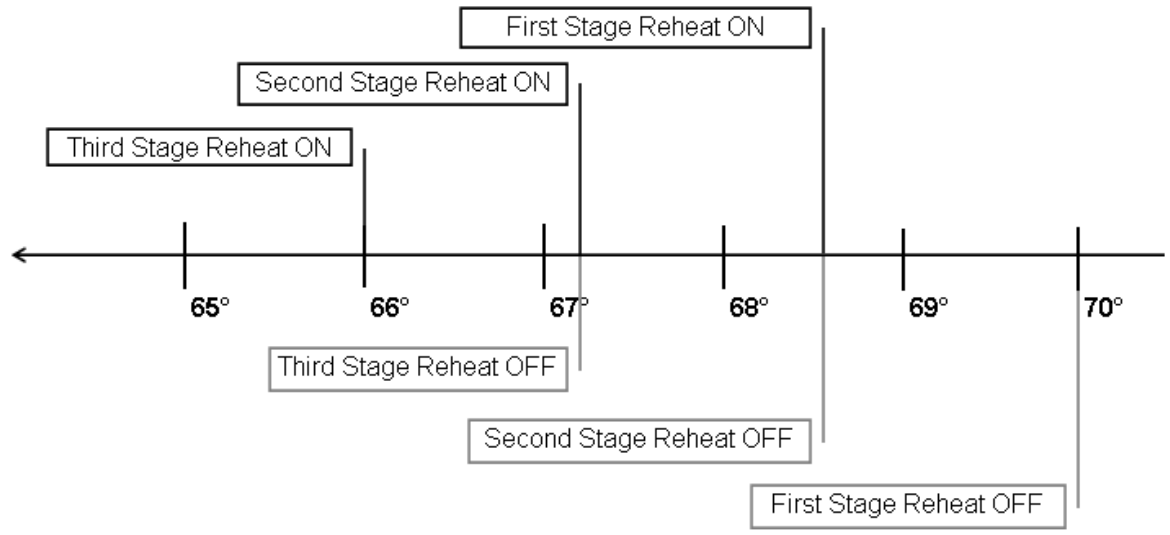
The basic temperature heating control band is established at the temperature set point with the length equal to ½ of the programmed temperature proportional band divided by the number of reheat stages.

When Liebert DS units are supplied with the optional three (3) stage electric reheat assembly, the three (3) stages (elements) will operate in an on/off configuration to reheat the unit discharge air as it enters the space.

The temperature controller activates the first electric heating stage when the return air temperature decreases to 33% of the heating proportional band. The second electric heating stage activates when the return air temperature decreases to 66% of the heating proportional band. The third electric heating stage activates when the return air temperature decreases to 100% of the heating proportional band.

The temperature controller deactivates the third heating stage when the return air temperature increases to 66% of the heating proportional control band value. The second heating is deactivated when the return air temperature increases to 33% of the heating proportional control band value. The first heating stage is deactivated when the return air temperature increases to the temperature set point value or 0% of the heating proportional control band value.

3 Stage Electric Reheat – No Dead Band

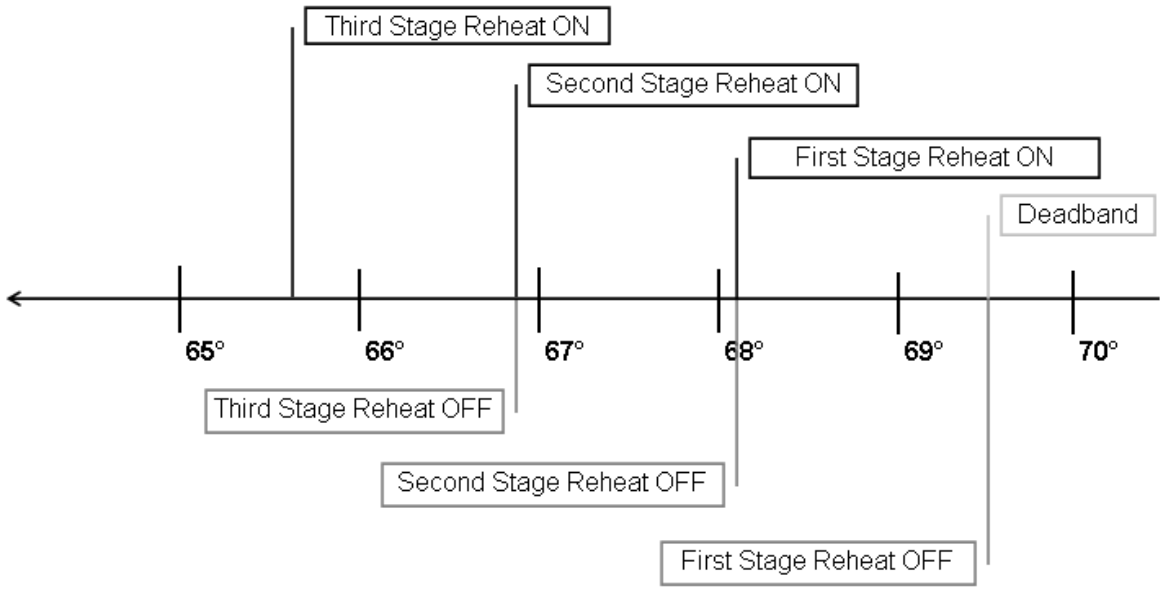


Temperature Setpoint: 70° Temperature Proportional Band: 8°

As the return air temperature decreases Reheat 1 is activated at 68.7°F or 33% of the heating control band. If the return air temperature continues to decrease Reheat 2 will activate at 67.4°F or 66% of the heating control band. If the return air temperature continues to decrease Reheat 3 will activate at 66°F or 100% of the heating control band.

When the return air temperature starts to increase, Reheat 3 is deactivated at 67.4°F or 66% of the heating control band, Reheat 2 is deactivated at 68.7°F or 33% of the heating control band and Reheat 1 is deactivated at the temperature set point of 70°F or 0% of the heating control band.

3 Stage Electric Reheat – With Dead Band



Temperature Setpoint: 70° **Temperature Proportional Band: 8°** **Deadband: 1°**

In the above example that the control band begins at the 70°F temperature set point plus ½ of the programmed temperature proportional band value.

As the return air temperature decreases Reheat 1 is activated at 68.2°F or ½ of the dead band value plus 33% of the heating control band. If the return air temperature continues to decrease Reheat 2 will activate at 66.9°F or ½ of the dead band value plus 66% of the heating control band. If the return air temperature continues to decrease Reheat 3 will activate at 65.6°F or ½ of the dead band value plus 100% of the heating control band.

When the return air temperature starts to increase, Reheat 3 is deactivated at 66.9°F or ½ of the dead band value plus 66% of the heating control band. Reheat 2 is deactivated at 68.2°F or ½ of the dead band value plus 33% of the heating control band. Reheat 1 is deactivated at 69.5°F or ½ of the dead band value plus 0% of the heating control band.

Remember the temperature dead band value is used by the control to shift the cooling on/off operations away from the temperature set point.

Humidity Control

Humidification and/or Dehumidification in Percent (%)

The humidity control program for the *iCOM* microprocessor is based on a calculated percent (%RH) requirement for humidification and/or dehumidification. This percent (%RH) requirement is determined by the control type (algorithm) selected by the user.

There three (3) user selectable humidity control programs are:

- Absolute Humidity, grains of moisture in the air
- Relative Humidity (%RH)
- Compensated

Humidity Control Program Types

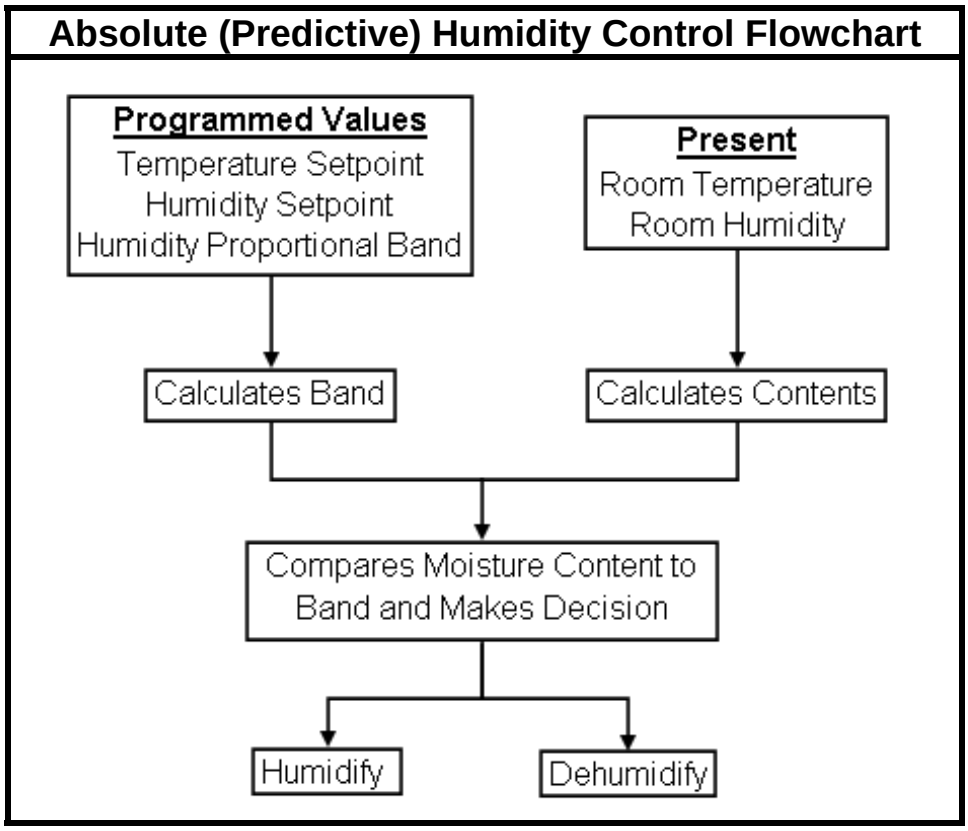
Absolute (predictive) Humidity Control – Factory Default Setting

Absolute (predictive) humidity control is based on the moisture content in the return air. The *iCOM* microprocessor control automatically adjusts the humidity control as the return air temperature deviates from the programmed temperature setpoint. This calculation converts the return temperature and humidity values to a moisture content value defined as either grains per cubic foot or grains per pound. This recalculated content value is compared to the content control band that is determined by the:

- Programmed temperature setpoint
- Programmed humidity setpoint in %RH
- Programmed humidity proportional band in %RH

This automatic adjustment results in a predictive humidity control response. With absolute humidity control, the humidity control program is automatically adjusted by approximately 2% RH for each degree difference between the return air temperature and the temperature set point. See the following example on the next page.

Temperature Set Point	Humidity Set Point	Humidity Proportional Band = 6%	Content Level Grains per LB
70°F	50%	+3%	59.2
70°F	50%	-3%	52.5



When utilizing the absolute (predictive) humidity control program feature, the humidity level is automatically adjusted ~ 2% RH for each degree difference between the return air temperature and the temperature set point. It is important to remember that the unit displays relative humidity %RH not the actual moisture content value. The moisture content (grains) values are used only in the internal control program for control operation. Example: if the temperature setpoint is 70°F and return air temperature is 72°F the humidity will read 4% higher than the actual value.

The absolute humidity program can be analyzed by using the Moisture Content Charts supplied in Chapter 4 of this manual. It is important to remember that the System and Unit Views shows the adjusted humidity value in %RH.

The High and Low Humidity Alarm setpoints will be recalculated internally. In the Graphics Menu, the humidity graphs will show the real humidity reading of the sensor. In the Calibrate Sensor Menu, the humidity sensor is showing the real humidity reading.

Relative Humidity Control
Relative humidity control is based on the humidity content in the return air. The iCOM microprocessor control determines the unit humidification/dehumidification operation by comparing the return air humidity value to the control band that is determined by the:

- Programmed humidity setpoint in %RH
- Programmed humidity proportional band in %RH

Compensated Humidity Control
Compensated humidity control functions the same as Absolute Humidity, except it does not adjust the actual humidity reading it adjusts the Humidity Setpoint. This automatic adjustment results in a predictive humidity control response. With absolute humidity control, the humidity setpoint is automatically adjusted approximately 2% RH for each degree difference between the return air temperature and the temperature set point.

Humidity Control Operations and Charts

The humidity proportional control band value is divided into two parts: the humidity setpoint plus ½ of the programmed humidity proportional band for dehumidification operation and the humidity setpoint minus ½ of the programmed humidity proportional band for humidification operation.

A humidity dead band can also be programmed into the control to shift the humidification and/or dehumidification on/off operations away from the humidity setpoint.

This programmed humidity dead band value is divided into two parts: the humidity setpoint plus ½ of the dead band – no dehumidification operation and the humidity setpoint minus ½ of the band – no humidification operation.

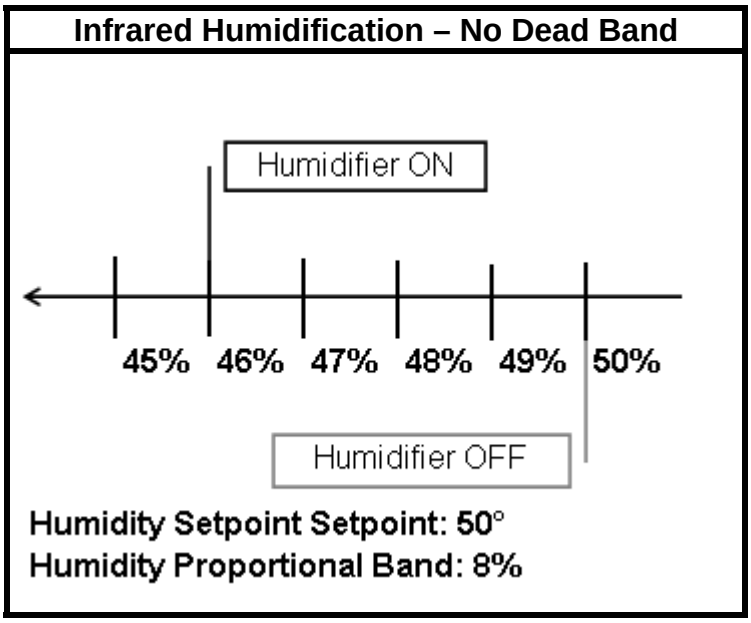
The humidity setpoint range is adjustable from 1 – 80% RH in increments of 1% RH. The humidity proportional band range is adjustable from 1 – 20% RH in increments of 1% RH. The humidity dead band range is adjustable from 0 – 50% RH in increments of 1% RH.

Humidifier Operation

The Relative Humidity control program is used to illustrate the humidification operation in the following examples. The basic humidification control band is established at the humidity setpoint with the length equal to ½ of the programmed humidity proportional band value. Liebert DS/VS units are supplied with an infrared humidifier.

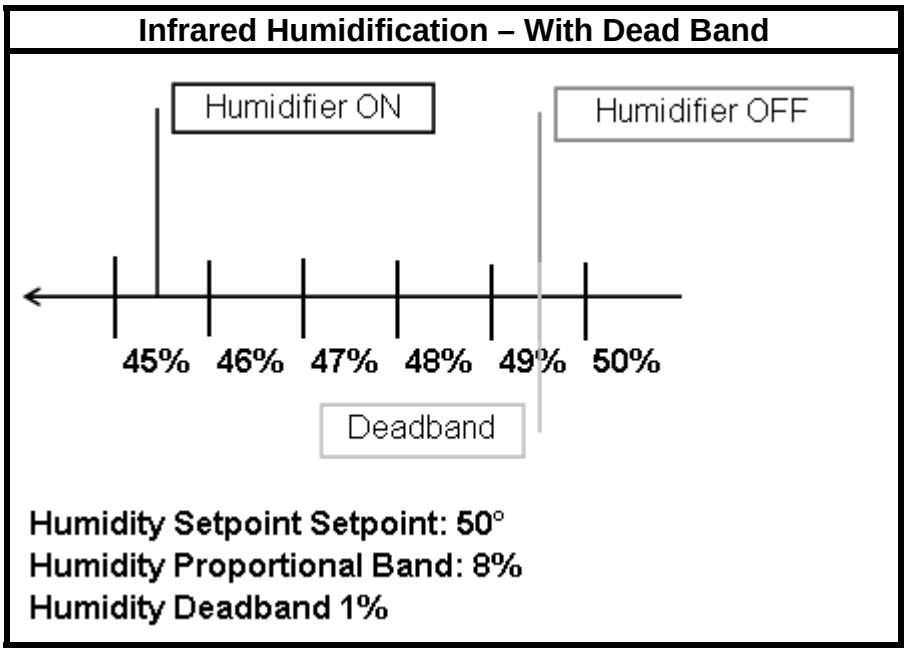
The humidity controller activates the infrared humidifier when the return air humidity level decreases to 100% of the humidity proportional band. The humidifier makeup water solenoid valve also operates during humidification operation based on a timing sequence.

The humidity controller deactivates the infrared humidifier and makeup water solenoid valve when the return air humidity level increases to the programmed humidity set point.



Note: in the above example that the control band begins at the 50% humidity setpoint and has a length of 4%, which is ½ of the programmed humidity proportional band value.

As the return air humidity decreases the infrared humidifier is activated at 46%RH or 100% of the humidification control band. When the return air humidity starts to increase, the infrared humidifier is deactivated at the humidity setpoint or 0% of the humidity control band.



In the above example that the control band begins at the 50% humidity setpoint plus ½ of the programmed dead band value plus ½ of the programmed humidity proportional band value.

As the return air humidity decreases the infrared humidifier is activated at 45.5% RH or ½ of the dead band value plus 100% of the humidification control band. When the return air humidity starts to increase, the infrared humidifier is deactivated at 49.5% RH or ½ of the dead band value plus 0% of the humidification control band.

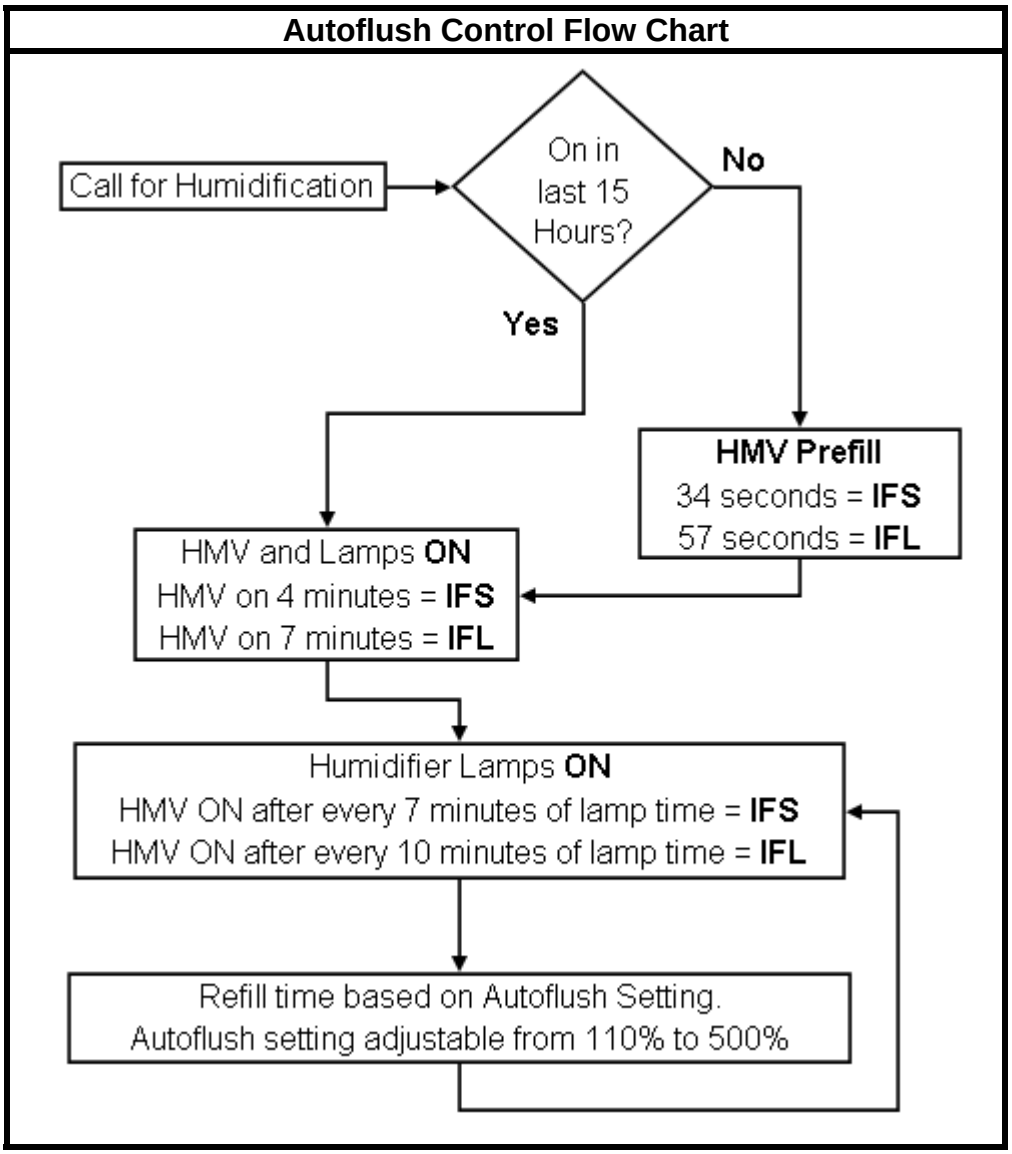
Autoflush Control for Infrared Large (IFL) or Small (IFS) Pans
The Autoflush Water-Level Control software program is an integral part of the infrared humidifier system. The program automatically controls a water makeup valve to maintain the proper water level in the humidifier pan during operation. When a call for humidification exists, the program performs a series of checks.

The first check to see how long the infrared humidifier has been off; if the off time is equal to or greater than the programmed value (factory default is 15 hours), it is assumed that the pan is dry and a program called pre-fill is initiated to add water to the pan. During the pre-fill operation the infrared lamps are inactive. The pre-fill time is programmable with an adjustable range of 1 to 120 seconds for either pan size. The factory default for a large (IFL) pan is 57 seconds and for a small (IFS) pan is 34 seconds.

If the off time is less than 15 hours (or user programmed value) the pre-fill program is bypassed and the infrared lamps and water valve are activated at the same time to fill the pan to the proper water level and initiate humidification.

During normal infrared humidification operation the water makeup valve is periodically opened (pan refill) and closed (no pan refill) based on a timing sequence. This process replenishes the evaporated water from the pan.

With the humidifier water flush rate set at the factory default value of 150% the water makeup valve will open for 51 seconds of fill time with an off time of 7 minutes between fill cycles for a small pan. For a large pan water makeup valve will open for 85.5 seconds of fill time with an off time of 10 minutes between fill cycles. The user can modify the percentage from 110% to a maximum of 500% in 1% increments.



Dehumidification Operation

Dehumidification with Absolute (Predictive) Humidity Control
When absolute humidity control is used, over dehumidification is avoided in the space. When overcooling occurs, causing an increase in the relative humidity reading, the humidity control program "predicts" what the RH will be when the dehumidification cycle ends and the temperature returns to the programmed set point. This allows the dehumidification cycle to end at the proper time.

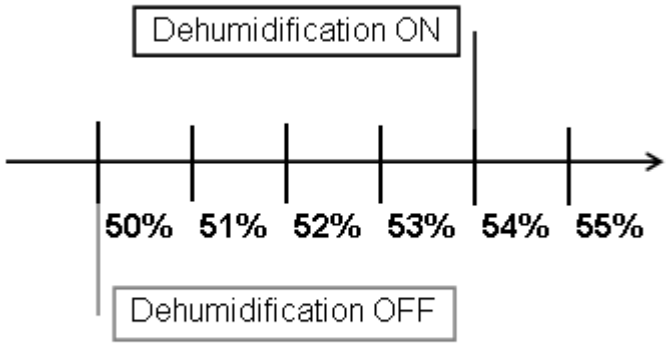
The Relative Humidity control program is used to illustrate the dehumidification operation in the following examples. The basic dehumidification control band is established at the humidity setpoint with the length equal to ½ of the programmed humidity proportional band value.

The humidity controller activates dehumidification operation when the return air humidity level increases to 100% of the humidity proportional band. The humidity controller deactivates dehumidification operation when the return air humidity level decreases to 0% of the humidity proportional control band value.

1-Stage Dehumidification, Compressorized Direct Expansion (DX) Systems
The Liebert DSVS unit is supplied with two (2) compressors. If single compressor dehumidification is selected (Compressor #1 or #2), that compressor is activated by the humidity controller when the return air humidity level increases to 100% of the humidity proportional band.

The humidity controller deactivates the compressor when the return air humidity level decreases to 0% of the humidity proportional control band value.

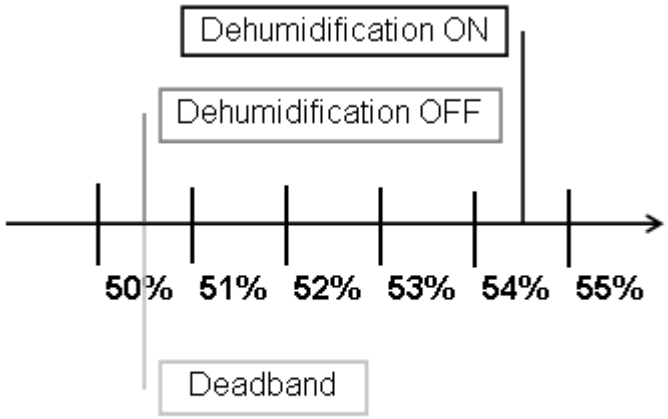
1 Stage Compressorized Dehumidification – No Dead Band



Humidity Setpoint Setpoint: 50°
Humidity Proportional Band: 8%

In the above example, that the control band begins at the 50% humidity setpoint and has a length of 4%, which is ½ of the programmed humidity proportional band value. As the return air humidity increases, dehumidification operation is activated at 54%RH or 100% of the dehumidification control band. When the return air humidity starts to decrease, dehumidification operation is deactivated at the humidity setpoint or 0% of the humidity proportional control band.

1 Stage Compressorized Dehumidification – With Dead Band



Humidity Setpoint Setpoint: 50°
Humidity Proportional Band: 8%
Humidity Deadband 1%

In the above example that the control band begins at the 50% humidity setpoint plus ½ of the programmed dead band value plus ½ of the programmed proportional band value. As the return air humidity increases, dehumidification operation is activated at 54.5% RH or ½ of the dead band value plus 100% of the dehumidification control band. When the return air humidity starts to decrease, dehumidification operation is deactivated at 50.5% RH or ½ of the dead band value plus 0% of the humidity proportional control band.

2-Stage Dehumidification, Compressorized Direct Expansion (DX) Systems
The basic dehumidification control band is established at the humidity setpoint with the length equal to ½ of the programmed humidity proportional band value. When 2 stage dehumidification is selected, the controller works as follows.

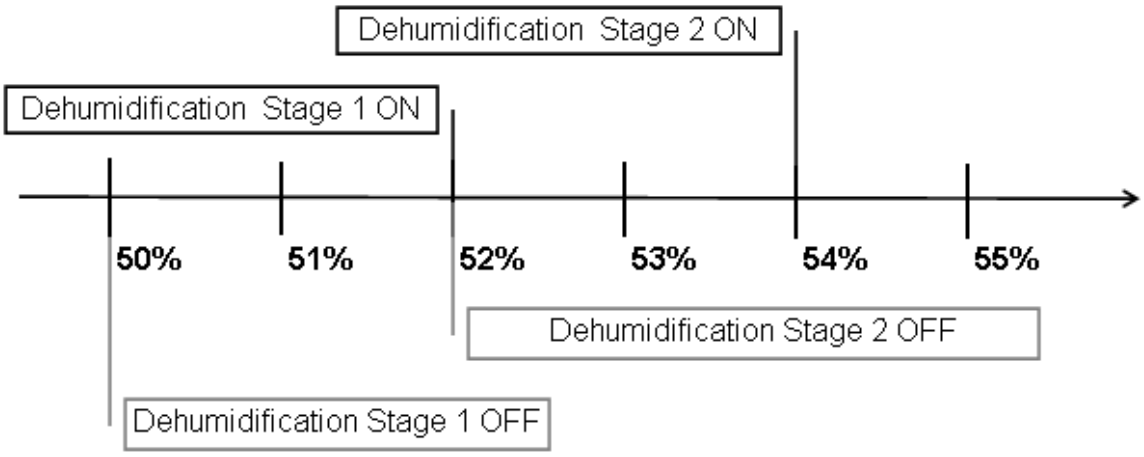
The humidity controller activates the first stage of dehumidification operation when the return air humidity level increases to 50% of the humidity proportional band. The second stage of dehumidification is activated when the return air humidity level increases to 100% of the humidity proportional band.

The humidity controller deactivates the second stage of dehumidification operation when the return air humidity level decreases to 50% of the humidity proportional control band value. The first stage of dehumidification is deactivated when the

return air humidity level decreases to the humidity setpoint or 0% of the humidity proportional band.

If the compressors have unloading capability (4-stage cooling), the compressors are activated in the fully loaded condition for each stage of dehumidification.

2 Stage Compressorized Dehumidification – No Dead Band



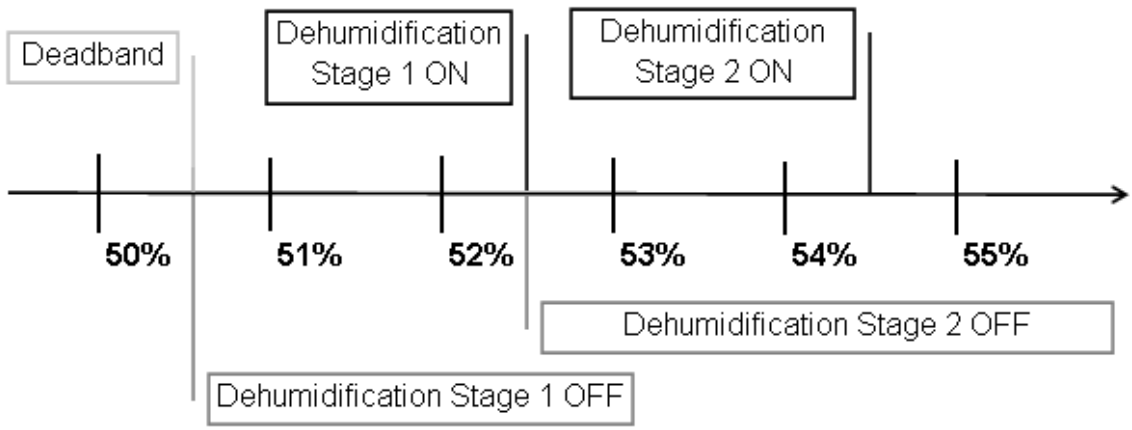
Humidity Setpoint Setpoint: 50°
Humidity Proportional Band: 8%

In the above example, the control band begins at the 50% humidity setpoint and has a length of 4%, which is ½ of the programmed humidity proportional band value.

As the return air humidity level increases, first stage dehumidification operation is activated at 52% RH or 50% of the dehumidification control band. If the return air humidity level continues to increase the second dehumidification stage actives at 54% RH, which 100% of the dehumidification control band.

When the return air humidity level decreases to 52% RH or 50% of the dehumidification control band the second dehumidification stage is deactivated. When the return air humidity level decreases to the humidity set point of 50% or 0% of the humidity proportional band the first dehumidification stage is deactivated.

2 Stage Compressorized Dehumidification – With Dead Band



Humidity Setpoint Setpoint: 50°
Humidity Proportional Band: 8%
Humidity Deadband 1%

In the above example that the control band begins at the 50% humidity setpoint plus ½ of the programmed dead band value plus ½ of the programmed humidity proportional band value.

As the return air humidity level increases, first stage dehumidification operation is activated at 52.5% RH or ½ of the programmed dead band value plus 50% of the dehumidification control band. If the return air humidity level continues to increase the second dehumidification stage actives at 54.5% RH or ½ of the programmed dead value plus 100% of the programmed humidity proportional control band.

When the return air humidity level decreases to 52.5% RH or ½ of the programmed dead band value plus 50% of the programmed proportional control band the second dehumidification stage is deactivated. When the return humidity level decreases to 50.5% RH or ½ of the dead band value plus 0% of the programmed proportional control band the first stage dehumidification deactivated.

Reheating during Dehumidification
The parameter Electric Reheat Operation defines how the reheats react when the return air temperature decreases below the temperature setpoint during the dehumidification process. The following are the selections:

Selection	Operation
No	No electric reheat allowed during compressorized dehumidification operation.
Normal	If normal reheat control is selected, the reheats are turned ON at the normal points of 33%, 66%, and 100%. If the temperature drops to Low Limit 1 then 1 compressor is temporarily disabled (the dehumidification request is reduced to 50%). It is re-enabled when the heating requirement is decreased to Low Limit 1 reset value. If the temperature drops to Low Limit 2, both compressors are temporarily disabled (the dehumidification request is reduced to 0%). One of the two compressors is re-enabled at the Low Limit 2 reset value.
Delayed	When 1 compressor dehumidification and delayed reheat is selected, the reheats are turned ON at the normal points of 33%, 66%, and 100%. On 2 compressor dehumidification all three stages of electric reheat are OFF until the return air temperature falls to Low Limit 1, then 1 stage of dehumidification is disabled and all three reheats are activated. If the return air temperature falls to Low Limit 2, both stages of dehumidification are disabled. One stage of dehumidification will be re-enabled at the Low Limit 2 reset value. Both stages of dehumidification are re-enabled at the Low Limit 1 reset value.

Warning:

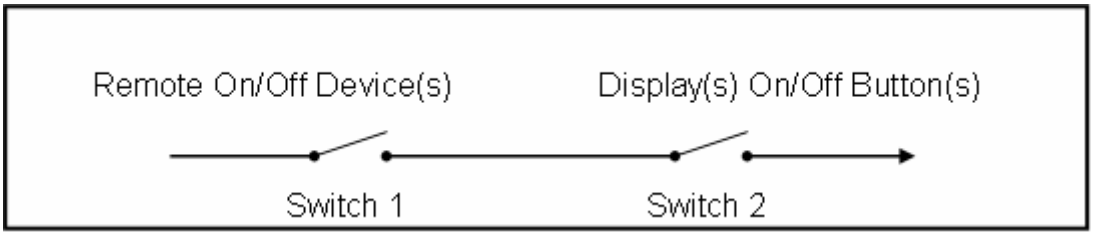
Dehumidification with normal reheat allows for operating both compressors and all reheat stages simultaneously. It is very important that the electrical service to the unit be sized and wired for this option if selected. If not sized properly the electrical service could experience nuisance trips and or possible damage to building circuit breakers (or Fuses) and wiring.

Additional Programs

Start Circuit
The unit fan is activated. The unit can be switched on or off from 2 inputs:

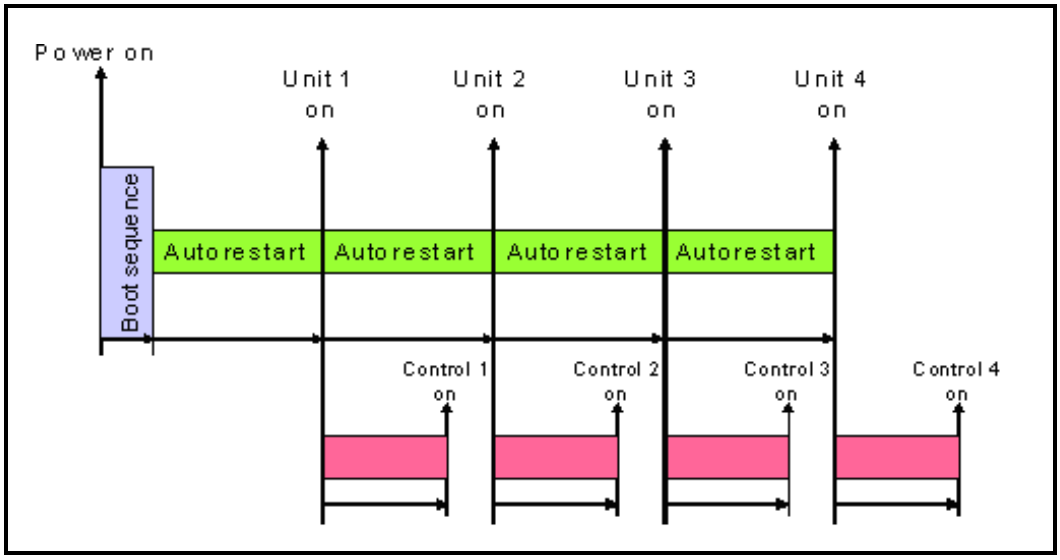
1. Remote on/off input (RSD – Remote Shutdown Device)
2. Display button

Note: Switches 1 and 2 must be wired in series, the unit will start only if both switches are in the ON position. If either switch is in the OFF position the unit will stop.



Auto Restart
When there is a power outage the unit will provide an automatic restart on power restoration when programmed. The unit will start and the loads will sequence on with the Fan first, then so forth until all loads are on as the room requirement demands.

When the Unit Auto Restart Sequence (customer programmable) takes place, each unit will restart by this program. However with a network of units, the start loop will start the next unit when the individual time has elapsed beginning with unit number ID #1. The unit control start sequence will start at this point as well.



Fan Alarm/Fan settings
The fan operation is controlled by two (2) digital devices: the Loss of Airflow differential pressure switch and the Main fan overload motor protection. The time delay at the unit start is always 5 seconds shorter than the control delay.

High Pressure Cutout
When the compressor is commanded to turn ON after being OFF for a period of 10 minutes, or if the power has been removed from the unit and then turned back on, this sequence of operations happens:

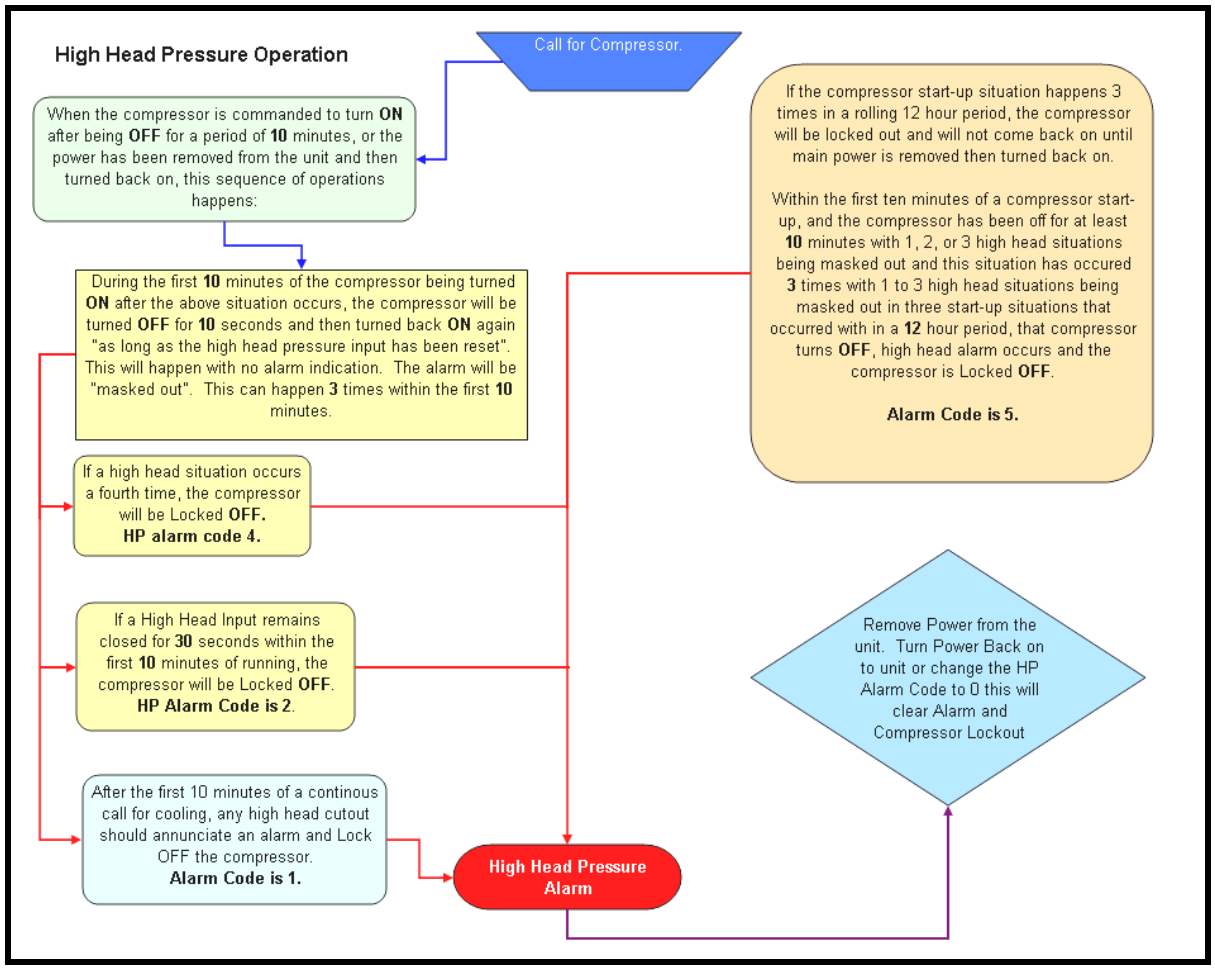
During the first 10 minutes of the compressor being turned ON after the above situation, if a high head pressure situation occurs, the compressor will be turned OFF for 10 seconds and then turned back ON again "as long as the high head pressure input has been reset". This will happen with no alarm indication. The alarm will be "masked out". This can happen 3 times within the first 10 minutes of compressor being turned on.

These HP situations will not be visible on the service menu screens lines S313 or S314 counters, but will be counted on an internal counter, not shown on the display. This internal counter increases by 1, regardless if 1, 2 or 3 HP alarms were masked out within the first 10 minutes after compressor start.

If a high head pressure situation occurs a fourth time (or if the HP input remains in alarm position continuously for 30 seconds) in the first 10 minutes of running, the compressor will be Locked OFF, an alarm will happen, and the counter of the affected circuit will show "1" alarm occurred. Reaching "1" will lockout the compressor and it will not come back on until main power is reset or the S313 or S314 counters are reset to 0. Setting the counter to 0 (zero) will auto-reset the alarm without the need of pressing the reset button on the control display. Setting the visible counter to 0 (zero) will also reset the internal counter to 0 (zero); the internal counter also will be reset to 0 (zero) after a power cycle. This has in effect masked out the first three high head pressure situations if they are within the first 10 minutes of starting.

Note: if the unit is equipped with manual reset high head pressure switches, or if the auto reset high head pressure switches don't reset, the compressor will not be turned back on in the above situation, but there will be a 30 second delay from when the high head pressure situation occurs and when the alarm is enunciated.

High Head Pressure upon Startup continued:
If the above "situation" happens 3 times in a rolling twelve-hour period (that means the internal counter reaches 3) the compressor will be locked out and will not come back on until main power is reset or the S302 or S303 counters are reset to 0 (zero). "Situation" is defined exactly as above. That is if within the first 10 minutes of a compressor startup if the compressor has been off for at least 10 minutes 1, 2, or 3 high head situations have been masked out "inhibited". If this situation has occurred 3 times with 1 to 3 high head situations being masked out in three startup situations that have occurred within a 12 hour period, turn off that compressor, alarm high head pressure, and lock out the compressor. The compressor will not come back on until main power is reset or the S302 or S303 counters are reset to 0 (zero).



High Pressure Internal Counter
The internal counter can have 4 states 0, 1 and 2 are OK states, no alarm will show up. If a “Situation”, which caused the counter to increase by 1 becomes older than 12 hours, the value of the counter will be decreased by 1 again.
3 is alarm state: it shows as “1” on the S302 or S303 counters and locks out the compressor.

Suction Pressure Transducers
The new DS units use pressure transducers on the low side of the system instead of low pressure switches. Parameter A116 Low Pressure Device Type should be set to ANALOG. The transducer pressure measurements are read at 1 second intervals. During all other operating times for the compressors additional pressure measurements are read based on operating at “at limit conditions” for 5 seconds and shall not include readings taken during Pumpdown or Winter Start Kit (WSK) timeout.

Call for Compressor (Cooling or Dehumidification) w/Transducers

Note: The following applies for both R22 and R407C refrigerant systems with all compressor types.

When the compressor starts, the low-pressure value is ignored for a selected period of time. This time value is set to 3 minutes (factory default) on air-cooled units and to 0 minutes (factory default) on water and glycol cooled units.

After a **Call for Compressor**

a) With Low Pressure Delay Time (LPDT) set to = 0: the Liquid Line Solenoid Valve (LLSV) opens, after one reading above Threshold 1 the compressor starts (earliest 1 second after LLSV opens). Flow moves to Phase 2 for all compressors.

b) With Low Pressure Delay Time set to ≠ 0: the LLSV opens, 1 second later the compressor starts. The “flow” is now in **Phase 1**.

NON DigiScroll Compressors
The compressor(s) continue to run for LPDT value. If any single reading during the LPDT is above Threshold 1 "and" the last reading (when LPDT elapses) is above the pump-down cut-out value, the “flow” is now in **Phase 2**. The very first 6 minutes of phase 2 ignores all thresholds, except the Loss of Charge threshold. After 6 minutes the “flow” changes into Phase 3 and starts check about NOT being below Low Pressure Threshold 2 continuously for 240 seconds (the average value of 3 minutes is used). If so, continue operation.

Note: Semi-hermetic (4-step) compressors shall run @100% (capacity valve off) during the whole LPDT sequence.

DigiScroll compressors

Note: On units with Digital Scroll Compressors the unloader is energized 0.1 second before the compressor contactor is energized.

The compressor(s) run @ 50% for the LPDT value. For the last 30 seconds of the LPDT value, run compressor at 100%. If the reading shows values continuously above the threshold 1 for 15 seconds any time during the LPDT time, "and" the last reading (when LPDT elapses) is above the pump-down cut-out value, the "flow" moves to Phase 2 and in parallel the Loss of Charge Protection starts. If 15 seconds has elapsed, and the pressure was not continuously above TH1, the next 15 seconds window will start, where the pressure again has to be continuously above TH1 before to move to the next Phase. The “flow” is now in **Phase 2**. The very first 6 minutes of phase 2 ignores all thresholds, except the Loss of Charge threshold.

After 6 minutes the “flow” changes into Phase 3 and starts check about NOT being below Low Pressure Threshold 2 continuously for 240 seconds (the average value of 3 minutes is used). If so, continue operation.

Low Pressure Phase Conditions

Failure in Phase 1
If Phase 1 has elapsed, the “flow” moves to **Phase 4**, with a maximum waiting time of 5 minutes, where it is looking for a single reading above Threshold 1. If reached, the “flow” moves to Phase 2. NOTE: The compressor is OFF, no Pump down, LLSV is OPEN.

Failure in Phase 4
If pressure is not reached in Phase 4, the “flow” moves to phase 5: Sound Alarm (Code 1), stop compressors, leave LLSV open, no pump down; and waits a single reading to be above threshold 1 to move to Phase 2. This waiting phase will last forever or as long as there is a call for cooling. The compressor may operate during the alarm is active, once the pressure conditions allow for it (see above).

Failure in Phase 3
If the average pressure is continuously below the threshold 2 for 240 seconds, the compressor will be stopped (and allowed to pump-down [NOTE: Pump Down shall be performed before stopping the compressor, if the actual pressure is above the cut-out value]), and waits 600 seconds (Phase 6). If elapsed, the “flow” moves to Phase 1. If Phase 2 failure happens 2 times in one (rolling) hour, a message will be set, and the compressor continues to cycle between Phase 1, then Phase 2 and probably Phase 6.

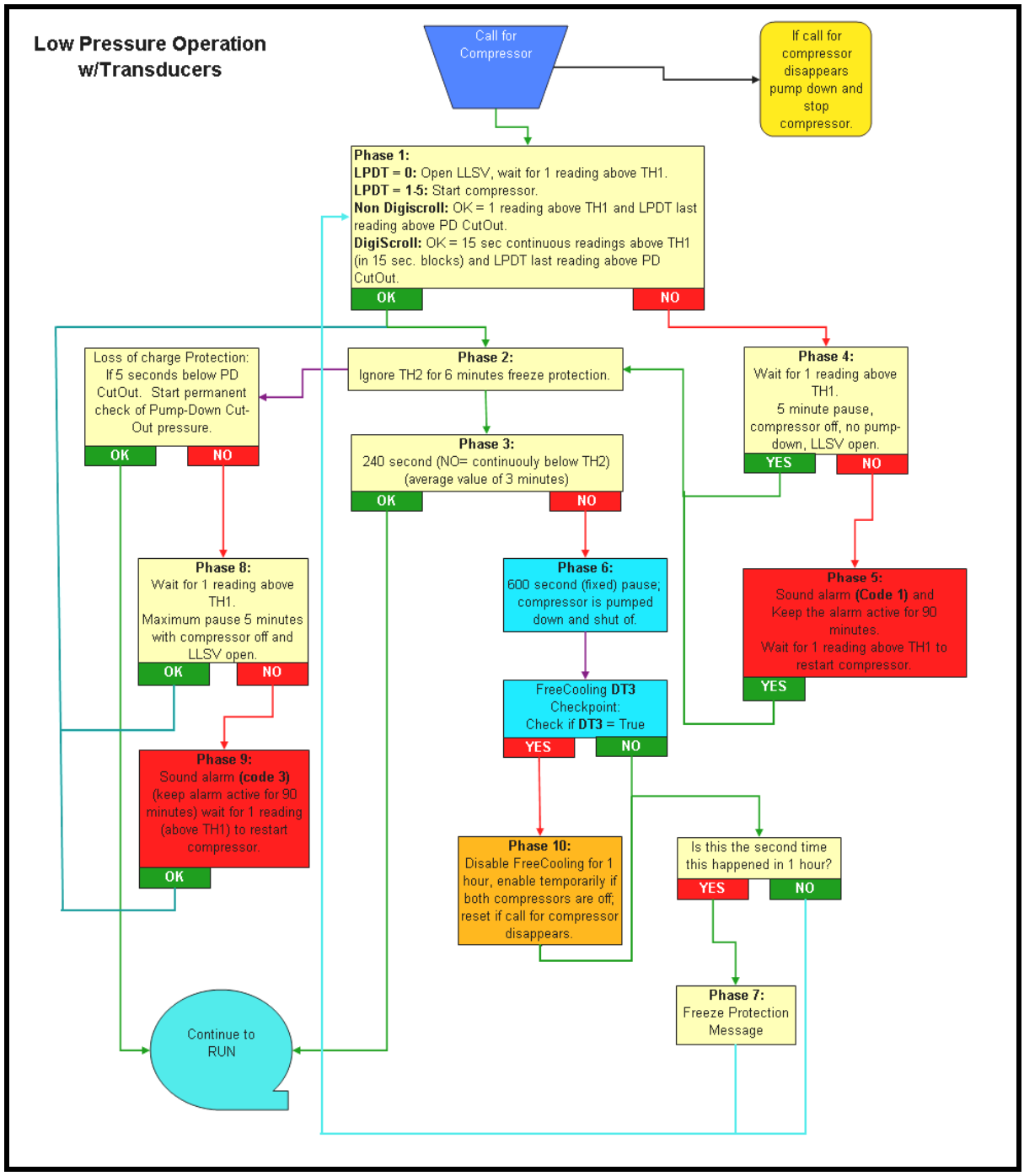
If the unit was operating in DX + FC Mode (and the FC valve is open), at the first leaving of Phase 6 the "flow" will check (after the 600 seconds compressor off time) if at the DT 3 (A138) checkpoint the actual unit temperature is above DT 3 (A138 see below). If true, then Freecooling will be disabled (Phase 10) for maximum of 1 hour or until both compressors are off (Freecooling will be disabled inside this 1 hour when 1 compressor restarts), and the compressor continues to cycle between Phase 1, then Phase 2 and probably Phase 6. If the call for cooling goes away, Phase 10 is reset, 1-hour timer.

Loss of Charge Protection

After Phase 1, once the pressure reaches the low pressure cut-out (single reading) the "flow" moves to phase 8: Wait 5 minutes to reach one single reading above Threshold 1. If OK move back to Phase 2, if NOK then move to Phase 9 and sound Alarm (Code 3), stop compressors, leave LLSV open, no pump down; and continue to wait a single reading to be above Threshold 1 to move to Phase 2. This waiting phase will last forever or as long as there is a call for cooling. The compressor may operate during the alarm is active, once the pressure conditions allow for it.

Phases	Conditions
1	Winter Start (Low Pressure Time Delay)
2	Start of Freeze Protection (6 minutes Threshold Phase 2 ignored)
3	Freeze Protection (4 minutes of 3 minutes worth of averages)
4	Did not make Winter Start. Waiting on one reading above Threshold Phase 1. LLSV open and compressor OFF. Five minute wait time.
5	Low Pressure Alarm (Code 1)
6	Compressor off for 10 minutes. LLSV Closed.
7	Freeze Protection Message (Code 2)
8	Off on Loss of Charge. Waiting on one reading above Threshold Phase 1. LLSV open and compressor OFF. Five minute wait time.
9	Low Pressure Alarm (Code 3)
10	Disable Freecooling for one hour. Compressor(s) will operate during this time.

See Flow Chart on next page.


Low Pressure Operation w/Transducers
Call for Compressor
If call for compressor disappears pump down and stop compressor.
Phase 1:
LPDT = 0: Open LLSV, wait for 1 reading above TH1.
LPDT = 1-5: Start compressor.
Non Digiscroll: OK = 1 reading above TH1 and LPDT last reading above PD CutOut.
DigiScroll: OK = 15 sec continuous readings above TH1 (in 15 sec. blocks) and LPDT last reading above PD CutOut.
OK
NO
Loss of charge Protection: If 5 seconds below PD CutOut. Start permanent check of Pump-Down Cut-Out pressure.
OK
NO
Phase 2:
Ignore TH2 for 6 minutes freeze protection.
Phase 3:
240 second (NO= continuouly below TH2) (average value of 3 minutes)
OK
NO
Phase 4:
Wait for 1 reading above TH1.
5 minute pause, compressor off, no pump-down, LLSV open.
YES
NO
Phase 8:
Wait for 1 reading above TH1.
Maximum pause 5 minutes with compressor off and LLSV open.
OK
NO
Phase 6:
600 second (fixed) pause; compressor is pumped down and shut of.
Phase 5:
Sound alarm (Code 1) and Keep the alarm active for 90 minutes.
Wait for 1 reading above TH1 to restart compressor.
YES
FreeCooling DT3 Checkpoint:
Check if DT3 = True
YES
NO
Phase 9:
Sound alarm (code 3) (keep alarm active for 90 minutes) wait for 1 reading (above TH1) to restart compressor.
OK
Phase 10:
Disable FreeCooling for 1 hour, enable temporarily if both compressors are off; reset if call for compressor disappears.
Is this the second time this happened in 1 hour?
YES
NO
Phase 7:
Freeze Protection Message
Continue to RUN

Pump Down
If the pump down parameter is enabled and when there is a call to turn off a compressor the LLSV is closed. If the low suction transducer value does not reach the pumpdown cutout parameter value within 60 seconds the LLSV is turned on than back off (to try to un-stick the LLSV). The control waits another 60 seconds trying to reach the cutout value, this process will be repeated 3 times. If, after 3 times, the low suction pressure switch does not open, the compressor and LLSV are locked off and an alarm "Pump Down not completed" will appear.

An additional internal program called pumpdown recycle is used to control compressor pump cycling. The control will re-pump down the compressor circuit if the transducer-value goes higher than the pumpdown recycle parameter value after the compressor has been stopped (turned off). A maximum of 6 re pump down cycles per hour are allowed by the control per compressor circuit. At the 7th request of re-pump down the alarm "Pump Down Fail" will appear and the compressor will be locked out.

Pump down is always performed loaded (for compressors with unloaders: unloader off, digital scroll: control solenoid valve disabled).

Low Pressure Switches
Units supplied with low pressure switches have fixed cut-in and cut-out values. Parameter A116 Low Pressure Device Type should be set to SWITCH.

When the compressor starts, the low-pressure digital input is ignored for a selected period of time. This time value is set to 3 minutes (factory default) on air-cooled units and to 0 minutes (factory default) on water and glycol cooled units.

Call for Compressor (Cooling or Dehumidification) w/Pressure Switches
After a **Call for Cooling** (CFC):

a) With Low Pressure Delay Time set to = 0: the LLSV opens, after one input OK reading the compressor starts (earliest 1 second after LLSV) Flow moves to phase 3 for both, digital scroll and all compressors.
b) With Low Pressure Delay Time set to ≠ 0: the LLSV opens, 1 second later the compressor starts.

The "flow" is now in **Phase 1**.

NON DigiScroll compressors
Let the compressor continue to run for LPDT value. If at the end of the LPDT time the switch is closed the flow moves to "Loss of Charge Protection" (Phase 3), and Phase 1 is finished.

Note: Semi-hermetic (4-step) compressors shall run @100% (capacity valve off) during the whole LPDT sequence.

DigiScroll compressors

Note: On units with Digital Scroll Compressors the unloader is energized 0.1 second before the compressor contactor is energized.

Let the compressor run @ 50% capacity for the LPDT value. For the last 30 seconds of the LPDT value, run compressor at 100%. If at the end of the LPDT time the switch is closed the flow moves to "Loss of Charge Protection" (Phase 3), and Phase 1 is finished. The “flow” is now in Phase 3, **Loss of charge protection**. The “flow” checks about having the digital input continuously OK for 5 seconds. If so, continue operation.

Low Pressure Phase Conditions

Failure in Phase 1
If Phase 1 is elapsed, the “flow” moves to **Phase 4**, with a maximum waiting time of 5 minutes, where it is looking for a single reading to be OK. If OK, then “flow” moves to “Loss of charge protection”.

NOTE: The compressor is OFF, no Pump down, LLSV is OPEN.

Failure in Phase 4
If pressure is not reached in Phase 4, the “flow” moves to phase 5: Sound an alarm (Code 1), stop the compressors, leave the LLSV open, no pump down; and waits a single reading to be above threshold 1 to move to Phase 3, “Loss of charge protection”. This waiting phase will last forever or as long as there is a call for cooling. The compressor may operate during the alarm is active, once the pressure conditions allow for it (see above).

Phase 3
After Phase 1, once the pressure input is NOK, the “flow” moves to Phase 8: Waits 5 minutes to reach one single OK reading. If OK continue operation, if NOK then move to Phase 9 and sound an alarm (Code 3), stop the compressors, leave LLSV open, no pump down; and continue to wait a single OK to start normal compressor operation. This waiting phase will last forever or as long as there is a call for cooling. The compressor may operate during the alarm is active, once the pressure conditions allow for it (see above).

Pump Down
If the pump down parameter is enabled, anytime a compressor is turned OFF and the low-pressure switch is closed (pressure OK), the compressor will be operated with the LLSV (liquid line solenoid valve) closed (de-energized) until the low-pressure switch opens (low pressure condition, without giving alarm). When there is a call to turn off a compressor the LLSV is closed. If the low suction pressure switch (LPS) does not open within 60 seconds the LLSV is turned on than back off (to try to unstuck the LLSV). The control waits another 60 seconds for the LPS to open, this will happen 3 times. If, after 3 times, the low suction pressure switch

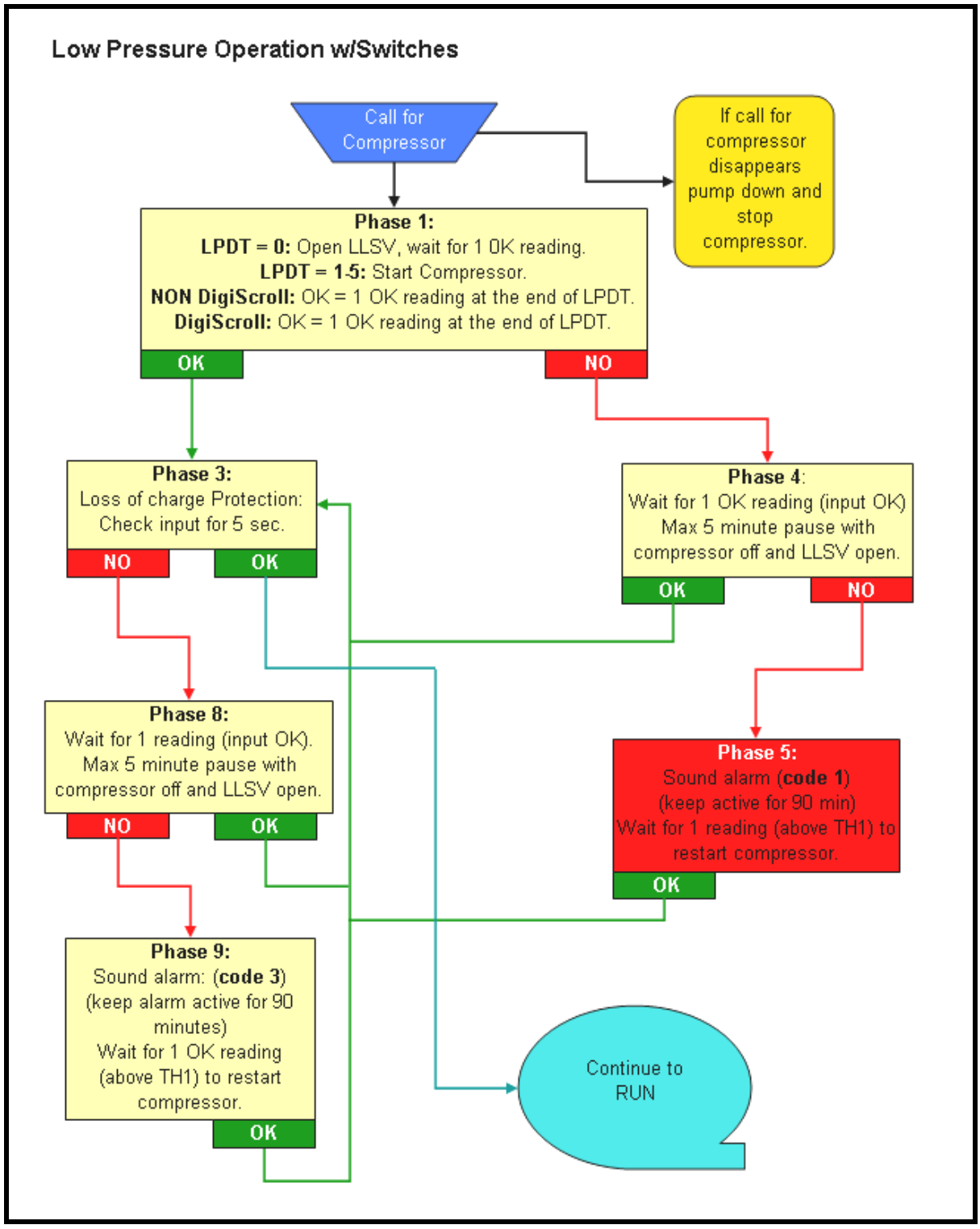
does not open, the compressor and LLSV are locked off and an alarm “Pump Down Fail” will appear.

There is a re-pump down if the LPS opens again after the compressor has been already stopped – a maximum of 6 re-pump-down cycles per hour are allowed: at the 7th request of re-pump down the alarm “Pump Down Fail” will appear and the compressor will be locked out.

Pump down is always performed loaded (for compressors with unloaders: unloaders off, digital scroll: control solenoid valve disabled).

Phases	Conditions
1	Winter Start (Low Pressure Time Delay)
3	Loss of Charge
4	Did not make Winter Start. Waiting on closure of pressure switch. LLSV open and compressor OFF. Five minute wait time.
5	Low Pressure Alarm (Code 1)
8	Off on Loss of Charge. Waiting on closure of pressure switch. LLSV open and compressor OFF. Five minute wait time.
9	Low Pressure Alarm (Code 3)

See Flow Chart on next page.


Low Pressure Operation w/Switches
Call for Compressor
If call for compressor disappears pump down and stop compressor.
Phase 1:
LPDT = 0: Open LLSV, wait for 1 OK reading.
LPDT = 1-5: Start Compressor.
NON DigiScroll: OK = 1 OK reading at the end of LPDT.
DigiScroll: OK = 1 OK reading at the end of LPDT.
OK
NO
Phase 3:
Loss of charge Protection:
Check input for 5 sec.
NO
OK
Phase 4:
Wait for 1 OK reading (input OK)
Max 5 minute pause with compressor off and LLSV open.
OK
NO
Phase 8:
Wait for 1 reading (input OK).
Max 5 minute pause with compressor off and LLSV open.
NO
OK
Phase 5:
Sound alarm (code 1)
(keep active for 90 min)
Wait for 1 reading (above TH1) to restart compressor.
OK
Phase 9:
Sound alarm: (code 3)
(keep alarm active for 90 minutes)
Wait for 1 OK reading (above TH1) to restart compressor.
OK
Continue to RUN

Next Maintenance Calculation

Foreword
The next maintenance calculation will help run the Liebert Environmental unit in an optimum way to ensure minimum component stress resulting in increased reliability.

Calculation of next Maintenance Parameters
The following components are included in the calculation individually:

- Fan(s)
- Compressor 1
- Compressor 2
- Electric Heaters
- Humidifier

For **each individual component** the next maintenance will be calculated from following parameters:

1. Standard service interval: No, 1 through 12 times per year (programmed by the customer).
2. Working hours (counted by control).
3. Number of starts (counted by control).
4. Average running time (calculated by control).
5. Optimum number of starts per hour (programmed by the customer).
6. Maximum number of starts per hour (programmed by the customer).
7. Maximum bonus to enlarge time to next maintenance (calculated by control).
8. Maximum penalty to reduce time to next maintenance (calculated by control).

Maintenance Calculation
Basic: maintenance frequency (1). The control counts the working hours of the component, as well as the number of starts.

The working hours and the number of starts are compared with the programmed optimum/maximum starts per hour. This results in “Wellness Factor”.

This factor, in accordance to the service interval, will add a “Bonus” to increase the time before the next maintenance, or will add a “Penalty” to decrease the time before the next maintenance. In simple words: If a component starts very often, the time to next maintenance will be decreased, if it starts rarely, the time to next maintenance will be increased.

The control always takes the component with the most on/ off (cycling) as the reference component, which asking for the nearest maintenance (example: if the fan runs continuously, but the compressor switches on/off all the time, the next maintenance will be calculated from the compressor).

Alarms or warnings (like clogged filter, high or low pressure, fans alarm etc.) will decrease the time to next maintenance immediately to 0. If the alarm was reset, the original situation will be displayed again, but the alarm will be counted in the diagnostics window.

The display's main window provides information about the next maintenance: a bar graph (graphical display screen) will fill in, as the next maintenance gets closer (the width of the graph equals to the standard maintenance Interval (No, 1 through 12 times a year). The date of the next maintenance is also displayed.

Parameters for next Maintenance Calculation

General Maintenance Settings

Maintenance Frequency
Can be set for NO or 1 thru 12 times a year. NO means the maintenance calculation program is disabled.

Maximum Bonus
This value increases the time to next maintenance if all components run in optimum way (number of starts, average running time).

Maximum Penalty
This value decreases the time to next maintenance if some components run in non-optimum way (number of starts, average running time).

Last Maintenance
This date can be will be set by the calculations and the service-engineer and can be viewed by others.

Service Engineer
Name can be added or edited.

Reset
Resets the counters for all of the components (fans, compressors, etc.) to zero (0). Starts new maintenance calculation (reset after maintenance is completed).

Fans/Heaters/Humidifier/Compressor 1 and 2 Settings

Number of Starts and Working hours
The number of starts and total operating hours of each device is counted and recorded since the last maintenance reset. Total working hours can be read in the standard working hour's window (customer window).

Average Working Hours
This value is calculated from the total run hours or each component and the number of starts per component.

Starts per Day Optimum
The number of individual component starts that is considered good or optimum. To be set by the Service Engineer if the next Maintenance Calculation program is used.

Starts per Day Worst
The number of individual component starts that is considered as "hunting" (worst case). To be set by the Service Engineer if the next Maintenance Calculation program is used.

Number of Alarms
Counts the number of alarms occurring between service intervals per the individual components.

Actual Bonus
Is calculated from the "number of starts" and "average working time". The result can be positive (for a bonus) or negative (for a penalty). This value influences the time remaining to the next maintenance interval.

Shared Parameters

If we have multiple units in the same room (zone) they will need to communicate with each other to avoid opposite operational functions. This will prevent the cooling and heating functions from operating at the same time on different units. This condition called "fighting", often exists in the room due to imbalanced loads and the crossing of airflow conditions. This is also considered when using the Lead/Lag and Cascade functions.

When a system is setup the parameters are shared by all units. The unit selected as the Lead Unit (#1 unit) is used to program the system. If program parameters are not set in this unit they will be ignored. This is true for all of the active units in the system. However, if a unit in the system is not active it will be ignored until it is active and the parameters will be shared within 2 minutes of activation.

Shared Temperature and Humidity Parameters Example
Two units share the master Temperature Control (1/2) Proportional Band Setting such as 10°F, and then each unit will use the master band divided by 2 (units) or 5°F proportional bands. To avoid the cooling hunting process or compressor cycling too quickly, the primary temperature proportional band needs to be set wide enough to compensate for the number of units in the system setup. Note that shared parameters are not used on single unit applications.

Heating, humidification, and dehumidification will follow the same example with each function starting in each unit one after the other or in sequence.

In Chilled Water units the valves normally operate in parallel, but this operation may be overridden by using the optional Supply Limit Sensor. This parameter used with the optional sensor allows the chilled water valve to be controlled by the individual unit. Here we may see uneven valve positioning (operation) in some of the units.

Freecooling and Dual Cooling units will operate in the same manner as chilled water with the supervision of the Supply Limit, again showing different valve positions on the units

If in a Freecooling or Dual Cooling unit if the limit of the coil operation is detected (no free cooling or no CW available) the valve will close off and unit will become DX operation in the system.

Networking and Functions

Unit 2 Unit (U2U) Communications by networking will allow the following functions to be placed into operation when the requirements exist. The user must install the correct hardware and properly program the units to use any of the functions.

In the *iCOM* Network the owner may perform the following functions:

Teamwork Mode Functions
Allow multiple stages of Cooling/Heating and/or Humidification/Dehumidification. The ability to prevent the units fighting is included in this control feature.

Lead/Lag Function
Allows one or more units to be programmed as “Lead” (Running) as well as one or more units to be programmed as “Lag” (Standby) for unit switchover if an alarm is activated in one of the “Lead” units. This control feature also has the ability to be programmed to perform unit rotation to assure the operational functionality of the standby units.

Cascade Function
Allows additional units to be staged on/off based on the temperature or humidity requirement.

iCOM Network Setup Process

To setup a system network with the iCOM control requires a complete understanding of the control processes and parameter programming to insure the proper functional operation without incident. To insure the setup is correct and that the operation will function as selected you need to map both the room layout and the unit setup. First, read and record all programmed settings in all of the single units. Second, document the network parameter settings that are needed and identify the numerical order of the units to be networked. The order of the setup process is very important.

Basics for Cooling Unit Placement
Installation instructions are found in the product manuals for the Cooling units. Networking setup should include these additional factors for planning.

- Locations of heat loads in conditioned space.
- Air distribution for cooling.
- Number of operating units versus standby.

Multi-unit networking hardware

Minimum Network Switch Requirements:

- IEEE 802.3, IEEE 802.3u
- 10/100 Mbps speed
- Multiple RJ-45 ports – one shared RJ45 uplink
- CAT 5 or greater patch cables (straight through) in the proper lengths not to exceed 150 ft. maximum length each. One for each board and large display added into the iCOM network. Cable management will apply.

Basics for Programming
An IP address number will be used to identify each receiver/ sender of information. (See Computer and Network Terms in Training and Service Manual)

The iCOM Network is a Class C **Private Network** and will use the 192.168.254.xxx series of static IP address. This has nothing to do with the local building or owner network. The iCOM Network may only be connected to these networks through a Liebert WEB Card or 485 Card using the Liebert Intellislot.

A series of basic rules must be followed to connect and program the units for this private iCOM Network. See the following rules.

Small Displays

1. Small Displays use a single CAN (controller area network) connection between the display and the unit control board. A small display can only program the control board it is connected to.

2. Only two units with Small Displays can be networked together. Networking is accomplished using a direct wiring connection with a CAT 5 or greater crossover cable between the two control boards.

3. Small Displays **cannot** look at or be used to program the other *iCOM* control board when connected in a Network configuration.

4. Typically two units with small displays are networked for Lead/Lag (Running/Standby) operation. The units will rotate on either an alarm condition or by operating time.

Large Displays

1. All Large Displays and Control Boards will use a CAT 5 or greater straight through (patch) cables to connect to the switch.

2. One Large Display (Wall Mount) with a separate power adapter may be used with multiple units through the network switch.

3. Each set of unit control boards must be set up individually, then connected to the network switch and checked before the next unit can be setup.

4. Large Displays and Control Boards must different IP Addresses between them.

- Factory Default: Large Display: 192.168.254.003
- Factory Default: Control Board: 192.168.254.001

5. Each Large Display and Control Board in the *iCOM* network does not use the Gateway IP Addresses (all zeros).

- Factory Default: Gateway IP Address: 000.000.000.000

6. Each Display and Control Board in the *iCOM* network must have the same Netmask IP Address.

- Factory Default: Netmask IP Address = 255.255.255.000

7. The Unit to Unit (U2U) Address must be programmed for each control board and large display. U2U Addresses must be used in sequence.

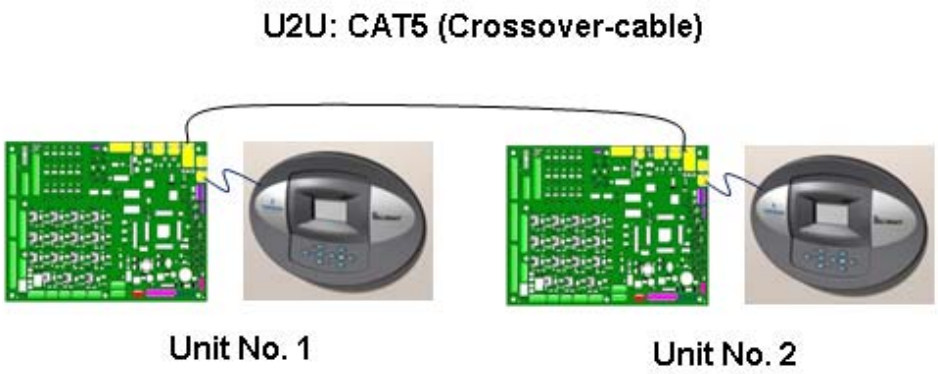
- Control Board U2U Address Range: 1 – 32 (factory default is 1)
- Large Display U2U Address Range: 33 – 64 (factory default is 33)

Example A: 2 Units with Small Display's

The following referenced parameters are located in the in the Network Menu.

Large Control Boards

S836	Control Board IP Address	192.168.254.xxx
S837	Control Board Netmask IP Address	255.255.255.000 (must be the same in each unit)
S838	Control Board Gateway IP Address	000.000.000.000 (must be the same in each unit)
S841	Control Board U2U Address	1 or 2 (unit #1 is the lead unit)
S842	U2U Group	1 (must be the same in each unit)



The cross-over cable is connected to the Ethernet port on each control board.

Example B: 2 Units, One Large Display and One Small Display

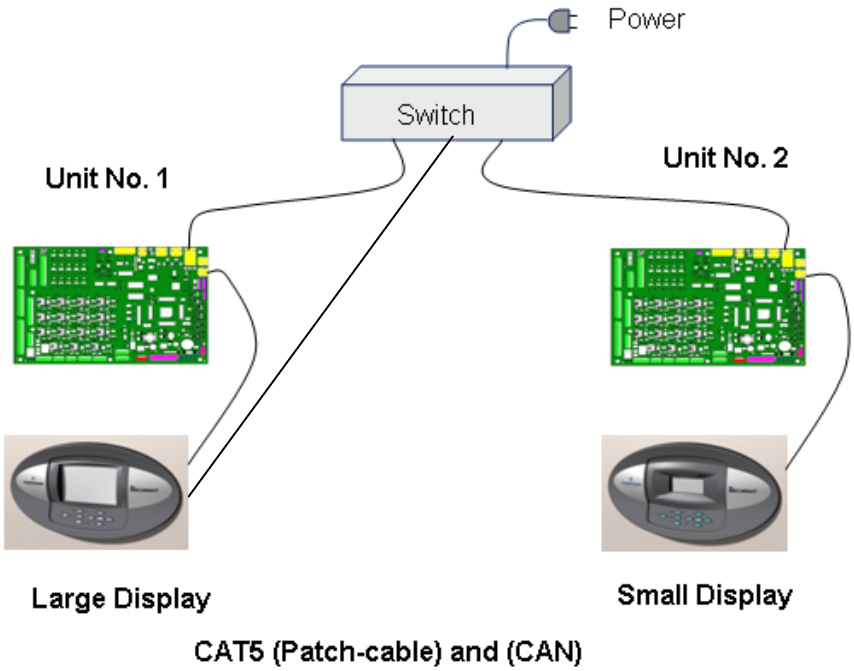
The following referenced parameters are located in the in the Network Menu.

Large Display

S802	Number of Connected Units	1 - 32
S813	Large Display IP Address	192.168.254.xxx
S814	Large Display Netmask IP Address	255.255.255.000 (must be the same in each display)
S815	Large Display Gateway IP Address	000.000.000.000 (must be the same in each display)
S818	Large Display U2U Address	33
S819	Large Display U2U Group	1 (must be the same in each display)

Large Control Boards

S836	Control Board IP Address	192.168.254.xxx
S837	Control Board Netmask IP Address	255.255.255.000 (must be the same in each unit)
S838	Control Board Gateway IP Address	000.000.000.000 (must be the same in each unit)
S841	Control Board U2U Address	1 or 2 (unit #1 is the lead unit)
S842	U2U Group	1 (must be the same in each unit)



Example C: One Large Wall Display and Five Small Display Units

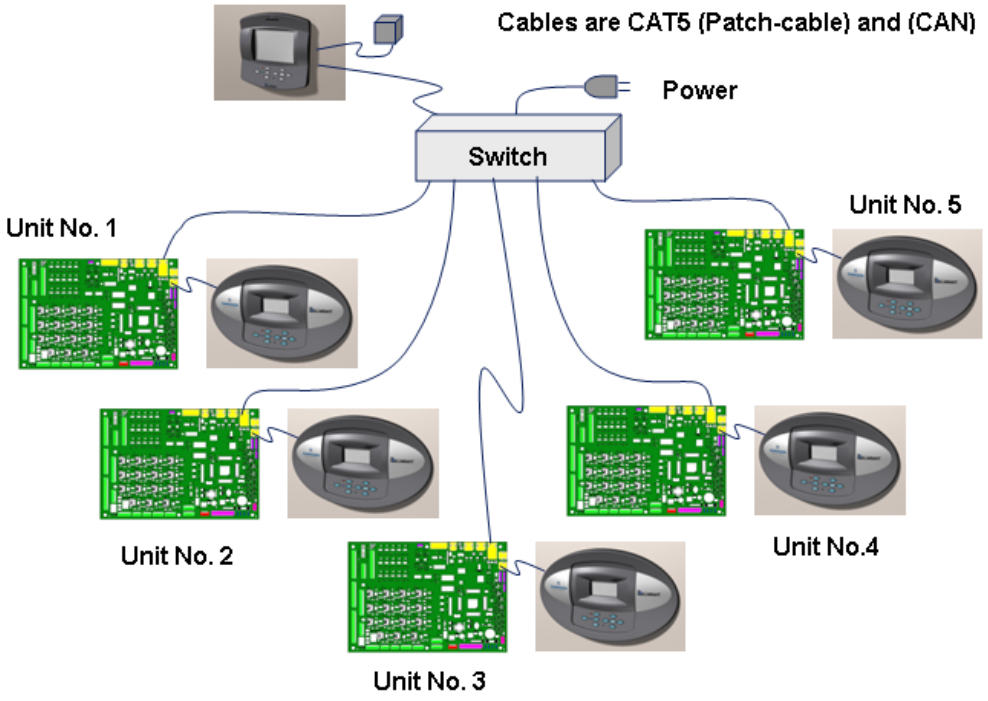
The following references parameters in the Network Menu.

Remote Wall Mounted Large Display

S802	Number of Connected Units	1 - 32
S813	Large Display IP Address	192.168.254.xxx
S814	Large Display Netmask IP Address	255.255.255.000 (must be the same in each display)
S815	Large Display Gateway IP Address	000.000.000.000 (must be the same in each display)
S818	Large Display U2U Address	33
S819	Large Display U2U Group	1 (must be the same in each display)

Large Control Boards

S836	Control Board IP Address	192.168.254.xxx
S837	Control Board Netmask IP Address	255.255.255.000 (must be the same in each unit)
S838	Control Board Gateway IP Address	000.000.000.000 (must be the same in each unit)
S841	Control Board U2U Address	1 or 2 (unit #1 is the lead unit)
S842	U2U Group	1 (must be the same in each unit)



Example D: Four Units with Small Displays in 2 Groups with Large Wall Mounted Displays

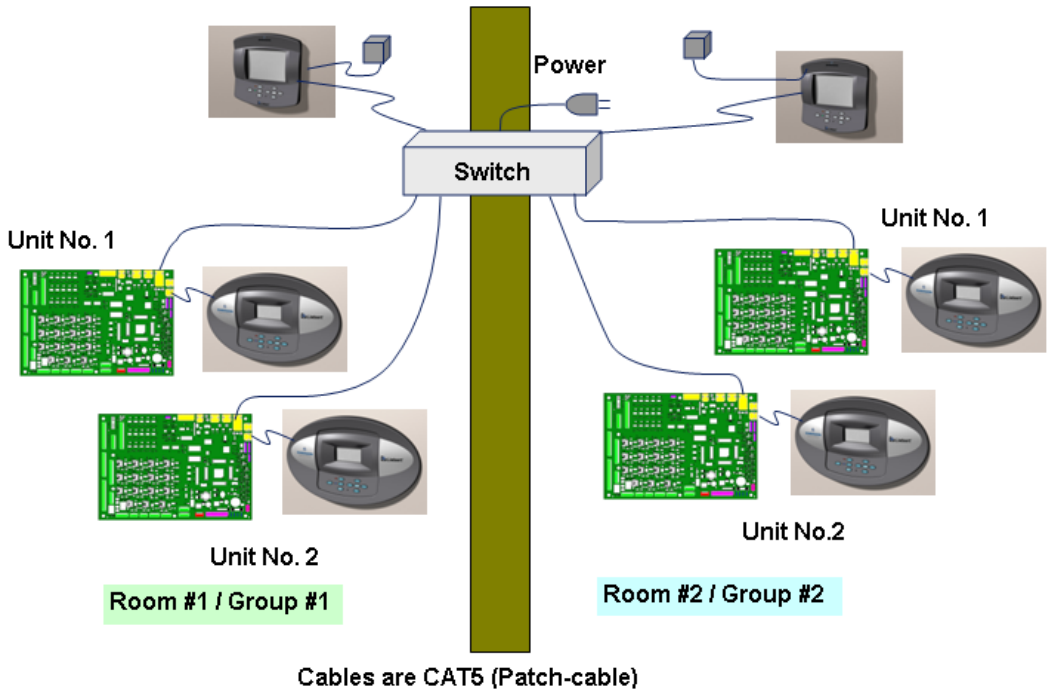
The following references parameters in the Network Menu.

Remote Wall Mounted Large Displays

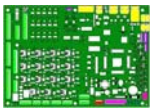
S802	Number of Connected Units	1 - 32
S813	Large Display IP Address	192.168.254.xxx
S814	Large Display Netmask IP Address	255.255.255.000 (must be the same in each unit)
S815	Large Display Gateway IP Address	000.000.000.000 (must be the same in each unit)
S818	Large Display U2U Address	33, 34
S819	Large Display U2U Group	1, 2

Large Control Boards

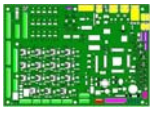
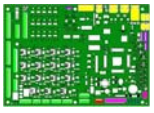
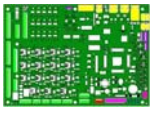
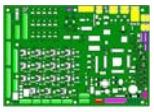
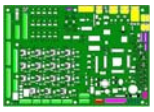
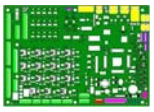
S836	Control Board IP Address	192.168.254.xxx
S837	Control Board Netmask IP Address	255.255.255.000 (must be the same in each unit)
S838	Control Board Gateway IP Address	000.000.000.000 (must be the same in each unit)
S841	Control Board U2U Address	1 or 2
S842	U2U Group	1, 2



Multi-Unit IP Address Setup Chart Sample



Default Addresses			
Control Board		**Large Display**	
S836	192.168.254.001	**S813**	192.168.254.003
S837	255.255.255.000	**S814**	255.255.255.000
S838	000.000.000.000	**S815**	000.000.000.000

Unit #1		Unit #2		Unit #3	
					
U2U = 1	**U2U = 33**	**U2U = 2**	**U2U =34**	**U2U = 3**	**U2U =35**
192.168.254.001	192.168.254.002	192.168.254.003	192.168.254.004	192.168.254.005	192.168.254.006
253.255.255.000	255.255.255.000	253.255.255.000	253.255.255.000	253.255.255.000	253.255.255.000
000.000.000.000	000.000.000.000	000.000.000.000	000.000.000.000	000.000.000.000	000.000.000.000
Unit #4		**Unit #5**		**Unit #6**	
					
U2U = 4	**U2U = 36**	**U2U = 5**	**U2U = 37**	**U2U = 6**	**U2U = 38**
192.168.254.007	192.168.254.008	192.168.254.009	192.168.254.010	192.168.254.011	192.168.254.012
253.255.255.000	255.255.255.000	253.255.255.000	255.255.255.000	253.255.255.000	255.255.255.000
000.000.000.000	000.000.000.000	000.000.000.000	000.000.000.000	000.000.000.000	000.000.000.000

Teamwork

Teamwork

Teamwork is the ability to group unit functionality, while connected in a network to provide the ability to work together as a team. There are three different teamwork modes.

No Teamwork

In this mode all units are working independently for control and functionality. No values or sensors are shared. System View will show averaged temperature and humidity conditions of all networked units. While in this mode units may be setup to provide the Lead/Lag function and rotation, however, units may not be setup in the Cascade functionality.

Teamwork Mode 1

In this mode unit parameters (system settings) are shared if the system value is changed in any of the units, all units will follow with same settings. (See Glossary of Unit and System parameters section).

- If the switch used in the network fails, all units will run independently
- Autoset Enable automatically sets the Proportional Band for each unit networked at 7ºF..
- If more than two units; Integration Time may be required
- Averaged Temperature and Humidity conditions shown in System View
- Units operate off of the averaged T/H values of all available units (fans on) and compares to system setpoint and proportional band
- Unit #1 calculates the system deviation (0 - 100%)
- Unit #1 determines the operational requirements
- Full band divided by number of available units
- 2 unit example: Unit #1 operates in 1-50% (first half) of the proportional band; Unit #2 operates in 51 – 100% (second half) of the proportional band. This applies to all functions – Cooling, Heating, Humidification and Dehumidification.
- Standby – Lead/Lag allowed
- Cascades standby unit(s)
- Chilled Water and Freecooling valves driven in parallel
- Changeover to second cooling source, dehumidification low limit and supply limit are controlled locally by each unit in operation
- Operates by staging loads on starting with the #1 unit and will rotate this function every 24 hours

Teamwork Mode 2

In teamwork mode 2 all system parameters are shared equally as in teamwork mode 1. The lead unit will average the temperature and humidity of all connected units. Each unit operates on its own sensors for their operational needs if there is a request for cooling, heating, dehumidification or humidification.

- Autoset will not automatically adjust the proportional band
- Uses the average temperature and humidity readings to release all units to operate in Cooling, Heating, Humidification, or Dehumidification
- Each unit in the network operates on its own temperature and humidity sensors
- Opposite operational functions prevented (stops fighting)
- Standby – Lead/Lag allowed
- No Cascade of standby unit(s)
- If the switch used in the network fails, all units will run independently

Unit Lead/Lag or Running/Standby Function

This program will allow the user to select the multi-unit function of Lead – Lag operation of the networked unit (sometimes called Running and Standby). By selecting the number of running and standby units, you can to provide the redundancy needed in controlling the conditioned space.

Typical Lead/Lag (Running/Standby) Function

The lead/lag operational sequence has a lead (running) unit(s) operating. If an alarm becomes active, the active alarm will cause the first lag (standby) unit to active and maintain the space conditions. If multiple units are selected as lag (standby) the units will continue to rotate on active alarms as long as a lag unit is available. If there are no lag (standby) units left in the sequence the first failed will restart (if not in a critical alarm state i.e. fan overload, etc).

The lag unit will start one minute after the alarm has sounded. The unit with the active alarm will operate in the fan only mode for 3 minutes before going into a standby mode to stabilize its internal conditions, and then it will turn off.

The Lead/Lag function may be used in the No Teamwork Mode, Teamwork 1 Mode, or Teamwork 2 Mode. One or more units can be defined as lag (standby), the normal status of the lag (standby) unit(s) is off.

The lag or standby function can be performed as a daily rotation (setting the time), weekly rotation (setting the day of the week and time) or as a monthly rotation. The units will rotate based on the programmed number of units.

If the end user enables the parameter "Start all Standby units by HT" all available standby units will turn ON and will continue to run until the return air temperature in the unit in alarm decrease to approximately 5°F below the high temperature alarm setpoint.

Example A: In a basic 4 unit configuration, units 1, 2 and 3 are programmed to be operating and unit 4 is programmed to be standby. The "Rotate By" parameter is programmed to 1 unit. When the control calls for the units to rotate by "1 unit" the following sequence occurs:

Unit Number	Initial Setup	1st Rotation	2nd Rotation	3rd Rotation	4th Rotation
1	Operating	Standby	Operating	Operating	Operating
2	Operating	Operating	Standby	Operating	Operating
3	Operating	Operating	Operating	Standby	Operating
4	Standby	Operating	Operating	Operating	Standby

In this configuration, by the fourth rotation the units are back to the original setup - units 1, 2 and 3 operating with unit 4 in standby.

Example B: In a basic 4 unit configuration, units 1 and 2 are programmed to be operating and units 3 and 4 are programmed to be standby. The "Rotate By" parameter is programmed to 2 units. When the control calls for the units to rotate by "2 units" the following sequence occurs:

Unit Number	Initial Setup	1st Rotation	2nd Rotation	3rd Rotation	4th Rotation
1	Operating	Standby	Operating	Standby	Operating
2	Operating	Standby	Operating	Standby	Operating
3	Standby	Operating	Standby	Operating	Standby
4	Standby	Operating	Standby	Operating	Standby

In this configuration, by every second rotation the units are back to the original setup - units 1 and 2 operating with units 3 and 4 in standby.

Standby and Cascade

Normally the standby unit(s) will start when an alarm occurs in of one of the running units. If the standby units are also programmed to cascade, they will start in order to "help" the operating units control the room. If the temperature and/or humidity condition exceeds the programmed control range, the cascaded units are switched ON before a high or low temperature or humidity alarm occurs. The cascaded units are switched OFF again as soon as the temperature and/or humidity conditions return to the programmed control range.

- Available in Teamwork 1 only
- Starts stand-by unit(s) to help operating unit(s)
- Stand-by unit requires a 100% call from the Lead (#1) unit before turning on
- Standby unit waits for an alarm or additional requirement
- Lead (#1) unit defines proportional band according to available units
- Cascaded units are not included in the calculation of the average temperature and/or humidity readings

Programmable Cascade Settings	
Cascade Cooling/Heating and Humidification/Dehumidification	Yes
Cascade for Cooling and Heating	Cool/Heat
Cascade for Cooling only	Cooling

Notes:

Chapter 2

Programming Functions

The standard *iCOM* control is supplied with a front panel mounted small display screen display which features a 128 x 64 dot matrix graphics. The display provides both descriptive text readouts and two (2) menu icons. The optional large screen display features a 320 x 240 dot matrix graphic display that shows user and service icons as well as descriptive text and graphics. The information provided visually on either of these displays are room temperature and humidity, temperature and humidity set points, alarm status and settings, event histories and the current time. All programming functions will be done through the supplied display.

Small Display with Panel Mounted Bezel

Optional Large Display with Panel Mounted Bezel

iCOM Display Components and Functions

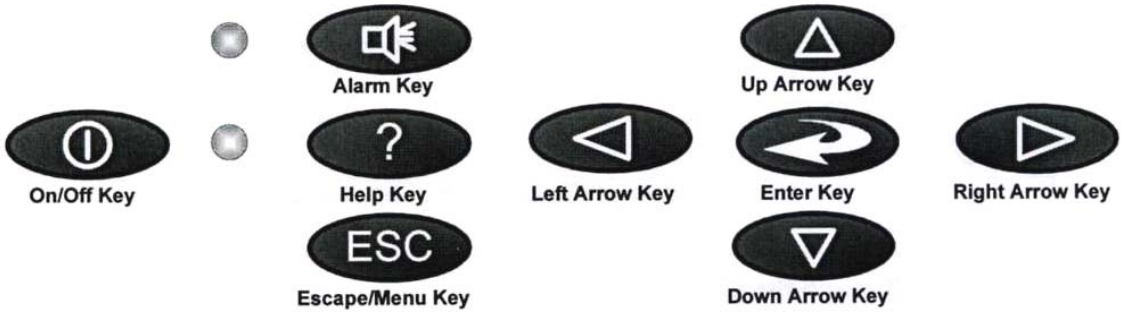
The keypad functions and LEDs are identical on both the Small and Large displays. The large display is shown for reference.

Liquid Crystal display

LED Status Indicators
Top LED is red or flashing red - alarm,
Bottom LED is amber (power on) or green (unit on)

Keypad

iCOM Keypad Layout:

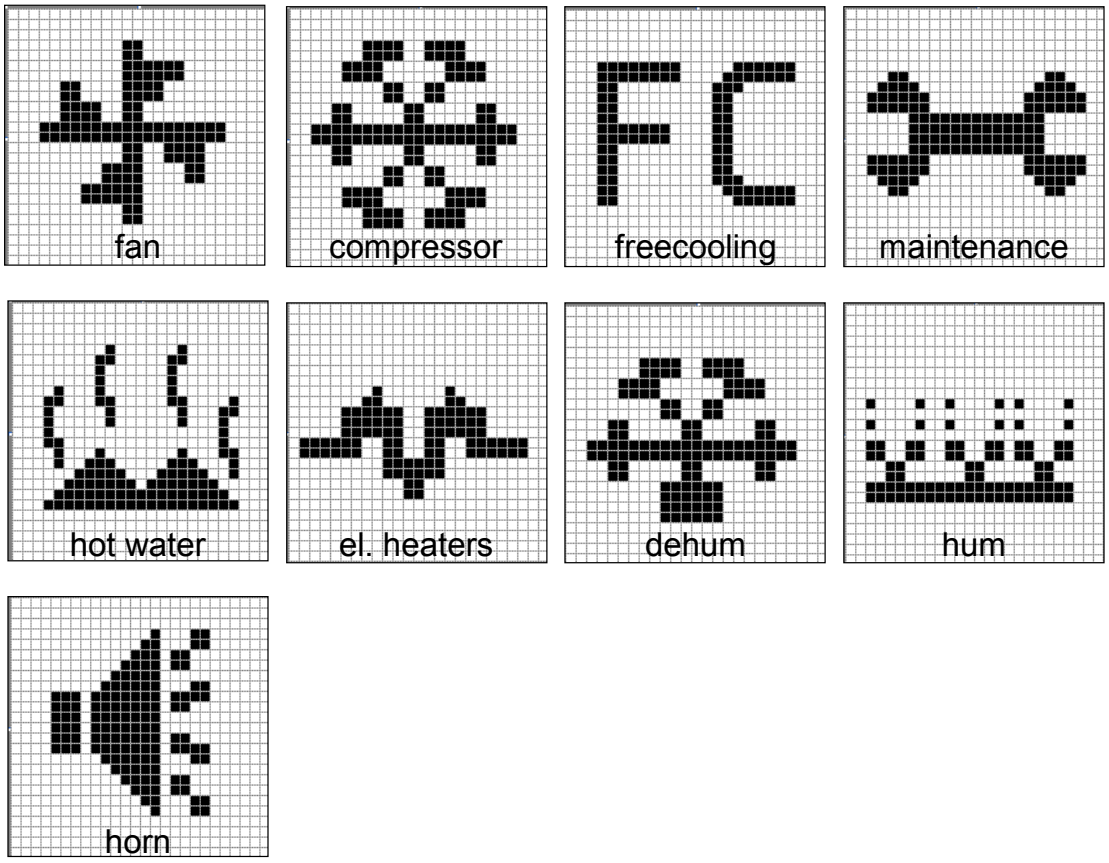


The *iCOM* control screen displays text and icons for monitoring and programming your Liebert unit and/ or network of units. The number of icons and the amount of text shown depends upon the display type supplied on your unit. From the default menu, the user menu may be accessed by pressing the enter key. When the user selects an icon the various submenus, set points, status, thresholds and service information is displayed. The following defines the various keyboard icons and functions.

iCOM Keypad Descriptions:

Icon	Key Name	Function
	On/Off Key	Controls the operation state of the unit.
	Alarm Key	Silences the audible alarm.
	Help Key	Accesses the integrated help menus.
	ESCape Key	Returns to the previous display.
	Enter Key	Confirms all selections, icons and text.
	Increase Key (Up Arrow)	Moves upward through the menu or increases the value of the selected parameter.
	Decrease Key (Down Arrow)	Moves downward through the menu or decreases the value of the selected parameter.
	Left Arrow Key	Navigates through text and selections of the display.
	Right Arrow Key	Navigates through text and selections of the display.
	Upper LED	Blinking Red: Active, unacknowledged alarm exists. Solid Red: Active, acknowledged alarm exists.
	Lower LED	Amber: Power available to the unit, unit is NOT operating. Green: Power available to the unit, unit is operating.

iCOM Display Symbols/Icons



The *iCOM* programming functions are separated into three (3) basic menus:

- User Menu
- Service Menu
- Advanced Menu

When the desired icon has been selected, press the enter key. If the selected menu item has submenus, they are now revealed. If there are no submenus, the function or setting or command level text is displayed. User and Service menu settings are readable without a password, changing the programmed values requires a password. When a password is required to perform a programming function, the *iCOM* displays a password prompt. Advanced menu setting requires a password to read and program.

Programming Functions

Displays
The **Large and Small Display's** have the ability to present information in two formats:

The **Graphic** format shows a bar graph and icon for every function (even if your unit does not use this function). The bar is highlighted when the function is operational, indicating the percent operating of the required function.

The **Simple** format will reduce the amount of graphics displayed and offers a not so busy display of the same information. If the operational function is not active the icon will not appear on the screen. The Large Display will show the percent operating of the required function.

The end user can also select from dark background with white text or light background with dark text.

The Large Display provides the additional information:

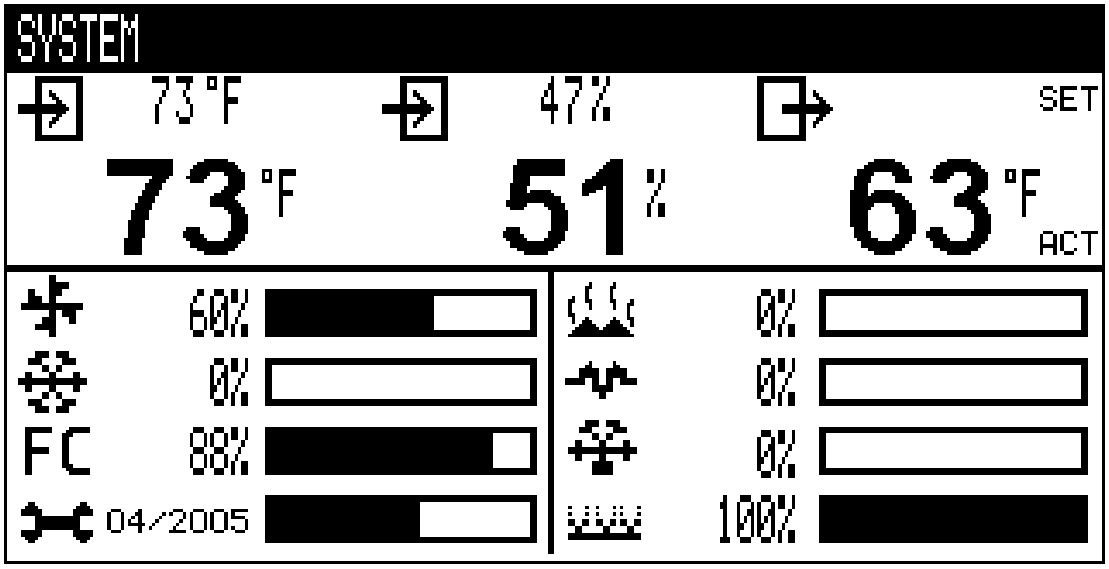
A **System** View and **Unit** View plus, the bottom of the screen will indicate date, time, on/off status and events. The message area below will provide additional information and provide some basic navigation help.

In the System View, only the temperature and humidity readings from the sensors will be displayed. In the Unit View, it shows the temperature and humidity setpoint plus the temperature and humidity readings from the sensor and also the unit name and number.

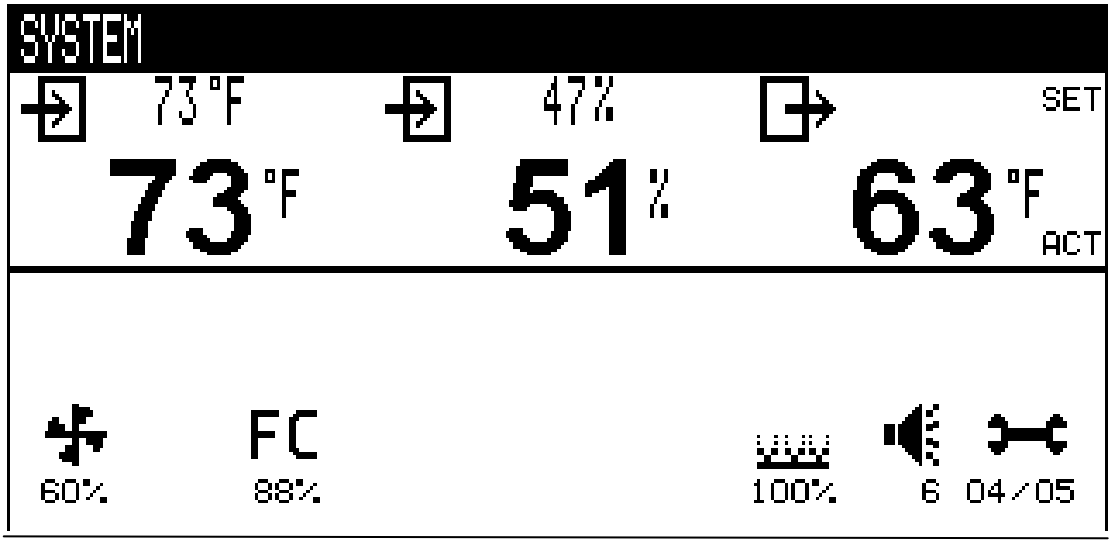
The Small Display only shows a Unit View. It also shows the temperature and humidity setpoint plus the temperature and humidity readings from the sensor. The top of the display will give you the unit name and number and on/off status.

On the next two pages are the views you would see.

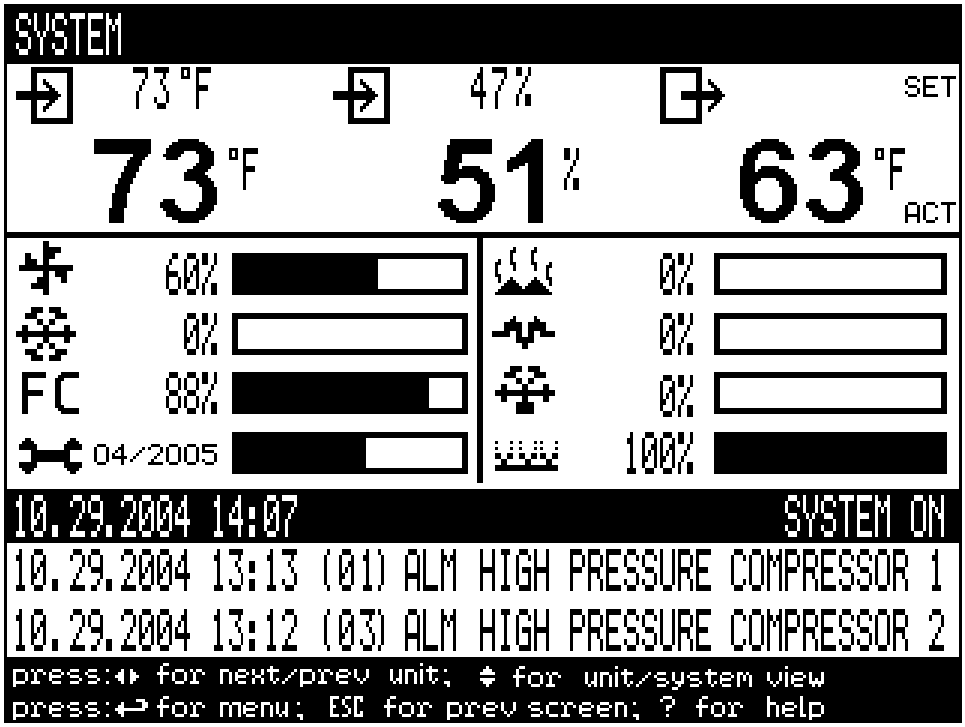
Small Display Graphic View



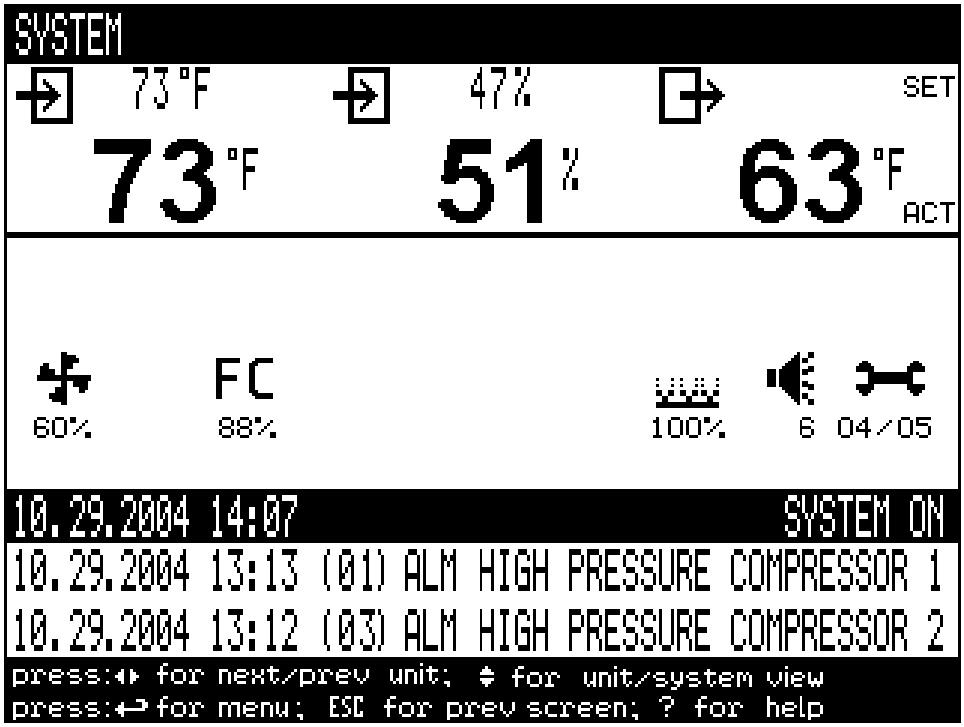
Small Display Simple View



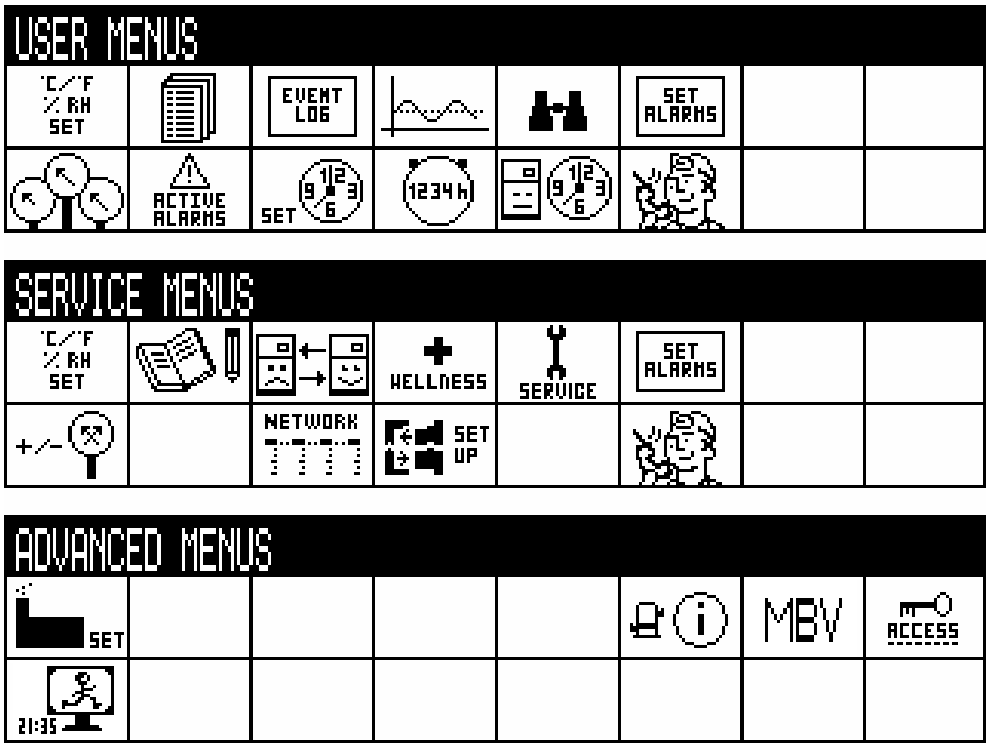
Large Display Graphic View



Large Display Simple View



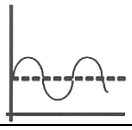
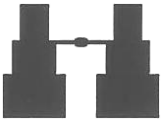
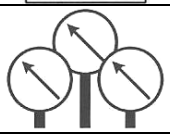
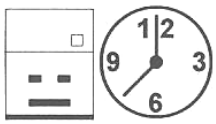
Menu Screens and Symbols



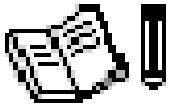
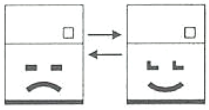
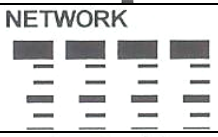
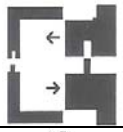
Menu Parameters Names

Level 1: User	Level 2: Service	Level 3: Advanced
Readable w/o password PW required to program	**Readable w/o password PW required to program**	**Readable w/o password PW required to program**
Setpoints	Setpoints	Factory Settings
Spare Parts List **(Large Display - Read only)**	Unit Diary **(Large Display - Read only)**	Compressor Info **(Read only - Large Display)**
Events Log **(Read Only)**	Standby Settings/Lead-Lag	Motorized Ball Valve Settings **(Large Display only)**
Graphics	Wellness/Maintenance	Access **(Large Display only)**
View Network **(Large Display - Read Only)**	Diagnostics/Service Mode	Runtime Monitoring **(Large Display only)**
Set Alarms	Set Alarms	
Sensor Data **(Read Only)**	Sensor Calibration/Setup	
Active Alarms **(Read Only)**	System/Network Setup	
Display Setup	Options Setup	
Total Run Hours **(Read Only)**	Service Contact Info	
Sleep Mode		
Service Contact Info **(Read Only)**		

User Menu Icons and Descriptions

Icon	Name	Descriptions	Available Display
°C/ °F % RH SET	Setpoints	To view and change temperature and humidity set points	Small and Large
	Spare Parts List	Displays the spare parts list of the unit	Large only
EVENT LOG	Event Log	Contains a log of the last 400 events	Small and Large
	Graphic Data Record	Displays the temperature and humidity graphs	Small and Large
	View Network	Shows the status of all connected units	Large only
SET ALARMS	Set Alarms	Allows the enabling, disabling and setting of the alarm parameters	Small and Large
	Sensor Data	Shows readings for the standard and optional sensors	Small and Large
	Active Alarms	Display all alarms that are active at the present time	Small and Large
	Display Setup	Change the settings for display, language, time and simple or graphic display	Small and Large
	Total Run Hours	Records the run time of all components and allows for setting the limits on run time	Small and Large
	Sleep Mode	Allows for setback programming for non-peak operation	Small and Large
	Service Contacts	Contains key contact information for local service, including names and phone numbers	Large only

Service Menu Icons and Descriptions

Icon	Name	Descriptions	Available Display
°C/ °F % RH SET	Set Points	To view and change temperature and humidity set points	Small and Large
	Unit Diary	Is a notepad containing notes from the service person or customer	Large only
	Standby Settings	Programs lead/ lag setup when multiple units are connected together	Small and Large
	Wellness/ Maintenance Settings	Allows programming of the maintenance interval reminder, maintenance messages, number of unit starts and stops, time since last maintenance	Small and Large
	Diagnostic/ Service Mode	Allows for troubleshooting, manual mode and viewing of the analog and digital inputs	Small and Large
	Set Alarms	Allows the enabling, disabling and setting of the alarm parameters	Small and Large
	Sensor Calibration/ Setup	Allows for the calibration of the various sensors	Small and Large
	System/ Network Setup	Allows for setup and unit-2-unit communication for multiple units	Large only
	Options Setup	Allows for the setup of component operation	Small and Large
	Service Contacts	Contains key contact information for local service, including names and phone numbers	Small and Large

Advanced Menu Icons and Descriptions

Icon	Name	Descriptions	Available Display
	Factory Settings	Factory configuration files. **Do Not Change Settings Consult the Factory First**	Small and Large
	Compressor Info	Shows operational status of the compressor(s).	Large Display
	MBV (Motorized Ball Valve)	Shows operational status of the optional motorized ball valves supplied on water or glycol units.	Large Display
	Access	Allows the user to change the various passwords.	Small and Large Display
	Runtime Monitoring	Shows the operational status of the various devices supplied in the unit.	Large Display

Parameter Codes
All parameters will have a parameter code on the left side of the page. This parameter code is the assignment number in the Menu. The code indicates the menu and parameter item being accessed. Example: U401 means "USER MENU parameter item 401. This code is as an excellent communication tool when talking to someone about the parameter (especially if their screen is in a different language).

Navigating and Accessing Sub-Menus for Large Displays
To navigate and access any parameter when in the MENU screens press the ENTER key. This will select the icon in the upper left hand corner of the menu screen. The icon will become highlighted.

If this is the sub-menu you want to access press the ENTER key again. The parameter pages will now appear for the sub-menu. Press the ESCAPE key to return to the previous screen.

If you want to access another sub-menu icon use the arrow keys to move to your choice and then press the enter key to access.

Continue pressing the ESCAPE key until the display returns to the System Status Screen.

Navigating and Accessing Sub-Menus for Small Displays

To navigate and access any parameter when in the MENU screens press the ENTER key. This will highlight the Password Level. Pressing the DOWN arrow key will let you navigate the sub-menus.

Press the ENTER key on the sub-menu you want to access. The parameter pages will now appear for the sub-menu. Press the ESCAPE key to return to the previous screen.
If you want to access another sub-menu icon use the arrow keys to move to your choice and then press the enter key to access.

Continue pressing the ESCAPE key until the display returns to the Unit Status Screen.

Navigating and Accessing Parameters for Programming when in the Sub-Menu Screens

In the selected menu screen press the ENTER key to select the parameter to be viewed. The parameter will become high-lighted. Press the ENTER key again to access the value for the parameter. Use the UP and Down keys to change the value. Press the ENTER key to accept the change. Press the ESCAPE key to abort the change. All parameter changes require a password to be entered.

Where and When to Save

This section of the manual provides a quick reference of where to save changes to the various *iCOM* programming parameters. Small Display parameters are shown in CAPITAL LETTERS and Large Display parameters are shown in (Parenthesis)

Control Board Saves			
Save Parameters			
Large Display	**Small Display**	**Menu Location**	**Menu Line**
(Unit Code Control)	UC CTRL	Advanced Menu	A008
(Configuration Safe)	CS CTRL	Network Menu/Unit View (PG 1)	S831
(Network Safe)	NW CTRL	Network Menu/Unit View (PG 1)	S832
(Bootloader Variables)	BL CTRL	Network Menu/Unit View (PG 2)	S843

Large Display Saves		
Save Parameters	**Menu Location**	**Menu Line**
(Configuration Safe)	Network Menu/System View (PG 1)	S809
(Network Safe)	Network Menu/System View (PG 1)	S810
(Bootloader Variables)	Network Menu/System View (PG 2)	S821

Entering a Password

To enter a password to change a parameter press the ENTER key. Password will be highlighted. Press the ENTER key a second time. This will move the highlight to the first numeral of the password. Press the UP arrow key to select the appropriate number. Once you have your first number entered press the RIGHT arrow key to the second numeral. Use the UP arrow key to select the number. Once you have the second number entered press the RIGHT arrow key to the third numeral. Use the UP arrow key to select the number. Once the third number is entered, press the ENTER key. Your Actual Password Level will be displayed in the parentheses.

Note: The fourth digit in the password is not used.

Passwords

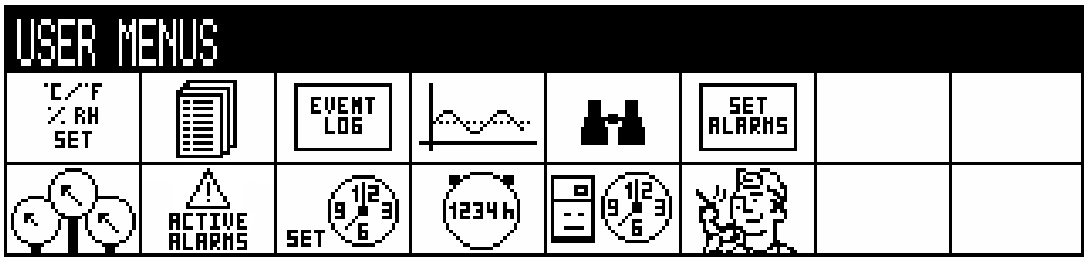
Passwords	Access Level
1490	Allows changes in the User Menu
5010	Allows changes in the User Menu and Service Menu
2210	Allows changes in the User Menu, Service Menu and Advanced Menu

Menu Parameters

The following pages show all of the various parameters, default values and programming ranges.

USER MENU Parameters - Password: 1490

Small Display parameters are shown in CAPITAL LETTERS
Large Display parameters are shown in (Parenthesis)
Parameters may be System or Unit and either Read only or Read/Write.



Note: Parameters may be a System or Unit View when Networked

Note: The column indicated by TW1 (Teamwork Mode 1) is a list of parameters that are shared when TW1 is selected for the control operation.

Setpoint Parameters

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Shared in TW1	Control Board Safe
U101	(Password)	-	-	-	-
U102	TEMP SET (Temperature Setpoint)	73°F	41 - 104°F	Yes	CSF
U103	HUM SET (Humidity Setpoint)	50%	1 - 80%	Yes	CSF
U104	HUM CTRL (Humidity Control Type)	PRED (Predictive)	REL, COMP, PRED (Relative, Compensated, Predictive)	Yes	CSF
U105	SUP LIM (Supply Limit)	Dsabl (Disable)	Enabl, Dsabl (Enable, Disable)	Yes	CSF
U106	SUP TEMP (Supply Limit Temp Value)	41°F	41 - 77°F	Yes	CSF
U107	BACK TSP (Backup Temperature Setpoint)	73°F	41 - 104°F	Yes	CSF

USER MENU's Continued

Spare Parts List (Large Display only) – Read Only

Displays the various part numbers of the components/parts supplied in the unit.

Event Log – Read Only

Stores and displays the last 400 events that have occurred at the unit.

Graphics Parameters

Parameter SMALL DISPLAY (Large Display)	Default	Range	Shared in TW1	Control Board Safe	Display Safe
System Temperature Time Scale	24 Hours	8, 32 min 1, 12, 24 hours 2, 4, 8, 16 days	No	CSF	-
System Temperature Graph Height	11°F	± 5 - 36°F	No	-	CSF
System Humidity Time Scale	24 Hours	8, 32 min 1, 12, 24 hours 2, 4, 8, 16 days	No	CSF	-
System Humidity Graph Height	25%	10 – 30%	No	-	CSF
Unit Temperature Time Scale	24 Hours	8, 32 min 1, 12, 24 hours 2, 4, 8, 16 days	No	CSF	-
Unit Temperature Graph Height	11°F	± 5 - 36°F	No	-	CSF
System Humidity Time Scale	24 Hours	8, 32 min 1, 12, 24 hours 2, 4, 8, 16 days	No	CSF	-
System Humidity Graph Height	25%	10 – 30%	No	-	CSF

View Network Parameters (viewable on Large Display only) – Read Only

Allows the end user to view the status all units connected together in a network configuration.

USER MENU's Continued

Set Alarm Parameters

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Shared in TW1	Control Board Safe
U201	(Password)	-	-	-	-
U202	RTN SNSR (Return Sensor Alarms)	NO (Disable)	NO, YES (Enable, Disable)	Yes	CSF
U203	HI TEMP (High Return Temperature)	80°F	34 - 210°F	Yes	CSF
U204	LO TEMP (Low Return Temperature)	65°F	34 - 210°F	Yes	CSF
U205	HI HUM (High Return Humidity)	60%	1 – 99%	Yes	CSF
U206	LO HUM (Low Return Humidity)	40%	1 – 99%	Yes	CSF
U207	SENSOR A (Sensor A Alarms)	NO (Disable)	NO, YES (Enable, Disable)	Yes	CSF
U208	HI TEMPA (High Temperature Sensor A)	90°F	34 - 210°F	Yes	CSF
U209	LO TEMPA (Low Temperature Sensor A)	55°F	34 - 210°F	Yes	CSF
U210	HI HUM A (High Humidity Sensor A)	70%	1 – 99%	Yes	CSF
U211	LO HUM A (Low Humidity Sensor A)	30%	1 – 99%	Yes	CSF

USER MENU's Continued

Sensor Data Parameters, page 1 of 2 – Read Only

Menu Line	Parameter SMALL DISPLAY (Large Display)
U301	TEMP A (Optional Sensor A Temperature)
U302	HUM A (Optional Sensor A Humidity)
U303	TEMP B (Optional Sensor B Temperature)
U304	HUM B (Optional Sensor B Humidity)
U305	TEMP C (Optional Sensor C Temperature)
U306	HUM C (Optional Sensor C Humidity)
U307	FC TEMP (Freecooling Fluid Temperature)
U308	AMB TEMP (Outdoor Temperature)
U309	FC STATE (Freecooling Status)
U310	DS1 TEMP (DigiScroll 1 Temperature)
U311	DS2 TEMP (DigiScroll 2 Temperature)

Sensor Data Parameters, page 2 of 2 – Read Only

Menu Line	Parameter SMALL DISPLAY (Large Display)
U313	Hi Te HMS (Daily High Temperature)
U314	Lo Te HMS (Daily Low Temperature)
U315	Hi Hu HMS (Daily High Humidity)
U316	Lo Hu HMS (Daily Low Humidity)

Active Alarms – Read Only (Last Menu selection on Small Display)

Allows the end user to view all present active alarms.

USER MENU's Continued

Display Setup Parameters

Menu Line	Parameter SMALL DISPLAY	Default	Range	Shared in TW1	Display Safe
U401	LANGUAGE (Language)	EN (English)	EN (English), DEU (Deutsch), ITA (Italiano), FRE (French), ESP (Espanol), POR (Portugues), CZE (Czech), RUS (Russian), CHI (Chinese), GRE (Greek)	No	CSF
U402	YEAR/MONTH/ DAY (Date)	MM/DD/ YY	–	Yes	-
U403	HOUR/MIMUTE/ SECOND (Time)	HH/MM/ SS	–	Yes	-
U404	TEMP F/C (Temperature Indication)	°C	°C, °F	No	CSF
U405	CONTRAST (Display Contrast)	50%	0 – 100%	No	CSF
U406	BUZ FREQ BUZ TEST (Buzzer Frequency)	50%	0 – 100%	No	CSF
U407	BACKLITE (Backlite Off after)	5 min	5, 10, 30 min 1, 12 hr	No	CSF
U408	SCREEN (Screen)	GRAPH (Graphical)	GRAPH, SIMPL (Graphical, Simple)	No	CSF
U409	SHOWS (Display Shows)	A+S (Set+Act)	S+A, ACT, SET (Set+Act, Act, Set)	No	CSF
U410	DISPLAY (Display Colors)	NORM (Normal)	NORM, INV (Normal, Inverted)	No	CSF
U411	DATE (Date Format)	M/D/Y (mm/dd/yyyy)	M/D/Y, D.M.Y, Y-M-D (mm/dd/yyyy dd.mm.yyyy yyyy-mm-dd)	No	CSF

USER MENU's Continued

Total Run Hours Parameters

Menu Line	Parameter SMALL DISPLAY (Large Display)		LIMIT (Limit Range Hr)	Control Board Safe
U501		(Actual Hours)	LIMIT (Limit)	-
U502	MOTOR(S) (Fan Motors)		0 - 32000	CSF
U503	COMP1 (Compressor 1)		0 - 32000	CSF
U504	COMP2 (Compressor 2)		0 - 32000	CSF
U505	CW/FC (Chilled Water/Free Cool)		0 - 32000	CSF
U506	HG / HW (HotGas / HotWater)		0 - 32000	CSF
U507	EL HEAT1 (Electric Heater 1)		0 - 32000	CSF
U508	EL HEAT2 (Electric Heater 2)		0 - 32000	CSF
U509	EL HEAT3 (Electric Heater 3)		0 - 32000	CSF
U510	HUM (Humidifier)		0 - 32000	CSF
U511	DEHUM (Dehumidification)		0 - 32000	CSF

USER MENU's Continued

Sleep Mode Parameters

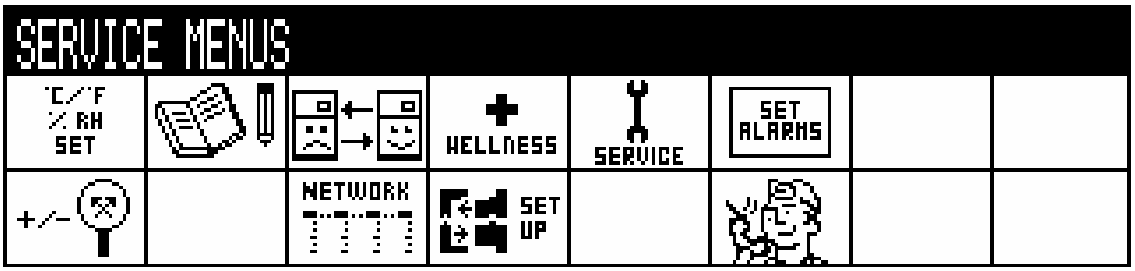
Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Shared in TW1	Control Board Safe
U601	(PASSWORD)				
U602	MON, TUE, WED, THU, FRI, SAT, SUN (Sleep On)	-	No, Yes	-	-
U603	M, T, W, T, F, S, SU (No)	No	No, Yes	Yes	CSF
U604	(Sleep Everyday 1)	No	No, Yes	Yes	CSF
U605	START 1 / STOP 1 (From / To)	00:00 / 00:00	Time (hh:mm)	Yes	CSF
U606	(Sleep Everyday 2)	No	No, Yes	Yes	CSF
U607	START 2 / STOP 2 (From / To)	00:00 / 00:00	Time (hh:mm)	Yes	CSF
U609	TIME MOD (Timer Mode)	No	No, Yes, Auto	Yes	CSF
U610	TIME TYP (Timer Mode Type)	System Off	System Off, Dead Band	Yes	CSF
U611	DEADBAND (DeadBand)	4°F	4 - 27°F	Yes	CSF

Service Contact Parameters – Read Only

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range	Control Board Safe
U701	Address Line 1	Text - String	CSF
U703	Address Line 2	Text - String	CSF
U703	Address Line 1	Text - String	CSF
U704	Address Line 1	Text - String	CSF

SERVICE MENU - 5010

Small Display parameters are shown in CAPITAL LETTERS
Large Display parameters are shown in (Parenthesis)
Parameters may be System or Unit and either Read only or Read/Write



Note: The column indicated by TW1 (Teamwork Mode 1) is a list of parameters that are shared when TW1 is selected for the control operation.

Setpoint Parameters, page 1 of 3

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Shared in TW1	Control Board Safe
S101	(Password)	-	-	-	-
S102	TEMP SET (Temperature Setpoint)	73°F	41 - 104°F	Yes	CSF
S103	CTRL TYP * (Control Type)	INTEL (Intelligent)	INTEL, PID, PI, PROP, (Intelligent, PID, PI, Proportional)	Yes	CSF
S104	TEMP PB (Temperature Proportional Band)	7°F	2 – 54°F	Yes	CSF
S105	TEMP INT (Temperature Integration Time)	0 min	0 – 15 min	Yes	CSF
S106	TEMP DER * (Temperature Derivative Time)	0 sec	0 – 900 seconds	Yes	CSF
S107	AUTOSET (Autoset Enabled)	YES	YES, NO, (No, Yes)	Yes	CSF
S108	TEMP DB (Temperature DeadBand)	0°F	0 - 36°F	Yes	CSF
S109	2^{ND} SETP (Second Setpoint)	73°F	41 - 104°F	Yes	CSF
S110	BACK TSP (Backup Temperature Setpoint)	73°F	41 - 104°F	Yes	CSF

SERVICE MENU's Continued

*** Note:** Menu line S103 – Control type selection for PID and Menu line S106 - Temperature Derivative Time parameters appear on the display but are not active at this time.

Setpoint Parameters, page 2 of 3

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Shared in TW1	Control Board Safe
S112	(Password)	-	-	-	-
S113	HUM SET (Humidity Setpoint)	50%	1 - 80%	Yes	CSF
S114	HUM CTRL (Humidity Control Type)	PRED (Predictive)	REL, COMP, PRED (Relative, Compensated, Predictive)	Yes	CSF
S115	HUM PB (Humidity Proportional Band)	10%	1 – 20%	Yes	CSF
S116	HUM INT (Humidity Integration Time)	0 min	0 – 15 min	Yes	CSF
S117	HUM DB (Humidity Deadband)	0%	0 – 50%	Yes	CSF
S118	LO LIM 1 (Dehum/Heat Low Limit 1) *****	-3.4°F	(-9.9) – (-2.0°F)	No	CSF
S119	LO LIM 2 (Dehum/Heat Low Limit 2) *****	-7°F	(-9.9) – (-2.0°F)	No	CSF

*** Note:** Menu line S118 – Low Limit 1 is for Compressor 1 control during dehumidification. The return air temperature will not decrease below this programmed value during dehumidification. If the return air temperature decreases to this programmed value Compressor #1 will stop dehumidification until the return air temperature increases above this value. Menu line S119 – Low Limit 2 performs the same function for Compressor 2 during dehumidification.

SERVICE MENU's Continued

Setpoint Parameters, page 3 of 3

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Shared in TW1	Control Board Safe
S123	(Password)	-	-	-	-
S124	SUP LIM (Supply Limit)	NO (Disable)	NO, YES (Enable, Disable)	Yes	CSF
S125	SUP TEMP (Supply Limit Temp Value)	41°F	41 – 77°F	Yes	CSF
S126	AMB TYPE (DT between Room / Outdoor Type)	NO	NO, CONT, DIFF (Value, Contact, EFC, Disable)	No	CSF
S127	AMB DT (DT between Room Air/ Outdoor)	8°F	0 – 36°F	No	CSF
S128	FC TYPE (DT Between Room / FC Type)	NO (Disable)	NO, YES, CONT, DIFF (Value, Contact, Disable)	No	CSF
S129	FC DT (DT Between Room Air/ FC Fluid)	36°F	0 – 36°F	No	CSF
S130	MIN CW (Minimum CW)	NO (Disable)	NO, YES (Enable, Disable)	No	CSF
S131	MIN CW (Minimum CW Temp Value)	45°F	32 – 68°F	No	CSF
S135	FANSPEED (VSD Fanspeed)	MAN (Manual)	AUTO, MAN, ECO (Auto, Manual, Economy)	No	CSF
S136	VSD SET (VSD Setpoint STD)	100%	0 – 100%	No	CSF
S137	VSD MIN (VSD Setpoint MIN)	-	%	No	CSF
S138	VSD DEH (VSD Setpoint Dehum)	100%	0 – 100%	No	CSF
S139	VSD NOP (VSD Setpoint No Power)	100%	0 – 100%	No	CSF
S146	SCR TYPE (SCR Control Type)	-	-	-	-
S147	C01 ON (Start Compressor 1 At)	-	%	-	-
S148	C01 OFF (Stop compressor 1 At)	-	%	-	-

SERVICE MENU's Continued

Setpoint Parameters, page 3 of 3 continued

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Shared in TW1	Control Board Safe
S149	C01 TD (Compressor 1 Stop delay)	-	m (min)	-	-
S150	C02 ON (Start Compressor 2 At)	-	(%)	-	-
S151	C02 OFF (Stop Compressor 2 At)	-	(%)	-	-
S152	C02 TD (Compressor 2 Stop Delay)	-	m (min)	-	-
S153	CYCLET (Cycle time)	-	s (sec)	-	-
S154	SCRFACT (SCR Factor)	-	-	-	-
S155	ACT SCR (Actual SCR Request)	-	(%)	-	-

Unit Diary (Large Display only) – Read Only

Allows the end user to view all entered program changes and maintenance to the unit.

SERVICE MENU's Continued

Standby Settings/Lead-Lag Parameters

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Shared in TW1	Control Board Safe
S501	(Password)	-	-	-	-
S502	#STANDBY (Number of Standby Units)	0	0 - 32	Yes	CSF
S503	ROTATION (Rotation Frequency)	No	NO, DAILY, MON, TUE, WED, THU, FRI, SAT, SUN, M-MO, M-TU, M-WE, M-TH, M-FR, M-SA, M-SU (No, Daily, Every MON, Every TUE, Every WED, Every THU, Every FRI, Every SAT, Every SUN, Monthly MON, Monthly TUE, Monthly WED, Monthly THU, Monthly FRI, Monthly SAT, Monthly SUN)	Yes	CSF
S504	ROT HOUR (Rotate at hour)	No	0 - 23	Yes	CSF
S505	ROT MIN (Rotate at minute)	No	0 - 59	Yes	CSF
S506	ROT BY (Rotate by)	1	1 – 8	Yes	CSF
S507	DO ROT (Perform one Rotation)	NO (No)	NO, YES (No, Yes)	Yes	CSF
S508	CASCADE (Cascade Units)	NO (No)	NO, YES, COOL, CO/HE (No, Yes, Cooling, Cool/Heat)	Yes	CSF
S509	STBY HT (Start all Standby Units by HT)	NO (No)	NO, YES (No, Yes)	Yes	CSF

SERVICE MENU's Continued

Maintenance/ Wellness Parameters
Basic Settings, page 1 of 8

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Shared in TW1	Control Board Safe
S001	(Password)	-	-	-	-
S002	FREQ/YR (Maintenance Frequency Per Year)	1	0 – 12 Per Year	Yes	CSF
S003	BONUS (Max Bonus)	0	0 – 12MM	Yes	CSF
S004	PENALTY (Max Penalty)	0	0 – 12MM	Yes	CSF
S005	LAST PM YY/MM/DD (Last Maintenance)	-	MM/DD/YY	Yes	CSF
S006	NAME (Service Engineer)	-	Name	Yes	CSF
S007	CONFIRM (Confirm PM)	-	No, Yes	Yes	-
S008	NEXT PM (Calculated Next Maintenance)	-	Date	Yes	-

Wellness Motor Settings, page 2 of 8

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
S012	(Password)	-	-	-
S013	STARTS (Number of Starts)	-	0 – 32000	-
S014	RUN HRS (Run Hours)	-	0 – 32000	-
S015	AVG RUN (Average Run Time)	-	0 – 999 m	-
S016	BEST (Starts per Day Best)	1	1 – 240	CSF
S017	WORST (Starts per Day Worst)	24	1 – 240	CSF
S018	ALARMS (Number of Alarms)	-	0 - 32000	-
S019	BONUS (Actual Bonus)	-	0 - 12	-

SERVICE MENU's Continued

Wellness Compressor 1 Settings, page 3 of 8

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
S023	(Password)	-	-	-
S024	STARTS (Number of Starts)	-	0 – 32000	-
S025	RUN HRS (Run Hours)	-	0 – 32000	-
S026	AVG RUN (Average Run Time)	-	0 – 999 m	-
S027	BEST (Starts per Day Best)	12	1 – 240	CSF
S028	WORST (Starts per Day Worst)	240	1 – 240	CSF
S029	HP AL (Number HP Alarms)	-	0 - 32000	-
S030	LP AL (Number LP Alarms)	-	0 – 32000	-
S031	OL AL (Number OL Alarms)	-	0 – 32000	-
S032	DS HT AL (Number DS HT Alarms)	-	0 - 32000	-
S033	BONUS (Actual Bonus)	-	0 - 12	-

Wellness Compressor 2 Settings, page 4 of 8

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
S034	(Password)	-	-	-
S035	STARTS (Number of Starts)	-	0 – 32000	-
S036	RUN HRS (Run Hours)	-	0 – 32000	-
S037	AVG RUN (Average Run Time)	-	0 – 999 m	-
S038	BEST (Starts per Day Best)	12	1 – 240	CSF
S039	WORST (Starts per Day Worst)	240	1 – 240	CSF
S040	HP AL (Number HP Alarms)	-	0 - 32000	-
S041	LP AL (Number LP Alarms)	-	0 – 32000	-
S042	OL AL (Number OL Alarms)	-	0 – 32000	-
S043	DS HT AL (Number DS HT Alarms)	-	0 - 32000	-
S044	BONUS (Actual Bonus)	-	0 - 12	-

SERVICE MENU's Continued

Wellness Electric Heater 1 Settings, page 5 of 8

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
S045	(Password)	-	-	-
S046	STARTS (Number of Starts)	-	0 – 32000	-
S047	RUN HRS (Run Hours)	-	0 – 32000	-
S048	AVG RUN (Average Run Time)	-	0 – 999 m	-
S049	BEST (Starts per Day Best)	24	1 – 240	CSF
S050	WORST (Starts per Day Worst)	240	1 – 240	CSF
S051	ALARMS (Number of Alarms)	-	0 - 32000	-
S052	BONUS (Actual Bonus)	-	0 – 12	-

Wellness Electric Heater 2 Settings, page 6 of 8

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
S056	(Password)	-	-	-
S057	STARTS (Number of Starts)	-	0 – 32000	-
S058	RUN HRS (Run Hours)	-	0 – 32000	-
S059	AVG RUN (Average Run Time)	-	0 – 999 m	-
S060	BEST (Starts per Day Best)	24	1 – 240	CSF
S061	WORST (Starts per Day Worst)	240	1 – 240	CSF
S062	ALARMS (Number of Alarms)	-	0 - 32000	-
S063	BONUS (Actual Bonus)	-	0 – 12	-

SERVICE MENU's Continued

Wellness Electric Heater 3 Settings, page 7 of 8

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
S067	(Password)	-	-	-
S068	STARTS (Number of Starts)	-	0 – 32000	-
S069	RUN HRS (Run Hours)	-	0 – 32000	-
S070	AVG RUN (Average Run Time)	-	0 – 999 m	-
S071	BEST (Starts per Day Best)	24	1 – 240	CSF
S072	WORST (Starts per Day Worst)	240	1 – 240	CSF
S073	ALARMS (Number of Alarms)	-	0 - 32000	-
S074	BONUS (Actual Bonus)	-	0 – 12	-

Wellness Humidifier Settings, page 8 of 8

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
S078	(Password)	-	-	-
S079	STARTS (Number of Starts)	-	0 – 32000	-
S080	RUN HRS (Run Hours)	-	0 – 32000	-
S081	AVG RUN (Average Run Time)	-	0 – 999 m	-
S082	BEST (Starts per Day Best)	24	1 – 240	CSF
S083	WORST (Starts per Day Worst)	240	1 – 240	CSF
S084	ALARMS (Number of Alarms)	-	0 - 32000	-
S085	BONUS (Actual Bonus)	-	0 – 12	-

SERVICE MENU's Continued

Diagnostics/Service Mode, page 1 of 7

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range
S301	(Password)	-
S302	HP1 CODE (HP 1 Alarm Code)	1, 2, 4 or 5
S303	HP2 CODE (HP 2 Alarm Code)	1, 2, 4 or 5
S304	HT1 CNT (HT 1 Alarm Counter)	No
S305	HT2 CNT (HT 2 Alarm Counter)	No
S306	LP1 CODE (HP 1 Alarm Code)	1 or 3
S307	LP2 CODE (HP 2 Alarm Code)	1 or 3

Notes:
Menu Lines S302 and 303:
Code 1: High pressure condition 10 minutes after compressor starts.
Code 2: High pressure condition lasted more than 30 seconds during the first 10 minutes of compressor operation.
Code 4: High pressure conditions during the first 10 minutes of compressor operation. Code 5: Three (3) high pressure conditions during compressor startup within a rolling 12 hour period.

Menu Lines S304 and S305: Counts the number of high temperature alarms on scroll compressors with thermister temperature monitoring.

Menu Lines S306 and S307:
Code 1: Compressor experienced low pressure during winter start time delay.
Code 3: Lose of charge, pressure decreased below 20 PSIG and did not increase within the 5 minute time period during with the compressor was turned off by the control.

SERVICE MENU's Continued

Diagnostics/Service Mode, page 2 of 7

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range
S312	(Password)	-
S313	MANUAL (Manual Mode)	YES, NO (Yes, No)
S314	MOTOR(S) (Motors)	OFF, ON (Off, On)
S315	COMP1 (Compressor 1)	OFF, ON, RUN, EVAC, CHARG (Off, On, Run, Evacuate, Charge)
S316	C1 CAP (Compressor 1 Capacity)	OFF, ON (Off, On)
S317	C1 CYCLE (Compressor 1 Cycle Ramp)	0 – 100%
S318	LLSV1 (Compressor 1 LLSV)	OFF, ON (Off, On)
S319	COMP2 (Compressor 2)	OFF, ON, RUN, EVAC, CHARG (Off, On, Run, Evacuate, Charge)
S320	C2 CAP (Compressor 2 Capacity)	OFF, ON (Off, On)
S321	C2 CYCLE (Compressor 2 Cycle Ramp)	0 – 100%
S322	LLSV2 (Compressor 2 LLSV)	OFF, ON (Off, On)

SERVICE MENU's Continued

Diagnostics/Service Mode, page 3 of 7

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range
S323	(Password)	-
S324	EL HEAT1 (Electric Heat 1 or HG/HW)	OFF, ON (Off, On)
S325	EL HEAT2 (Electric Heat 2 or E.Heat 1)	OFF, ON (Off, On)
S326	EL HEAT3 (Electric Heat 3 or E.Heat 2)	OFF, ON (Off, On)
S328	LWD Val (LWD Valve) *	OFF, ON (Off, On)
S329	HUM FILL (Humidifier Fill)	OFF, ON (Off, On)
S330	HUM (Humidifier)	OFF, ON (Off, On)
S331	H DRAIN (Humidifier Drain) **	OFF, ON (Off, On)
S332	HUM.C. (Humidifier Current) **	0.00A
S333	LSI ** (not on Large Display)	-

*** Note:** Even through parameters S327 and S328 for electrically actuated ball type water regulating valves are displayed on the menu screen, they are not active at this time. ** Parameters S331, S332 and S333 are options for PEX units only.

Diagnostics/Service Mode, page 4 of 7

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range
S334	(Password)	-
S335	ALM REL (Alarm Relay)	OFF, ON (Off, On)
S336	FC REL (FC Relay)	OFF, ON (Off, On)
S337	3P OPEN (3P Actuator Open)	OFF, ON (Off, On)
S338	3P CLOSE (3P Actuator Close)	OFF, ON (Off, On)
S340	BV CTRL	-
S341	ANALOG1 (Analog Out 1)	0 – 100%
S342	ANALOG2 (Analog Out 2)	0 – 100%
S343	ANALOG3 (Analog Out 3)	0 – 100%
S344	ANALOG4 (Analog Out 4)	0 – 100%

SERVICE MENU's Continued

Diagnostics/Service Mode, page 5 of 7 – Read Only

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range
S345	RSD (Status Remote Shutdown)	ON. OFF (On, Off)
S346	AIR LOSS (Status Airflow Loss)	OK, ACT (OK, Active)
S347	MOTOR OL (Status Motor Overload)	OK, ACT (OK, Active)
S348	FILTER (Status Filter)	OK, ACT (OK, Active)
S349	CUSTOM 1 (Status Customer Input 1)	OK, ACT (OK, Active)
S350	CUSTOM 2 (Status Customer Input 2)	OK, ACT (OK, Active)
S351	CUSTOM 3 (Status Customer Input 3)	OK, ACT (OK, Active)
S352	CUSTOM 4 (Status Customer Input 4)	OK, ACT (OK, Active)
S353	HEAT SAF (not on Large Display)	-
S354	FLOW AT (Loss of Airflow AT)	% (-)
S355	FLOW ACT (not on Large Display)	% (-)

Diagnostics/Service Mode, page 6 of 7 – Read Only

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range
S356	HP1 (Status HP1)	OK, ACT (OK, Active)
S357	LP1 (Status LP1)	OK, ACT (OK, Active)
S358	C1 OL (Status C1 OL)	OK, ACT (OK, Active)
S359	HP2 (Status HP2)	OK, ACT (OK, Active)
S360	LP2 (Status LP2)	OK, ACT (OK, Active)
S361	C2 OL (Status C2 OL)	OK, ACT (OK, Active)

SERVICE MENU's Continued

Diagnostics/Service Mode, page 7 of 7 – Read Only

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range
S367	HUM PROB (Status Humidifier Problem)	OK, ACT (OK, Active)
S368	DT1 (not on Large Display)	-
S369	DT2 ***** (Status DT2 Glycol/Room)	OFF, ACT (OK, Active)
S370	DT3 ***** (Status DT3 Room/Setpoint)	OFF, ACT (OK, Active)
S371	MIN CW (Status Min CW)	OFF, ACT (OK, Active)
S372	COND 1 (not on Large Display)	-
S373	COND 2 (not on Large Display)	-

*** Note:**

S369: Active: Compressorized and Freecooling available.

Off: Compressorized cooling only available.

S370: Active: If Low Pressure condition occurs freecooling will be disabled for 1 hour and system will operate on compressors only.

Off: Restarts compressor after 10 minutes.

S371: Active: Above the Minimum Chilled Water temperature setpoint.

S372 OFF: Below the Minimum Chilled Water Temperature Setpoint

SERVICE MENU's Continued

Set Alarm Parameters, page 1 of 7

Menu line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Shared in TW1	Control Board Safe
S201	(Password)	-	-	-	-
S202	RTN SNSR (Return Sensor Alarms)	YES (Enabled)	YES, NO (Enable, Disable)	Yes	CSF
S203	HI TEMP (High Return Temperature)	80°F	34 – 210°F	Yes	CSF
S204	LO TEMP (Low Return Temperature)	65°F	34 – 210°F	Yes	CSF
S205	HI HUM (High Return Humidity)	60%	1 – 99%	Yes	CSF
S206	LOW HUM (Low Return Humidity)	40%	1 – 99%	Yes	CSF
S207	SENSOR A (Sensor A Alarms)	NO (Disable)	NO, YES (Enable, Disable)	Yes	CSF
S208	HI TEMPA (High Temperature Sensor A)	90°F	34 – 210°F	Yes	CSF
S209	LO TEMPA (Low Temperature Sensor A)	55°F	34 – 210°F	Yes	CSF
S210	HI HUM A (High Humid Sensor A)	70%	1 – 99%	Yes	CSF
S211	LO HUM A (Low Humid Sensor A)	30%	1 – 99%	Yes	CSF

SERVICE MENU's Continued

Set Alarm Parameters, page 2 of 7

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
S212	(Password)	-	-	-
S213	CUST IN1 (Customer Input 1)	Water Alarm	See Note	CSF
S214	C1 ACT (Customer Input 1 active when)	CLOSED (Closed)	CLOSED, OPEN (Closed, Open)	CSF
S215	CUST IN2 (Customer Input 2)	Water Alarm	See Note	CSF
S216	C2 ACT (Customer Input 2 active when)	CLOSED (Closed)	CLOSED, OPEN (Closed, Open)	CSF
S217	CUST IN3 (Customer Input 3)	Water Alarm	See Note	CSF
S218	C3 ACT (Customer Input 3 active when)	CLOSED (Closed)	CLOSED, OPEN (Closed, Open)	CSF
S219	CUST IN4 (Customer Input 4)	Water Alarm	See Note	CSF
S220	C4 ACT (Customer Input 4 active when)	CLOSED (Closed)	CLOSED, OPEN (Closed, Open)	CSF
S221	WA AC AL (Warning Activates Alarm Relay)	YES (Yes)	YES, NO (Yes, No)	CSF
S222	AL.RES. (Reset Disabled Alarms)	NO (No)	YES, NO (Yes, No)	CSF

Note: Customer Input 1, 2, 3 and 4 alarm messages are selected by the customer. See the table on the next page for the pre-programmed alarm message choices. The customer cannot write a custom alarm message.

SERVICE MENU's Continued

Small Display messages in CAPITAL LETTERS (large display messages in parenthesis):

Customer Input 1, 2, 3 and 4 alarm messages are selected by the customer. Below are the pre-programmed alarm message choices. The customer cannot write a custom alarm message.

Display Message	Display Definition	Display Message	Display Definition
SMOKE (Smoke)	Smoke Detected	COMP (Comp Lockout)	Compressor Lockout w/o Pumpdown
WATER (Water Alarm)	Water Detected	CALL (Call Service)	Call Service
C PMP (C Pmp Alarm)	Condensate Pump	TEMP (High Temp)	High Temperature
FLOW (Flow Alarm)	Loss of Flow	AIR (FC Lockout)	Free Cooling Lockout
G PMP (Stdby G Pmp)	Standby Glycol Pump	FC L. (Air Loss)	Air Flow Loss
STBY (Stdby Unit)	Standby Unit	HEATA * (Heater Alarm)	Heater Alarm
C-IN1 (C-Input 1)	Customer Input 1	FLOSD (Flow AL SD)	Flow Alarm Shutdown
C-IN2 (C-Input 2)	Customer Input 2	FLOLC (Flow AL LC)	Flow Alarm Lockout Compressor
C-IN3 (C-Input 3)	Customer Input 3	COMPD (Comp Lock PD)	Compressor lockout w/ Pumpdown
C-IN4 (C-Input 4)	Customer Input 4	EN FC (FC Enable)	FreeCooling Enable
RHT (Rht Lockout)	Reheat Lockout	VFD (HTRJ VFD)	Heat Rejection Variable Fan Drive
HUM (Hum Lockout)	Humidifier Lockout	HTRJ (HTRJ TVSS)	Heat Rejection Transient Voltage Surge Suppression
RH+HU (Rht+Hum Lock)	Reheat and Humidifier Lockout		

* Available on PEX units only.

SERVICE MENU's Continued

The end user may be able to change the default Alarm Type setting for some of the alarms. The table below defines what occurs at the unit when an alarm becomes active.

Alarm Type	Audible Alarm	Red Alarm LED	Event Log Entry	Common Alarm Activated
Alarm	Yes	Yes	Yes	Yes
Warning	Yes	Yes	Yes	Yes (see note)
Message	No	No	Yes	No

Note: To change this program parameter, menu line S221, to NO requires entering a password 2210.

SERVICE MENU's Continued

Set Alarm Parameters, page 3 of 7

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default / Range in Seconds	Default / Range	Default / Range	Control Board Safe
S223	(Password)	-	-	-	-
S225	FOL (Main Fan Overload)	10 sec / 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S226	LOA (Loss of Airflow)	10 sec / 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S227	CF (Clogged Filters)	60 sec / 0 – 9999	YES, NO (Enable, Disable)	Warning / Alarm, Message	CSF
S228	HRT (High Room Temp)	10 sec / 0 – 9999	YES, NO (Enable, Disable)	Warning	CSF
S229	LRT (Low Room Temp)	10 sec / 0 – 9999	YES, NO (Enable, Disable)	Warning	CSF
S230	HRH (High Room Hum)	10 sec / 0 – 9999	YES, NO (Enable, Disable)	Warning	CSF
S231	LRH (Low Room Hum)	10 sec / 0 – 9999	YES, NO (Enable, Disable)	Warning	CSF
S232	HTA (High Temp Sensor A)	10 sec / 0 – 9999	YES, NO (Enable, Disable)	Warning	CSF
S233	LTA (Low Temp Sensor A)	10 sec / 0 – 9999	YES, NO (Enable, Disable)	Warning	CSF
S234	HHA (High Hum Sensor A)	10 sec / 0 – 9999	YES, NO (Enable, Disable)	Warning	CSF
S235	LHA (Low Hum Sensor A)	10 sec / 0 – 9999	YES, NO (Enable, Disable)	Warning	CSF

SERVICE MENU's Continued

Set Alarm Parameters, page 4 of 7

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default / Range in Seconds	Default / Range	Default / Range	Control Board Safe
S236	(Password)	-	-	-	-
S238	OL1 (Comp 1 Overload)	Internal – Non Adj	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S239	OL2 (Comp 2 Overload)	Internal – Non Adj	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S240	HP1 (Comp 1 High Pressure)	Internal – Non Adj	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S241	HP2 (Comp 2 High Pressure)	Internal – Non Adj	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S242	LP1 (Comp 1 Low Pressure)	Internal – Non Adj	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S243	LP2 (Comp 2 Low Pressure)	Internal – Non Adj	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S244	PD1 (Comp 1 Pumpdown Fail)	Internal – Non Adj	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S245	PD2 (Comp 2 Pumpdown Fail)	Internal – Non Adj	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S246	HT1 (Dig Scroll1 High Temp)	Internal – Non Adj	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S247	HT2 (Dig Scroll2 High Temp)	Internal – Non Adj	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S248	EHO (EL Heat High Temp)	10 sec 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF

SERVICE MENU's Continued

Set Alarm Parameters, page 5 of 7

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default / Range in Seconds	Default / Range	Default / Range	Control Board Safe
S249	(Password)	-	-	-	-
S251	WHE (Working Hours Exceeded)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Warning	CSF
S252	SMO (Smoke Detected)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S253	WUF (Water Under Floor)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S254	CPH (Cond Pump-High Water)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S255	LOF (Loss of Flow)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S256	SGP (STBY Glycol Pump On)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S257	STB (Standby Unit On)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S258	HUP (Humidifier Problem)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S259	NOC (No Connection w/ Unit 1)	Internal – Non Adj	YES, NO (Enable, Disable)	Alarm / Warning, Message	-
S260	(Unit X Disconnected) *	Internal – Non Adj	YES, NO (Enable,	Warning	-
S261	LOP * (Loss of Power)	Internal – Non Adj	YES, NO (Enable, Disable)	Warning	CSF

Note: Parameter menu line S260 is only viewable on the Large Display.
Parameter menu line S261 is displayed after menu line S274 on the Small Display.

SERVICE MENU's Continued

Set Alarm Parameters, page 6 of 7

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default / Range in Seconds	Default / Range	Default / Range	Control Board Safe
S262	(Password)	-	-	-	-
S264	CI1 (Customer Input 1)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S265	CI2 (Customer Input 2)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S266	CI3 (Customer Input 3)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S267	CI4 (Customer Input 4)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Alarm / Warning, Message	CSF
S268	CS (Call Service)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Message / Alarm, Warning	CSF
S269	HTD (High Temperature)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Message / Alarm, Warning	CSF
S270	LB1 (Loss of Air Blower 1)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Message / Alarm, Warning	CSF
S271	RL (Reheat Lockout)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Message / Alarm, Warning	CSF
S272	HL (Humidifier Lockout)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Message / Alarm, Warning	CSF
S273	FCL (FC Lockout)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Message / Alarm, Warning	CSF
S274	CL (Compressor(s) Lockout)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Message / Alarm, Warning	CSF

SERVICE MENU's Continue

Set Alarm Parameters, page 7 of 7

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default / Range in Seconds	Default / Range	Default / Range	Control Board Safe
S275	(Password)	-	-	-	-
S277	SC1 (Comp 1 Short Cycle)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Message / Alarm, Warning	CSF
S278	SC2 (Comp 2 Short Cycle)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Message / Alarm, Warning	CSF
S279	NOP (No Power)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Message / Alarm, Warning	CSF
S280	CN 1 (Condenser 1 Failure)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Message / Alarm, Warning	CSF
S281	CN 2 (Condenser 2 Failure)	5 sec / 0 – 9999	YES, NO (Enable, Disable)	Message / Alarm, Warning	CSF

Sensor Calibration Parameters, page 1 of 3

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range	Control Board Safe
S601	(Password)	-	-
S602	RTN TEMP (Return Temperature)	±18°F	CSF
S603	CAL TEMP (Calibrated Return Temperature)	32 – 122°F	CSF
S604	RTN HUM (Return Humidity)	±9.9%	CSF
S605	CAL HUM (Calibrated Return Humidity)	20 – 80%	CSF
S606	DS1 NTC (Digiscroll 1 NTC)	±18°F	CSF
S607	CAL DS1 (Calibrated Digiscroll 1 NTC)	84 – 313°F	CSF
S608	DS2 NTC (Digiscroll 2 NTC)	±18°F	CSF
S609	CAL DS2 (Calibrated Digitscroll 2 NTC)	84 – 313°F	CSF

SERVICE MENU's Continue

Sensor Calibration Parameters, page 2 of 3

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range	Control Board Safe
S612	(Password)	-	-
S613	TEMP A (Temperature Sensor A)	±18°F	CSF
S614	CAL A (Calibrated Temperature Sensor A)	32 – 122°F	CSF
S615	HUM A (Humidity Sensor A)	±9.9%	CSF
S616	CAL A (Calibrated Humidity Sensor A)	20 – 80%	CSF
S617	TEMP B (Temperature Sensor B)	±18°F	CSF
S618	CAL B (Calibrated Temperature Sensor B)	32 – 122°F	CSF
S619	HUM B (Humidity Sensor B)	±9.9%	CSF
S620	CAL B (Calibrated Humidity Sensor B)	20 – 80%	CSF

Sensor Calibration Parameters, page 3 of 3

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
S623	(Password)	-	-	-
S624	FC SNSR (Freecool Sensor PTC or NTC)	NTC	PTC, NTC	CSF
S625	FC SNSR (Freecool Sensor)	-	±18°F	CSF
S626	CAL FC (Calibrated Freecool Sensor)	-	4 – 113°F	CSF
S627	SUP SNSR (Supply Sensor PTC or NTC)	NTC	PTC, NTC	CSF
S628	SUP TEMP (Supply Sensor)	-	±18°F	CSF
S629	CAL SUP (Calibrated Supply Sensor)	-	32 – 122°F	CSF
S630	TEMP C (Temperature Sensor C)	-	±18°F	CSF
S631	CAL C (Calibrated Temperature Sensor C)	-	32 – 122°F	CSF
S632	HUM C (Humidity Sensor C)	-	±9.9%	CSF
S633	CAL C (Calibrated Humidity Sensor C)	-	20 – 80%	CSF

Note: PTC – Positive Temperature Co-efficient Sensor. NTC – Negative Temperature Co-efficient Sensor.

SERVICE MENU's Continue

Network Setup Parameters – SMALL Display Unit View (Control Board)

Menu Line	Parameter SMALL DISPLAY	Default	Range	Control Board Safe
S802	# UNITS	1	1 – 32	CSF
S803	TEAMWORK	No	No, 1, 2	CSF
S824	MON ADD	3	1 – 99	CSF
S831	CS CTRL	-	No, Save, Load	CSF
S832	NW CTRL	No	No, Load, Save	CSF
S835	MON PROT (Monitoring Protocol)	Velocity	No, Velocity, Hironet, IGM	CSF
S836	IP #1, IP #2, IP #3, IP #4	192.168.254.001	IP Range	CSF
S837	NM #1, NM #2, NM #3, NM #4	255.255.255.000	Netmask Range	CSF
S838	GW #1, GW #2, GW #3, GW #4	000.000.000.000	Gateway Range	CSF
S840	U2U PROT	GBP	GBP	CSF
S841	U2U ADD	1	1 – 32	CSF
S842	U2U GRP	1	1 - 99	CSF
S843	BL CTRL	No	No, Save+Reboot	CSF
S844	SR CTRL (Static Ram)	-	No, Clear+Reboot	CSF
-	SW#	-	-	-
-	MAC	-	-	-
-	NAME	-	6 digits	CSF

SERVICE MENU's Continued

System/Network Setup Parameters - LARGE Display (System View), page 1 of 2

Menu Line	Parameter (Large Display)	Default	Range	Control Board Safe	Display Safe
S801	(Password)	-	-	-	-
S802	(Number of Connected Units)	1	1 – 32	CSF	-
S803	(Teamwork Mode)	No	No, 1, 2	CSF	-
S809	(Configuration Safe)	-	No, Save, Load	-	-
S810	(Network Safe)		No, Load, Save	-	-
S811	(SW Version)	-	-	-	-

System/Network Setup Parameters - LARGE Display (System View), page 2 of 2

Menu Line	Parameter (Large Display)	Default	Range	Display Safe
S812	(Password)	-	-	-
S813	(IP Address)	192.168.254.003	IP Range	NSF
S814	(Netmask)	255.255.255.000	Netmask	NSF
S815	(Gateway)	000.000.000.000	Gateway	NSF
S816	(MAC)	-	MAC	NSF
S817	(U2U Protocol)	GBP	-	NSF
S818	(U2U Address)	33	33 - 64	NSF
S819	(U2U Group)	1	1 - 99	NSF
S821	(Boot Loader Variables)	No	No, Save+Reboot	-

SERVICE MENU's Continued

System/Network Setup Parameters – LARGE Display Unit View, page 1 of 2

Menu Line	Parameter (Large Display)	Default	Range	Control Board Safe
S823	(Password)	-	-	-
S824	(Monitoring Address)	3	1 – 99	NSF
S825	(Monitoring Timeout/Handshake) *	No	No, 0 – 120 seconds	-
S827	(Unit Name)	01	6 Digits	NSF
S831	(Configuration Safe)	-	No, Save, Load	-
S832	(Network Safe)	No	No, Load, Save	-
S833	(SW Version)	-	-	-

*** Note:** Parameter used with Liebert OpenComm-485 card to control fan motor by VFD. Manual timer will down to "0" (zero) which switches the VFD control mode to "Auto". When the timer counts to zero a BMS disconnect alarm will be generated.

System/Network Setup Parameters– LARGE Display Unit View, page 2 of 2

Menu Line	Parameter (Large Display)	Default	Range	Control Board Safe
S834	(Password)	-	-	-
S835	(Monitoring Protocol)	Velocity	No, Velocity, Hironet, IGM	NSF
S836	(IP Address)	192.168.254.001	IP Range	NSF
S837	(Netmask)	255.255.255.000	Netmask	NSF
S838	(Gateway)	000.000.000.000	Gateway	NSF
S839	(MAC)	-	MAC	NSF
S840	(U2U Protocol)	GBP	GBP	NSF
S841	(U2U Address)	1	1 – 32	NSF
S842	(U2U Group)	1	1 - 99	NSF
S843	(Bootloader Variables)	No	No, Save+Reboot	-
S844	(Static Ram)	-	No, Clear+Reboot	-

SERVICE MENU's Continued

Options Setup Parameters, page 1 of 2

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
S401	(Password)	-	-	-
S402	COMP SEQ (Compressor Sequence)	Auto	Auto, 1, 2	CSF
S403	LP DELAY (Low Pressure Alarm Delay)	3 min	0 – 5 min	CSF
S404	LP1 ACT (Actual LP1 Pressure)	-	14.5 – 87.0 psi	CSF
S405	LP2 ACT (Actual LP2 Pressure)	-	14.5 – 87.0 psi	CSF
S406	EL HEAT (Electric Stages)	-	0, 1, 2, 3	CSF
S407	HW HEAT (Hot Water Heat On/Off)	No	No, Yes	CSF
S408	ALL HEAT (Total Heat Stages)	0	0, 1, 2, 3	CSF
S409	LWDconn (LWD Connected)	No	No, Yes	CSF
S410	3P RUN (3P Actuator Runtime)	165 sec	30 – 500 sec	CSF
S411	3P DIR (3P Actuator Direction)	DIR (Direct)	DIR, REV (Direct, Reverse)	CSF

SERVICE MENU's Continued

Options Setup Parameters, page 2 of 2

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe	Display Safe
S412	(Password)	-	-	-	-
S413	HUM ENAB (Humidification Enabled)	Yes	No, Yes	CSF	-
S414	IR FLUSH (Infrared Flush Rate)	150%	110 – 500%	CSF	-
S415	HUMSTREAM * (Humidifier Steam Rate)	-	0 - 100%	CSF	-
S416	HUM.TIME * (Humidifier Bottle Flush Time)	-	-	CSF	-
S417	HM.MAN * (Humidifier Bottle Manual Flush)	-	-	CSF	-
S418	DEHUM EN (Dehumidifier Enabled)	YES	NO, YES (Enable, Disable)	CSF	-
S419	REST EN (Auto Restart Enabled)	Yes	No, Yes (Yes, No)	-	CSF
S420	RESTART (Single Unit Auto Restart)	-	0 – 999 sec	CSF	-
S421	ONOFF EN (ON – OFF Enable)	-	No, Yes (Enable, Disable)	CSF	-

*** Note:** Displayed parameters S415, S416 and S417 are for the steam canister humidifier, they are not active at this time.

Options Setup Parameters, page 3 of 3

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
S423	(Password)	-	-	-
S424	CW FLUSH (CW Flush)	24 hr	0 – 99 hours	CSF
S425	FC FLUSH (Freecooling Flush)	24 hr	0 – 99 hours	CSF
S426	HW FLUSH (Hot Water Flush)	24 hr	0 – 99 hours	CSF
S427	BALL OFF (Ball Valve Setpoint Offset) *	-	(-26) / +50 psi	CSF

*** Note:** Even through parameter S427 for Ball Valve Setpoint is displayed on the menu screen, it is not active at this time.

SERVICE MENU's Continued

Service Contacts Parameters

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range	Control Board Safe
S701	(Password)	-	-
S702	COUNTRY (Country)	NONE, AUSTRIA, SWISS D, SWISS F BENELUX D, BENEL.FL, GERMANY, FRANCE, UK, HUNGARY, ITALY, POLAND, SPAIN, USA, AUSTRALIA, N ZEALAND, INDONESIA, MALAYSIA, SINGAPORE (None, Austria, Switzerland D, Switzerland F, Benelux D, Benelux FL, Germany, France, UK, Hungary, Italy, Poland, Spain, United States, Australia, New Zealand, Indonesia, Malaysia, Singapore)	CSF
S703	(Address Line 1)	Text - String	CSF
S704	(Address Line 2)	Text - String	CSF
S705	(Address Line 3)	Text - String	CSF
S706	(Address Line 4)	Text - String	CSF

ADVANCED MENU - Password: 2210

Small Display parameters are shown in CAPITAL LETTERS
Large Display parameters are shown in (Parenthesis)

Parameters may be System or Unit and either Read only or Write.

Factory Settings Parameters, page 1 of 9

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
A001	(Password)	-	-	-
A002	Unit Code Field (1 – 6)	* See Note	-	-
A003	UC 01, UC 02, UC 03, UC 04, UC 05 UC 06 (Set Code 1 – 6)	-	-	UCO
A004	Unit Code Field (7 – 12)	* See Note	-	-
A005	UC 07, UC 08, UC 09, UC 10, UC 11, UC 12 (Set Code 7 – 12)	-	-	UCO
A006	Unit Code Field (13 – 18)	* See Note	-	-
A007	UC 13, UC 14, UC 15, UC 16, UC 17, UC 18 (Set Code 13 – 18)	-	-	UCO
A008	UC CTRL (Unit Code Control)	No	NO, SAVE, LOAD, COMP (No, Save+Execute, Load+Execute, Compare	-
A009	UC STAT (Unit Code Status)	-	Not Available, Invalid, OK, Changed, Updating	-
A010	EL CTRL (Exception List Control)	No	No, Load	-
A011	EL STAT (Exception List Status)	-	NOT A (Not Available, Invalid, OK, Changed, Updating)	-

ADVANCED MENU Continued

*** Notes:** Menu lines A008 and A009 are for the unit code. When the status indicates "Code Not Available" you will need to enter the correct code for the system as listed on the decal located on the dead front panel of the unit. These values must be entered on menu lines A003, A005 and A007.

When the unit code has been entered scroll to menu line A008, select the "Save+Execute command and then select the "Load+Execute" command. The unit code status menu line A009 should display "OK".

See unit configuration tables in this manual for the various code descriptions Menu line A011 is for the exception list. If this line displays "Not Available" scroll to menu line A010, exception list control, and select the "Load" command.

Factory Settings Parameters, page 2 of 9

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
A101	(Password)	-	-	-
A102	REFRIG (Refrigerant Type)	R22	R22, R407C	CSF
A103	MOTOR OL (Main Fan Overload)	Shutdown	Shutdown, Disable	CSF
A104	AIR LOSS (Loss of Airflow)	Shutdown	Shutdown, Disable	CSF
A105	# COMP (Number of Compressors)	2	0, 1, 2	CSF
A106	COMP DLY (Compressor Delay Time)	0 sec	0 – 120 sec	CSF
A107	COMP ON (Compressor Min ON Time)	3 min	0 – 5 min	CSF
A108	COMP OFF (Compressor Min OFF Time)	3 mMin	0 – 5 min	CSF
A109	PUMPDOWN (PumpDown)	Yes	No, Yes	CSF
A110	CAP TYPE (Capacity Control Type)	4step	No, 4step, HGBP, Digital, Digital + TH, SC - HGBP	CSF
A111	FLOCT (Loss Of Flow Compressor Timer)	0 sec	0 – 180 seconds	CSF

ADVANCED MENU Continued

Factory Settings Parameters, page 3 of 9

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
A112	(Password)	-	-	-
A113	DS CYCLE (Digital Scroll Cycle)	15 sec	No, 10 – 30 sec	CSF
A114	DS HT (High Temp Digital Scroll)	268°F	33 – 392°F	CSF
A115	DS SWB (Digital Scroll Switchback)	250°F	33 – 392°F	CSF
A116	LP TYPE (Low Pressure Device Type)	Analog	Analog, Switch	CSF
A117	LP PH1 (Low Pressure Threshold Phase 1)	See Note 1	0.0 – 145 psia	CSF
A118	LP PH2 (Low Pressure Threshold Phase 2)	See Note 2	0.0 – 145 psia	CSF
A119	LC PRE *** (Liquid Control Pre-time)	-	sec	CSF
A120	LC POST *** (Liquid Control Post-time)	-	sec	CSF

***** Note:** Parameters A119 and A120 for the electrically actuated ball type water regulating valves are displayed but, they are not active at this time.

Note 1: Low Pressure Threshold Phase 1 (Menu Line A117):
The displayed pressure value for menu line A117 – Low Pressure Threshold Phase 1 is determined by the programmed selection on menu line A132 – Heat Rejection Control Type. The pressure displayed is as follows:

Menu Line A133	Menu Line A117
Fanspeed Condenser	50 psia
Lee-Temp Condenser	75 psia
Water/Glycol	75 psia

If menu line A132 - Heat Rejection Control Type is changed, the value on menu line A117 is updated automatically.

ADVANCED MENU's Continued

Note 2: Low Pressure Threshold Phase 2 (Menu Line A118):
The displayed pressure value for menu line A118 – Low Pressure Threshold Phase 2 is determined by the combinations of programmed selections on menu lines:

A102 (Refrigerant Type) + A137 (Cooling Type) + S407 (Hot Water Reheat). The pressure value displayed is as follows:

Menu Line A102 – R22	Menu Line A102 – R407C
(A137) NO Freecooling/Dualcooling + (S407) NO Hot Water Reheat = 50 psia	(A137) NO Freecooling/Dualcooling + (S407) NO Hot Water Reheat = 54 psia
(A137) YES Freecooling/Dualcooling + (S407) NO Hot Water Reheat = 63 psia	(A137) YES Freecooling/Dualcooling + (S407) NO Hot Water Reheat = 67 psia
(A137) NO Freecooling/Dualcooling + (S407) YES Hot Water Reheat = 63 psia	(A137) NO Freecooling/Dualcooling + (S407) YES Hot Water Reheat = 67 psia
(A137) YES Freecooling/Dualcooling + (S407) YES Hot Water Reheat = 63 psia	(A137) YES Freecooling/Dualcooling + (S407) YES Hot Water Reheat = 67 psia

If menu line A102 or A137 or S407 is changed, the value on menu line A118 is updated automatically.

Factory Settings Parameters, page 4 of 9

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
A123	(Password)	-	-	-
A124	LP1 LOW (LP1 Sensor) 10%	0 psi	-145 to +725 psi	CSF
A125	LP1 HIGH (LP1 Sensor) 90%	150 psi	-145 to +725 psi	CSF
A126	LP1 ACT (Actual LP1 Signal)	-	0 – 100%	CSF
A127	LP2 LOW (LP2 Sensor) 10%	0 psi	-145 to +725 psi	CSF
A128	LP2 HIGH (LP2 Sensor) 90%	150 psi	-145 to +725 psi	CSF
A129	LP2 ACT (Actual LP2 Signal)	-	0 – 100%	CSF
A130	PD CUT (Pumpdown Cutout)	35 psi	0 – 87 psi	CSF
A131	PD RECYC (Pumpdown Recycle)	80 psi	0 – 87 psi	CSF
A132	HEAT REJ (Heat Rejection Control Type)	Fanspeed	AC Fanspeed, AC Lee-Temp, Water/Glycol	CSF

ADVANCED MENU's Continued

Factory Settings Parameters, page 5 of 9

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
A134	(Password)	-	-	-
A136	CW F DUR (CW Flush Duration)	0	0, 1, 2, 3 Min	CAF
A137	COOL TYPE (Cooling Type)	SINGL (Single Source)	SINGL, FC, DC (Single Source, Freecooling, Dual Cool	CSF
A138	STOP FC+ (Stop FC at Setpoint + Value)	8°F	2 - 18°F	CSF
A139	FC F DUR (Freecooling Flush Duration)	0	0, 1, 2, 3 min	CSF
A140	FC F R5 (Freecooling Flush Starts R5)	No	No, Yes	CSF
A141	COMP+FC (Comp + FC Simultaneously)	Yes	No, Yes	CSF
A142	HW F DUR (Hot Water Flush Duration)	0	0, 1, 2, 3 min	CSF
A143	HG HEAT (Hot Gas Heat)	No	No, Comp.1, Comp.2	CSF
A144	HEAT OP (Electric Reheat Operation)	No	No, Staged, Delayed	CSF

*** Note:** Parameter A138 is the temperature difference that parameter A370 – Status DT3 (Room/Setpoint) will use to switch from Off to Active.

If parameter A141 is set to Yes, than the value is determined by the following calculation:

Temperature Setpoint + Deadband + Proportion Band + 1°F

If parameter A141 is set to No, than the value is determined by the following calculation:

Temperature Setpoint + Deadband + ½ Proportion Band + 1°F

ADVANCED MENU's Continued

Factory Settings Parameters, page 6 of 9

Menu Line	Parameter SMALL DISPLAY (Large Display)	Default	Range	Control Board Safe
A145	(Password)	-	-	-
A146	HUM TYPE (Humidifier Model)	NO (No)	NO, EXT, IFS, IFL, PEX6, PEX9, PEX12, 21LLA, 53LLC, 53HLB, 93LLE, 93HLD, d3H, HT2, HT5, HT9 (No, External, IFS, IFL, PeX @ 6 Amp, PeX @ 9 Amp, PeX @ 12 Amp, 21L-CLA, 53L-CLC, 53H-CLB, 93L-CLE, 93H-CLD, d3H,HT2, HT5, HT9)	CSF
A147	HUM VOLTAGE (Humidifier Voltage)	-	Volts	CSF
A148	HUM LAST (Humidity in Last xxx Hours)	15 hours	1 – 120 hours	CSF
A149	PREFILL (Prefill Time)	IFS = 30 sec IFL = 60 sec	1 – 120 sec	CSF
A150	FILL (Fill Time)	IFS = 30 sec IFL = 60 sec	1 – 120 sec	CSF
A151	HUM ON (Humidifier On Time)	IFS = 8 min IFL = 10 min	1 - 3600 sec	CSF
A152	DEH COMP (Dehumidification with	1	1, 2, Both	CSF

ADVANCED MENU's Continued

Factory Settings Parameters, page 7 of 9

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range	Control Board Safe
A156	(Password)	-	-
A157	ANOUT1LO/HI (Analog Output 1 Low/High Limit)	0 – 100%	CSF
A158	ANOUT2LO/HI (Analog Output 2 Low/High Limit)	0 – 100%	CSF
A159	ANOUT3LO/HI (Analog Output 3 Low/High Limit)	0 – 100%	CSF
A160	ANOUT4LO/HI (Analog Output 4 Low/High Limit)	0 – 100%	CSF
A161	FS HE/HU (Fanspeed Heat/Hum)	0 – 100%	CSF
A163	ANLOUT1 (Analog Output 1)	See Note	CSF
A164	ANLOUT2 (Analog Output 2)	See Note	CSF
A165	ANLOUT3 (Analog Output 3)	See Note	CSF
A166	ANLOUT4 (Analog Output 4)	See Note	CSF

Note: The Analog Outputs 1 – 4 can be labeled as follows:
3PACT (3P Valve), HW (Hot Water), HW175 (Hot Water 1.75), VSD (Var SpeedDrive), COOL (Cooling), CV175 (Cooling CW/FC 1.75), COOL1 (Cooling 1), COOL2 Cooling 2), HEAT (Heating), NO (not used), MBV1 (MBV1), MBV2 (MBV2), SCR (SCR), CONF (Configurable), ALBD1 (AlarmBoard 1), ALBD2 (AlarmBoard 2), ALBD3 (AlarmBoard 3).

ADVANCED MENU's Continued

Factory Settings Parameters, page 8 of 9

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range	Control Board Safe
A167	(Password)	-	-
A168	AO1 STA (Analog Output 1 Start Point)	0% = 0.0V	CSF
A169	AO1 END (Analog Output 1 End Point)	100% = 10.0V	CSF
A170	AO2 STA (Analog Output 2 Start Point)	0% = 0.0V	CSF
A171	AO2 END (Analog Output 2 End Point)	100% = 10.0V	CSF
A172	AO3 STA (Analog Output 3 Start Point)	0% = 0.0V	CSF
A173	AO3 END (Analog Output 3 End Point)	100% = 10.0V	CSF
A174	AO4 STA (Analog Output 4 Start Point)	0% – 0.0V	CSF
A175	AO4 END (Analog Output 4 End Point)	100% – 10.0V	CSF

Factory Settings Parameters, Large Display only page 9 of 9

Menu Line	Parameter SMALL DISPLAY (Large Display)	Range	Control Board Safe
A178	(Password)	-	-
A179	LL Sensor 1 (Low Limit Sensor 1)	psia	CSF
A180	LL Sensor 1 (Low Limit Sensor 1)	psia	CSF
A181	Actual LL 1 Signal (Low Limit 1 Signal 1)	%	CSF
A182	Actual LL 1 Pressure (Low Limit 1 Pressure)	psia	CSF
A183	LL Sensor 2 (Low limit Sensor 2)	psia	CSF
A184	LL Sensor 2 (Low Limit Sensor 2)	psia	CSF
A185	Actual LL 2 Signal (Low Limit 2 Signa)	%	CSF
A186	Actual LL 2 Pressure (Low Limit 2 Pressure)	psia	CSF

*** Note:** Parameters A168 – A175 and A179 – A187 are for the electrically actuated ball type water regulating valves, they are not active at this time.

ADVANCED MENU's Continued

Compressor Status Parameters - Large Display only, page 1 of 6

Menu Line	Parameter (Large Display)	Range	Definition
A301	(Password)	-	-
A302	(First Compressor)	1, 2	Compressor rotation, shows actual lead compressor
A303	(Compressor 1 Alarm OFF)	No, Yes	Yes: Compressor is Off by alarm
A304	(Compressor 1 Quiet OFF)	No, Yes	Yes: Compressor is Off by alarm, but alarm is masked out (Low Pressure Phases and Head Pressure start attempts)
A305	(Compressor 1 Alarm PD OFF)	No, Yes	No: Pumpdown and re-pump down is allowed. Yes: Pumpdown and re-pump down is not allowed
A306	(Compressor 1 Temp PI Request)	0 – 100%	Cooling request for compressor 1
A307	(Compressor 1 Humi PI Request)	0 – 100%	Dehumidification request for compressor 1
A308	(Compressor 1 Min On Time Run)	No, Yes	Yes: If minimum On time is active
A309	(Compressor 1 Min Off Time Run)	No, Yes	Yes: If minimum Off time is active
A310	(Compressor 1 Alarm Off Run)	No, Yes	No: OK Yes: Compressor requested, but locked out by alarm condition
A311	(Compressor 1 Next Comp. Lock)	No, Yes	Yes: Compressor 1 adds a start time delay to compressor 2 (10 seconds) to avoid parallel start

ADVANCED MENU's Continued

Compressor Status Parameters - Large Display only, page 2 of 6

Menu Line	Parameter (Large Display)	Range	Definition
A312	(Password)	-	-
A313	(Compressor 1 On direct)	No, Yes	Yes if compressor is requested
A314	(Compressor 1 On delayed)	No, Yes	Yes if compressor is requested and timers have elapsed, compressor should operate
A315	(Compressor 1 Pumpdown On)	No, Yes	Yes if compressor is in pump down mode
A316	(Compressor 1 Re-PD Counter)	Number	Counts the number of re-pump down activities
A317	(Compressor 1 PD Unstuck Count)	Number	Counts the number of LLSV unstuck attempts
A318	(Compressor 1 Ramp)	0 – 100%	Shows the value of analog out "Cooling 1"
A319	(Compressor 1 HP Alarm Code)	0 – 3	Shows the actual Head Pressure alarm code
A320	(Compressor 1 HP Alarm Int)	No, Yes	Yes if Head Pressure alarm is active, no matter if alarm is enabled or disabled
A321	(Compressor 1 HP Comp Lock)	No, Yes	Compressor stopped due to Head Pressure alarm algorithm, with or without alarm notification
A322	(Compressor 1 HP 10min counter)	Number	Counts the number Head Pressure alarms within the first 10 minutes of compressor on

ADVANCED MENU's Continued

Compressor Status Parameters - Large Display only, page 3 of 6

Menu Line	Parameter (Large Display)	Range	Definition
A323	(Password)	-	
A324	(Compressor 1 LP Phase)	Number	Shows actual Low Pressure phase
A325	(Compressor 1 LP Alarm Code)	0 – 3	Shows actual Low Pressure Alarm code
A326	(Compressor 1 LP Alarm Int)	No, Yes	Yes if Low Pressure alarm is active, no matter if alarm is enabled or disabled
A327	(Compressor 1 LP Comp Lock)	No, Yes	Yes if compressor is locked out by Low Pressure phase
A328	(Compressor 1 LP Comp Stop)	No, Yes	Yes if compressor is regularly stopped
A329	(Compressor 1 LP FC Lock 4h)	No, Yes	Yes if FreeCooling is locked out due to Low Pressure conditions
A330	(Compressor 1 LP Press AVG On)	No, Yes	Yes if Low Pressure is in averaging mode
A331	(Compressor 1 LP PH6 Timer Run)	No, Yes	Yes if Phase 6 was within this hour
A332	(Compressor 1 TH Alarm Int)	No, Yes	Yes if 30 minute delay of DigiScroll High Temperature alarm is active

ADVANCED MENU's Continued

Compressor Status Parameters - Large Display only, page 4 of 6

Menu Line	Parameter (Large Display)	Range	Definition
A334	(Password)	-	-
A335	(First Compressor)	1, 2	Compressor rotation, actual lead compressor
A336	(Compressor 2 Alarm OFF)	No, Yes	Yes: Compressor is Off by to alarm
A337	(Compressor 2 Quiet OFF)	No, Yes	Yes: Compressor is Off by alarm, but alarm is masked out (Low Pressure Phases and Head Pressure start attempts)
A338	(Compressor 2 Alarm PD OFF)	No, Yes	No: Pump down and re-pump down allowed. Yes: Pump down and re-pump down not allowed
A339	(Compressor 2 Temp PI Request)	0 – 100%	Cooling request for compressor 2
A340	(Compressor 2 Humi PI Request)	0 – 100%	Dehumidification request for compressor 2
A341	(Compressor 2 Min On Time Run)	No, Yes	Yes: If minimum On time is active
A342	(Compressor 2 Min Off Time Run)	No, Yes	Yes: If minimum Off time is active
A343	(Compressor 2 Alarm Off Run)	No, Yes	No: OK Yes: Compressor requested, but locked out due to alarm
A344	(Compressor 2 Next Comp. Lock)	No, Yes	Yes: Compressor 2 adds a start time delay to compressor 1 (10 seconds) to avoid parallel start

ADVANCED MENU's Continued

Compressor Status Parameters - Large Display only, page 5 of 6

Menu Line	Parameter (Large Display)	Range	Definition
A345	(Password)	-	-
A346	(Compressor 2 On direct)	No, Yes	Yes if compressor is requested
A347	(Compressor 2 On delayed)	No, Yes	Yes if compressor is requested and timers have elapsed, compressor should operate
A348	(Compressor 2 Pumpdown On)	No, Yes	Yes if compressor is in pump down mode
A349	(Compressor 2 Re-PD Counter)	Number	Counts the number of re-pump down activities
A350	(Compressor 2 PD Unstuck Count)	Number	Counts the number of LLSV unstuck attempts
A351	(Compressor 2 Ramp)	0 – 100%	Shows the value of analog out "Cooling 2"
A352	(Compressor 2 HP Alarm Code)	0 – 3	Shows the actual Head Pressure alarm code
A353	(Compressor 2 HP Alarm Int)	No, Yes	Yes if Head Pressure alarm is active, no matter if alarm is enabled or disabled
A354	(Compressor 2 HP Comp Lock)	No, Yes	Compressor stopped due to Head Pressure alarm algorithm, with or without alarm notification
A355	(Compressor 2 HP 10min Counter)	Number	Counts the number Head Pressure alarms within the first 10 minutes of compressor on

ADVANCED MENU's Continued

Compressor Status Parameters - Large Display only, page 6 of 6

Menu Line	Parameter (Large Display)	Range	Definition
A356	(Password)	-	
A357	(Compressor 2 LP Phase)	Number	Shows actual Low Pressure phase
A358	(Compressor 2 LP Alarm Code)	0 – 3	Shows actual Low Pressure Alarm code
A359	(Compressor 2 LP Alarm Int)	No, Yes	Yes if Low Pressure alarm is active, no matter if alarm is enabled or disabled
A360	(Compressor 2 LP Comp Lock)	No, Yes	Yes if compressor is locked out by Low Pressure phase
A361	(Compressor 2 LP Comp Stop)	No, Yes	Yes if compressor is regularly stopped
A362	(Compressor 2 LP FC Lock 4h)	No, Yes	Yes if FreeCooling is locked out due to Low Pressure conditions
A363	(Compressor 2 LP Press AVG On)	No, Yes	Yes if Low Pressure is in averaging mode
A364	(Compressor 2 LP PH6 Timer Run)	No, Yes	Yes if Phase 6 was within this hour
A365	(Compressor 2 TH Alarm Int)	No, Yes	Yes if 30 minute delay of DigiScroll High Temperature alarm is active

Access Parameters (NOT accessible to change)

Menu Line	Parameter	Default	Range
A201	Password Level 1 - User	1490	4 Digits
A202	Password Level 2 - Service	5010	4 Digits
A203	Password Level 3 - Advanced	2210	4 Digits

ADVANCED MENU's Continued

Motorized Ball Valve Settings - Large Display only, page 1 of 1

Menu Line	Parameter (Large Display)	Range
A401	(Password)	-
A403	(Max Setpoint/Output)	0 – 580 psia / 0 – 100%
A404	(U4 Actual/Setpoint/Ouput Change)	0 – 580 psia / 0 – 100%
A405	(U3A Actual/Setpoint/Ouput Change)	0 – 580 psia / 0 – 100%
A406	(U3B Actual/Setpoint/Ouput Change)	0 – 580 psia / 0 – 100%
A407	(U2A Actual/Setpoint/Ouput Change)	0 – 580 psia / 0 – 100%
A408	(U2B Actual/Setpoint/Ouput Change)	0 – 580 psia / 0 – 100%
A409	(U1 Actual/Setpoint/Ouput Change/Delay)	0 – 580 psia / 0 – 100% / 0 – 1800 sec
A410	(L1 Actual/Setpoint/Ouput Change/Delay)	0 – 580 psia / 0 – 100% / 0 – 1800 sec
A411	(L2A Actual/Setpoint/Ouput Change)	0 – 580 psia / 0 – 100%
A412	(L2B Actual/Setpoint/Ouput Change)	0 – 580 psia / 0 – 100%
A413	(L3 Actual/Setpoint/Ouput Change)	0 – 580 psia / 0 – 100%
A414	(Min Setpoint/Output)	0 – 580 psia / 0 – 100%
A415	(Start Delay Output/Time)	0 – 100% / 0 – 600 sec
A416	(Stop Delay Setpoint/Output/Time)	0 – 580 psia / 0 – 100% / 0 – 1800 sec
A417	(Dig. Scroll Filter)	1 - 100
A418	(Offset)	± 26 psia
A419	(MBV 1 Pressure/Position)	± 999 psia / 0 – 100%
A420	(MBV 2 Pressure/Position)	± 999 psia / 0 – 100%
A421	(MVB Reinit)	0 = No, 1 = Yes
A422	(Reading Interval)	0 – 600 sec

Note: Parameters A403 – A422 are for the electrically actuated ball type water regulating valves, they are not active at this time.

ADVANCED MENU's Continued

Runtime Monitoring - Large Display only, page 1 of 7 – State, Read Only

Menu Line	Parameter (Large Display)	Range
A601	(Password)	-
A602	(Current Operating State)	0 – 99
A603	(Current Control Mode State)	0 – 99
A604	(Reason of Current Operating State)	0 – 99
A605	(Manual On Time)	0 - 9999 sec

Runtime Monitoring - Large Display only, page 2 of 7 – PID, Read Only

Menu Line	Parameter (Large Display)	Range
A613	(P Temperature Deviation)	0.0 – 100%
A614	(P Humidity Deviation)	0.0 – 100%
A615	(PI Temperature Deviation)	0.0 – 100%
A616	(PI Humidity Deviation)	0.0 – 100%
A618	(PID Temperature Deviation)	0.0 – 100%
A619	PID Proportion Part)	0.0 – 100%
A620	(PID Integral Part)	0.0 – 100%
A621	(PID Derivative Part)	0.0 – 100%
A623	(Current Temp P-Band)	0 - 99ºF
A624	(Current Hum P-Band)	0.0 – 100%

ADVANCED MENU's Continued

Runtime Monitoring - Large Display only, page 3 of 7 – Heaters, Read Only

Menu Line	Parameter (Large Display)	Range
A625	(Heater 1 State without Rotation)	0 – 3
A626	(Heater 2 State without Rotation)	0 – 3
A627	(Heater 3 State without Rotation)	0 – 3
A628	(Heat Step 1 Output Order)	0 – 3
A629	(Heat Step 2 Output Order)	0 – 3
A630	(Heat Step 3 Output Order)	0 – 3
A631	(Heater 1 Output State)	0, 1
A632	(Heater 2 Output State)	0, 1
A633	(Heater 3 Output State)	0, 1
A634	(Actual Cycle Time)	0 - 9999 sec

Runtime Monitoring - Large Display only, page 4 of 7 – Deh/Hum, Read Only

Menu Line	Parameter (Large Display)	Range
A637	(Fill Time Multipl. with Flushrate)	0 – 999 sec
A638	(After Prefill time On)	0, 1
A639	(Low Limit 1 Boarder)	± 200%
A640	(Low Limit 2 Boarder)	± 200%
A641	(Low Limit Prop. Temp. Deviation)	± 200%

ADVANCED MENU's Continued

Runtime Monitoring - Large Display only, page 5 of 7 – Fuzzy 1, Read Only

Menu Line	Parameter (Large Display)	Range
A649	(Fuzzy Input)	0.00 – 99.99%
A650	(Fuzzy Output Deviation)	0.00 – 99.99%
A651	(Fuzzy Sensible Percent)	0.00 – 99.99%
A652	(Fuzzy Latent Percent)	0.00 – 99.99%
A653	(Fuzzy Delta Temp)	0.00 – 99.99%
A654	(Fuzzy Delta Hun)	0.00 – 99.99%
A655	(Fuzzy Cool)	0.00 – 99.99%
A656	(Fuzzy Dehum)	0.00 – 99.99%
A657	(Fuzzy Temp Sensitivity)	0.00 – 99.99%
A658	(Fuzzy Hum Sensitivity)	0.00 – 99.99%

Runtime Monitoring - Large Display only, page 6 of 7 – Fuzzy 2, Read Only

Menu Line	Parameter (Large Display)	Range
A661	(Fuzzy Min Temp)	± 999
A662	(Fuzzy Max Temp)	± 999
A663	(Fuzzy Min Hum)	± 999
A664	(Fuzzy Max Hum)	± 999
A665	(Fuzzy Valve Temp Diff)	± 999
A666	(Fuzzy Valve Hum Diff)	± 999
A667	(Fuzzy Valve Swing)	± 999
A668	(Fuzzy Timer)	± 999
A669	(Fuzzy Cool Change)	± 999
A670	(Fuzzy Dehum Change)	± 999

ADVANCED MENU's Continued

Runtime Monitoring - Large Display only, page 7 of 7 – Fuzzy 3, Read Only

Menu Line	Parameter (Large Display)	Range
A673	(Fuzzy Temp Rate)	± 999
A674	(Fuzzy Hum Rate)	± 999
A675	(Fuzzy Sensible Value)	± 999
A676	(Fuzzy Latent Value)	± 999
A677	(Fuzzy Sensible DX)	± 999
A678	(Fuzzy Latent DX)	± 999
A679	(Fuzzy Member PT1)	± 999
A680	(Fuzzy Member PT2)	± 999
A681	(Fuzzy Member PT3)	± 999
A682	(Fuzzy Membership)	± 999

Chapter 3

iCOM

Board Electrical Connections

Introduction

This section describes the basic connection points on the Liebert DS units. Each sub-section describes the standard electrical connections and control DIP switches supplied with the various i*COM* control boards. The detail is as follows:

Display Assembly: Small and Large

Plug and Terminal Block Connections

Fuse Board: All Units

Display Assemblies

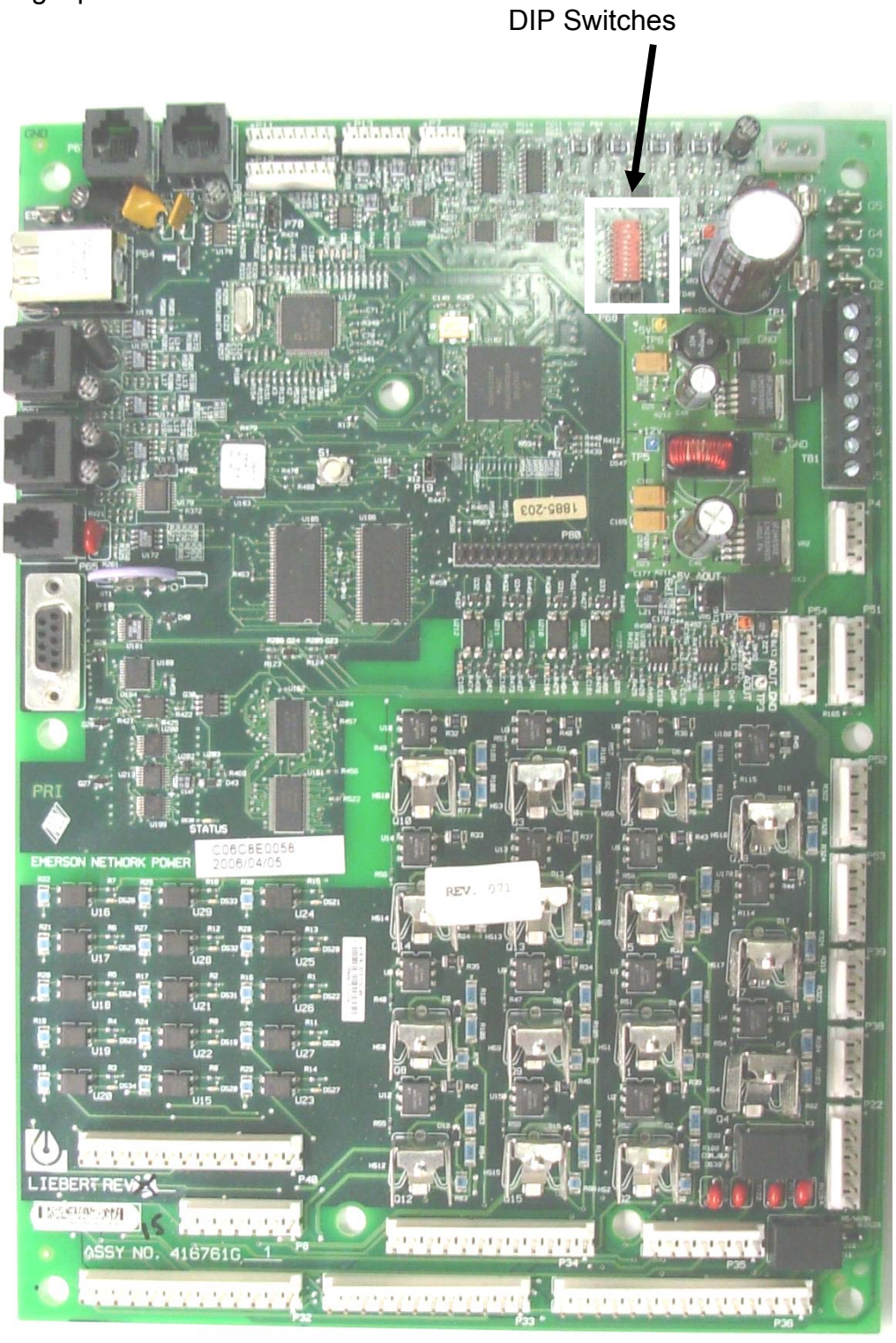
Both the Large and Small display assemblies are mounted to the unit accent panel. The large Display assembly uses one (1) CAN cable and one (1) crossover Ethernet cable to connect to the control board. The Small Display assembly uses one (1) CAN cable to connect to the control board

Small Display

Large Display

Control Board DIP Switches

The following section describes the control board DIP switch settings for defining the analog inputs.



Unit Mounted Control Board

iCOM Control Board DIP Switch Settings for Analog Input Setup

Plug Connector	Input/Output Type	Setting
P7-1 (+) / P7-2 (-)	NTC Thermistor	***** Software (ASW1 = 1)
	PTC Thermistor	Software (ASW1 = 0)
P11-1 (+) / P11-2 (-)	Analog Voltage: 0 to +5V	***** Sw2-1: On / Sw2-2: Off
	Analog Voltage: 0 to +10V	Sw2-1: Off / Sw2-2: Off
	Analog Current: 4 to 20mA	Sw2-1: On / Sw2-2: On
P11-3 (+) / P11-4 (-)	+5V Output	None
P11-5 (+) / P11-6 (-)	Analog Voltage: 0 to +5V	***** Sw2-3: On / Sw2-4: Off
	Analog Voltage: 0 to +10V	Sw2-3: Off / Sw2-4: Off
	Analog Current: 4 to 20mA	Sw2-3: On / Sw2-4: On
P11-7 (+) / P11-8 (-)	+5V Output	None
P12-1 (+) / P12-2 (-)	Analog Voltage: 0 to +5V	***** Sw2-5: On / Sw2-6: Off
	Analog Voltage: 0 to +10V	Sw2-5: Off / Sw2-6: Off
	Analog Current: 4 to 20mA	Sw2-5: On / Sw2-6: On
P12-3 (+) / P12-4 (-)	+5V Output	None
P12-5 (+) / P12-6 (-)	Analog Voltage: 0 to +5V	***** Sw2-7: On / Sw2-8: Off
	Analog Voltage: 0 to +10V	Sw2-7: Off / Sw2-8: Off
	Analog Current: 4 to 20mA	Sw2-7: On / Sw2-8: On
P12-7 (+) / P12-8 (-)	+5V Output	None
P13-1 (+) / P13-2 (-)	NTC Thermistor	***** Software (ASW2 = 1)
	PTC Thermistor	Software (ASW2 = 0)
P13-3 (+) / P13-4 (-)	NTC Thermistor	Sw2-9: On
	NTC Scroll Thermistor	***** Sw2-9: Off
P13-5 (+) / P13-6 (-)	NTC Thermistor	Sw2-10: On
	NTC Scroll Thermistor	***** Sw2-10: Off

*** Default Setting**

iCOM Control Board Jumper Settings

Jumper	Type	Setting
P19	Watchdog	*Shunt on Pins 1 & 2
P78	CAN Bus Terminator	*Shunt on Pins 1 & 2
P83	Bootloader	*No Shunt

*** Default Setting**

Small Display DIP Switch #3 Settings

	Type	Setting
SW3 - 1	CAN Address	Off
SW3 - 2	CAN Address	Off
SW3 - 3	CAN Address	Off
SW3 - 4	CAN Address	Off
SW3 - 5	CAN Operating Mode	On
SW3 - 6	CAN Operating Mode	On
SW3 - 7	CAN Baud	Off
Sw3 - 8	CAN Baud	Off

Small Display Jumper Settings

Jumper	Type	Setting
P4	Contrast (Software function)	* Shunt Pins 1 & 2
P78	CAN Termination	* Shunt on Pins 2 & 3
P80	BDM Header	Open
P82	Watchdog (416821G1 – 5 Rev. 0 - 7)	* Shunt on Pins 1 & 2

*** Default Setting**

Large Display DIP Switch #3 Settings

Large Display DIP Switch #3 Settings

Position	Type	Setting
SW3 - 1	CAN Address	Off
SW3 - 2	CAN Address	Off
SW3 - 3	CAN Address	Off
SW3 - 4	CAN Address	Off
SW3 - 5	CAN Address	Off
SW3 - 6	CAN Address	Off
SW3 - 7	CAN Baud	Off
SW3 - 8	CAN Baud	Off

Large Display Jumper Settings

Jumper	Type	Setting
P4	Contrast (Software function)	* Shunt on Pins 1 & 2
P8	Open	Open
P13	BDM Mode	Open
P18	RS232 Header	Open
P78	CAN Termination	* Shunt on Pins 2 & 3
P80	BDM Header	Open
P83	Bootloader Jumper	Open

*** Default Setting**

Temperature/Humidity Board DIP Switch #1 Settings

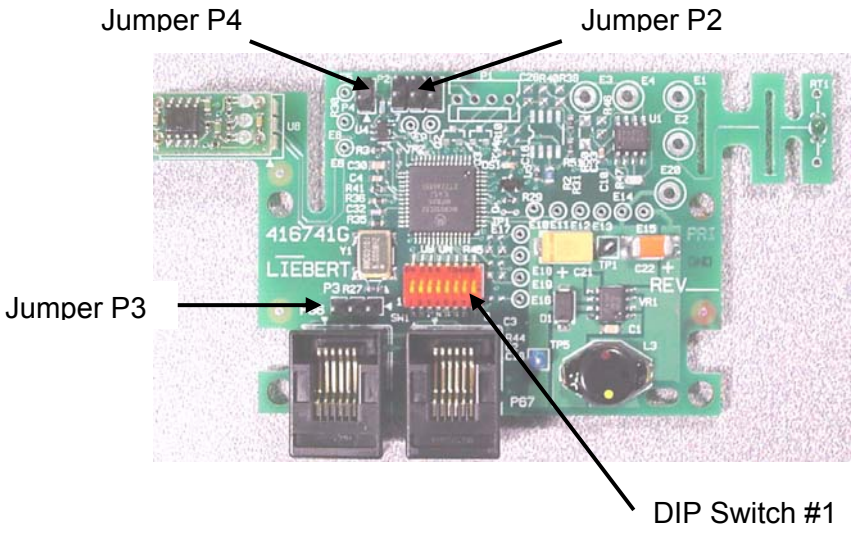
SW1 - 1	SW1 - 2	SW1 - 3	SW1 - 4	SW1 - 5	SW1 - 6	Comments
Off	Off	Off	Off	On	Off	Internal T/H Sensor
On	Off	Off	Off	On	Off	Sensor A
Off	On	Off	Off	On	Off	Sensor B
On	On	Off	Off	On	Off	Sensor C

Temperature/Humidity Board Jumper Settings

Jumper	Type	Setting
P2	BDM Header	***** Open
P3	CAN Termination	***** Shunt on Pins 2 & 3
P4	Programming	***** Open
E10 – E13	Serial Port	***** Open

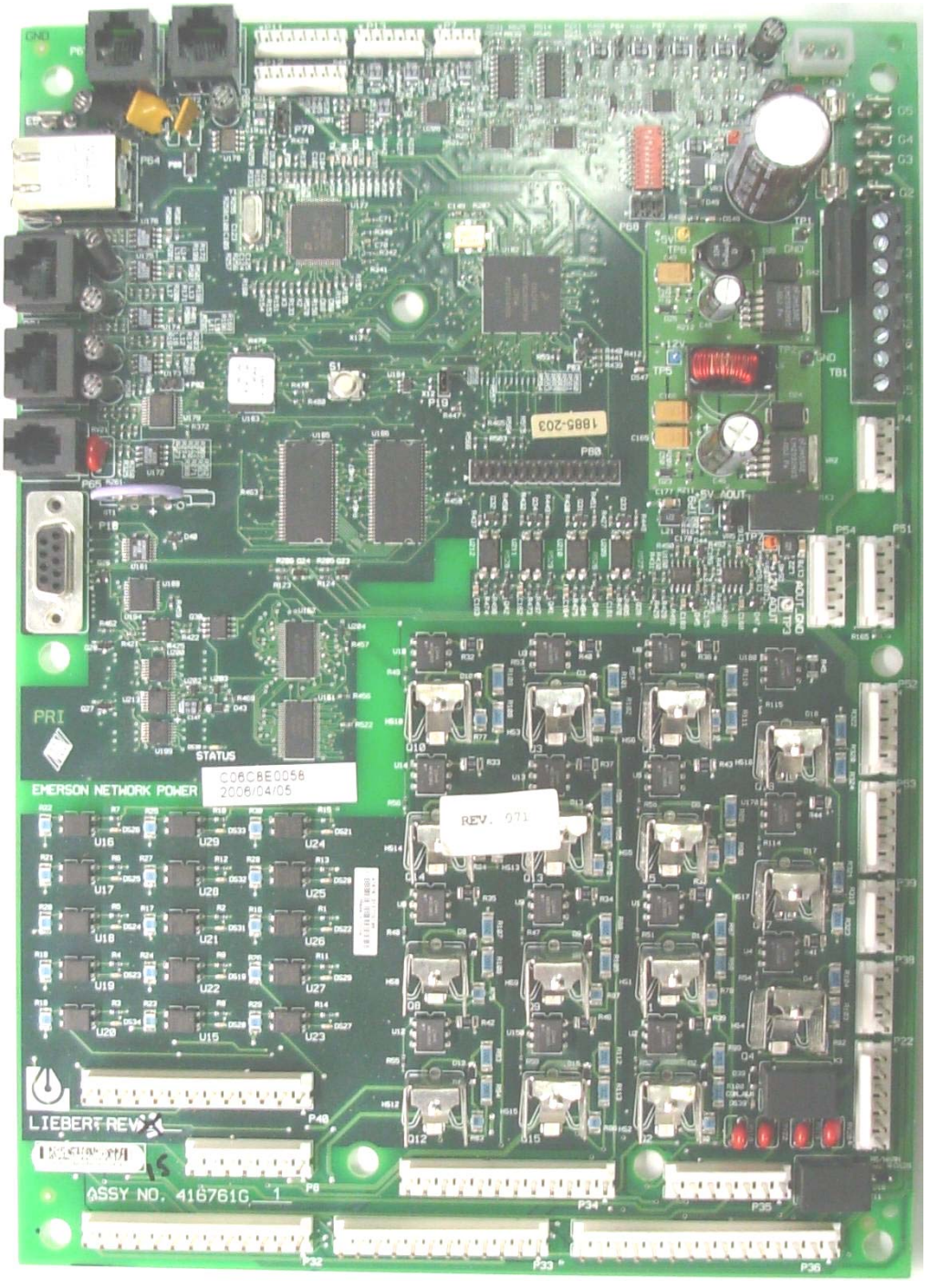
***** Default Setting

Jumper P3 CAN Bus Termination: The correct position of this jumper is dependant on your environment. If the board is physically the first or last node on the CAN Bus, the jumper needs to be shunted across pins 2 – 3 (Default position). Otherwise position the shunt across pins 1 – 2.



Control Board Plug Connectors

This section identifies the various plug connections and the terminal block connections located on the unit control board. The tables in this section show all of the pin connections and the reference points for signal flow through these connections.



Unit Mounted Control Board

DS/VS Units:

P4: 24 VAC Power

P4-1:	Fuse 1 (24 VAC)	P4-3:	Fuse 3 (24 VAC)
P4-2:	Fuse 2 (24 VAC)	P4-4:	Fuse 4 (24 VAC)

P7: Fluid Sensor

P7-1:	Aquastat Sensor	P7-3:	No Connection
P7-2:	Aquastat Sensor	P7-4:	No Connection

P8: 24 VAC Alarm Inputs

P8-1:	24 VAC (RAD1/TS 50)	P8-5:	24 VAC (HWA)
P8-2:	24 VAC (RAD2/TS 51)	P8-6:	24 VAC Out (TS 24)
P8-3:	24 VAC (RAD3/TS 55)	P8-7:	24 VAC Out (HWA)
P8-4:	24 VAC (RAD4/TS 56)		

P11: Low Pressure Transducer Circuits

P11-1: DCV Signal to LPT1
P11-2: Cold Start Bypass 1 Signal
P11-3: MP Signal to LPT1
P11-4: LPT1 Input to MP
P11-5: DCV Signal to LPT2
P11-6: Cold Start Bypass 2 Signal
P11-7: MP Signal to LPT2
P11-8: LPT2 Input to MP

P12: Analog Sensor 1 and 2 Inputs

P12-1: T+ Analog 1 (TS 41)
P12-2: T- Analog 1 (TS 42)
P12-5: T+ Analog 2 (TS 43)
P12-6: T- Analog 2 (TS 44)

P12: Optional High Pressure Transducer Circuits

P12-1: DCV Signal to HPT1
P12-2: HTP1 Input to MP
P12-3: MP Signal to HPT1
P12-4: HPT1 Input to MP
P12-5: DCV Signal to HPT2
P12-6: HTP2 Input to MP
P12-7: MP Signal to HPT2
P12-8: HPT2 Input to MP

P13: DCV Thermistor Signals

P13-1: No Connection
P13-2: No Connection
P13-3: DCV Signal to Digital Scroll Thermistor 1
P13-4: DCV Signal from Digital Scroll Thermistor 1
P13-5: DCV Signal to Digital Scroll Thermistor 2
P13-6: DCV Signal from Digital Scroll Thermistor 2

P18: Serial Cable Plug Connection – NOT Used

P22: Glycool Valve/Chilled Water Valve (Std. Pressure Actuator)

P22-1: 24 VAC Out (Q18 Close Valve)
P22-2: DCV Signal
P22-3: 24 VAC Out (Q17 Open Valve)
P22-4: DCV Signal
P22-5: E2 (24 VAC Gnd)
P22-6: +5 VDC

P32: Compressor Devices

P32-1: 24 VAC Out (LLSV1)
P32-2: E1 (LLSV1)
P32-3: 24 VAC Out (LLSV2)
P32-4: 24 VAC Out (OL/KL1/HP1)
P32-5: 24 VAC Out (OL/KL2/HP2)
P32-6: 24 VAC (HP1 to Q14)
P32-7: 24 VAC (HP2 to Q10)
P32-8: 24 VAC
P32-9: 24 VAC (HP1 Alarm)
P32-10: 24 VAC Out (C1)
P32-11: E1 (C1)
P32-12: 24 VAC Out (C2)
P32-13: E2 (C2)

P33: Compressor Devices

P33-1: 24 VAC Out (CUV1/DSV1)
P33-2: E1 (CUV1/DSV1)
P33-3: E2 (LLSV2)
P33-4: 24 VAC Out (CUV2/DSV2)
P33-5: E2 (CUV2/DSV2)
P33-6: 24 VAC (OL/KL1 Alarm)
P33-7: 24 VAC (OL/KL2 Alarm)
P33-8: 24 VAC
P33-9: 24 VAC (HP2 Alarm)
P33-10: K11 (N.O.)
P33-11: K11 (N.O.)
P33-12: No connection

P34: Reheat Devices

P34-1: 24 VAC Out (RS1/RS2/RS3)
P34-2: E3 (RS1/RS2/S3)
P34-3: E3 (GCD/ BR)
P34-4: 24 VAC Out (RH1/HGRS)
P34-5: No connection
P34-6: 24 VAC Out (RH2)
P34-7: No connection
P34-8: 24 VAC Out (RH3)
P34-9: No connection
P34-10: E3 (RH1/ HGRS/ RH2/ RH3)
P34-11: No connection
P34-12: 24 VAC Out (GCD/ BR)

P35: Infrared Humidifier Devices

P35-1: 24 VAC Out (H)
P35-2: E3 (H)
P35-3: 24 VAC Out (HMV)
P35-4: E4 (HMV)
P35-5: E3 (HS3)
P35-6: 24 VAC Out (HS3)
P35-7: No Connection

P36: Basic Unit Connections

P36-1:	24 VAC Out (Filter Clog)	P36-9:	No connection
P36-2:	24 VAC (Filter Clog Alarm)	P36-10:	E2
P36-3:	24 VAC Out (MF)	P36-11:	No connection
P36-4:	24 VAC Out (AS Switch)	P36-12:	No connection
P36-5:	24 VAC (AS Alarm)	P36-13:	K3 (Common: TB75)
P36-6:	24 VAC (MF Overload Alarm)	P36-14:	K3 (N.O.: TB76/R3)
P36-7:	24 VAC	P36-15:	K3 (N.C.)
P36-8:	E4 (MF)		

P38: Smoke Detector

P38-1:	24 VAC Out (SDC)	P38-3:	24 VAC (RAD1)
P38-2:	E4 (SDC)	P38-4:	No connection

P39: Firestat & Remote Shutdown

P39-1:	24 VAC Out (HTS)	P39-3:	24 VAC Out (RDS1/TS 37)
P39-2:	24 VAC Return (HTS)	P39-4:	24 VAC Return (RSD1/ TS 38)

P40: Basic Unit Connections

P40-1:	No connection	P40-8:	E4 (Opt. CPAR)
P40-2:	No connection	P40-9:	No connection
P40-3:	No connection	P40-10:	E4
P40-4:	No connection	P40-11:	No connection
P40-5:	No connection	P40-12:	24 VAC Out (MF Ovld)
P40-6:	No connection	P40-13:	24 VAC
P40-7:	24 VAC Out (Opt. CPAR)		

P43: T6 Transformer Secondary (Power to Rectifier Circuit)

P43-1:	24 VAC Gnd
P43-2:	24 VAC

P51: Hot Water Reheat

P51-1:	24 VAC Out	P51-4:	24 VAC Gnd (E1)
P51-2:	-5 VDC Gnd	P51-5:	No Connection
P51-3:	H.W. Mod (0 – 2.5 VDC)		

P52: Glycool Valve/Chilled Water Valve (Opt. Pressure Modulating)

P52-1:	24 VAC Out	P52-4:	24 VAC Gnd (E1)
P52-2:	-5 VDC Gnd	P52-5:	no connection
P52-3:	Mod Valve (0 – 2.5 VDC)		

P53: Motorized Ball Valve #1 (MBV-1)

P53-1:	24 VAC Out to MVB-1	P53-4:	24 VAC Gnd (E4)
P53-2:	24 VAC Out	P53-5:	No connection
P53-3:	MVB-1 Signal to MP		

P54: Motorized Ball Valve #2 (MBV-2)

P54-1:	24 VAC Out to MVB-2	P54-4:	24 VAC Gnd (E4)
P54-2:	24 VAC Out	P54-5:	no connection
P54-3:	MVB-2 Signal to MP		

P61: Optional Intellislot 12 VDC Power Supply, connect only if optional device is used.

P63: NOT Used

P64: Ethernet Port
Connects the Large Display to the Control Board using a crossover cable or connects the Control Board to the switch using a straight patch cable when networking.

P65: Site Monitoring Signals when the Intellislot is not used

P65-1:	+5 VDC to TS 78
P65-2:	-5 VDC to TS 77

Must be re-connected to the optional Intellislot for communications when used.

P66: Unit Display Power CAN Bus Connection (Digital Signal).

P67: Temperature/Humidity Assembly Power CAN Bus Connection (Digital Signal).

TB1: 24 VAC

TB1-1:	24 VAC (T2)	TB1-5:	E1 (G2)
TB1-2:	24 VAC (T3)	TB1-6:	E2 (G3)
TB1-3:	24 VAC (T4)	TB1-7:	E3 (G4)
TB1-4:	24 VAC (T5)	TB1-8:	E4 (G5)

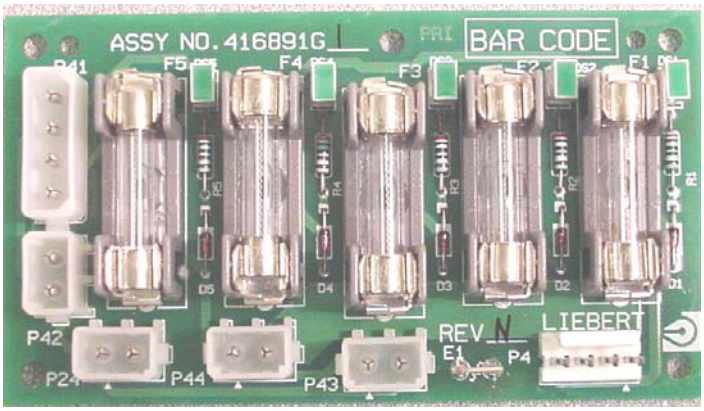
E1/ E2/ E3/ E4: Transformer Grounds

Test Points for DC Voltage on Control Board

TP1:	DC Gnd	TP6:	+ 5 VDC
TP2:	DC Gnd	TP7:	+ 12 VDC – A out
TP3:	DC Gnd – A out	TP8:	
TP4:	+ 3.3 VDC	TP9:	+ 5 VDC – A out
TP5:	+ 12 VDC	TP10	

Fuse Board Layout: All Units

This section deals with the seven (7) plug connectors on the fuse board. The fuse board is supplied on all systems with iCOM and is located in the low voltage section of the unit. The tables in this section show all of the connections and reference points for signal flow through these connectors.



Fuse Board

P4: 24 VAC Power

P4-1:	Fuse 1	P4-3:	Fuse 3
P4-2:	Fuse 2	P4-4:	Fuse 4

P24: T1 Transformer – Line Voltage Primary 24VAC Secondary

P24-1: 24 VAC Gnd (T1)
P24-2: 24 VAC (T1)

P41: 24 VAC Power – T6 Isolation Transformer

P41-1: 24 VAC Gnd (T6 Primary)
P41-2: 24 VAC (T6 Primary)
P41-3: 24 VAC Gnd (T6 Secondary)
P41-4: 24 VAC (T6 Primary)

P42: Intellislot – NOT USED

P43: T6 Transformer Secondary (Power to Rectifier Circuit)

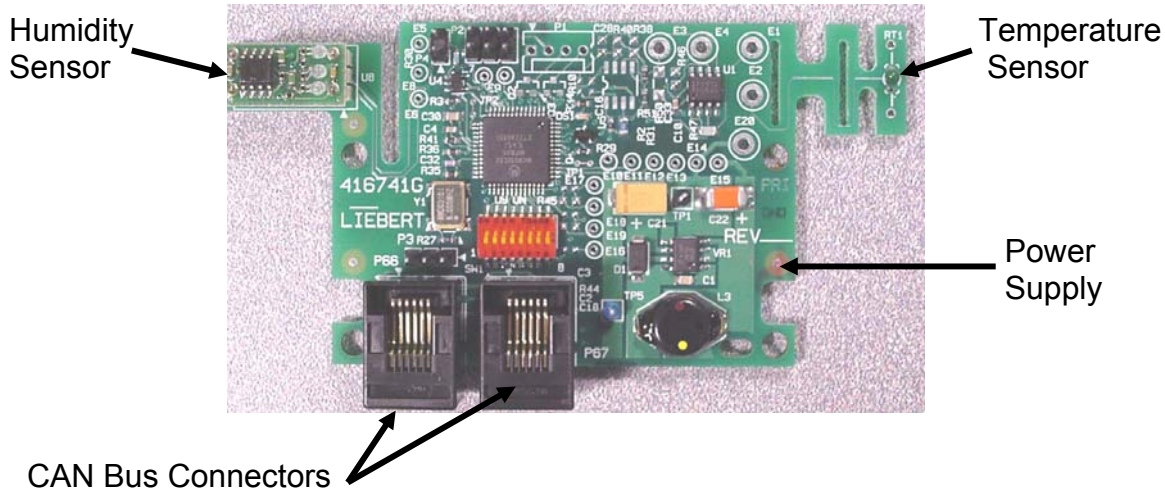
P43-1: 24 VAC
P43-2: 24 VAC

P44: Jumper

E1: Transformer Secondary Ground (unit ground)

Temperature/Humidity Board: All Units

This section deals with the single plug connection located on the system temperature and humidity board. The temperature/ humidity board is supplied on all systems with *iCOM* controls. The cable is plugged into Plug P67 on the unit microprocessor board and transmits information using "CAN" – Controlled Area Network communication. Troubleshooting is accomplished by observing an LED located on the board. If the LED is glowing the board is good. The temperature and humidity board is typically located in the unit return.



Temperature/Humidity Board

P67: Return Air Temperature/Humidity Board

P67-1: CAN communication
P67-6: CAN communication

Standard Return Air Housing

Optional Remote housing

NOTES:

Chapter 4

General Troubleshooting Data

* Basic Operation of the Opto and Triac

* Troubleshooting the Opto-Isolator and Triac

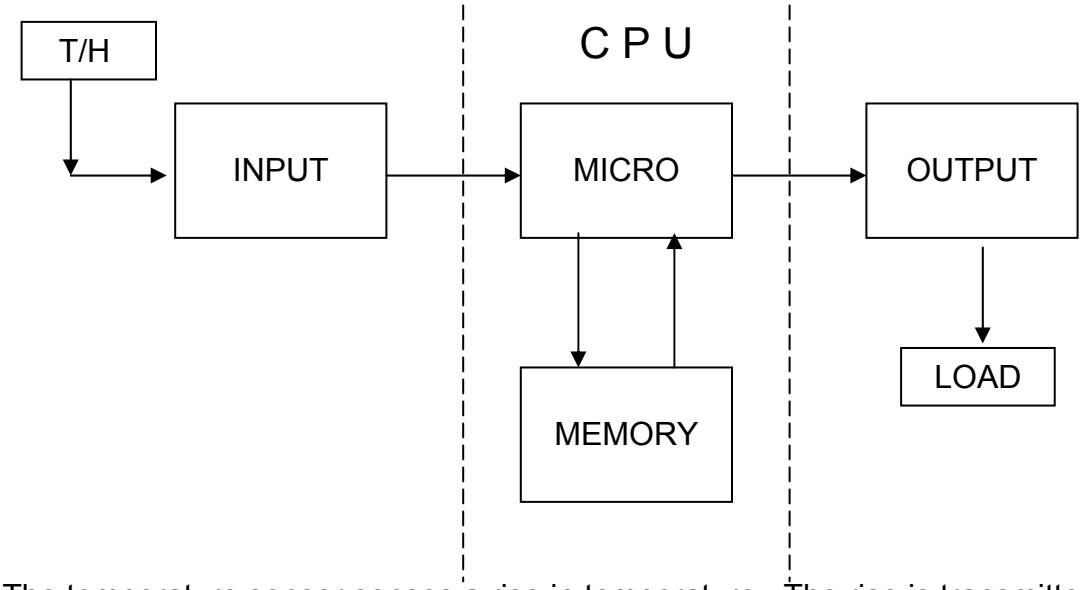
* Control Input Check (Sensors)

* Troubleshooting Signals and Checklist

* Moisture Content Charts

This section covers only very basic electronics. The major components, such as triacs and opto-isolators are briefly described and related to the Liebert units you have come to study. It is our hope that this brief introduction to electronics stimulates your interest and encourages you to go further in the field.

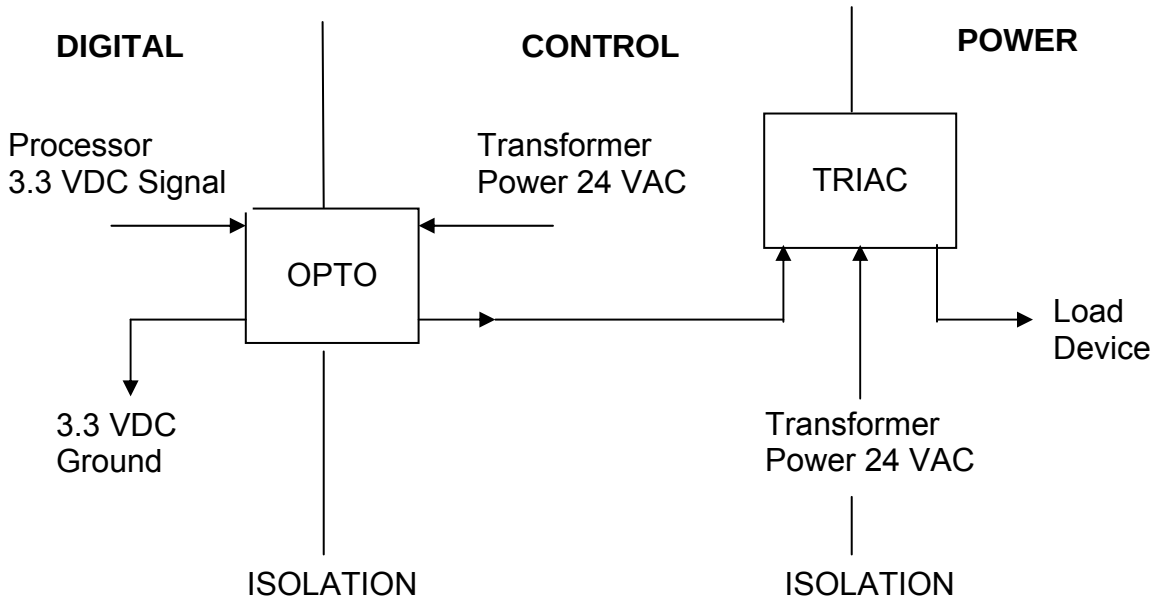
The path of a signal from beginning to the end - using the four block process.



The temperature sensor senses a rise in temperature. The rise is transmitted to the **C**entral **P**rocessing **U**nit (CPU). The CPU looks into its memory for information and instructions on what to do with the rise in temperature. The CPU then makes the decision to call for cooling.

Isolation

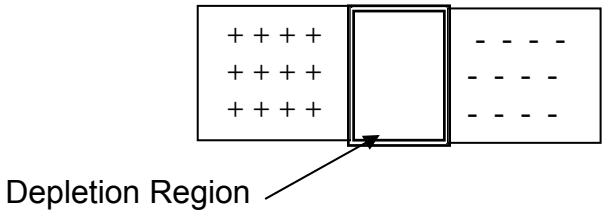
We use the opto-isolator and the triac to isolate areas of control and voltage. There are three areas of control and two voltage levels. Digital control comes from the microprocessor at 5 VDC and the other voltage level is 24 VAC. One voltage is used to turn on the triac and the other is used to operate the load device.



Areas of Control

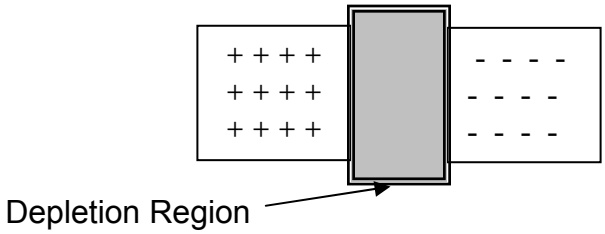
BASIC OPERATION OF THE TRIAC

To better understand the operation of the triac, we need to look at the movement of electrons in a special type of material used in electronics. Here we have a semiconductor material with what is called a depletion region. The depletion region restricts the flow of electrons to a point.



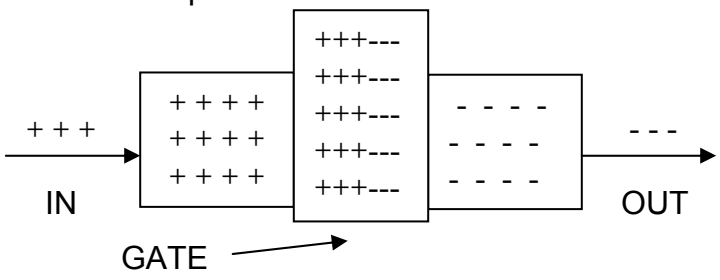
Semiconductor

By forcing more electrons in to the depletion region, we can cause an overflow of these electrons resulting in electron flow that in turn produces current. When we have current flow, the device is on.



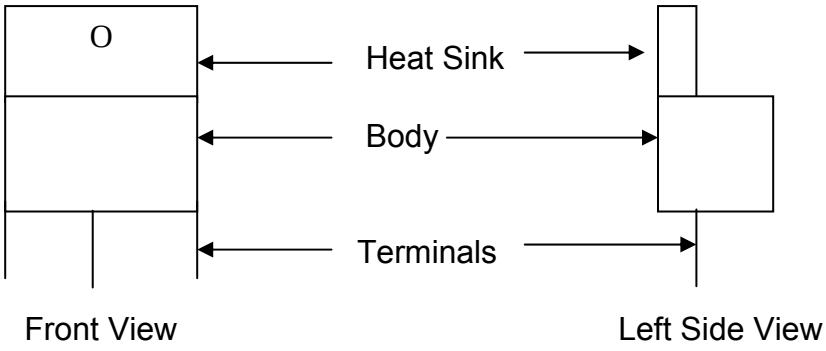
Semiconductor Showing No Movement of Electrons

If we add a third terminal to this simple device and call it the Gate, we have a basic triac. By sending electrons to the gate, which is connected to the depletion region, we create an overflow condition. You can see how this device can be turned on or off by this process. Now to put this in perspective with AC voltage circuits, this ON and OFF condition takes place every half cycle. When the AC voltage is removed from the gate, conduction stops.



Semiconductor Showing Movement of Electrons

The triacs that Liebert uses are standard in the industry and are rated at a 2-amp capacity. You can check these devices for proper operation while they are connected in the circuit. If the load is removed from the device, you can get a false reading from the meter. This is because the voltage potential is present and is detected by the meter. When the load is applied to the device, the potential is not detected by the meter. To test a triac for proper operation, energize the circuit and connect the load.

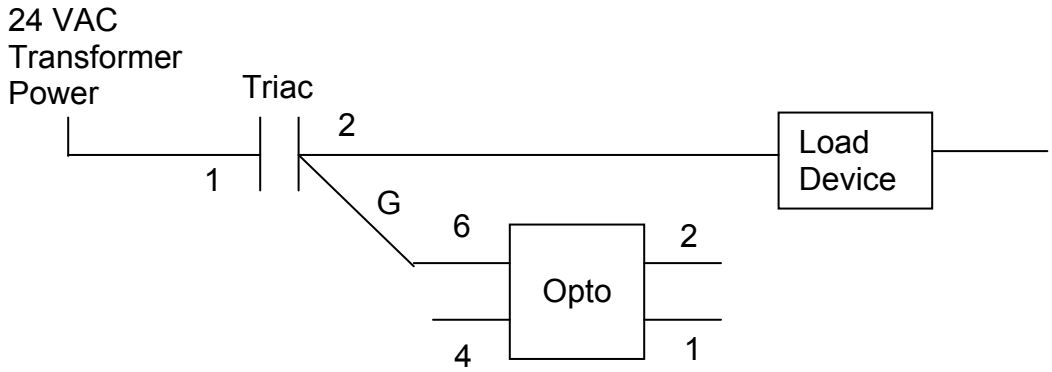


Front and Left Side Views of the Triac

As your view the triac from the front, the terminals are numbered as follows:

Terminal	Connection
Left	#2 Connects to the Load
Middle	#1 Connects to the Transformer power
Right	G(ate) Connects to the Opto-Isolator

Below is a simple schematic drawing for the triac using Liebert symbols.



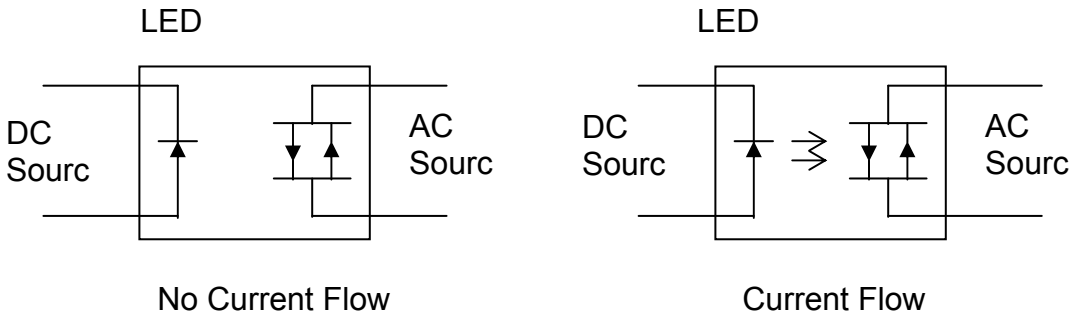
Schematic Drawing for the Triac

Basic Operation of the Opto-Isolator

The purpose of the opto-isolator is to provide isolation of two voltage sources. This allows a DC voltage source to activate an AC voltage load device or allows an AC voltage source to provide a DC signal.

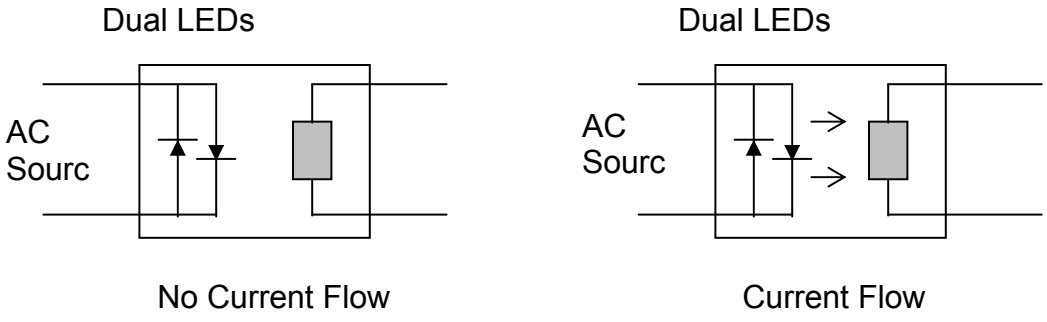
We are working with two types of circuits, an input and an output. Therefore, we require two types of opto-isolators (referred to as optos).

The output opto uses a DC voltage source to activate a **L**ight **E**mitting **D**iode (LED) internal to the IC chip. This causes a triac, also internal to the IC chip, to switch ON allowing current to flow to the AC load device.



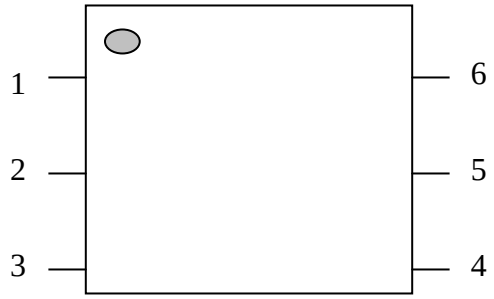
Output Opto-Isolator

The input opto uses an AC voltage source to activate dual LEDs and turn on a transistor to pass the DC voltage and allow current to flow.



Troubleshooting the Output Opto-Isolator

The opto-isolator IC chips used in these circuits are the H11J (output) devices. The drawing shows the pin location for component checks on the output opto. The indented circle in the upper left hand corner of this chip indicates the location of Pin 1. Note that the number sequence is in a "U" format: downward 1, 2 and 3 on the left and upward 4, 5 and 6 on the right.



Output Opto-Isolator Pin Location

OUTPUT VOLTAGE CHECK

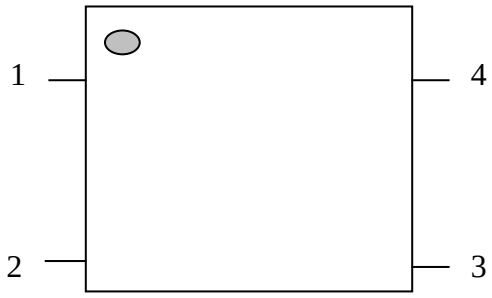
Pin 1	Receives the DC source voltage (3.3 VDC range)
Pin 2	Completes the DC source to the digital ground
Pin 3	No voltage signal at this point
Pin 4	Receives the AC source voltage signal from the input transformer
Pin 5	No voltage signal at this point
Pin 6	Completes the AC voltage path to the gate of the triac (24VAC)

Note that all AC source checks are referenced to the associated transformer neutral and/or the safety ground, and that the DC source reference is to V- or digital ground.

An Output Opto-isolator is a DCV device used to control the ACV Triac and load device.

Troubleshooting the Input Opto-Isolator

The opto-isolator IC chips used in these circuits are the H11AA (input) devices. The pin location for component checks on the input opto. The indented circle in the upper left hand corner of this chip indicates the location of Pin 1. Note that the number sequence is in a "U" format: down 1 and 2 on the left and up 3 and 4 on the right.



Input Opto-Isolator Pin Location

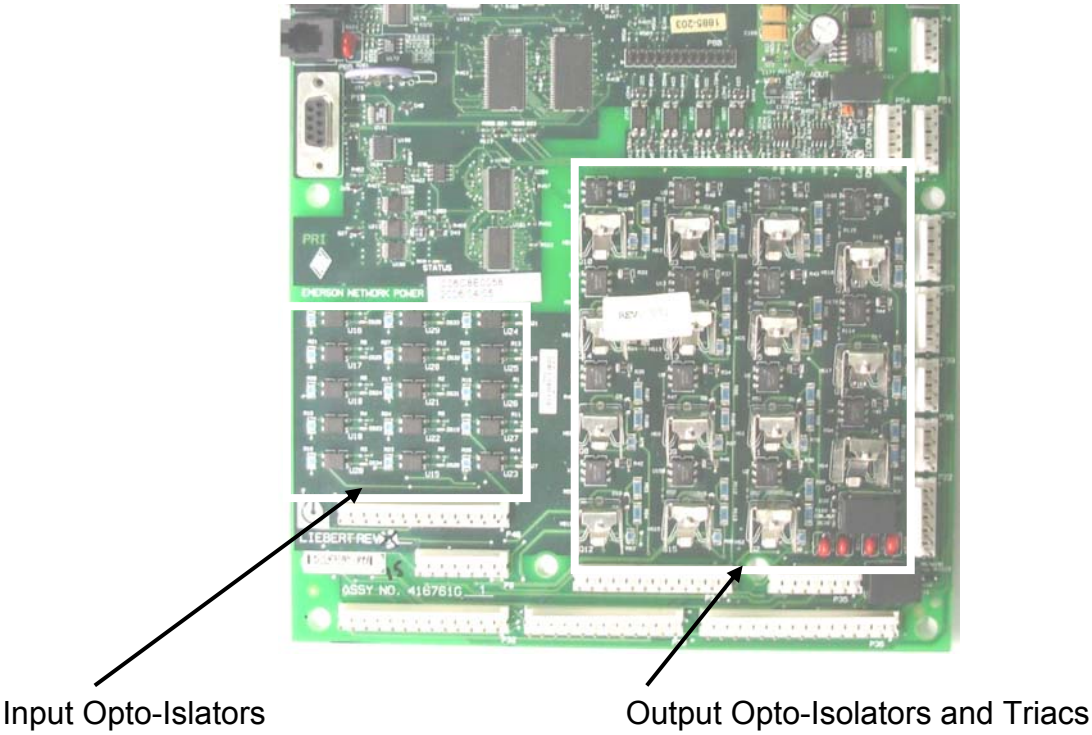
INPUT VOLTAGE CHECK

Pin 1	Receives the AC source voltage (This voltage is 24 VAC prior to the Opto and is about 1.2 VAC at the opto).
Pin 2	Completes the AC source to the neutral and or safety ground.
Pin 3	Completes the DC source to the digital ground.
Pin 4	Receives the DC voltage source from the microprocessor (This voltage level is 3.3 VDC when not activated and is 0 VDC when activated.)

Note that all AC source checks are referenced to the associated transformer neutral and/or the safety ground, and that the DC source reference is to -V or digital ground.

An Input Opto-isolator is a ACV device used to control the DCV microprocessor circuits, typically for alarms.

Microprocessor Control Board: Typical Location othe Opto-Isolators and Triacs



Microprocessor Control Board

Alarm Input Opto-Isolator Legend:

Opto	Purpose	Opto	Purpose
U15	Air Safety Switch	U23	Power On
U16	Custom Alarm 1	U24	Compressor 2 Overload
U17	Custom Alarm 2	U25	Low Pressure Switch 2
U18	Custom Alarm 3	U26	High Head Pressure 2
U19	Custom Alarm 4	U27	Compressor 1 Overload
U20	Humidifier Problem	U28	Low Pressure Switch 1
U21	Filter Clog switch	U29	High Head Pressure 1
U22	Main Fan Overload		

Note: Use Pin 5 on the input opto-isolator with reference to the V- terminal for voltage check. The voltage level is 3.3 VDC.

Control Output Opto-Isolator and Triac Legend:

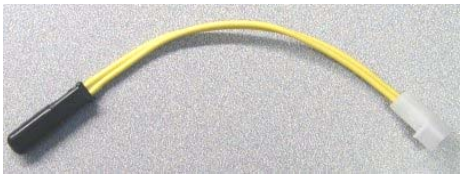
Opto	Triac	Purpose
U1	Q1	Reheat 1
U2	Q2	Reheat 2
U3	Q3	Reheat 3
U4	Q4	Humidifier
U5	Q5	Main Fan
U6	Q6	Humidifier Makeup Valve
U8	Q7	Liquid Line Solenoid 2
U9	Q9	CUV2 or DSV2 *
U10	Q10	Compressor 2
U12	Q12	Liquid Line Solenoid 1
U13	Q13	CUV1 or DSV1 *
U14	Q14	Compressor 1
U15	Q15	Not Used
U17	Q17	CW Actuator
U18	Q18	CW Actuator Close

Note: Use Pin 4 on the output opto-isolator with reference to the correct transformer neutral/ground. The voltage level is 24 VAC.

*** Note:**
CUV1 or 2: Cylinder Unloader Valve 1 or 2.
DSV1 or 2: Digital Scroll Valve 1 or 2.

Control Input Check (Aquastat Sensor)

The *iCOM* control system may be supplied with the either the Glycool or Dual Cooling option. These options are supplied with an additional sensor to provide an input to the control board. This additional sensor measures either the chilled glycol or chilled water temperature. The control input check allows the end user to better troubleshoot the glycol or dual cooling type units. The sensor is located on the entering glycol or chilled water line to the unit. The return air sensor is used as an input to the unit control software program to calculate the needed capacity. This optional sensor wired to Plug P7 on the unit control board. The chart that follows can help to troubleshoot this circuit.



Aquastat Sensor

Use the table below to check the fluid thermistor sensor for accuracy. To read the resistance value of the thermistor it must be electrically removed from the circuit.

Fluid Sensor Temperature to Resistance Table

Temperature ºF	Resistance Value Ohms
32ºF	32,650
34ºF	30,859
36ºF	29,176
38ºF	27,595
40ºF	26,109
42ºF	24,712
44ºF	23,398
46ºF	22,160
48ºF	20,996
50ºF	19,899
52ºF	18,872

Temperature ºF	Resistance Value Ohms
54ºF	17,903
56ºF	16,990
58ºF	16,128
60ºF	15,315
62ºF	14,547
64ºF	13,823
66ºF	13,139
68ºF	12,492
70ºF	11,884
72ºF	11,309

iCOM Diagnostics/Service Mode Program

The *iCOM* controller has a valuable tool built into software under the **SERVICE MENU**. This program allows the user to evacuate and charge the refrigerant circuit during installation, turn on/off all loads (outputs) for testing, and allows user to check all inputs.

The procedure is as follows:

1. From the main screen select the **SERVICE MENU** parameters.
2. In the **SERVICE MENU** screen select the **SERVICE** icon.
3. Enter password and scroll to **MANUAL MODE,** select YES with the up key.
4. Now scroll to Fan On and select ON with the up key. The fan must be on to operate loads in this mode. You must turn off the fan and service mode when completed.

The Compressor 1 and 2 selections are for the **ON/OFF** and **RUN, EVACUATE, and CHARGE** modes.

When user scrolls to the Compressor 1 or 2 positions in the parameters list he must press enter to select the first item. Enter again will move the cursor to the ON/OFF selection first (far right item) then using the up arrow key the compressor may be turn on and down key will turn off. Now with the cursor on the ON/OFF position, now use the right arrow key to select the RUN, EVACUATE, CHARGE function and the up or down arrow key to make changes. The RUN selection is the normal operating position.

Troubleshooting Checklist

1. Check the obvious before beginning troubleshooting.

   A. Be sure that a remote control switch has not been shut off.
   B. Be sure that the communication cable is properly connected.
   C. Be sure that power is reaching all modules associated with the system.

2. Power down the entire unit during the process of removing or replacing any component or cable.

   A. Serious damage to components may result if this step is not taken.
   B. After removal or replacement actions, power may be restored to the unit.

3. Wear a personal ground strap when handling printed circuit boards or associated connecting cables**.** Static electricity, besides being annoying, can damage delicate electronic components.

4. Protect exposed components from accidental contact by personnel or dropped hardware or tools.

5. When checking voltage, use the correct reference (ground) points. The chassis is not always the correct ground point, especially within the electronic housing.

6. Reassemble modules correctly.
   A. Observe assembled appearance prior to disassembly.
   B. Replace all hardware (especially insulating or nylon hardware) in the same places and in the same relationship as the original.

7. When advised to check and replace cables, do the following:
   A. Inspect for damaged insulation, broken conductors, and/or loose connectors.
   B. Check continuity with an ohm meter (Flex cable while checking.).
   C. Make certain that connectors mate firmly with proper receptacles.

8. When changing set points to cause a call for heating or cooling, set the points at least 10° - 15° above (for heating) or below (for cooling) the present room temperature.

9. Bring the room temperature level to within the working range of the equipment (35° - 90°F) before attempting troubleshooting.

10. Bring the room humidity level to within the working range of the equipment (35% - 65%) before attempting troubleshooting**.**

Basic Troubleshooting Steps:

Example: Unit load is not energizing.

Programming:

1. Read and record all program parameter values.
2. Read and record all DIP (control) switch positions on all boards. Check all jumpers on each board, check for the CAN healthy light on the boards and check programming per the read and record sheet in appropriate manuals to verify selected options.
3. Turn Unit off with ON/OFF button and reboot system power (disconnect switch off - on) to reconfigure system. If programming error is detected, recheck unit for proper operation.

If problem is not resolved in programming section, begin the signal flow check.

Signal Flow Check: Assumption is the unit is calling for a mechanical operation but the load is not activated. Using the appropriate control training and service manual, identify the output opto-isolator to be checked, locate the opto-isolator on the PCB and perform the following.

DC Voltage check:

1. Using a digital voltmeter check for the correct VDC signal at the output opto-isolator. Pin 1 referenced to - VDC will show low VDC (approximately 1.2 VDC) if the microprocessor control side of the device is functioning. A high VDC (approximately 3.3 VDC) indicates a microprocessor control problem. A meter reading of 0 VDC indicates a loss of microprocessor voltage, check VDC at the power supply referenced +VDC to -VDC should be approximately 3.3 VDC.

2. This check involves the microprocessor. To bypass the microprocessor completely, jumper from Pin 2 on the output opto-isolator to -VDC. As soon as the jumper is applied the load device should activate. If the load device activates the problem is in the microprocessor itself or the programming. If the load device does not activate continue the signal flow check.

AC Voltage check:

1. Place the digital VOM meter on AC voltage scale and verify that 24 VAC is being applied to the output opto-isolator by placing the VOM between Pin 4 and the proper transformer ground connection. To verify that the switch leg of the output opto-isolator is working properly place the VOM between Pin 6 and the proper transformer ground connection. A high VAC (approximately 24 VAC) display indicates a closed switch leg; a low VAC indicates an open switch leg.

2. If the programming is correct and the output opto-isolator is functioning properly but the load device is not activated the next step is to check the triac and hard wiring to the load device. Verify that 24 VAC is being applied to Pin 1 of the triac, place the VOM leads between Pin 1 and the proper transformer ground connection. If 24 VAC is not present at Pin 1 of the triac backtrack the circuit to the proper secondary hot of the control transformer.

If 24 VAC is present perform the following:

Select the appropriate diagnostics function from the control menu; use the training and service manual for reference. During the TEST OUTPUTS function the green LED on the microprocessor should light. If the LED lights check the hardware from the plug to the load device. If the LED does not light run the TEST CONTROL BOARD diagnostics function. If board failure is displayed contact your local sales office.

Note: Triacs are current limiting devices; therefore the load device must be connected to obtain valid voltage readings when doing VOM checks and circuit troubleshooting. Repair or replace any missing or defective components in the circuit.

Mechanical Problems: If the failure of the load device to activate is determined to be mechanical in nature consult the appropriate Liebert system operation and maintenance, reference the individual component manufacturers literature or contact your local Liebert representative.

Moisture Content Charts

The following charts show moisture content of various levels of relative humidity for given temperatures. Follow the procedures below to use the charts:

STEP 1: Locate the chart for the temperature with which you are working.

STEP 2: Locate the line with the relative humidity value you are using.

STEP 3: Read the moisture content of the relative humidity in either grains per cubic foot or grains per pound of air.

For example, you have a room temperature of 70°F and 50% relative humidity.

STEP 1: Locate the chart for 70°F.

STEP 2: Locate the line with relative humidity 50%.

STEP 3: Read the moisture content value of 50% relative humidity (4.0275 grains per cubic foot of air **OR** 55.86143 grains per pound of air).

Moisture Content at Temperature = 80°F (26.7ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	3.864	53.59368
36	3.9744	55.12493
37	4.0848	56.65618
38	4.1952	58.18743
39	4.3056	59.71868
40	4.416	61.24992
41	4.5264	62.78116
42	4.6368	64.31241
43	4.7472	65.84367
44	4.8576	67.37492
45	4.968	68.90616
46	5.0784	70.43741
47	5.1888	71.96865
48	5.2992	73.4999
49	5.4096	75.03115
50	5.52	76.5624
51	5.6304	78.09365
52	5.7408	79.6249
53	5.8512	81.15615
54	5.9616	82.68739
55	6.072	84.21864
56	6.1824	85.74989
57	6.2928	87.28112
58	6.4032	88.81239
59	6.5136	90.34362
60	6.624	91.87488
61	6.7344	93.40612
62	6.8448	94.93738
63	6.9552	96.46862
64	7.0656	97.99987
65	7.176	99.53111

Moisture Content at Temperature = 79°F (26.1ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	3.7485	51.9917
36	3.8556	53.47717
37	3.9627	54.96265
38	4.0698	56.44813
39	4.1769	57.9336
40	4.284	59.41908
41	4.3911	60.90456
42	4.4982	62.39004
43	4.6053	63.87551
44	4.7124	65.36099
45	4.8195	66.84647
46	4.9266	68.33194
47	5.0337	69.81742
48	5.1408	71.3029
49	5.2479	72.78838
50	5.355	74.27385
51	5.4621	75.75933
52	5.5692	77.2448
53	5.6763	78.73028
54	5.7834	80.21575
55	5.8905	81.70123
56	5.9976	83.18671
57	6.1047	84.67218
58	6.2118	86.15767
59	6.3189	87.64314
60	6.426	89.12862
61	6.5331	90.6141
62	6.6402	92.09958
63	6.7473	93.58504
64	6.8544	95.07052
65	6.9615	96.55601

Moisture Content at Temperature = 78°F (25.6ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	3.633	50.38971
36	3.7368	51.82942
37	3.8406	53.26913
38	3.9444	54.70883
39	4.0482	56.14854
40	4.152	57.58824
41	4.2558	59.02795
42	4.3596	60.46765
43	4.4634	61.90736
44	4.5672	63.34707
45	4.671	64.78677
46	4.774801	66.22648
47	4.8786	67.66618
48	4.9824	69.10589
49	5.0862	70.5456
50	5.19	71.9853
51	5.2938	73.425
52	5.3976	74.86471
53	5.5014	76.30441
54	5.605201	77.74413
55	5.709	79.18383
56	5.812801	80.62335
57	5.9166	82.06325
58	6.0204	83.50295
59	6.1242	84.94265
60	6.228	86.38236
61	6.3318	87.82207
62	6.4356	89.26176
63	6.5394	90.70148
64	6.6432	92.14118
65	6.747	93.58089

Moisture Content at Temperature = 77°F (25.0ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	3.521	48.83628
36	3.6216	50.2316
37	3.7222	51.62691
38	3.8228	53.02224
39	3.9234	54.41756
40	4.024	55.81288
41	4.124601	57.20821
42	4.2252	58.60353
43	4.3258	59.99885
44	4.4264	61.39417
45	4.527	62.78949
46	4.6276	64.18481
47	4.7282	65.58013
48	4.8288	66.97546
49	4.9294	68.37078
50	5.03	69.7661
51	5.1306	71.16143
52	5.2312	72.55674
53	5.3318	73.95206
54	5.4324	75.34738
55	5.533001	76.74271
56	5.6336	78.13803
57	5.734201	79.53336
58	5.8348	80.92868
59	5.935401	82.32401
60	6.036001	83.71933
61	6.136601	85.11465
62	6.237201	86.50996
63	6.3378	87.90529
64	6.438401	89.30061
65	6.539	90.69593

Moisture Content at Temperature = 76°F (24.4ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	3.41215	47.32652
36	3.50964	48.67871
37	3.60713	50.03089
38	3.70462	51.38307
39	3.80211	52.73527
40	3.8996	54.08745
41	3.99709	55.43964
42	4.09458	56.79182
43	4.19207	58.14401
44	4.28956	59.4962
45	4.38705	60.84838
46	4.48454	62.20057
47	4.58203	63.55276
48	4.67952	64.90494
49	4.77701	66.25713
50	4.8745	67.60931
51	4.97199	68.9615
52	5.06948	70.31368
53	5.16697	71.66587
54	5.26446	73.01805
55	5.36195	74.37024
56	5.45944	75.72243
57	5.55693	77.07461
58	5.65442	78.4268
59	5.75191	79.77898
60	5.8494	81.13118
61	5.94689	82.48336
62	6.04438	83.83555
63	6.14187	85.18773
64	6.23936	86.53992
65	6.336849	87.8921

Moisture Content at Temperature = 75°F (23.9ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	3.3068	45.86532
36	3.40128	47.17575
37	3.49576	48.48619
38	3.59024	49.79663
39	3.68472	51.10707
40	3.7792	52.4175
41	3.87368	53.72794
42	3.96816	55.03838
43	4.06264	56.34882
44	4.15712	57.65926
45	4.251601	58.9697
46	4.34608	60.28013
47	4.44056	61.59057
48	4.53504	62.901
49	4.62952	64.21145
50	4.724	65.52188
51	4.81848	66.83231
52	4.91296	68.14276
53	5.00744	69.45319
54	5.10192	70.76363
55	5.1964	72.07407
56	5.29088	73.38451
57	5.38536	74.69495
58	5.479841	76.00539
59	5.57432	77.31581
60	5.6688	78.62625
61	5.76328	79.9367
62	5.85776	81.24713
63	5.95224	82.55757
64	6.04672	83.86801
65	6.1412	85.17844

Moisture Content at Temperature = 74°F (23.3ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	3.20355	44.43324
36	3.29508	45.70276
37	3.38661	46.97228
38	3.47814	48.2418
39	3.56967	49.51132
40	3.6612	50.78085
41	3.75273	52.05037
42	3.84426	53.31989
43	3.93579	54.58941
44	4.02732	55.85893
45	4.11885	57.12845
46	4.21038	58.39797
47	4.30191	59.66749
48	4.39344	60.93701
49	4.48497	62.20654
50	4.5765	63.47605
51	4.66803	64.74558
52	4.75956	66.0151
53	4.85109	67.28461
54	4.94262	68.55414
55	5.03415	69.82366
56	5.12568	71.09318
57	5.21721	72.3627
58	5.30874	73.63223
59	5.40027	74.90173
60	5.4918	76.17126
61	5.58333	77.44079
62	5.67486	78.7103
63	5.76639	79.97983
64	5.85792	81.24935
65	5.94945	82.51887

Moisture Content at Temperature = 73°F (22.8ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	3.10345	43.04485
36	3.19212	44.2747
37	3.28079	45.50456
38	3.36946	46.73441
39	3.45813	47.96426
40	3.5468	49.19412
41	3.63547	50.42397
42	3.72414	51.65382
43	3.81281	52.88367
44	3.90148	54.11352
45	3.99015	55.34338
46	4.07882	56.57323
47	4.16749	57.80309
48	4.25616	59.03294
49	4.34483	60.26279
50	4.4335	61.49264
51	4.52217	62.72249
52	4.61084	63.95235
53	4.69951	65.1822
54	4.78818	66.41206
55	4.87685	67.64191
56	4.96552	68.87176
57	5.05419	70.10161
58	5.14286	71.33146
59	5.23153	72.56132
60	5.3202	73.79117
61	5.40887	75.02102
62	5.49754	76.25087
63	5.58621	77.48073
64	5.67488	78.71058
65	5.76355	79.94044

Moisture Content at Temperature = 72°F (22.2ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	2.9988	41.59336
36	3.08448	42.78174
37	3.17016	43.97012
38	3.25584	45.1585
39	3.34152	46.34688
40	3.4272	47.53527
41	3.51288	48.72365
42	3.59856	49.91203
43	3.68424	51.10041
44	3.76992	52.28879
45	3.8556	53.47717
46	3.94128	54.66555
47	4.02696	55.85393
48	4.11264	57.04232
49	4.19832	58.2307
50	4.284	59.41908
51	4.36968	60.60746
52	4.45536	61.79584
53	4.54104	62.98422
54	4.62672	64.17261
55	4.7124	65.36099
56	4.79808	66.54937
57	4.88376	67.73775
58	4.96944	68.92613
59	5.05512	70.11452
60	5.1408	71.30289
61	5.22648	72.49128
62	5.31216	73.67966
63	5.39784	74.86805
64	5.48352	76.05642
65	5.5692	77.2448

Moisture Content at Temperature = 71°F (21.7ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	2.91165	40.38459
36	2.99484	41.53843
37	3.07803	42.69228
38	3.16122	43.84613
39	3.24441	44.99997
40	3.3276	46.15381
41	3.41079	47.30766
42	3.49398	48.46151
43	3.57717	49.61535
44	3.66036	50.7692
45	3.74355	51.92304
46	3.82674	53.07688
47	3.90993	54.23073
48	3.99312	55.38458
49	4.07631	56.53842
50	4.1595	57.69227
51	4.24269	58.84611
52	4.32588	59.99996
53	4.40907	61.1538
54	4.49226	62.30765
55	4.57545	63.46149
56	4.65864	64.61533
57	4.74183	65.76918
58	4.825021	66.92304
59	4.908211	68.07688
60	4.9914	69.23072
61	5.07459	70.38457
62	5.15778	71.53841
63	5.240971	72.69226
64	5.32416	73.8461
65	5.40735	74.99994

Moisture Content at Temperature = 70°F (21.1ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	2.81925	39.103
36	2.8998	40.22023
37	2.98035	41.33746
38	3.0609	42.45469
39	3.14145	43.57192
40	3.222	44.68914
41	3.30255	45.80637
42	3.3831	46.9236
43	3.46365	48.04083
44	3.5442	49.15806
45	3.62475	50.27529
46	3.7053	51.39252
47	3.78585	52.50975
48	3.8664	53.62697
49	3.94695	54.7442
50	4.0275	55.86143
51	4.10805	56.97866
52	4.1886	58.09588
53	4.269151	59.21311
54	4.349701	60.33035
55	4.43025	61.44757
56	4.510801	62.5648
57	4.59135	63.68203
58	4.6719	64.79925
59	4.75245	65.91648
60	4.833	67.03371
61	4.91355	68.15094
62	4.994101	69.26818
63	5.074651	70.3854
64	5.1552	71.50263
65	5.23575	72.61986

Moisture Content at Temperature = 69°F (20.6ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	2.7293	37.85539
36	2.80728	38.93697
37	2.88526	40.01856
38	2.96324	41.10014
39	3.04122	42.18173
40	3.1192	43.2633
41	3.19718	44.34489
42	3.27516	45.42647
43	3.35314	46.50805
44	3.43112	47.58964
45	3.5091	48.67122
46	3.58708	49.7528
47	3.66506	50.83438
48	3.74304	51.91596
49	3.82102	52.99755
50	3.899	54.07913
51	3.97698	55.16072
52	4.05496	56.2423
53	4.13294	57.32389
54	4.21092	58.40546
55	4.2889	59.48704
56	4.36688	60.56863
57	4.44486	61.65021
58	4.52284	62.73179
59	4.60082	63.81338
60	4.6788	64.89496
61	4.75678	65.97653
62	4.83476	67.05811
63	4.91274	68.1397
64	4.99072	69.22128
65	5.0687	70.30286

Moisture Content at Temperature = 68°F (20.0ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	2.64985	36.75342
36	2.72556	37.80352
37	2.80127	38.85362
38	2.87698	39.90371
39	2.95269	40.95381
40	3.0284	42.00391
41	3.10411	43.05401
42	3.17982	44.10411
43	3.25553	45.1542
44	3.33124	46.2043
45	3.40695	47.2544
46	3.48266	48.30449
47	3.55837	49.35459
48	3.63408	50.40469
49	3.70979	51.45479
50	3.7855	52.50489
51	3.86121	53.55499
52	3.93692	54.60509
53	4.01263	55.65518
54	4.08834	56.70528
55	4.16405	57.75538
56	4.23976	58.80547
57	4.31547	59.85557
58	4.39118	60.90567
59	4.46689	61.95576
60	4.5426	63.00587
61	4.61831	64.05596
62	4.694021	65.10606
63	4.76973	66.15616
64	4.84544	67.20625
65	4.92115	68.25635

Moisture Content at Temperature = 67°F (19.4ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	2.5578	35.47669
36	2.63088	36.49031
37	2.70396	37.50393
38	2.77704	38.51755
39	2.85012	39.53116
40	2.9232	40.54479
41	2.99628	41.5584
42	3.06936	42.57202
43	3.14244	43.58565
44	3.21552	44.59926
45	3.2886	45.61288
46	3.36168	46.62651
47	3.43476	47.64012
48	3.50784	48.65374
49	3.58092	49.66736
50	3.654	50.68098
51	3.72708	51.6946
52	3.80016	52.70822
53	3.87324	53.72184
54	3.94632	54.73546
55	4.0194	55.74908
56	4.09248	56.7627
57	4.16556	57.77632
58	4.238641	58.78994
59	4.31172	59.80356
60	4.3848	60.81718
61	4.45788	61.8308
62	4.53096	62.84442
63	4.60404	63.85804
64	4.67712	64.87166
65	4.750201	65.88528

Moisture Content at Temperature = 66°F (18.9ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	2.4759	34.34073
36	2.54664	35.3219
37	2.61738	36.30306
38	2.68812	37.28422
39	2.75886	38.26539
40	2.8296	39.24655
41	2.90034	40.22772
42	2.97108	41.20888
43	3.04182	42.19005
44	3.11256	43.17121
45	3.1833	44.15237
46	3.25404	45.13354
47	3.32478	46.1147
48	3.39552	47.09587
49	3.46626	48.07703
50	3.537	49.05819
51	3.60774	50.03935
52	3.67848	51.02052
53	3.74922	52.00168
54	3.81996	52.98285
55	3.8907	53.96401
56	3.96144	54.94517
57	4.03218	55.92634
58	4.10292	56.9075
59	4.17366	57.88866
60	4.2444	58.86983
61	4.31514	59.85099
62	4.38588	60.83216
63	4.45662	61.81332
64	4.52736	62.79449
65	4.5981	63.77564

Moisture Content at Temperature = 65°F (18.3ºC)		
RH	**Grains Per Cu Ft**	**Grains Per Lb.**
35	2.39575	33.22905
36	2.4642	34.17846
37	2.53265	35.12785
38	2.6011	36.07726
39	2.66955	37.02666
40	2.738	37.97606
41	2.80645	38.92546
42	2.8749	39.87486
43	2.94335	40.82426
44	3.0118	41.77366
45	3.08025	42.72307
46	3.1487	43.67247
47	3.21715	44.62187
48	3.2856	45.57127
49	3.35405	46.52067
50	3.4225	47.47008
51	3.49095	48.41947
52	3.5594	49.36888
53	3.62785	50.31828
54	3.6963	51.26768
55	3.76475	52.21708
56	3.8332	53.16648
57	3.90165	54.11589
58	3.9701	55.06528
59	4.03855	56.01469
60	4.107	56.96409
61	4.17545	57.91349
62	4.2439	58.86289
63	4.31235	59.81229
64	4.3808	60.76169
65	4.44925	61.7111

Suction Transducer Information (Codes A124 & A128)

%	psig	psia	volts	barg	bara
0	-33.5	-18.8	0	-2.31	-1.29
1	-31.6	-16.9	0.05	-2.18	-1.16
2	-29.7	-15.0	0.1	-2.05	-1.03
3	-27.8	-13.1	0.15	-1.92	-0.90
4	-26.0	-11.3	0.2	-1.79	-0.78
5	-24.1	-9.4	0.25	-1.66	-0.65
6	-22.2	-7.5	0.3	-1.53	-0.52
7	-20.3	-5.6	0.35	-1.40	-0.39
8	-18.5	-3.8	0.4	-1.27	-0.26
9	-16.6	-1.9	0.45	-1.14	-0.13
10	-14.7	0.0	0.5	-1.01	0.00
11	-12.8	1.9	0.55	-0.88	0.13
12	-11.0	3.8	0.6	-0.75	0.26
13	-9.1	5.6	0.65	-0.63	0.39
14	-7.2	7.5	0.7	-0.50	0.52
15	-5.3	9.4	0.75	-0.37	0.65
16	-3.5	11.3	0.8	-0.24	0.78
17	-1.6	13.1	0.85	-0.11	0.90
18	0.3	15.0	0.9	0.02	1.03
19	2.2	16.9	0.95	0.15	1.16
20	4.1	18.8	1	0.28	1.29
21	5.9	20.6	1.05	0.41	1.42
22	7.8	22.5	1.1	0.54	1.55
23	9.7	24.4	1.15	0.67	1.68
24	11.6	26.3	1.2	0.80	1.81
25	13.4	28.1	1.25	0.93	1.94
26	15.3	30.0	1.3	1.05	2.07
27	17.2	31.9	1.35	1.18	2.20
28	19.1	33.8	1.4	1.31	2.33
29	20.9	35.6	1.45	1.44	2.46
30	22.8	37.5	1.5	1.57	2.59
31	24.7	39.4	1.55	1.70	2.71
32	26.6	41.3	1.6	1.83	2.84
33	28.4	43.1	1.65	1.96	2.97
34	30.3	45.0	1.7	2.09	3.10
35	32.2	46.9	1.75	2.22	3.23
36	34.1	48.8	1.8	2.35	3.36
37	35.9	50.6	1.85	2.48	3.49
38	37.8	52.5	1.9	2.61	3.62
39	39.7	54.4	1.95	2.74	3.75
40	41.6	56.3	2	2.86	3.88
41	43.4	58.1	2.05	2.99	4.01
42	45.3	60.0	2.1	3.12	4.14
43	47.2	61.9	2.15	3.25	4.27
44	49.1	63.8	2.2	3.38	4.40
45	50.9	65.6	2.25	3.51	4.52
46	52.8	67.5	2.3	3.64	4.65
47	54.7	69.4	2.35	3.77	4.78
48	56.6	71.3	2.4	3.90	4.91
49	58.4	73.1	2.45	4.03	5.04
50	60.3	75.0	2.5	4.16	5.17

%	psig	psia	volts	barg	bara
51	62.2	76.9	2.55	4.29	5.30
52	64.1	78.8	2.6	4.42	5.43
53	65.9	80.6	2.65	4.55	5.56
54	67.8	82.5	2.7	4.67	5.69
55	69.7	84.4	2.75	4.80	5.82
56	71.6	86.3	2.8	4.93	5.95
57	73.4	88.1	2.85	5.06	6.08
58	75.3	90.0	2.9	5.19	6.21
59	77.2	91.9	2.95	5.32	6.33
60	79.1	93.8	3	5.45	6.46
61	80.9	95.6	3.05	5.58	6.59
62	82.8	97.5	3.1	5.71	6.72
63	84.7	99.4	3.15	5.84	6.85
64	86.6	101.3	3.2	5.97	6.98
65	88.4	103.1	3.25	6.10	7.11
66	90.3	105.0	3.3	6.23	7.24
67	92.2	106.9	3.35	6.36	7.37
68	94.1	108.8	3.4	6.48	7.50
69	95.9	110.6	3.45	6.61	7.63
70	97.8	112.5	3.5	6.74	7.76
71	99.7	114.4	3.55	6.87	7.89
72	101.6	116.3	3.6	7.00	8.02
73	103.4	118.1	3.65	7.13	8.14
74	105.3	120.0	3.7	7.26	8.27
75	107.2	121.9	3.75	7.39	8.40
76	109.1	123.8	3.8	7.52	8.53
77	110.9	125.6	3.85	7.65	8.66
78	112.8	127.5	3.9	7.78	8.79
79	114.7	129.4	3.95	7.91	8.92
80	116.6	131.3	4	8.04	9.05
81	118.4	133.1	4.05	8.16	9.18
82	120.3	135.0	4.1	8.29	9.31
83	122.2	136.9	4.15	8.42	9.44
84	124.1	138.8	4.2	8.55	9.57
85	125.9	140.6	4.25	8.68	9.70
86	127.8	142.5	4.3	8.81	9.82
87	129.7	144.4	4.35	8.94	9.95
88	131.6	146.3	4.4	9.07	10.08
89	133.4	148.1	4.45	9.20	10.21
90	135.3	150.0	4.5	9.33	10.34
91	137.2	151.9	4.55	9.46	10.47
92	139.1	153.8	4.6	9.59	10.60
93	140.9	155.6	4.65	9.72	10.73
94	142.8	157.5	4.7	9.85	10.86
95	144.7	159.4	4.75	9.97	10.99
96	146.6	161.3	4.8	10.10	11.12
97	148.4	163.1	4.85	10.23	11.25
98	150.3	165.0	4.9	10.36	11.38
99	152.2	166.9	4.95	10.49	11.51
100	154.1	168.8	5	10.62	11.63

Digital Scroll High Temperature Sensor Chart
NTC (Code S606 and S608)

Deg C	Deg F	Resistance (kOhms)
-40	-40	2889.60
-35	-31	2087.22
-30	-22	1522.20
-25	-13	1121.44
-20	-4	834.72
-15	5	627.28
-10	14	475.74
-5	23	363.99
0	32	280.82
5	41	218.41
10	50	171.17
15	59	135.14
20	68	107.44
25	77	86.00
30	86	69.28
35	95	56.16
40	104	45.81
45	113	37.58
50	122	30.99
55	131	25.68
60	140	21.40
65	149	17.91
70	158	15.07
75	167	12.73
80	176	10.79
85	185	9.20
90	194	7.87
95	203	6.77
100	212	5.85
105	221	5.09
110	230	4.45
115	239	3.87
120	248	3.35
125	257	2.92
130	266	2.58
135	275	2.28
140	284	2.02
145	293	1.80
150	302	1.59
155	311	1.39
160	320	1.25
165	329	1.12
170	338	1.01
175	347	0.92
180	356	0.83

Unit Code

The *iCOM* control uses a system that auto configures the control board for an individual unit based on options contained within the unit.

The unit will have a Unit Configuration Code Tag displayed on the front of the electric panel cover. This code when entered during the factory QA process will define unit configuration and auto set various parameters for functionality. The following pages will define the unit code parameters. They will also allow the service technician to re-enter or change the unit code manually if necessary through the control panel in the Factory Settings Menu in the Advanced Menus.

Once the ID numbers of the Unit Code are entered or changed the user must move to line A008 “Unit Code Control” and select “Save and Execute” to load the changes in to the control. On line A009 “Unit Code Status” will show “Changed” before “Save and Execute” is done. Once “Save and Execute” has completed, A009 should show OK.

If the control board does not have a Unit Code entered in the board the unit will not start and an alarm will appear “Unit Code Missing”. A code will need to be entered and saved.

The on the following pages are the 18 Unit Field Codes. The Unit Code Fields shows a number in the left column followed by the definition of the number in the right column.

THIS UNIT CODE MUST NOT BE CHANGED UNLESS INSTRUCTED BY A FACTORY SERVICE TECHNICIAN

Unit Configuration Code Definition

Unit Field Code 001 (Firmware Revision)

Code Field Value	Firmware Revision Level
000	**0**

Unit Field Code 002 (Unit Product Type)

Code Field Value	Product Type
000	**DS**
001	**Deluxe**
002	Himod
003	Challenger
004	ICS
005	Himod – S
006	MM
007	DM
008	**PeX**
009	HPS
010	XDA
011	XDC
012	XDE
013	XDO
014	XDP
015	XDR
016	XDV
017	XDWP
018	HPS
019	Matrix
020	Process Chiller
021	**XDF**

Note: Bold type indicates the code is available.

Unit Configuration Code Definition Continued

Unit Field Code 003 (Refrigerant Type)

Code Field Value	Refrigerant Type
000	**None**
001	**R22**
002	**R407C**
003	R410
004	R134A
005	R407C/R134A

Unit Field Code 004 (Cooling Operation)

Code Field Value	Cooling Operation
000	**Chilled Water**
001	**Scroll/Rotary, qty 1**
002	**Scroll, qty 1 w/ Hot Gas Bypass**
003	**Scroll, qty 2**
004	**Scroll, qty 2 w/ Hot Gas Bypass**
005	Scroll, qty 2 w/ Uneven Capacity
006	Scroll, qty 2 w/ Uneven Capacity, w/ Hot Gas Bypass
007	**Tandem Scroll, qty 1**
008	**Tandem Scroll, qty 2**
009	**Digital Scroll, qty 1**
010	**Digital Scroll, qty 2**
011	**Digital Scroll, qty 1 w/ Thermistor**
012	**Digital Scroll, qty 2 w/ Thermistor**
013	**Semi-hermetic 2 Step, qty 2**
014	**Semi-hermetic 2 Step, qty 2, w/ Hot Gas Bypass**
015	**Semi-hermetic 4 Step, qty 2**
016	Tandem Digital Scroll, qty 1
017	Tandem Digital Scroll, qty 2

Note: Bold type indicates the code is available.

Unit Configuration Code Definition Continued

Unit Field Code 005 (Humidifier Type)

Code Field Value	Humidifier Type
000	**None**
001	**Canister, On/Off, 200 Volt**
002	**Canister, On/Off, 208 Volt**
003	**Canister, On/Off, 230 Volt**
004	**Canister, On/Off, 380 Volt**
005	**Canister, On/Off, 415 Volt**
006	**Canister, On/Off, 460 Volt**
007	**Canister, On/Off, 575 Volt**
008	Canister, Proportional, 200 Volt
009	Canister, Proportional, 208 Volt
010	Canister, Proportional, 230 Volt
011	Canister, Proportional, 380 Volt
012	Canister, Proportional, 415 Volt
013	Canister, Proportional, 460 Volt
014	Canister, Proportional, 575 Volt
015	**Infrared Large**
016	**Infrared Small**
017	**On/Off, Steam Grid/Canister**
018	**PeX @ 6 Amps**
019	**PeX @ 9 Amps**
020	**PeX @ 12 Amps**

Note: Bold type indicates the code is available.

Unit Configuration Code Definition Continued

Unit Field Code 006 (Heating Type)

Code Field Value	Heating Type
000	**None**
001	**1 Stage Electric**
002	**2 Stage Electric**
003	**3 Stage Electric (3 Outputs)**
004	3 Stage Electric (2 Outputs)
005	SCR Electric
006	**(0 – 10 V) Hot Water/Steam Valve**
007	**(0 – 10 V) Hot Water/Steam Valve w/ Electric (1 Stage)**
008	**(0 – 10 V) Hot Water/Steam Valve w/ Electric (2 Stage)**
009	(0 – 10 V) Hot Water/Steam Valve w/ Electric (3 Stage – 3 Outputs)
010	(0 – 10 V) Hot Water/Steam Valve w/ Electric (3 Stage – 2 Outputs)
011	(0 – 10 V) Hot Water/Steam Valve w/ SCR Electric (1 Element)
012	(0 – 10 V) Hot Water/Steam Valve w/SCR Electric (2 Elements)
013	(0 – 10 V) Hot Water/Steam Valve w/ SCR Electric (3 Elements)
014	**Hot Gas Reheat Valve**
015	**Hot Gas Reheat Valve w/ Electric (1 Stage)**
016	**Hot Gas Reheat Valve w/ Electric (2 Stage)**
017	Hot Gas Reheat Valve w/ Electric (3 Stage – 2 Outputs)
018	Hot Gas Reheat Valve w/ SCR Electric
019	**(On/Off) Hot Water/Steam Valve**
020	**(On/Off) Hot Water/Steam Valve w/ Electric (1 Stage)**
021	**(On/Off) Hot Water/Steam Valve w/ Electric (2 Stage)**
022	(On/Off) Hot Water/Steam Valve w/ Electric (3 Stage – 2 Outputs)
023	**(1.75V) Hot Water/Steam Valve**
024	**(1.75V) Hot Water/Steam Valve w/ Electric (1 Stage)**
025	**(1.75V) Hot Water/Steam Valve w/ Electric (2 Stage)**
026	(1.75V) Hot Water/Steam Valve w/ Electric (3 Stage – 2 Outputs)
027	SCR Electric 50 HZ

Note: Bold type indicates the code is available.

Unit Configuration Code Definition Continued

Unit Field Code 007 (Heat Rejection Type)

Code Field Value	Heat Rejection Type
000	**Air (Lee-Temp)**
001	**Air (Fanspeed)**
002	**Air (Lee-Temp) w/ Freecooling Valve Standard Operation**
003	**Air Fanspeed) w/ Freecooling Valve Standard Operation**
004	**Air (Lee-Temp) w/ Freecooling Valve Reverse Operation**
005	**Air (Fanspeed) w/ Freecooling Valve Reverse Operation**
006	**Water/Glycol**
007	**Glycool w/ Valve Standard Operation**
008	**Glycool w/ Valve Reverse Operation**
009	**Dual Cool w/ Valve Standard Operation**
010	**Dual Cool w/ Valve Reverse Operation**
011	**Chilled Water w/ Valve Standard Operation**
012	**Chilled Water w/ Valve Reverse Operation**
013	Split Coil Air (Lee-Temp)
014	Split Coil Air (Fanspeed)
015	Split CoilAir (Lee-Temp) w/ Freecooling Valve Standard Operation
016	Split Coil Air Fanspeed) w/ Freecooling Valve Standard Operation
017	Split Coil Air (Lee-Temp) w/ Freecooling Valve Reverse Operation
018	Split Coil Air Fanspeed) w/ Freecooling Valve Reverse Operation
019	Split Coil Water/Glycol
020	Split Coil Glycool w/ Valve Standard Operation
021	Split Coil Glycool w/ Valve Reverse Operation
022	Split Coil Dual Cool w/ Valve Standard Operation
023	Split Coil Dual Cool w/ Valve Reverse Operation

Note: Bold type indicates the code is available.

Unit Configuration Code Definition Continued

Unit Field Code 008 (Cooling Valve Travel Time)

Code Field Value	Valve Travel Time
000	**No Valve/NA**
001	Valve (On/Off)/NA
002	**Valve (0 – 10V)/NA**
003	**Valve (0.9 – 1.8V)/NA**
004	**Valve 24V Modulating (62 Seconds)**
005	**Valve 24V Modulating (74 Seconds)**
006	**Valve 24V Modulating (90 Seconds)**
007	**Valve 24V Modulating (165 Seconds)**
008	**Valve 24V Modulating (220 Seconds)**

Unit Field Code 009 (Fan Control)

Code Field Value	Fan Control Type
000	**Standard**
001	ECM
002	**Inverter**

Unit Field Code 010 (Languages)

Code Field Value	Language Group
000	**Group 1**
001	Group 2
002	Group 3

Note: Bold type indicates the code is available.

Unit Configuration Code Definition Continued

Unit Field Code 011, 012, 013, 014 (Customer Input Alarms)

Code Field Value	Customer Input Alarms 1(50), 2(51), 3(55), 4(56)
000	**None (Use Default Setting)**
001	**Smoke Detected**
002	**Liquitect Alarm Only**
003	Liquitect Shutdown Unit
004	Liquitect Alarm and Lockout Humidifier Make-up Valve
005	**Condensate Pump Alarm Only**
006	Condensate Pump Shutdown Unit and Compressors Pumpdown
007	Condensate Pump Alarm and Lockout Humidifier Make-up Valve
008	**Loss of Flow Alarm Only**
009	**Loss of Flow Shutdown Unit and Compressors do not Pumpdown**
010	**Loss of Flow Lockout LLSV's and T/D Shutdown Compressors***
011	**Stand-by Glycol Pump On**
012	**Humidifier Off by Customer Input**
013	**Reheat Off by Customer Input**
014	**Humidifier and Reheat Off by Customer Input**
015	**Compressor Off by Customer Input and no Pumpdown**
016	Alarm Shutdown
017	Standby Unit On
018	**Freecooling Lockout**

* Time delay not implemented at this time.

Note: Bold type indicates the code is available.

Unit Configuration Code Definition Continued

Unit Field Code 015 (Dehumidification/Reheat Sequencing)

Code Field Value	Dehumidification/Reheat Sequencing
000	**No Dehumidification**
001	**Chilled Water Unit Dehumidification**
002	**2 Compressors (Two-Stage) Dehumidification: Lockout Reheat**
003	**2 Compressors (Two-Stage) Dehumidification: Normal Reheat***
004	**2 Compressors (Two-Stage) Dehumidification: Delayed Reheat**
005	**#1 Compressors (Single-Stage) Dehumidification: Lockout Reheat**
006	**#1 Compressors (Single-Stage) Dehumidification: Normal Reheat**
007	**#1 Compressors (Single-Stage) Dehumidification: Delayed Reheat**
008	**#2 Compressors (Single-Stage) Dehumidification: Lockout Reheat**
009	**#2 Compressors (Single-Stage) Dehumidification: Normal Reheat**
010	**#2 Compressors (Single-Stage) Dehumidification: Delayed Reheat**

*** Requires increased input wire and circuit breaker for the unit**

Unit Field Code 016 (Q15 output Signal)

Code Field Value	Q15 Output Signal
000	**No Output**
001	Q15 Output Dehumidification
002	Q15 Output Cooling
003	Q15 Output Reheat On
004	Q15 Output Compressor On
005	Q15 Output Humidifier On
006	Q15 Output Fan On
007	Q15 Output Freecooling On

Note: Bold type indicates the code is available.

Unit Configuration Code Definition Continued

Unit Field Code 017

Code Field Value	Reheat/Humidifier Lockout and Load Monitor
000	**No Override**
001	If Reheat On, Lockout Humidifier
002	If Humidifier On, Lockout Reheat
003	**Load Monitor 120 volts***
004	**Load Monitor 230 volts***

*** Used on XDF Products Only**

Unit Field Code 018 (Not Used)

Code Field Value	NOT USED
000	-

Note: Bold type indicates the code is available.

Glossary of Terms

Address: A pattern of characters that identifies a unique storage location

Algorithm: A set of procedures to obtain a given result

Ambient: Condition on immediately surrounding atmosphere or area: usually refers to temperature or pressure

Analog: Refers to circuitry; also called linear circuitry; circuitry that varies certain properties or electricity continuously and smoothly over a range

Anti-Static Material: A slightly conductive material that allows the net charge to be drained off through a path; an electrostatic protective material having a surface resistively greater than 10^4 but not greater than 10^9 Ohms per square inch (does not generate static electricity)

Binary Number System or Binary Code: A method of writing numbers by using two digits, 0 and 1

Bit: The smallest possible piece of information; a specification of one of two possible conditions. (Bits are written as 1 for yes and 0 for no.)

Bus: Large trace or foil extending around the edge of a PCB to provide conduction for several sources

Byte: A set of adjacent binary digits operated upon as a unit (usually 8 bits)

Charge: The product of capacitance times voltage

CMOS: Complimentary **M**etal **O**xide **S**ubstrate semiconductor

Computer: At least one CPU together with input, output, control switch buttons and memory units

Conductive Material: Material that conducts electrical charge (Because it conducts charge, there is no potential difference across or storage of a static charge.); electrostatic protective material having a maximum surface resistivity of 10 Ohms per square unit, or a maximum volume resistivity of 10 Ohms/cm.

Control Buttons: Push buttons on the display bezels to operate the increase/decrease, advance, or silence functions

Control Switches: Sometimes called dip switches and used for additional programming features on all levels

CPU: **C**entral **P**rocessing **U**nit; the part of a computer system that contains the main storage, arithmetic unit and special register groups (It performs arithmetic operations, controls instruction processing and provides timing signals.)

Data: Another name for information

Data Bus: One method of input/output for a system where data is moved by way of a group of wires forming a common bus

Decrease Button: Control button used to decrease values

Digital: Information in discrete or quantified form, not continuous

DIP: **D**ual **I**nline **P**ackage; a type of Integrated Circuit (IC)

DIP Switch: Type of electronic switch having multiple, manually selectable settings

Earth ground: The portion of an electrical circuit that is at zero potential with respect to the earth

Electrostatic Field: The field around an electrostatically charged object

Electrostatic Voltage: Voltage generated by the sliding, rubbing or separating action between materials

EPROM: **E**rasable and **P**rogrammable **R**ead-**O**nly **M**emory; an integrated circuit memory chip whose stored data can be read at random (Data can be erased and new data can be stored.)

ESDS: **E**lectro**S**tatic **D**ischarge **S**ensitive; sensitive to electrostatic voltage of 4000 volts or less as determined by the human test circuit

Fill Period: The period during which the humidifier pan is filled from a partially filled state to the level required for optimum humidification

Firmware: Software stored in EPROM or PROM

Hard Ground: A direct connection to earthground (also refer to soft ground)

Hardware: The PCB, cable, switches and associated devices

Hysteresis: Differential

IC: **I**ntegrated **C**ircuit; an assembly that consists of all the necessary parts of an electronic circuit

Impedance: Opposition that a circuit offers to the flow of current through it, measured in Ohms

Input: An incoming information signal

Isolation: Separation of one device or environment from the effects of an adjacent or connected device or environment

Lead Compressor: Compressor coming on first as a result of a call for Cooling 1

Lag Compressor: Compressor coming on second as a result of a call for Cooling 2

LED: **L**ight **E**mitting **D**iode; a semiconductor that emits light when electric current is passed through it by way of two terminals

Manual Override: A means of bypassing triac switches at all levels for manual operation of system components for test or emergency

Memory: In a digital system, the part of the system where information is stored

Microprocessor: An **I**ntegrated **C**ircuit (IC, or set of a few ICs) that can be programmed with stored instructions to perform a wide variety of functions (A microprocessor consists of at least a controller, some registers and some sort of **A**rithmetic **L**ogic **U**nit (ALU).

N-Type Semiconductor: Semiconductor crystal doped to have an excess of free electrons with a predominately negative current carrying capacity (also referred to as a P-Type Semiconductor).

Off Time: The time since humidification was last on

Output: An outgoing information signal

P-N-Junction: Interface boundary between two semiconductor regions with differing electrical properties (Current only flows across the junction in the forward direction if circuit voltage exceeds a certain threshold. Current cannot flow across the junction in the reverse direction.)

P-Type Semiconductor: Semiconductor crystal doped for an excess of holes to enable heavier positive current-carrying capacity (also referred to as an N-Type Semiconductor).

PCB: **P**rinted **C**ircuit **B**oard; made of insulating material with conducting paths secured to one or both sides

Prefill: The period of time between when the water begins to fill the pan and the humidifier lamps turn on

Program: A set of instructions to achieve a certain result

PROM: Programmable **R**ead-**O**nly **M**emory; an **I**ntegrated **C**ircuit (IC) memory chip whose stored data can be read at random (The IC can be used only one time.)

RAM: Random-**A**ccess **M**emory where work can be written (stored) or read (recovered) in any order

Remote: Component(s) or control(s) located at a distance away from the main components or controls

Reset: To return a control to its original position

ROM: Read-**O**nly **M**emory: the location reserved for data permanently stored by the manufacturer

Soft Ground: A connection to ground through an impedance sufficiently high to limit current flow to safe levels for personnel (Impedance needed for a soft ground is dependent upon the voltage levels that can be contacted by personnel near the ground.)

Software: A set of computer programs, procedures and possible associated documentation concerned with the operation of a data processing system

Static-Dissipative Material: Electrostatic protective material having surface restiveness greater than 10^4 but not greater than 10^9 Ohms per square inch

Static-Shielding Material: Material that does not allow spark energy or electrostatic fields to pass through or penetrate it

Surface Resistivity: An inverse measure of the conductivity of a material and equal to the ratio of the potential gradient to the current per unit width of the surface where the potential gradient is measured in the direction of current flow in the material (Surface resistivity is numerically equal to the surface resistance between two electrodes forming opposite sides of a square. The size of the square is immaterial. Its value is measured in Ohms per square inch.)

Transformer: Electromagnetic device for changing the voltage of an AC circuit by induction and/or isolating an AC circuit from its distribution

Triboelectric Effect: The generation of static electricity on an object by contact, separation or friction

Computer and Network Terms

Agent: A program that performs some information gathering or processing task in the background. Typically, an agent is given a very small and well-defined task. Although the theory behind agents has been around for some time, agents have become more prominent with the recent growth of the Internet. Many companies now sell software that enables you to configure an agent to search the Internet for certain types of information.

In computer science, there is a school of thought that believes that the human mind essentially consists of thousands or millions of agents all working in parallel. To produce real artificial intelligence, this school holds, we should build computer systems that also contain many agents and systems for arbitrating among the agents' competing results.

BOOTP: Short for Bootstrap Protocol, an Internet protocol that enables a diskless workstation to discover its own IP address, the IP address of a BOOTP server on the network, and a file to be loaded into memory to boot the machine. This enables the workstation to boot without requiring a hard or floppy disk drive. The protocol is defined by RFC 951.

Cookie: A message given to a Web browser by a Web server. The browser stores the message in a text file called cookie.txt. The message is then sent back to the server each time the browser requests a page from the server. The main purpose of cookies is to identify users and possibly prepare customized Web pages for them. When you enter a Web site using cookies, you may be asked to fill out a form providing such information as your name and interests. This information is packaged into a cookie and sent to your Web browser who stores it for later use. The next time you go to the same Web site, your browser will send the cookie to the Web server. The server can use this information to present you with custom Web pages. So, for example, instead of seeing just a generic welcome page you might see a welcome page with your name on it.

DHCP: Short for Dynamic Host Configuration Protocol, a protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network. In some systems, the device's IP address can even change while it is still connected. DHCP also supports a mix of static and dynamic IP addresses.

Dynamic addressing simplifies network administration because the software keeps track of IP addresses rather than requiring an administrator to manage the task. This means that a new computer can be added to a network without the hassle of manually assigning it a unique IP address. Many ISPs use dynamic IP addressing for dial-up users. DHCP client support is built into Windows 95 and NT workstation. NT 4 server includes both client and server support.

Ethernet: A local-area network (LAN) architecture developed by Xerox Corporation in cooperation with DEC and Intel in 1976. Ethernet uses a bus or star topology and supports data transfer rates of 10 Mbps. The Ethernet specification served as the basis for the IEEE 802.3 standard, which specifies the physical and lower software layers. Ethernet uses the CSMA/CD access method to handle simultaneous demands. It is one of the most widely implemented LAN standards.

A newer version of Ethernet, called 100Base-T (or Fast Ethernet), supports data transfer rates of 100 Mbps. And the newest version, Gigabit Ethernet supports data rates of 1 gigabit (1,000 megabits) per second.

Internet: A global network connecting millions of computers. More than 100 countries are linked into exchanges of data, news and opinions. Unlike online services, which are centrally controlled, the Internet is decentralized by design. Each Internet computer, called a host, is independent. Its operators can choose which Internet services to use and which local services to make available to the global Internet community. Remarkably, this anarchy by design works exceedingly well. There are a variety of ways to access the Internet. Most online services, such as America Online, offer access to some Internet services. It is also possible to gain access through a commercial Internet Service Provider (ISP).

IP address: An identifier for a computer or device on a TCP/IP network. Networks using the TCP/IP protocol route messages based on the IP address of the destination. The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be zero to 255. For example, 1.160.10.240 could be an IP address. Within an isolated network, you can assign IP addresses at random as long as each one is unique. However, connecting a private network to the Internet requires using registered IP addresses (called Internet addresses) to avoid duplicates.

The four numbers in an IP address are used in different ways to identify a particular network and a host on that network. The InterNIC Registration Service assigns Internet addresses from the following three classes.

- Class A - supports 16 million hosts on each of 127 networks
- Class B - supports 65,000 hosts on each of 16,000 networks
- Class C - supports 254 hosts on each of 2 million networks

The number of unassigned Internet addresses is running out, so a new classless scheme called CIDR is gradually replacing the system based on classes A, B, and C and is tied to adoption of IPv6.

Network: A group of two or more computer systems linked together. There are many types of computer networks, including:

- local-area networks (LANs): The computers are geographically close together (that is, in the same building).

- wide-area networks (WANs): The computers are farther apart and are connected by telephone lines or radio waves.
- campus-area networks (CANs): The computers are within a limited geographic area, such as a campus or military base.
- metropolitan-area networks MANs): A data network designed for a town or city.
- home-area networks (HANs): A network contained within a user's home that connects a person's digital devices.

In addition to these types, the following characteristics are also used to categorize different types of networks:

- topology: The geometric arrangement of a computer system. Common topologies include a bus, star, and ring. See the Network topology diagrams in the Quick Reference section.
- protocol: The protocol defines a common set of rules and signals that computers on the network use to communicate. One of the most popular protocols for LANs is called Ethernet. Another popular LAN protocol for PCs is the IBM token-ring network .
- architecture: Networks can be broadly classified as using either a peer-to-peer or client/server architecture.

Computers on a network are sometimes called nodes. Computers and devices that allocate resources for a network are called servers.

Network cross-over cable: A specially designed cable tin which the receive and transmit lines (input and output) are crossed. Used to connect two computers together or hubs. Also called a null modem cable using either RS-232 port connectors or RJ-45 connectors.

Network interface card: Often abbreviated as NIC, an expansion board you insert into a computer so the computer can be connected to a network. Most NICs are designed for a particular type of network, protocol, and media, although some can serve multiple networks.

Null-modem cable: A specially designed cable that allows you to connect two computers directly to each other via their communications ports (RS-232 ports). Null modems are particularly useful with portable computers because they enable the portable computer to exchange data with a larger system.

Protocol: An agreed-upon format for transmitting data between two devices. The protocol determines the following:

- the type of error checking to be used
- data compression method, if any
- how the sending device will indicate that it has finished sending a message
- how the receiving device will indicate that it has received a message

There are a variety of standard protocols from which programmers can choose. Each has particular advantages and disadvantages; for example, some are simpler than others, some are more reliable, and some are faster. From a user's point of view, the only interesting aspect about protocols is that your computer or device must support the right ones if you want to communicate with other computers. The protocol can be implemented either in hardware or in software.

RJ-45: Short for Registered Jack-45, an eight-wire **connector** used commonly to connect computers onto a **local-area networks (LAN)**, especially **Ethernets**. RJ-45 connectors look similar to the ubiquitous **RJ-11 connectors** used for connecting telephone equipment, but they are somewhat wider.

SNMP: Short for Simple Network Management Protocol, a set of protocols for managing complex networks. The first versions of SNMP were developed in the early 80s. SNMP works by sending messages, called protocol data units (PDUs), to different parts of a network. SNMP-compliant devices, called agents, store data about themselves in Management Information Bases (MIBs) and return this data to the SNMP requesters.
SNMP 1 reports only whether a device is functioning properly. The industry has attempted to define a new set of protocols called SNMP 2 that would provide additional information, but the standardization efforts have not been successful. Instead, network managers have turned to a related technology called RMON that provides more detailed information about network usage.

TCP/IP: Abbreviation for Transmission Control Protocol/Internet Protocol, the suite of communications protocols used to connect hosts on the Internet. TCP/IP uses several protocols, the two main ones being TCP and IP. TCP/IP is built into the UNIX operating system and is used by the Internet, making it the de facto standard for transmitting data over networks. Even network operating systems that have their own protocols, such as NetWare, also support TCP/IP.

10BaseT: One of several adaptations of the Ethernet (IEEE 802.3) standard for Local Area Networks (LANs). The 10Base-T standard (also called Twisted Pair Ethernet) uses a twisted-pair cable with maximum lengths of 100 meters. The cable is thinner and more flexible than the coaxial cable used for the 10Base-2 or 10Base-5 standards. Cables in the 10Base-T system connect with RJ-45 connectors. A star topology is common with 12 or more computers connected directly to a hub or concentrator. The 10Base-T system operates at 10 Mbps and uses baseband transmission methods.

Understanding IP Addressing: Every computer that communicates over the Internet is assigned an IP address that uniquely identifies the device and distinguishes it from other computers on the Internet. An IP address consists of 32 bits, often shown as 4 octets of numbers from 0-255 represented in decimal form instead of binary form. For example, the IP address 168.212.226.204 in binary form is: 10101000.11010100.11100010.11001100.

But it is easier for us to remember decimals than it is to remember binary numbers, so we use decimals to represent the IP addresses when describing them. However, the binary number is important because that will determine which class of network the IP address belongs to. An IP address consists of two parts, one identifying the network and one identifying the node, or host. The Class of the address determines which part belongs to the network address and which part belongs to the node address. All nodes on a given network share the same network prefix but must have a unique host number.

Class A Network: Binary address start with 0, therefore the decimal number can be anywhere from 1 to 126. The first 8 bits (the first octet) identify the network and the remaining 24 bits indicate the host within the network. An example of a Class A IP address is 102.168.212.226, where "102" identifies the network and "168.212.226" identifies the host on that network.

Class B Network: Binary addresses start with 10, therefore the decimal number can be anywhere from 128 to 191 (the number 127 is reserved for loopback and is used for internal testing on the local machine). The first 16 bits (the first two octets) identify the network and the remaining 16 bits indicate the host within the network. An example of a Class B IP address is 168.212.226.204 where "168.212" identifies the network and "226.204" identifies the host on that network.

Class C Network: Binary addresses start with 110, therefore the decimal number can be anywhere from 192 to 223. The first 24 bits (the first three octets) identify the network and the remaining 8 bits indicate the host within the network. An example of a Class C IP address is 200.168.212.226 where "200.168.212" identifies the network and "226" identifies the host on that network.

Class D Network: Binary addresses start with 1110, therefore the decimal number can be anywhere from 224 to 239. Class D networks are used to support multicasting.

Class E Network: Binary addresses start with 1111, therefore the decimal number can be anywhere from 240 to 255. Class E networks are used for experimentation. They have never been documented or utilized in a standard way.

Network Information

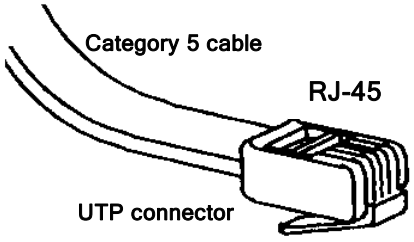
Commonly known as: Network wire, Ethernet cable, Cat5 cable, the information following will explain the connectivity for Liebert Environmental units. Fundamentally, this section will explain the terms of networking so that you can apply the information to building your own network. The parts and components are discussed in generic fashion since equipment manufacturers and price range of the equipment varies and changes on an almost daily basis. However, the terms themselves stay relatively consistent, so purchasing or discussing your needs with networking personnel remains the same.

What is networking?…

In it's simplest form, a network can be created when 2 units are connected through communication wires. This simple connection requires a special "crossover" cable which "crosses" the receive and transmit lines (hence, the name of the cable) and is readily available at your local computer store. However, for most applications, the simpler and more generic installation requires network cables and a hub or switch as explained below.

NETWORK CABLING

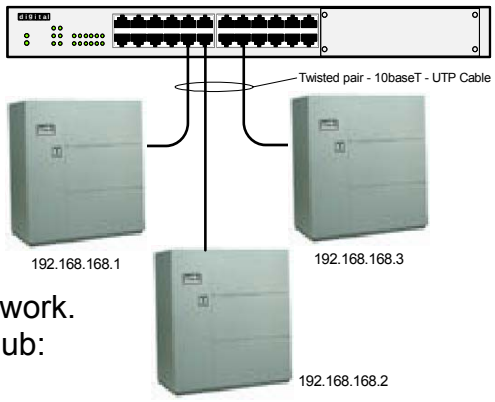
Twisted Pair Ethernet (10baseT), sometime also called "UTP" from "Unshielded Twisted Pair", is based on using a cable and connectors similar to phone-wiring. The cable is connected via an RJ-45 connectors to the network connection installed in the Air Unit. The wire itself is generally called Category 5 wire.



HUBS AND SWITCHES

The opposite end of the network cable connects each Air Unit to the "hub" or "switch": these devices amplify and distribute the signal to other connected units. Switches and hubs range in prices from $20 to thousands depending on the application. Most businesses have standardized on their networking equipment, so there is one probably already installed. Hubs are like mechanical devices where the connections themselves are automatically switched, allowing you to "bus" 2 or more devices easily. In a hub, only 1 device can communicate at a time. Switches perform the same mechanical function, but they also include software

inside that allows communication to operate at faster speeds and allow for multiple unit communication. Switches are the latest technology, but you are safe to use either device.



Hubs are available in different configuration, with 4, 8, 12, 15 or 24 RJ-45 connections. You can plug in the RJ45-connector into a hub while the network is running on the other connected systems, allowing you to move / add systems without having to shutdown the network. As network grow, you may need a second hub:

UNIT IDENTIFICATION OR ADDRESSING

The units are separated and identified through their TCP/IP address. TCP/IP refers to the protocol or language being used to communicate between the Environmental Units. The addresses are arranged in 32-bit numbers. To make it easier to memorize such IP-addresses, they are usually expressed as 4 8-bit numbers (example: 192.168.10.1), where each of the 4 numbers is within the range of '0' to '255' (there are restriction on using '0' and '255', avoid using them.)

When setting up a small private network, you are free to use ANY IP-address, however, when you are connected to a company network, you need to ask the Network-administrator to assign you an IP-address. And if you are connected to the Internet, your ISP (Internet Service Provider) will assign an IP-address to you.

Even if a network is NOT connected to the Internet, it has become custom to use on private networks a range of IP-addresses, which are reserved for private networks (that makes it later possible to connect your private network to the Internet without having to re-configure everything). The reserved IP-address is: **192.168.x.y**, where x=same number on all systems and y=different/unique number on all systems.

See the example above under HUBS AND SWITCHES for an example of this configuration.

How to Use the Schematic

As you look at the outside edge of the electrical schematic (drawing), you will see the numbers 8 through 1 (reading left to right) across the top and bottom and the letters D through A (reading from top to bottom) along both the left and right edges of the schematic. These numbers and letters are called locators, just like on a map. By intersecting the number and letter into the drawing, you can locate the section of the schematic you need to reference.

The next area of interest is the line numbers along both sides of the schematic. By using these line numbers and a straight edge, you can pinpoint a particular item in the located section. Also, useful is the Nomenclature section along the right side of the schematic. The nomenclature sections refers identifies the device by abbreviation and name and indicates on which line the device is found.

If you look deep into the schematic, you can see that the transformer section is laid out in a ladder progression making it easy to follow-out each circuit. You may wish to highlight each circuit with a marker making it easy to follow.

The number indicators in the area to the right of the ladder circuit section are also important. These are the contact locators for each relay or contactor shown on the drawing. The number represents the line location of the contact(s) for the adjacent shown relay or contactor. There are two types of line number indicators. One is highlighted with a bar across the top of the number, this indicates a normally closed contact. The other number shown without the bar indicates a normally open contact. Remember that the drawing is shown in the non-powered (de-energized) state.

These drawings are the latest revisions at publication of this manual and are what Liebert calls Universal drawings. Liebert has included numerous options on each one of these drawing to help in troubleshooting the system. These drawings may or may not be on your particular unit.

It is important to become familiar with legend, nomenclature and notes on each drawing.

Electrical Schematic List

Liebert DS/VS Schematics

182952 DS Board w/ iCOM Control Layout and Plug Assignments
183575 DS *iCOM* Global Control 8 - 12 Ton
183576 DS *iCOM* Global Control 15 – 30 Ton, 380 – 575V
183577 DS *iCOM* Global Control 15 – 30 Ton, 208 – 230V
183578 DS *iCOM* Global Control SCR Reheat 8 - 12 Ton
183579 DS *iCOM* Global Control 30 Ton, 208 – 230V Scroll Compr. w/ IR Humid
183580 DS *iCOM* Global Control 30 Ton, 380 – 575V Scroll Compr.
183581 DS *iCOM* Global Control 15 - 30 Ton, 380 – 575V SCR Reheat
183582 DS *iCOM* Global Control 15 - 30 Ton, 380 – 575V SCR Reheat
183583 DS *iCOM* Global Control 30 Ton, 208 – 230V SCR Reheat
183584 DS *iCOM* Global Control 30 Ton, 380 – 575V SCR Reheat
185555 Symbol Library and Schematic Specifications

Condenser – Drycooler Heat Rejection Schematics

1C16263 Condenser Fan Speed Control 3 Ph 60 Hz - 2 – 4 Fan
2CN-2185 Condenser Lee-Temp 1 - 4 Fan 3 Ph 60 Hz
184901 Condenser VFD 3 Phase 50/60 Hz - 1 – 4 Fan
3G-1000 Drycooler Dual Pumps 3 Ph 50/60 Hz – 1 – 4 Fan
3G-1001 Drycooler Single Pump 3 Ph 50/60 Hz – 1 – 4 Fan
3G-1052 Drycooler Dual Pumps 3 Ph 50/60 Hz – 1 – 4 Fan w/ Prop AQ Stat

Notes