Liebert® iCOM®

User Manual -Intelligent Communications & Monitoring for Liebert Challenger 3000™, Liebert CW™ and Liebert DS™ with Software Version PA2.01.48R

EMERSON
Network Power

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1.0 INTRODUCTION

The Liebert iCOM offers the highest capabilities in unit control, communication and monitoring of Liebert mission-critical cooling units.

Liebert iCOM may be used to combine multiple cooling units into a team that operates as a single entity, enhancing the already-high performance and efficiency of Liebert's units.

Liebert iCOM is available as a factory-installed assembly or may be retrofitted on existing products with SM, AM or AG controls. Large graphic display wall-mount versions of the control are available for remote operation and monitoring of cooling units.

1.1 Features

Large and Small Displays

The Liebert iCOM is available with either a large or small liquid crystal display.

- The **Liebert iCOM with small display** has a 128 x 64 dot matrix screen that simultaneously shows two menu icons, along with descriptive text. This display is capable of controlling only the unit it is directly connected to. The Liebert iCOM small display is not available on the Liebert DSE™.
- The **Liebert iCOM with large display** has a 320 x 240 dot matrix screen that shows up to 16 menu icons at a time, as well as descriptive text. This display can be used to control a single cooling unit or any cooling unit on a network, regardless of how it is connected—either integrated into a cooling unit or simply connected to the network and mounted remotely.

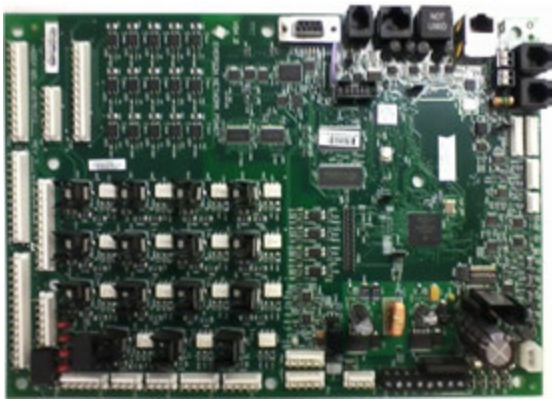
Liebert iCOM's menu-driven display is used for all programming functions on each connected cooling unit. The Status menu shows the status of the conditioned space, such as room temperature and humidity, temperature and humidity setpoints, alarm status and settings, event histories and the current time.

Figure 1 Liebert iCOM components

Wall Mount Large Display

Direct Panel Mount Large Display and Bezel

Direct Panel Mount
Small Display and Bezel

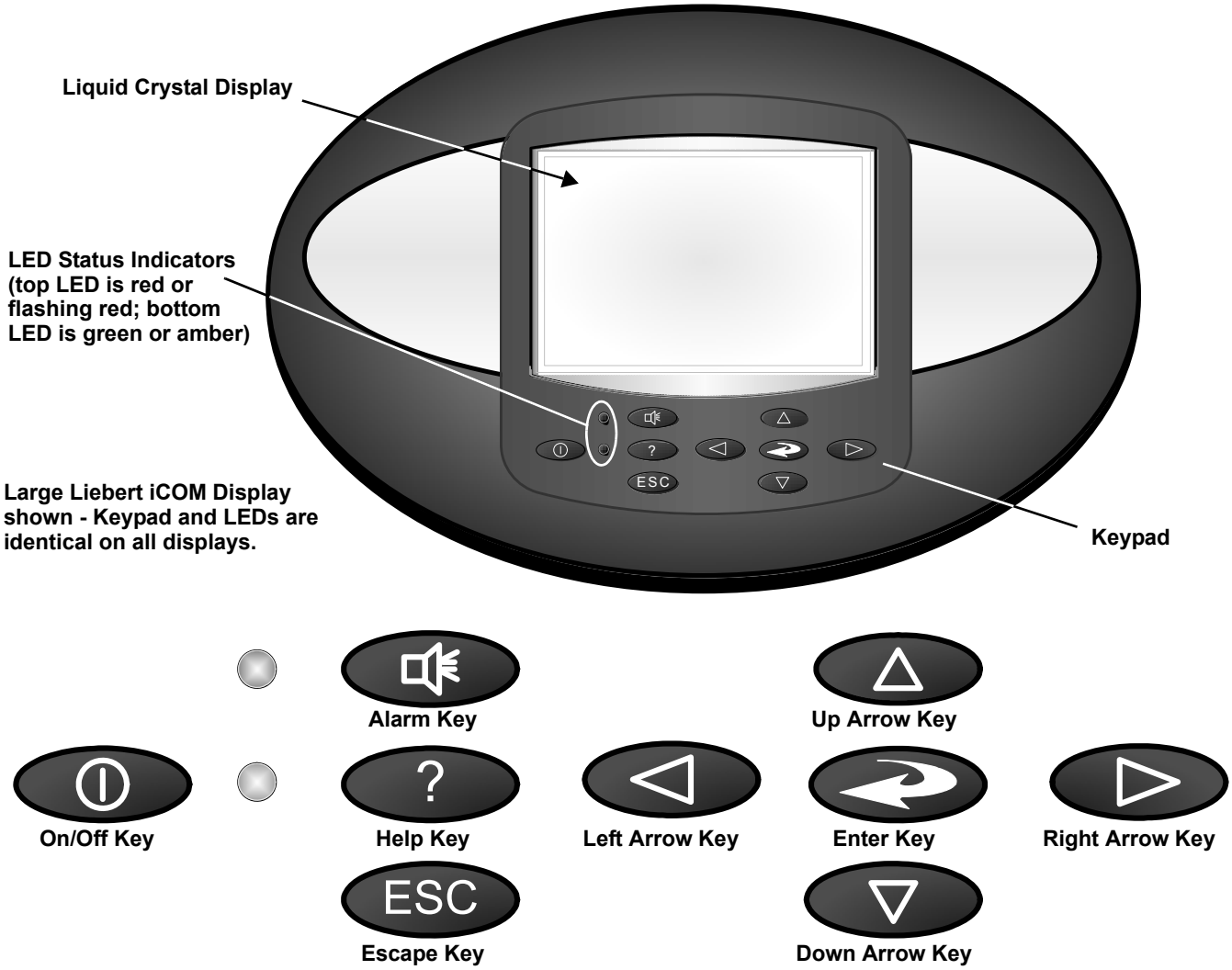


Liebert iCOM Input/Output Board

2.0 LIEBERT iCOM DISPLAY COMPONENTS AND FUNCTIONS

The small and the large display have a common key layout, as shown in **Figure 2**.

Figure 2 Liebert iCOM display components



NOTE

The Help key may be pressed at any time for a brief explanation of what is being viewed.

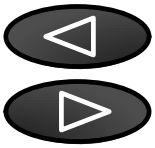
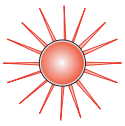
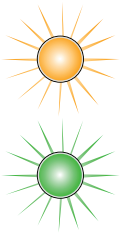
NOTICE

Risk of inadvertent system shutdown. Can cause loss of cooling and equipment damage.

Pressing the On/Off key on a Liebert iCOM large display while the system screen is shown permits shutting down all units on the network.

Large Liebert iCOM displays can view and control other units on the network when they are in the same group. When turning a unit Off or On with the large display, make sure that the unit to be shut down or started up is shown on the screen. If the system screen is shown and the On/Off key is pressed, the Liebert iCOM shows a notification that pressing the On/Off key again will turn Off all units on the network. See **7.5 - User-Display Setup Menu Screen** to disable this function.

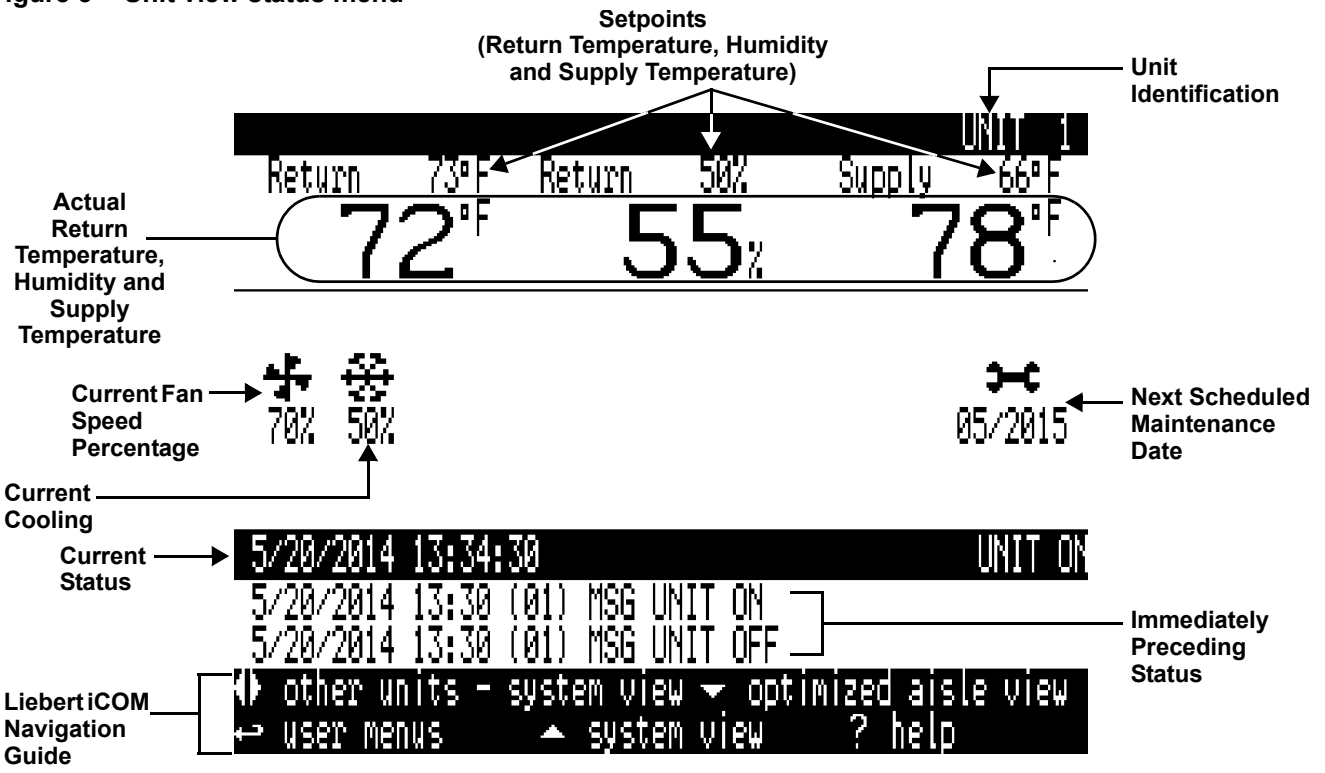
Table 1 Keyboard icons and functions

Icon	Key Name	Function
	On/Off Key	Begins Shutdown or Startup.
	Alarm Key	Silences/Resets an alarm.
	Help Key	Accesses integrated help menus.
	ESCape Key	Returns to the previous display view.
	Enter Key	Confirms all selections and selects icons or text.
	Increase Key (Up Arrow)	Moves upward in a menu or increases the value of a selected parameter.
	Decrease Key (Down Arrow)	Moves downward in a menu or reduces the value of a selected parameter.
	Left and Right Arrow Keys	Navigates through text and sections of the display.
	Upper LED	Blinking Red—Active, unacknowledged alarm exists
		Solid Red—Active, acknowledged alarm exists
	Lower LED	Amber—Power is available to the unit, unit is NOT operating
		Green—Power is available to the unit, unit is operating
	Lower LED	Green and Amber LEDs will flash alternately when the unit is in Standby

2.1 Control Interface—Large Display

The Liebert iCOM automatically opens to the Unit View Status Menu when the cooling unit is started. This view will display "Unit 1" in the upper right corner of the screen.

Figure 3 Unit view status menu

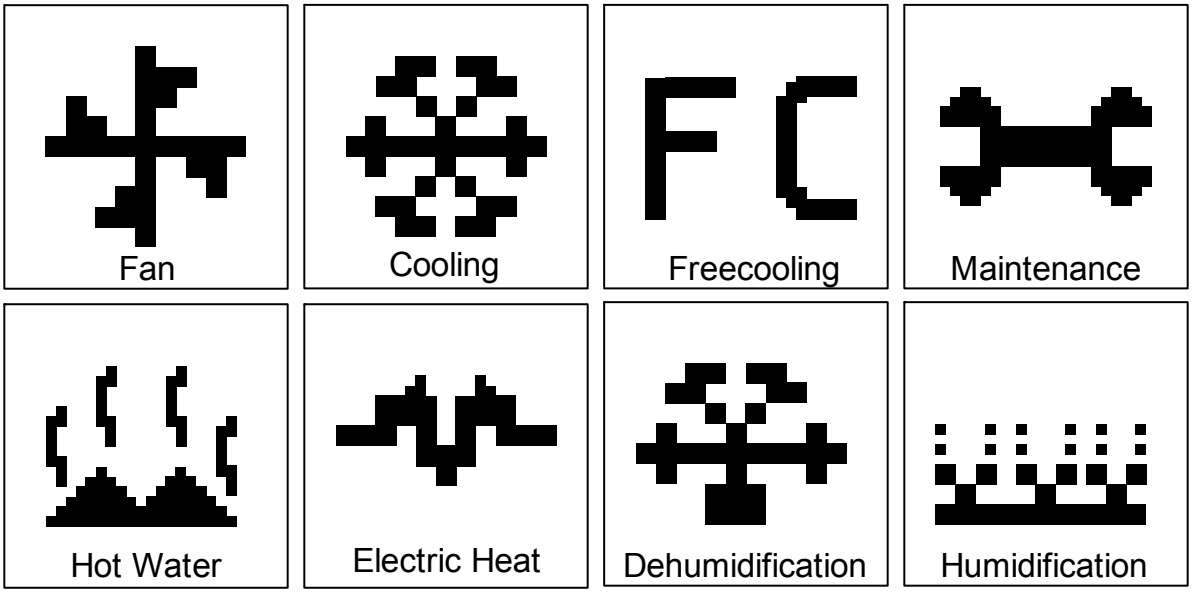


When no button on the Liebert iCOM control has been pressed for a short period, the display backlight turns Off. Pressing any key will reactivate the screen and display the status menu of the last cooling unit viewed.

The status menu will show the cooling unit's operational mode, including information such as return air temperature and humidity readings, temperature and humidity setpoints and any active alarms.

Symbols on the Liebert iCOM screens, shown in **Figure 4**, denote the operating modes.

Figure 4 Liebert iCOM default screen symbols



A Liebert iCOM will show only icons for functions available on the unit it is connected to. For instance, a Liebert iCOM on a unit that does not perform humidification or dehumidification will not display icons for those functions.

Cooling systems may also disable functions temporarily for protective reasons. Icons for disabled functions will be displayed with a large *X* over them. The *X* will disappear when the function becomes available.

2.1.1 Navigating to Various Views in the Liebert iCOM

Pressing any of the Liebert iCOM's arrow keys in the Unit View Status Menu brings screens with different information.

The bottom of the screen serves as a navigation guide, illustrating what buttons do in various Liebert iCOM screens; see **Figure 5**).

Figure 5 Use arrow keys to navigate among screens

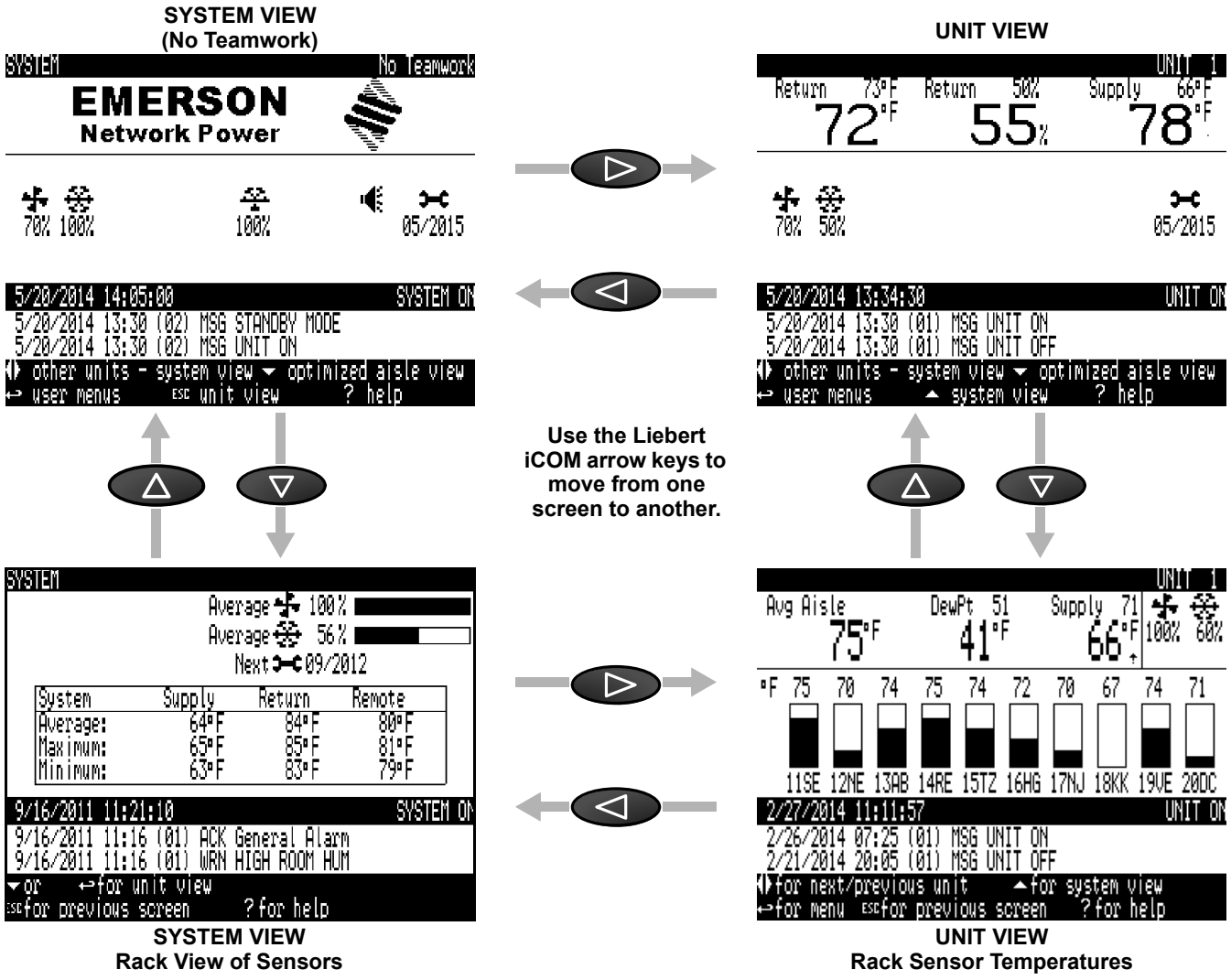


Figure 6 Unit status menu, large display, graphical comma view

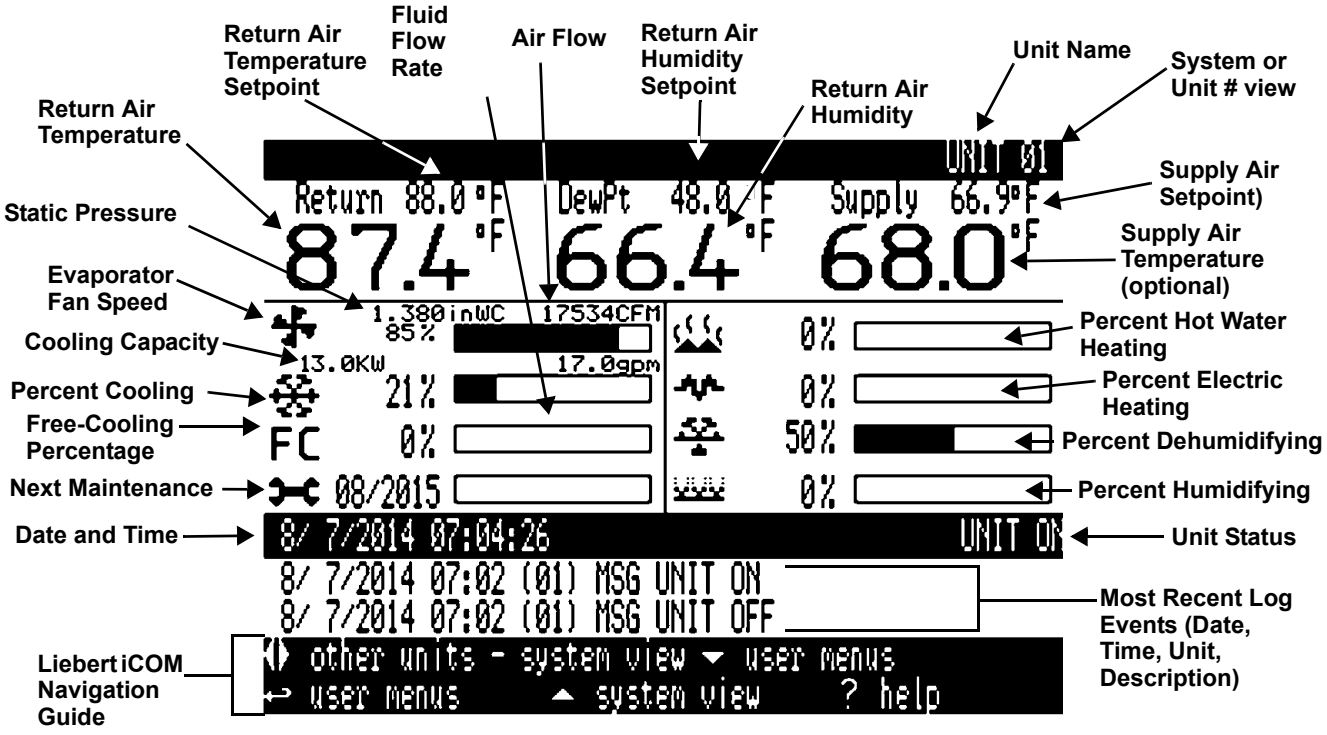


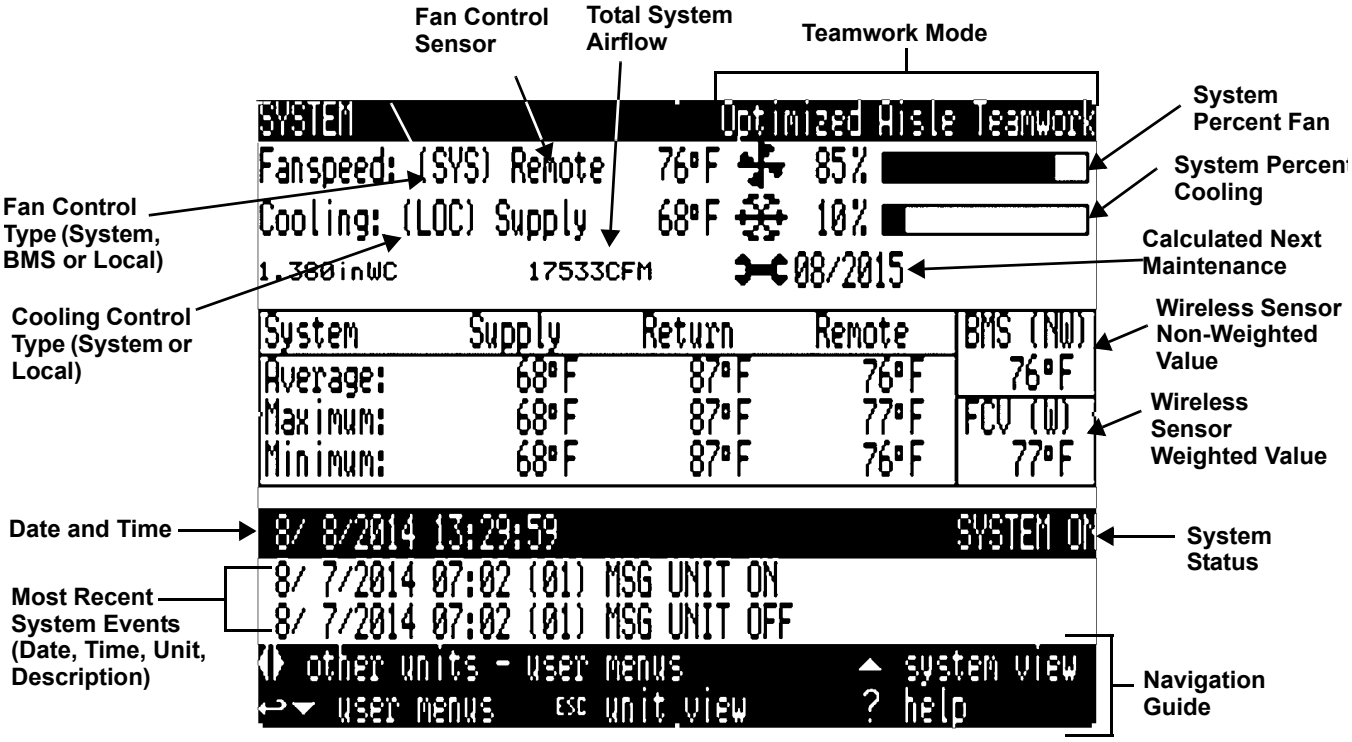
Figure 6 shows all icons and status bars for illustration only. Not all icons and status bars will be displayed on a particular unit. The Liebert iCOM will display icons and status only for functions available on the unit it is attached to. Some icons may, at times, be shown with an *X* over them, indicating that the function is temporarily disabled. The *X* will disappear when the component or function is re-enabled.

2.2 System Screen

The System Screen with Rack View of Sensors will display the average, maximum and minimum of all connected sensors for the supply, return and remote sensors.

This screen may display the total airflow of the connected units within the group, static pressure control point and temperatures reported by the wireless sensor(s) when the applicable devices are installed.

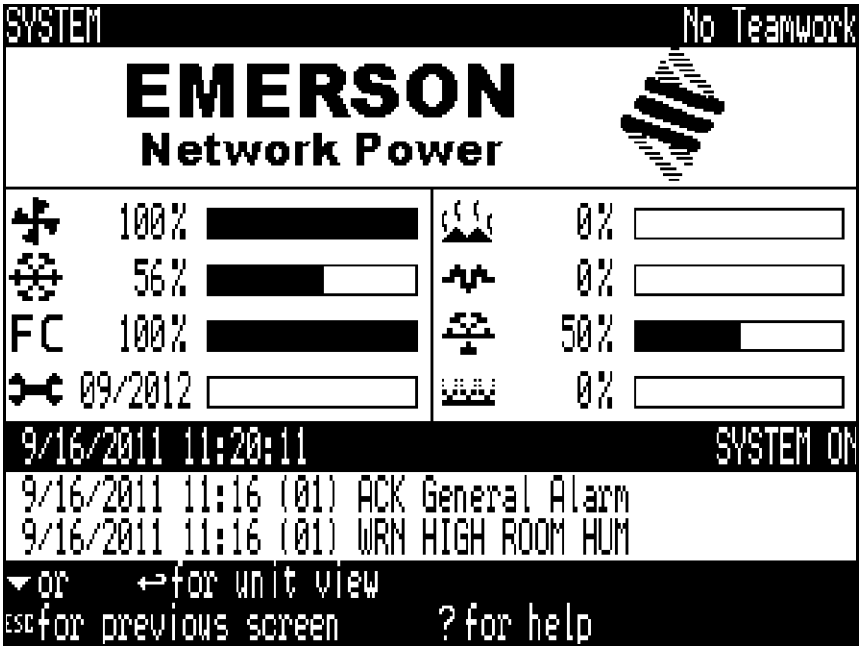
Figure 7 System screen with rack view of sensors



System Screen will indicate if Teamwork is turned On and which teamwork mode is currently set within the control.

This system screen displays the unit operation by displaying the average of all active components from each unit within the system.

Figure 8 System screen



2.3 Unit View with Rack Sensors

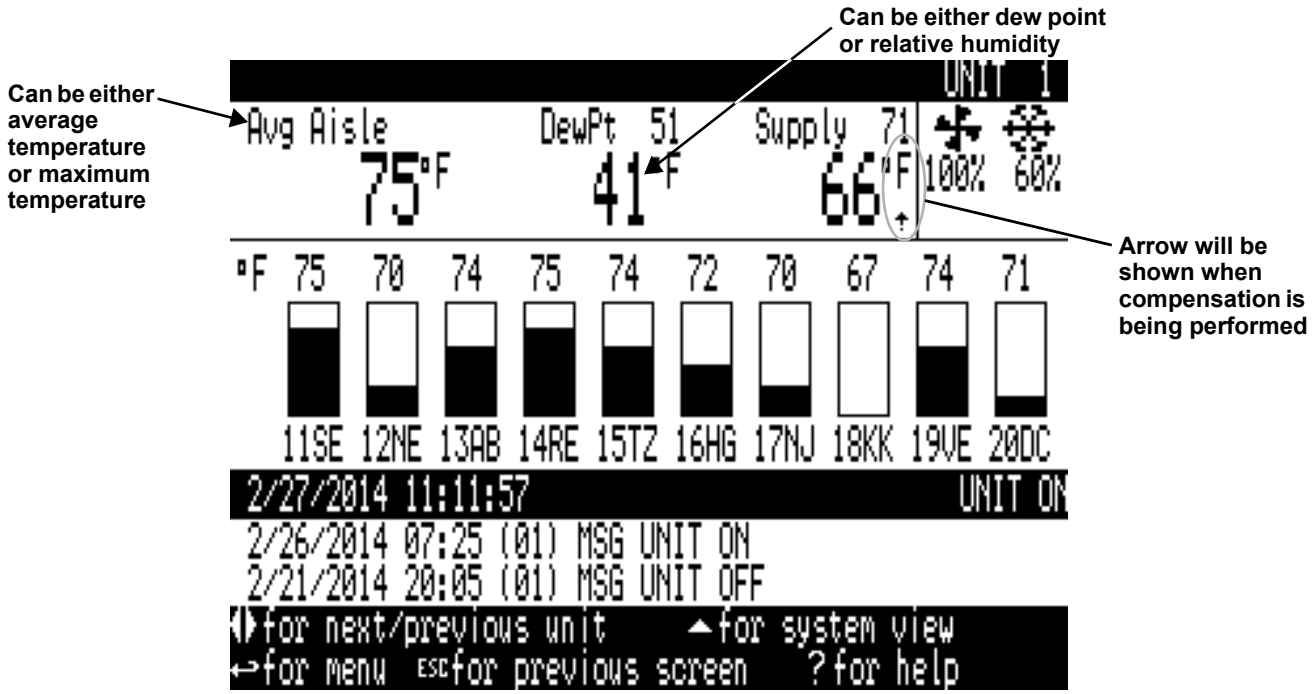
This screen is shown when rack sensors have been configured for control or reference. The temperatures at the top of the main unit screen are based on which sensors are used for controlling airflow, cooling capacity and humidification.

The data at the upper left of the screen can be either average or maximum rack temperature, depending on the selection in the Remote Sensors Mode. The data at the upper middle of the screen can be either dew point or relative humidity, depending on humidity control type.

Each unit can display individual remote rack sensor readings. The readings will be either an average or maximum reading between the two sensors connected at each 2T sensor module.

The bar graph's upper limit is set at 77°F (25.0°C). The lower limit is set at 68°F (20°C), the rack inlet temperature range recommended by ASHRAE. When a rack temperature is at or above the upper limit, the bar graph will be all black. When a rack temperature is at or below the lower limit, the bar graph will be all white.

Figure 9 Unit view with rack sensor temperatures



2.4 Navigating Through the Liebert iCOM Menus

Liebert iCOM shows icons and text for monitoring and controlling your Liebert cooling units or network of cooling units. The number of icons and amount of text shown depends on the display size.

The Liebert iCOM has three main menus; User, Service and Advanced.

The User menu contains the most frequently used features, settings and status information. The Service menu contains settings and features used to set up unit communications and for unit maintenance. The Advanced menu contains settings used to set up the unit at the factory. Do not attempt to make any changes in the Advanced menu without consulting the factory first.

NOTE

Menu settings may be viewed without a password, but changing settings requires a password. The password for the User menu is 1490. The password for Service menu is 5010. For details on entering a password, see ***Entering a Password on page 12***

2.4.1 Accessing Submenus on Large Displays

While the display is at unit status screen, press either the Enter or Down arrow key to display the User menu. To access the Service menu, press the Right arrow key. Pressing the Right arrow key again will display the Advanced menu.

Pressing the Enter key again will display the menu items. Use the arrow keys to navigate through the icons. When the desired icon highlighted, press the Enter key to enter that submenu. Once in a Submenu, a list of parameters will be displayed.

The Up and Down arrow keys may be used to scroll through the parameters page-by-page if the submenu has multiple pages. To scroll item-by-item, press the Enter key and then use the Up and Down arrow keys. Using the Right or Left arrow keys on large displays attached to a network will change the unit being viewed. Pressing the ESC key will go back a level. **Figures 10** and **15** show the Liebert iCOM menus for a stand-alone large display and for a networked large display, respectively.

NOTE
Settings are readable without a password.t Changing settings requires a password.

Figure 10 Menu tree—Large display, stand-alone

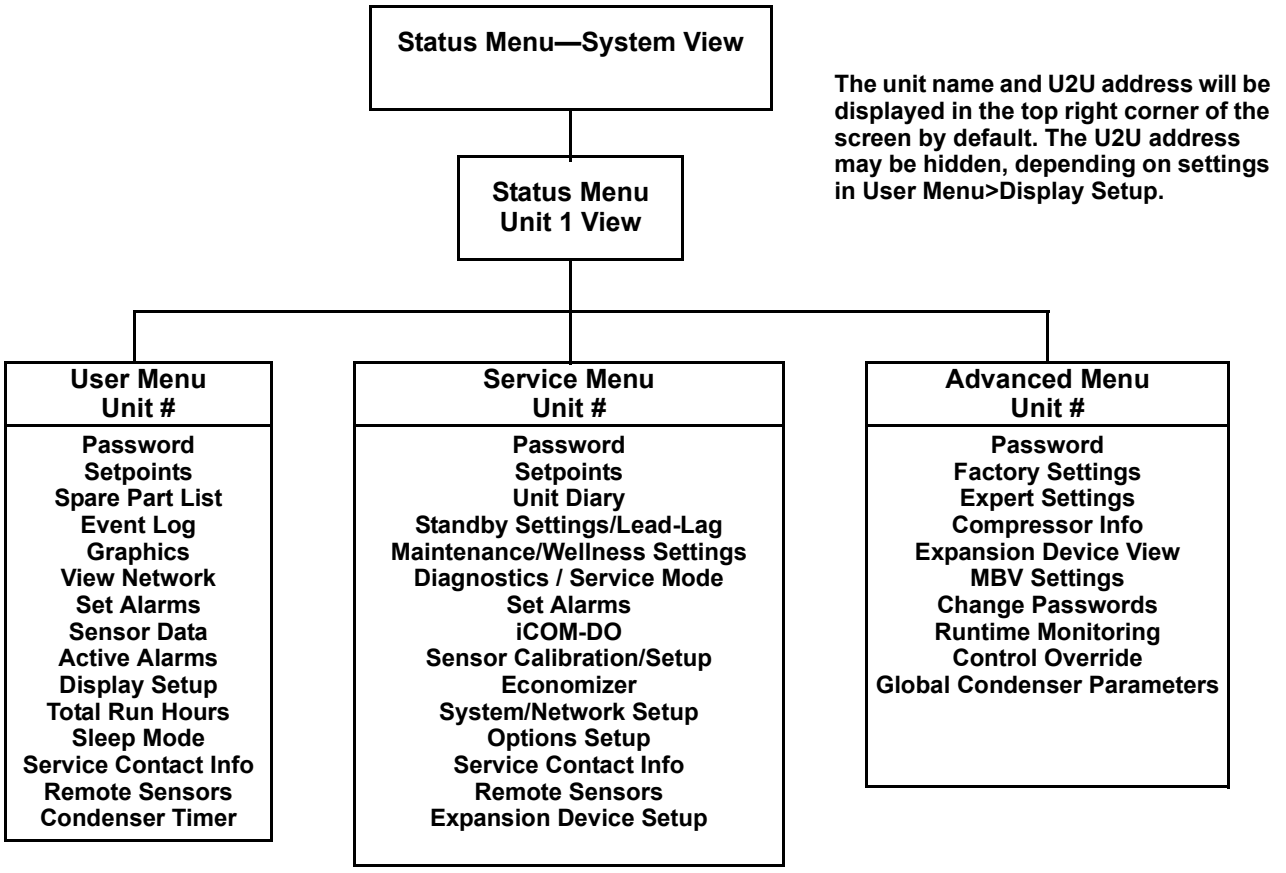


Figure 11 Navigation with a large display—single unit view

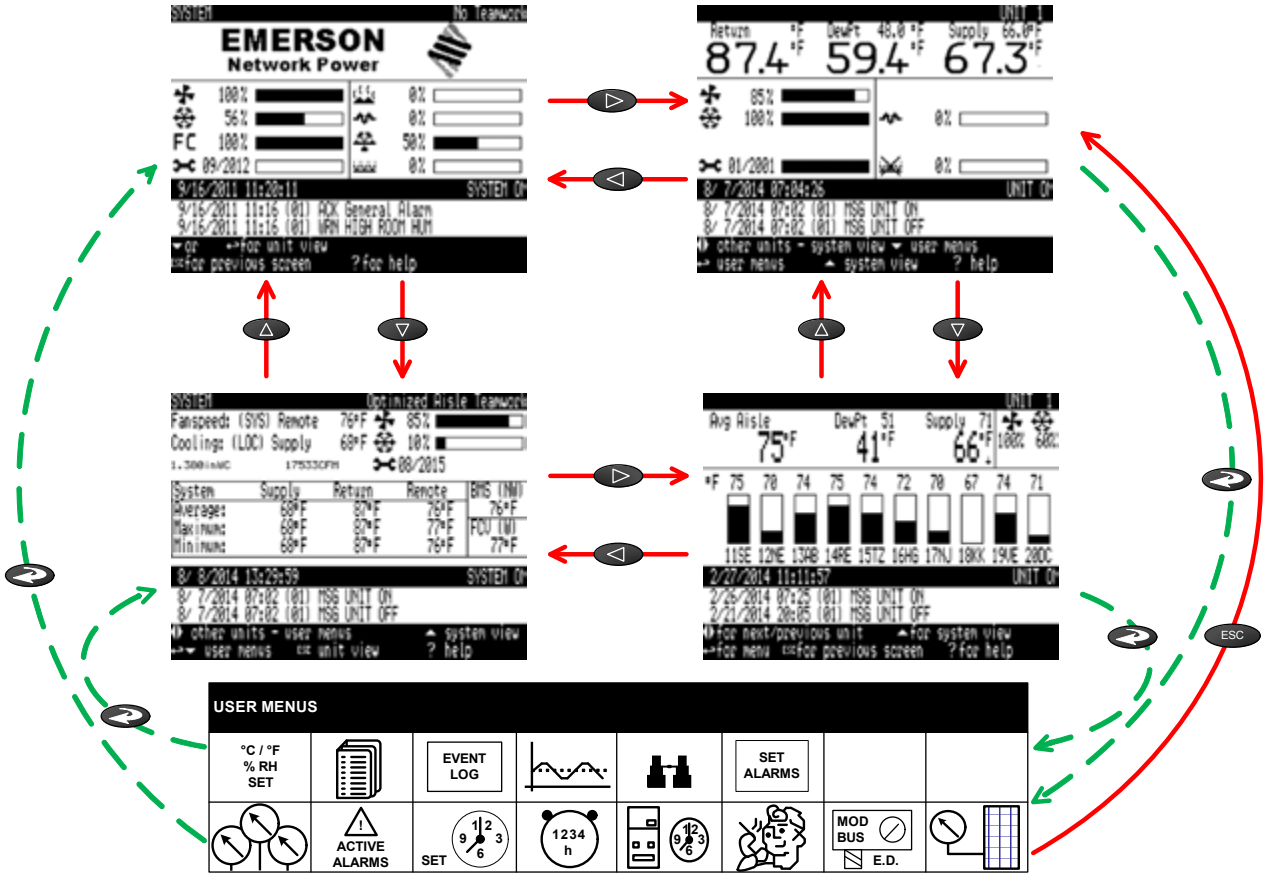
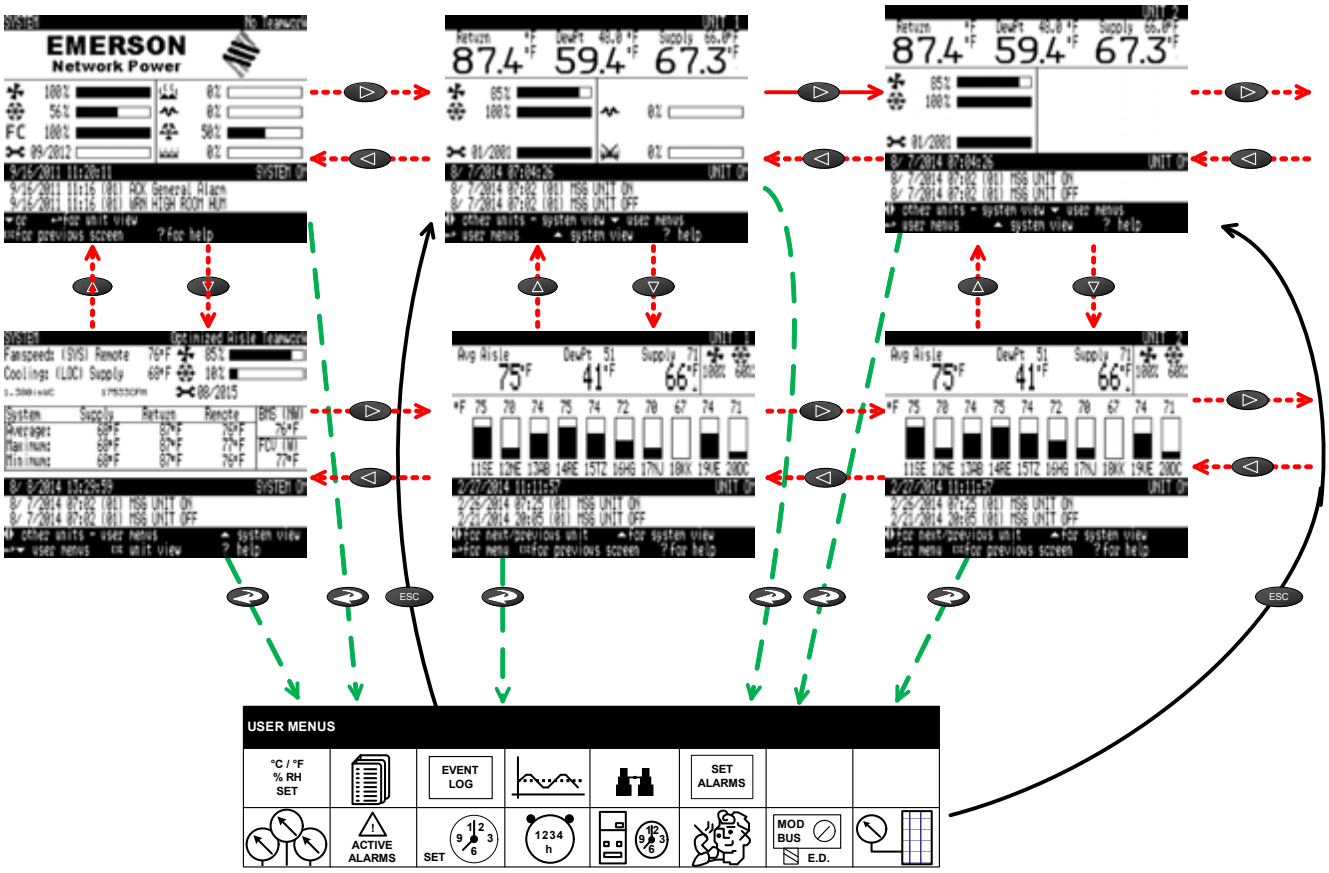


Figure 12 Navigation with a large display—Network view



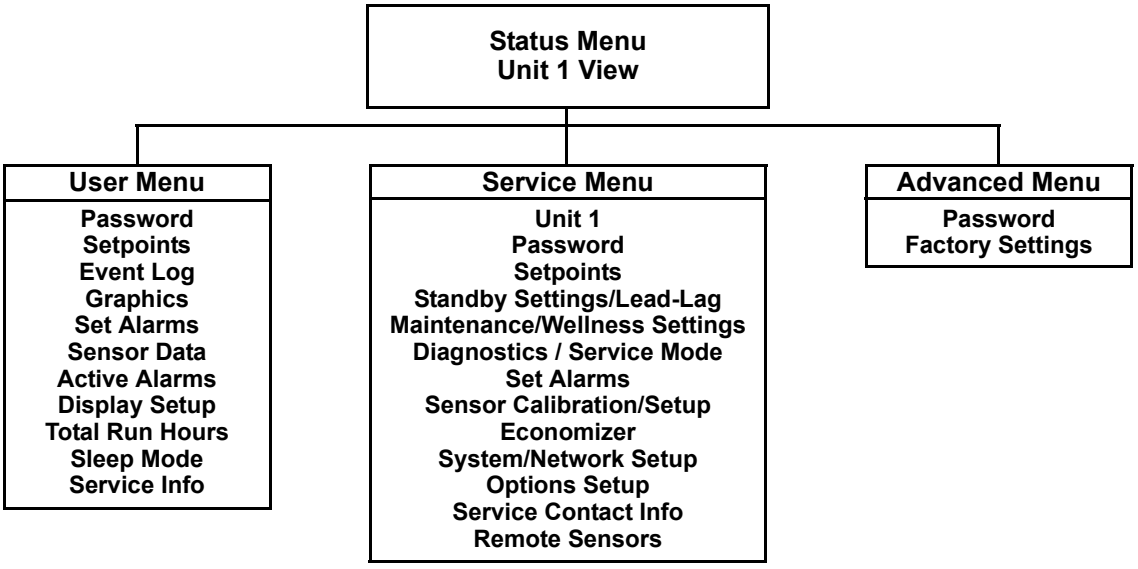
2.4.2 Accessing Submenus on Small Displays

While the display is at the main menu (User, Service or Advanced), use the Up and Down arrow keys to scroll through the icons a page at a time. To scroll through the icons one-by-one, press the Enter key and use the Up and Down arrow keys. Select the desired icon, press the Enter key to view that submenu's contents.

Press the Enter key and use the Up and Down arrow keys to navigate through the parameters one by one.

Pressing the ESC key will go back a level. **Figure 13**shows the Liebert iCOM menus for a small display.

Figure 13 Menu tree—Small display, stand-alone or networked



2.5 Display Setup

The Liebert iCOM can be programmed to display information based on user preferences in the User Menu> Display Setup icon. Here the user can set things such as display Language, units of measure, set screen contrast and hide/show certain display readouts.

A display filtering feature located within the Display setup menu allows the user to display information of a single unit in the network on the large display. This allows each cooling unit to have a large display that acts as a local display.

A system On/Off enable feature allows the user to enable and disable the I/O button from the System view. This helps to protect against accidental system shut downs.

The user may also hide and show the U2U network number to the right of the unit name to allow for more flexible unit naming.

The Liebert iCOM supports multiple unit and system screen layouts. These screen layouts are configured on line U408 of the user menus, Display Setup icon.

U408 Screen selections include:

- Simple (factory default)
- Graphical
- Simple comma
- Graphical comma

The graphical settings allow the user to view a graphical representation of the iCOM operations.

The simple setting shows the operating status only of components currently operating. If a component is not in use, the Liebert iCOM automatically hides that component's icon.

Both graphical comma and simple comma allow the user to see temperature and humidity reading to a tenth of a degree or percent.

2.5.1 Entering a Password

The password must be entered before any value of the menu item parameter can be changed. There are three levels of password for preventing unauthorized changes.

1. User menu password allows the operator the ability to change the parameters in the User menu. The User menu password is 1490.
2. Service menu password enables the operator to changes parameters in both Service and User. The Service menu password is 5010.
3. Advanced menu password allows the changes to be made in all parameters.

NOTE
Entering the Service menu password permits access to both the User and Service menus.

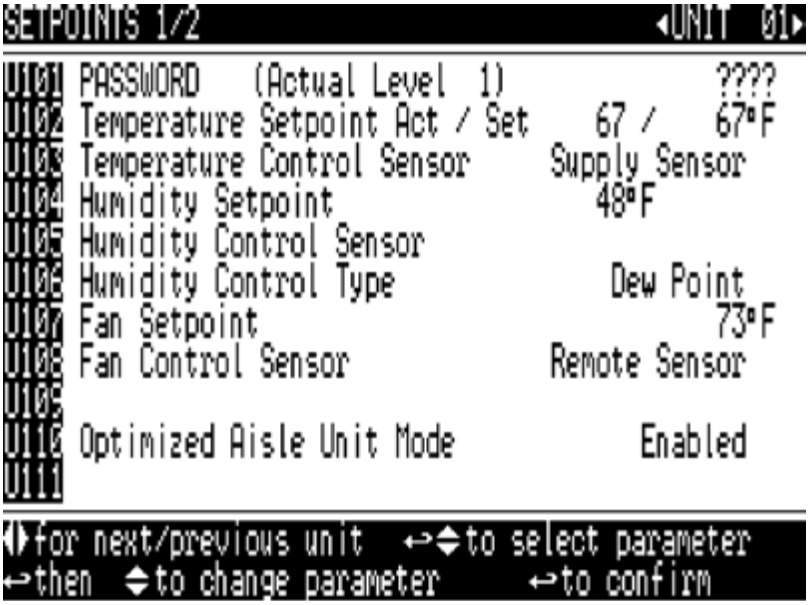
To enter a password:

1. Navigate to the menu that contains the parameter to be changed.
2. Select *Password* in the submenu by pressing the Enter key.
3. Press the Enter key to move your cursor to the right side of the screen to select the question marks.
4. Use the arrow keys to enter the numeral for the password's first digit (the Up arrow key moves from 1 to the next digit).
5. Use the Right arrow key to move to the next question mark and repeat **Step 4** to enter all digits in the password.
6. After entering the password, press enter.

If the password is correct, the *Actual Level* shown to the right of *Password* will change from 0 to 1 or 2. The menu will remain locked if the password was incorrect.

NOTE
Returning to the Status menu will require re-entering a password to make changes.

Figure 14 Entering a password



2.5.2 Viewing Multiple Units with a Networked Large Display

When you first wake up the control, press the Esc key to return to the System view Status menu. This view shows an average of all the units on the network and any alarms present. To view a specific unit on the network, press either the Enter key or Down arrow key. When you do this, you will see the word *System* in the top left of the screen change to a unit number. Use the Left and Right arrow keys to can toggle through the various units on the network. To go back to the System view, or back one level from any menu in the control, press the Esc key.

Figure 15 Menu tree—Large display, networked

The unit name and U2U address will be displayed in the top right corner of the screen by default. The U2U address may be hidden based settings in User Menu>Display Setup.

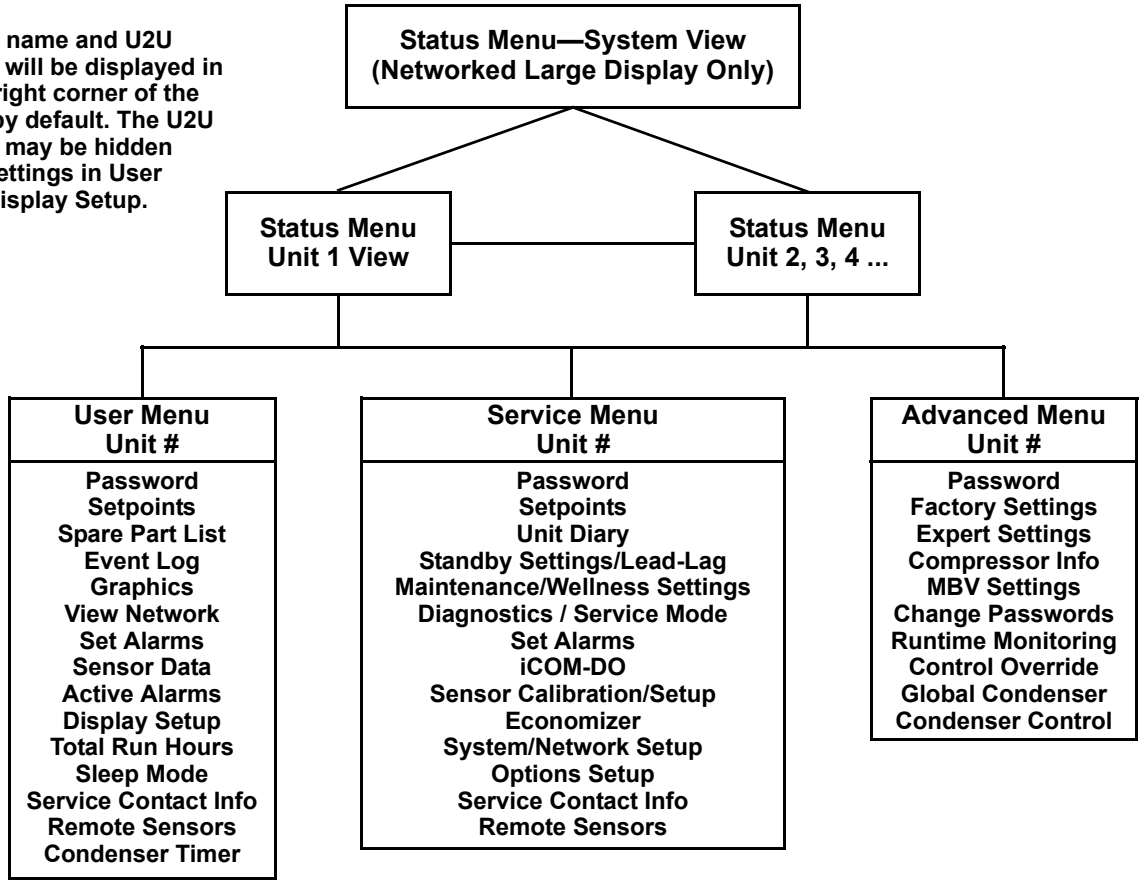
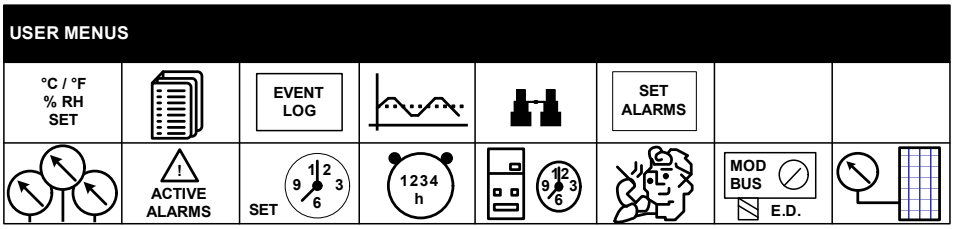


Figure 16 User menu icons



User Menu password: 1490

Table 2 User menu icons

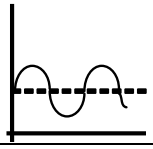
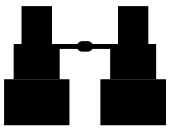
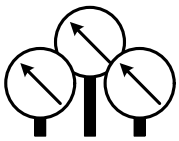
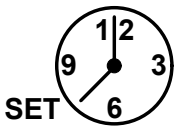
Icon	Name	Description	Available On Display
°C / °F % RH SET	Setpoints	View and change temperature and humidity setpoints	Small & Large
	Spare Part List	Displays the various part numbers of the components/parts in the cooling unit	Large
EVENT LOG	Event Log	Contains last 400 events	Small & Large
	Graphics	Displays temperature and humidity graphs	Small & Large
	View Network	Shows status of all connected units	Large
SET ALARMS	Set Alarms	Allows enable, disable and settings for alarms	Small & Large
	Sensor Data	Shows readings of standard and optional sensors	Small & Large
 ACTIVE ALARMS	Active Alarms	Allows the user to view all current active alarms	Small & Large
 SET	Display Setup	Change settings for display: language, time, simple or graphic view	Small & Large

Table 2 User menu icons *(continued)*

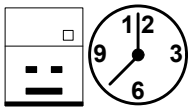
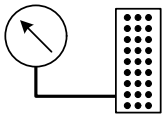
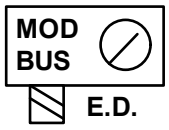
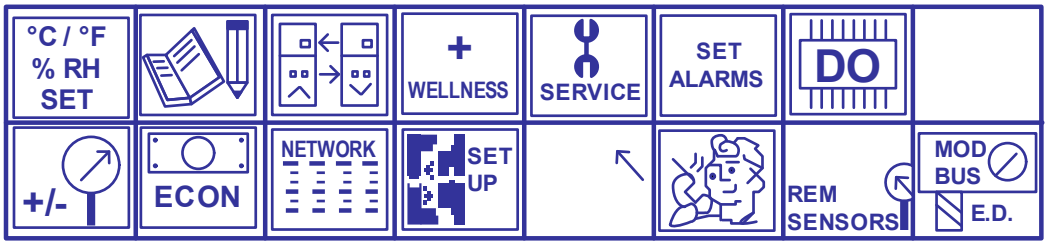
Icon	Name	Description	Available On Display
	Total Run Hours	Records the run time of all components and allows setting of limits on run time	Small & Large
	Sleep Mode	Allows setback settings for non-peak operation	Small & Large
	Service Contact Info	Contains key contact information for local service, including names and phone numbers	Small & Large
	Condenser Timer	Displays the timer settings for the Liebert MC™ (microchannel condenser)	Large
	Expansion Device	Displays readings of Modbus devices	Large

Figure 17 Service menu icons

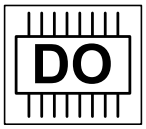
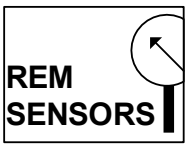
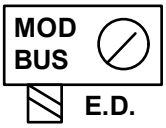


Service Menu password: 5010

Table 3 Service menu icons

Icon	Name	Description	Available On Display
°C / °F % RH SET	Setpoints	To view and change temperature and humidity setpoints	Small & large
	Unit Diary	Shows all entered program changes and maintenance performed on the unit	Large
	Standby Settings/ Lead-Lag	Allows lead/lag setup when multiple units are connected	Small & large
WELLNESS	Maintenance/ Wellness Settings	Allows setting maintenance interval reminder, maintenance message, number of unit starts and stops, and time since last maintenance	Small & large
SERVICE	Diagnostics/ Service Mode	Allows troubleshooting, manual mode, read analog and digital inputs	Small & large
SET ALARMS	Set Alarms	Allows enable, disable and settings for alarms	Small & large
+ / -	Sensor Calibration/Setup	Allows calibration of sensors	Small & large
NETWORK	System/Network Setup	Allows setup and U2U communication for multiple units	Small & large
	Options Setup	Allows setup of component operation	Small & large

Table 3 Service menu icons *(continued)*

Icon	Name	Description	Available On Display
	Service Contact Info	Contains key contact information for local service, including names and phone numbers	Small & large
	Liebert iCOM-DO™	Change settings for Liebert iCOM Discrete Output card	Large
	Remote Sensors	Change settings for Remote Sensors	Large
	Expansion Device	Displays readings of Modbus devices	Large

3.0 OPERATION

The Liebert iCOM display provides viewing, trending and configuration capability for Liebert cooling units. All unit settings and parameters can be viewed and adjusted through three menus: User, Service and Advanced. All active alarms are displayed on the LCD and annunciated.

The control is shipped from the factory with default selections for all necessary settings. Adjustments can be made if the defaults do not meet your requirements.

References to menu items in this manual are followed by the main menu and the submenu where they can be found.

For example:

- **Temperature Setpoint (User Menu, Setpoints)** - The Temperature Setpoint parameter is located in the User menu under the Setpoints submenu.
- **High Return Humidity (Service Menu, Set Alarms)** - The High Return Humidity alarm is located in the Service menu under the Set Alarms submenu.

3.1 Single Unit Functions

3.1.1 Unit/Fan Control

Start - Stop

The unit may be switched On and Off by pressing the On/Off button, through a remote device or by internal safety device(s). In all cases, the fan output is first activated when the unit is switched On and will remain On as long as the unit is running. Each time a unit is turned On or Off, the unit status is updated to reflect the current operating mode and an event is added to the Event Log. Unit statuses displayed include:

- ALARM OFF—The unit has an alarm that has forced the unit to turn Off.
- MANUAL—Unit is being controlled by a service technician using the Service Diagnostics Manual Mode.
- LOCAL OFF—When a unit is turned Off from the Unit Status Screen or small display, LOCAL OFF is shown for unit status.
- DISPLAY OFF—When a unit is turned Off from the System Screen of a large display, Display OFF is shown for unit status.
- ALARM STANDBY—The unit has been rotated into standby because an active alarm on the unit is present.
- STANDBY—The unit is in standby based on the Lead / Lag settings in the Service Menu.
- TIMER OFF—The unit has been set to Sleep and is waiting for the next start interval. See User / Sleep Mode Menu.
- UNIT ON—The unit is operating normally without alarm or warning.
- WARNING ON—The unit has an active warning but is still operating. See User / Active alarms for details.
- ALARM ON—The unit has an active alarm but is still operating. See User / Active alarms for details.
- TIMER—The unit is configured on a timer to only operate at certain times. See User / Sleep Mode Menu.
- REMOTE OFF—Remote shutdown terminals will turn Off the connected unit and the front display shows REMOTE OFF as the status. This command is invoked when a normally closed set of dry contacts opens. The remote On/Off and display On/Off switches are in series. A cooling unit will start only if both switches are On. If one of these switches is Off, the unit will stop. See **Figure 18** for more information.
- MONITORNG OFF—In this case, an override to the monitoring is possible: Pressing the On-Off button of the display will change the state to Unit Off; pressing again may start the unit in Unit On. If the unit does not turn On, check the remote monitoring device or call 800-543-2778 for assistance.
- BACK-DRAFT—The unit is in a non-operational mode, but is operating the EC fan as a back-draft damper.

Pressing the On/Off key on a small display will affect only the cooling unit it is mounted on, regardless of whether the cooling unit is a stand-alone unit or part of a network. The small Liebert iCOM display does not have access to the Unit-to-Unit network.

NOTE
Pressing the On/Off key on a large display of a stand-alone cooling unit will control only that unit.

The effect of pressing the On/Off key on a large display connected to a network depends on the view: System or Unit.

- In System view, pressing the On/Off key shows a warning asking for confirmation to **shut down the entire system**.
- In Unit view, pressing the On/Off key affects only the unit being viewed, without a confirmation request.

Each time a unit is powered On or Off, an event is added to the Event Log in the User menu.

Figure 18 Start-stop priority switches

NOTE
If Remote On/Off is not used, a jumper is inserted to bypass the switch.

Autorestart

When input power returns after a power failure, the unit will return to its previous operating status: On if it was On before the power failure, Off if it was Off.

When power returns, the autorestart time—time-selectable: Single Unit Auto Restart (Service Menu, Options Setup)—will determine how quickly the unit restarts.

Loss of Power Alarm

A Loss of Power Alarm is activated when power is restored after an interruption. If acknowledged, the alarm resets automatically after 30 minutes. This alarm can be set to different event types (Message, Alarm or Warning) and can be disabled under menu item Loss of Power (Service Menu, Set Alarms).

Fan Alarm / Fan Protection Settings

The fan operation is protected by two digital devices: motor protection (optional on VFD centrifugal and standard centrifugal drives) and a differential pressure switch. The motor protection monitors for main fan overload (Main Fan Overload alarm) or EC fan fault and the differential pressure switch detects a loss of airflow. If either protection device is activated after an adjustable time delay, an audible alarm occurs, an alarm relay activates and an event is recorded in the event log (Main Fan Overload or EC fan fault and Loss of Airflow in Service Menu > Set Alarms).

The fan delay at the unit start is always five seconds shorter than the control delay (to avoid short-cycling components when the fan is not working).

When a main fan overload occurs, the main fan, cooling, heating, humidification and dehumidification are disabled to prevent equipment damage; the unit status will show “Alarm Off.” The unit will automatically resume operation once the overload condition has cleared.

When an EC fan fault occurs, the unit will continue to operate normally unless a loss of airflow alarm occurs.

When a loss of airflow occurs, the fan(s) will continue to operate to keep the unit on line until the problem is corrected. Cooling, heating, dehumidification and humidification are disabled.

Variable Speed Fans—EC or Variable Frequency Drives

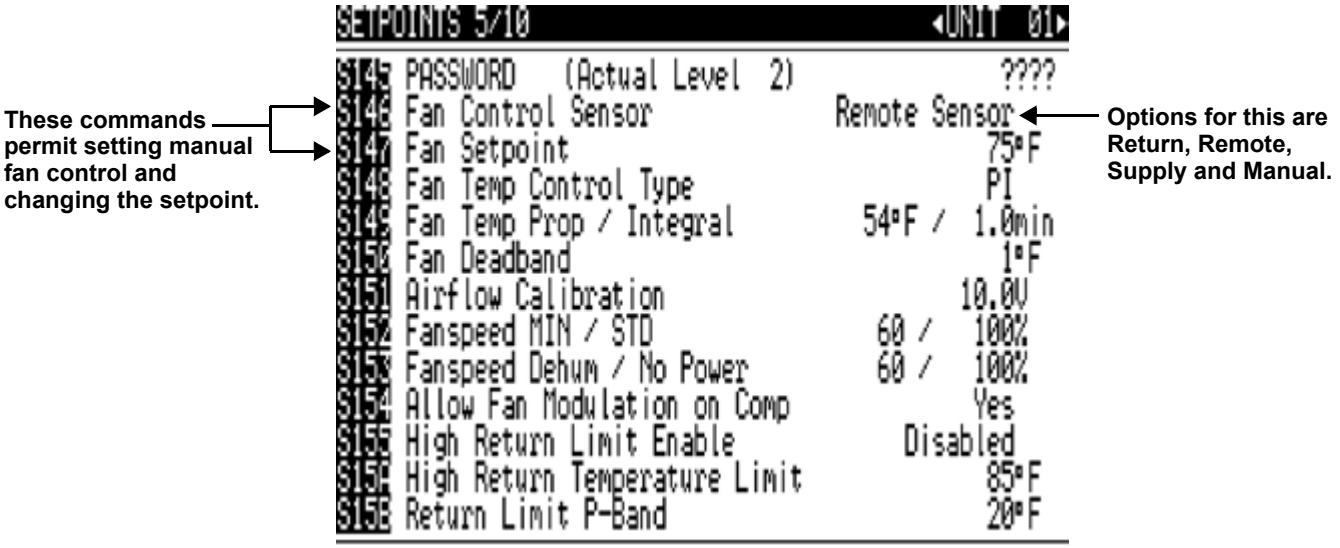
The Liebert iCOM control can adjust airflow manually through a BMS or dynamically using locally installed temperature sensors. Parameters related to VSD fan speed setting can be found in the Service Menu > Setpoints submenu on page 5 of 8. This menu allows the cooling unit's fan motor speed to be configured and adjusted for a variety of applications by selecting which sensor controls the fan speed.

Four fan control modes are available: Manual, Supply, Return and Remote. All units ship from the factory with the temperature control and fan speed control sensor set to the Return Air Sensor.

- **Manual Control**: When set to Manual, the speed of the fan motor can be wrote using a hard wired analog input or remotely through an optional Liebert IntelliSlot® card. Hard wired analog input signal types include 4-20mA, 0-10 VDC or 0-5VDC. See **6.0 - External Communication—Building Management Systems, Liebert SiteScan®** for more information regarding Liebert iCOM intellislot monitoring options.

  Before the building management system can control the fan speed, two parameters in the control must be set. S146 "Fan Control Sensor" must read *Manual* and line S164 "Allow BMS to change Fanspeed" must be changed to *YES* at the Liebert iCOM. Both parameters are found in Service Menus > Service Setpoints.

Figure 19 Setting manual fan control and changing the setpoint



Fan speed may be written through the building management system to line S152. The user can change this locally. However, if the speed is set by the BMS, it will override the local setting.

- **Supply, Return and Remote Control**: These selections allow fan modulation using an equipped return, supply or remote sensor; see **Table 4** for applicable control sensor combinations. If the fan control and the temperature control sensor have the same sensor selected, the control is considered coupled. If different sensors are selected, the control is considered decoupled. When operating the fan in coupled mode, the fan speed follows the call for cooling to reach the temperature setpoint. When the fans are operating in decoupled mode, the fans are ramped following the fan control band to achieve the fan setpoint.

Table 4 Controlling sensor settings

		S103 Temperature Control Sensor		
		Supply	**Remote Sensor**	**Return**
S125 Fan Control Sensor	Supply	Factory Default (Coupled)	N/A	N/A
	Remote Sensor	Recommended (Decoupled)	(Coupled)	N/A
	Return	(Decoupled)	(Decoupled)	(Coupled)

Minimum Fan Speed

Depending on the product control design, there may be an internal minimum speed, as defined by that specific product operation. Minimum fan speeds are defined below.

- Direct expansion units with pressure transducers 70%
- Chilled water units 60% (available option to 25%)
- Direct expansion units with low-pressure switches limited to 80%.
- Direct expansion units with standard scroll or 2-step semi-hermetic compressor(s) limited to 100%.

  Contact your local Emerson dealer for more information if fan speed minimum settings must be lowered from the values above.

Additional fan speed configuration parameters include a fan speed filter and fan speed reposition delay timer. These parameters allow fine tuning the fan speed control and, except for setting to Manual, are applicable to any other operation mode set in the VSD fan speed setting.

- The fan speed filter allows the fan to respond at a different rate depending on the location of the control point within the proportional band.

  Example: When the controlled temperature is near the setpoint or at conditions where the proportional band output is decreasing and approaching 0%, the fan speed change rates are proportionally decreased to avoid overshooting the controlled temperature. However, when the temperature rises above the setpoint or at conditions where the proportional band output is increasing, the fan speed change rates are proportionally increased.
- The fan speed reposition delay timer setting in the Liebert iCOM menu may be changed to improve the fan operation stability if it is oscillating. The delay timer holds back the fan output change until each delay period is reached if fan speed is decreasing. If fan speed is increasing, then the delay timer has no effect.

NOTE

- *The fan speed lower and upper limit settings are set at the factory.*
- *The standard fan speed control will be overridden during a call for Dehumidification if the function is enabled. When there is a call for dehumidification, the fan speed will change to the VSD Setpoint Dehum parameter found in the Service Menu>Setpoints. This routine may be disabled in Service Menus>Options setup line S419.*
- *The standard fan speed control will be overridden during a call for humidification or reheat. During a call for humidification or reheat, the fan speed will change to a higher speed, which is set at the factory to eliminate the possibility of condensation or damage to the unit.*

Fluid or Air Economizer with Variable Fan Speed Fans

An option in Service Menus > Setpoints > FC / AirEco Ramp Up w/CFC, allows the fan to ramp with the economizer. The default value is No, allowing the fan ramp independently of free-cooling. When set to Yes, the control will compare the call for fan to the free-cooling request. This will provide the most capacity from the Liebert Air Economizer and will help in holding off the mechanical cooling (second stage). When the economizer is not available, the fan will ramp based on the fan control sensor deviation from setpoint.

NOTE

This feature is overridden in Manual fan control. Fan control must be in a decoupled mode.

3.1.2 Back-Draft Fan Damper—Units with EC Fans

The Liebert iCOM controller has the ability to operate EC fans at very low speed to effectively act as a back-draft damper. The power used to prevent air flow from entering a standby unit from the raised floor by spinning the fans at a low speed is much less expensive than the additional static that conventional mechanical dampers introduce while the unit is in operation.

Mechanical Fan Dampers

- No damper = Waste of efficiency, mixture of discharge and return
- Increase pressure drop during unit operation
- Up-front cost of mechanical dampers
- Increases unit height or adds complexity under floor

EC Fan Dampers

- Fans rotate at low speed to prevent air flow through unit
- Adjustable, based on application
- No pressure drop during unit operation
- No up-front cost as with mechanical dampers

Figure 20 Energy efficiency—Air bypass through unit, no mechanical damper

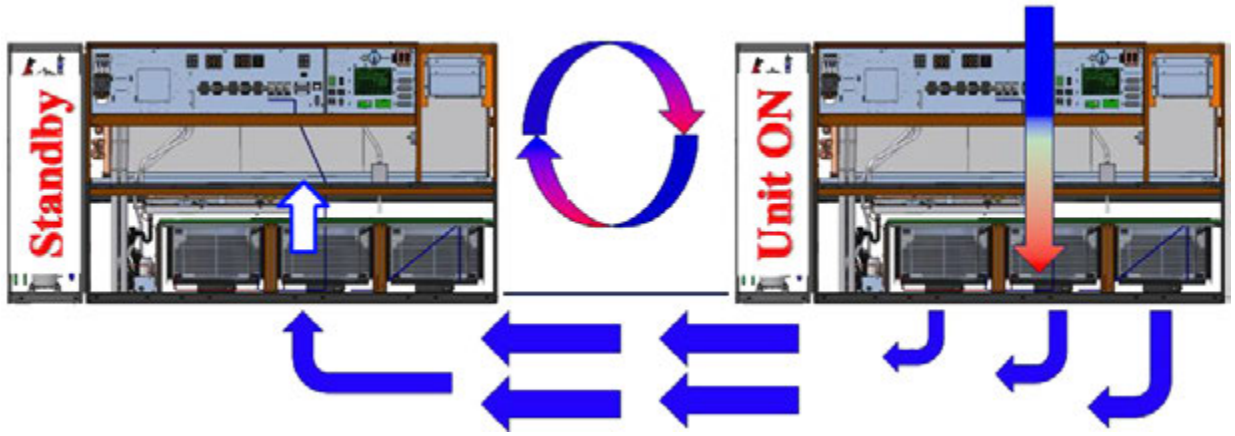
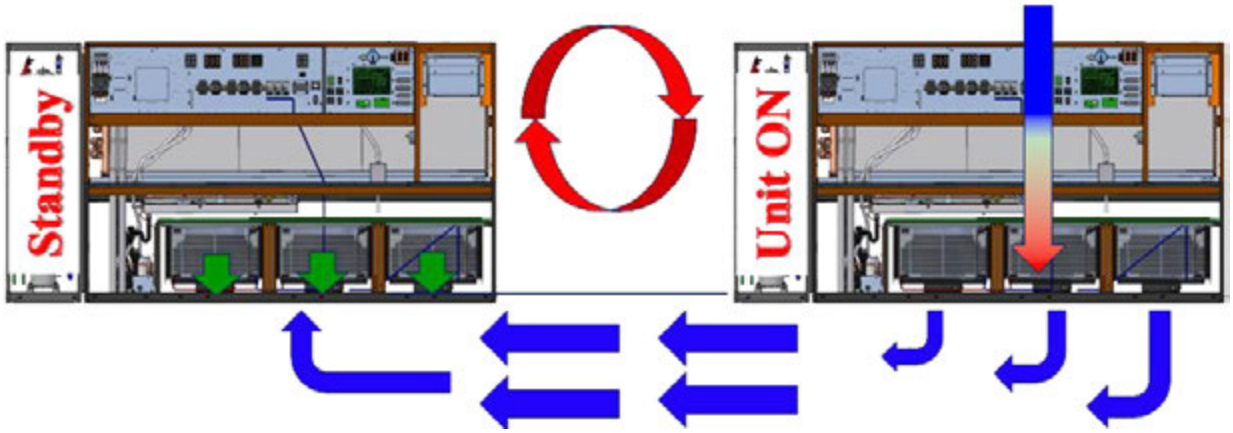


Figure 21 Energy efficiency—No bypass air, EC fan damper



3.1.3 Back-Draft Fan Damper—Units with Centrifugal Fans

The Liebert iCOM can operate mechanical dampers using digital outputs on the main control board to prevent airflow from entering a standby unit. Dampers can be controlled with or without a damper end switch. If a damper end switch is used, the Liebert iCOM will monitor damper operation and annunciate a *Damper Failure* event if the damper is not able to open. Damper opening and closing will be displayed in the unit status portion of the unit view screen.

The integral relay on the control board is rated up to 27VAC and 2A. An additional contactor or control relay with power supply will be required if the application exceeds this limit.

3.1.4 Power Monitoring

The user can connect h up to six power meters per unit. Power meters are factory-programmed to monitor power characteristics for either individual component or total units. These meters allow the user to monitor connection status, input undervoltage, input RMS voltage leg-to-leg and leg-to-ground, input current for each phase, energy consumption in kilowatt hours and instantaneous power in watts. The intelligent meters allow the user to monitor power consumption before and after making changes to the Liebert iCOM. This allows the user to determine the most efficient control setup for their data center.

3.1.5 General Compressor Operation

Low-Pressure Time Delay

When the compressor starts, the low-pressure input is ignored for a selected period of time based on the setting of the *Low Pressure Alarm Delay* (Service Menu, Options Setup). This time is usually set to 3 minutes on air-cooled units, and to 0 or 1 minute on water cooled units. When this time is expired, a second timer starts to operate if the low-pressure input is active. This second timer is active during normal compressor operation to avoid compressor trips due to bubbles in the refrigerant or other influences creating short trips of the low-pressure device. The low-pressure device input is ignored if the compressor is not operating. Exception: Pump Down (see **Pump Down**).

NOTE

Low-pressure condition could be read through contacts or through pressure transducers with threshold setting.

Advanced DX Freeze Protection

The advanced low-pressure routine is automatically used when a unit is equipped with the Liebert iCOM, unloading compressors (Tandem Scroll, Digital Scroll, and 4-Step), low-pressure transducers, and variable fan speed (VFD or EC fans). The low-pressure routine monitors the low-pressure transducers and interacts with the fan and compressor to prevent the unit's coil from freezing.

Applying fan speed to direct expansion systems generates the issue of how to avoid freezing condensate on the coil when the unit operates below 100% fan speed. Liebert iCOM's advanced freeze protection provides the ability to predict freeze conditions and correct this condition automatically by adjusting the fan speed and compressor capacity.

NOTE

Pressure transducers have been installed in all Liebert DS™, Liebert PDX™, Liebert DSE™ and Liebert Challenger 3000™ units. Some older systems may have low-pressure switches that cannot utilize the advanced freeze protection routine described above. Units equipped with such low-pressure switches have a higher minimum fan speed setting due to this limitation. Pressure transducers can be installed in older equipment in the field if lower fan speed settings are desired. Contact your local Emerson distributor for more information.

Compressor Type Support

- Digital scroll (all sizes)
- Tandem scroll
- Four-step (all sizes)
- No standard scroll support

Freeze Protection

- Fan and compressor will override sensors when freezing is detected
- Fan ramps up first, then compressor unloads

Pump Down

NOTE

The pump down function is not available on all units. Emerson removed pump down control from Thermal Management products in 2011. Units shipped in 2011 and before may have pump down enabled.

Pump down is applicable to compressorized systems that are equipped for pump-down operation, which is set at the factory. This operation prevents the compressor oil from being diluted with liquid refrigerant to ensure that the compressor is properly lubricated for the next startup. Systems equipped with crankcase heaters and discharge line check valves may be set for pump down, however it is not required.

The pump down operation operates in the following manner:

Whenever the control determines that no more cooling is required and a compressor should be shut Off, the liquid line solenoid valve (LLSV) is closed (de-energized). The compressor will continue to operate until the low suction pressure device (LPS or LPT) opens, which shuts Off the compressor. If the LP device does not open within a specified time, the LLSV is turned On, then back Off (the assumption is that the LLSV is stuck). If, after three times, the LP device does not open, the compressor and LLSV are locked Off and an alarm "Pump Down not completed" will appear.

There is a re-pump down if the LP device opens again after the compressor has been already stopped—a maximum of six re-pump-down cycles per hour are allowed. At the seventh request of re-pump down, the alarm "Comp 1 Pumpdown Fail" or "Comp 2 Pumpdown 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).

For digital scroll only: when pump down has finished successfully (LP device opened), pump down will be continued for another half-second with the control solenoid valve energized.

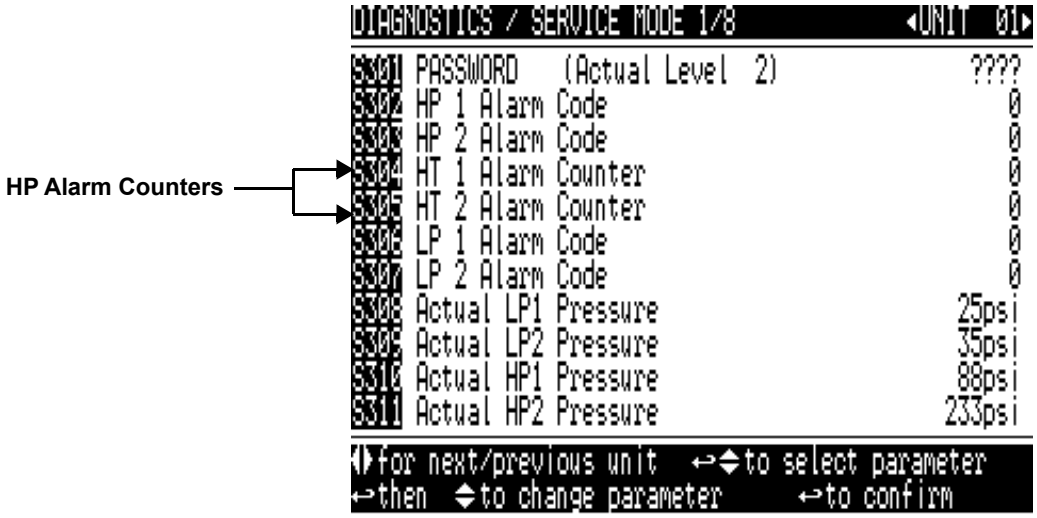
High-Pressure Alarm

When the compressor is initially activated, the system will be monitored for a high-pressure situation. When high-pressure is detected during the first 10 minutes of operation, the unit will attempt to correct the problem several times without notification. If the unit is unsuccessful in correcting the problem, an alarm will occur and the affected compressor will be locked Off. If high head pressure alarm trips three times in a rolling 12 hour period, the affected compressor will be locked Off.

After the compressor has been running for 10 minutes, if a high head pressure situation is detected, an alarm will occur and the affected compressor will be immediately locked Off without the unit trying to correct the problem.

Once the compressor is locked Off, it will not come back On until main power is reset or until the HP Alarm Counters (Service Menu, Diagnostics) are reset to 0.

Figure 22 Diagnostics/service mode screen, page 1 of 8



Setting the counter to 0 will reset the alarm without the need of pressing the reset button on the display. Even if the pressure in the system drops below the alarm point, the compressor will remain Off until the system is reset.

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, but there will be a 30-second delay from when the high head pressure situation occurs and when the alarm is annunciated.

Advanced DX High-Pressure Protection

Advanced high-pressure protection routines are intended to prevent high-pressure lockouts. Liebert iCOM does this by constantly monitoring the condensing pressure. If the control finds that pressure is not maintained, the compressor capacity will automatically adjust to help lower the operating pressure. This built-in intelligence operates the compressor at a slightly reduced capacity, reducing the chance of a total loss of cooling created by a high-pressure lockout.

This feature is standard on units equipped with liquid line transducers and these compressor types:

- 4-Step
- Digital Scroll
- Tandem Digital

NOTE

Advanced DX high-pressure protection is not supported on standard scroll compressors.

Digital Scroll High Temperature

A protective maximum operating compressor temperature limit is imposed on units with digital scroll compressor(s) with thermistor. If the digital scroll temperature reaches the maximum temperature threshold, the compressor will be locked out for at least 30 minutes and an alarm will be annunciated. If after 30 minutes the temperature has cooled to a safe operating temperature, the compressor will resume operation.

Each time a high-temperature alarm occurs, HT 1 Alarm Counter (Service Menu, Diagnostics) or HT 2 Alarm Counter (Service Menu, Diagnostics) is increased by one. Once these counters reach five occurrences in a rolling four-hour period, the compressor will be locked out. The alarm can be reset once the temperature returns to a safe level by:

1. Setting the counter back to 0 from the display and pressing the alarm reset button.
2. Shutting Off power to the control board by turning the cooling unit's main power disconnect switch Off and On.

3.1.6 Compressor Timing—Short-Cycle Protection

To help maximize the life of your compressor(s), there is a start-to-next start delay for each single compressor.

NOTE

*This delay may cause a short cycle if there is a very light room load. A short cycle means that the compressor has cycled On and Off 10 times in the past hour. This is typically caused by a lack of load or control settings set too tight (see **3.3.2 - Compressor Control** for more information on the control adjustment). Should short cycling still occur after the control has been adjusted, contact technical support at 800-543-2778 to adjust the minimum compressor Off delay.*

3.1.7 Compressor Sequencing on Two-Compressor Units

Compressor Sequencing parameter (Service Menu, Options Setup) is intended to maintain equal run times between compressors. This setting has three selection possibilities:

- Always use Compressor 1 as lead compressor.
- Always use Compressor 2 as lead compressor.
- Auto:
  - First priority: if the safety timings are acceptable for only one compressor, then it is the next to be started/stopped.
  - If both compressors are Off: the one with fewer working hours is the next to start.
  - If both compressors are in operation: the one that has been operating longer since the last start is the next to be stopped.

NOTE

The Auto setting attempts to maintain equal run times between compressors. However, the control will not turn Off a compressor to equalize run time when it is needed to control the space.

3.1.8 Motorized Ball Valve in Water-Cooled Units

On water/glycol-cooled units with digital scroll compressors), pressure changes during each digital cycle during unloaded operation. This rapid pressure change would cause a conventional water regulating valve to open and close an excessive number of times.

Excessive valve cycling is avoided on units with digital scroll compressors) by monitoring a liquid line transducer and regulating heat exchanger fluid flow with a motorized ball valve (MBV). The control algorithm for the motorized ball valve uses an intelligent sampling rate and adjustable pressure threshold (S427 Ball Valve Setpoint Offset in **Figure 169**) to reduce the number of times the valve opens and closes. System reliability and performance is enhanced using a brass valve, linkage and actuator.

Each compressor has one motorized ball valve that is driven by the analog output of the Liebert iCOM based on discharge pressure. If there is a call for cooling, the compressor start is delayed by a 30-second timer. During this delay, the motorized ball valve is set to 50% open to allow fluid flow through the unit condenser. The compressor will start after the 30-second timer elapses.

Motorized Ball Valve Manual Mode: (Service/Service, **Figure 130**) Manual operation can be selected to allow service personnel to control the motorized ball valve from the Liebert iCOM.

When Auto BV Control is selected, the motorized ball valve functions as it would be during normal system operation.

NOTE

Compressor operation will be delayed 30 seconds to allow the motorized ball valve to position itself for initial startup.

When Manual BV Control is selected, the user must be careful in setting the MBV position because the ball valves will remain in the position set in the Service menu until the control is switched back to Auto or until a technician changes the valves to another manual position (the motorized ball valve in manual mode can be set in 1% increments from fully closed to fully open). Low or high discharge pressure may occur during this mode, depending on environmental conditions and the position of the motorized ball valve.

The motorized ball valve is driven by a 2-10VDC proportional control signal: the valve is closed at 2VDC, 50% open at 6VDC and fully open at 10 VDC.

3.1.9 MBV Operation After Compressor is Turned Off

Once a compressor has stopped, the MBV control will continue to change the MBV position to maintain system pressures for a maximum time of 10 minutes by following the Auto BV control algorithm. When the 10-minute delay has expired or the discharge pressure is below its minimum threshold, the motorized ball valve will close until the next compressor activation.

3.1.10 Service Offset—Changing System Pressure Settings

The MBV control is set to maintain a system pressure specific to the particular type of cooling unit. A properly trained and qualified technician can increase or decrease the pressure through the Ball Valve Setpoint Offset found in the Service/Options Setup menu. The range is 0 to 50 PSI; the default is 30 PSI.

NOTE

Adjusting this parameter will increase or decrease the operating compressor discharge pressure by changing the targeted range of control. The discharge pressure is the peak pressure of the digital cycle.

3.2 General Chilled Water Operation

3.2.1 Chilled Water Quick Start

This standard Liebert iCOM feature cuts unit restart time to 15 seconds without adding additional power capacitors or battery backup. The quick start allows unit to start fan and modulate the chilled water valve open to predefined points while the Liebert iCOM is booting up. Once the control boots, Liebert iCOM holds the chilled water valve and fan at these predefined points% until the call for cooling and fan is established and then releases the valve and fan control to normal operation. Chilled water quick start is available on all chilled water actuator types. Contact your local Emerson representative or technical support for more information on enabling this feature.

3.2.2 Improved Valve Response

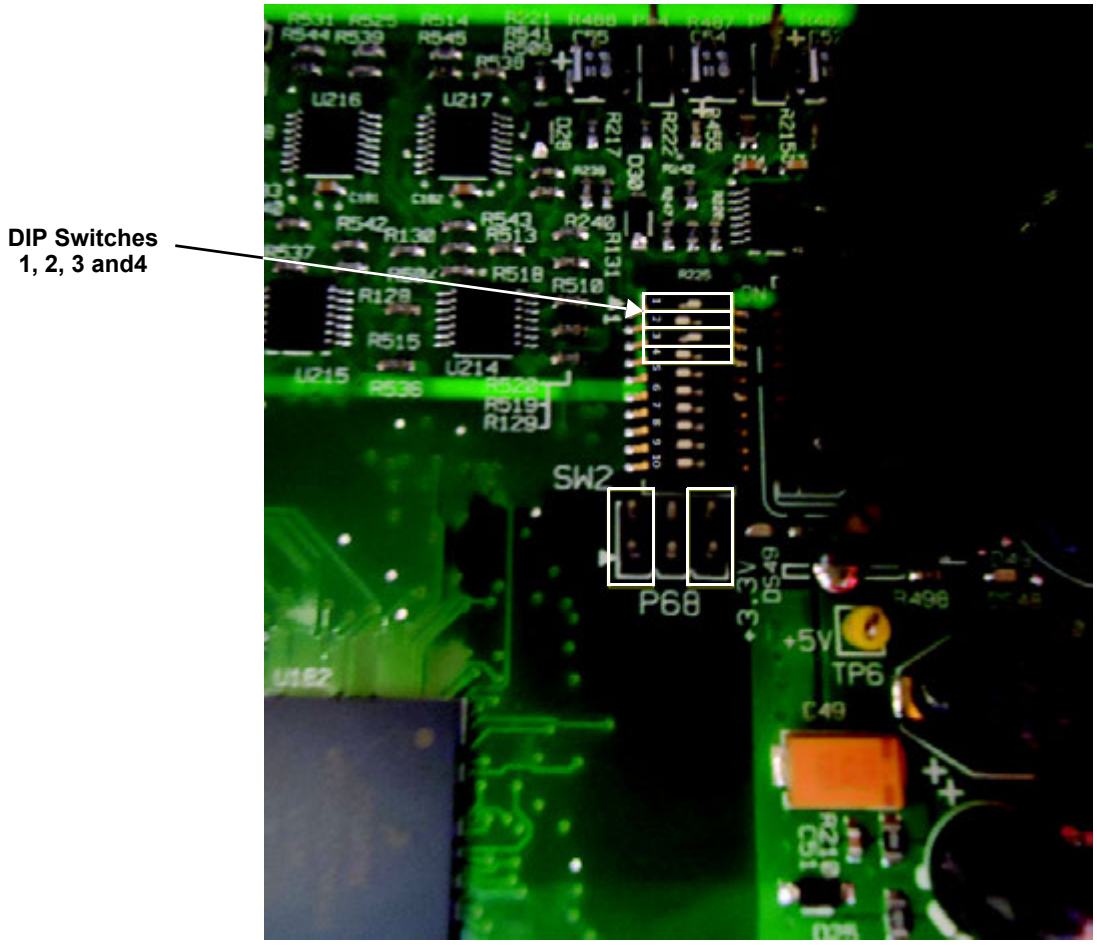
The actuator response time and actuator positioning can be improved by implementing valve feedback. Enabling the feedback signal will eliminate the need for floating point actuators to drive the valve closed after a loss of power or Unit Off command, decreasing the unit's restart time. Feedback provides analog and floating point actuators provides with enhanced actuator failure detection. Valve feedback is available only on Liebert single and dual valve CW models; feedback is not compatible on units with fluid economizer.

Valve feedback allows the control determine the valve position by timing how long the open or closed signals have been active based on the valve travel time set in the Service menu / Setup submenu. To determine the initial position of the valve, the unit must perform a 3P Reset. The 3P Reset closes the valve for a time of 110% of the 3P Actuator run time. This calibrates the valve with the controller and ensures that it is closed. A 3P Reset is also performed if the fan is switched Off for any reason (timer Off, unit Off, etc.).

Special wiring is required for implementing valve feedback on analog actuators. Signal floating point actuators are factory-wired (P22) to accommodate feedback. Authorized Emerson personnel should use the following steps to enable the feedback signal:

1. Turn unit Off at the display.
2. The Feedback Signal Connects To Analog input 1 on signal circuit units. The second circuit on dual circuit models connects to Analog Input 2. Nothing can be connected P11 Pins 1 through 4 on signal circuit units and P11 Pins 1 through 8 on dual circuit units.
3. Control board DIP switch SW2 Switch 1 must be On, 2 must be Off, 3 must be On and 4 must be Off.

Figure 23 DIP switch and jumper locations on Liebert iCOM control board



4. P68 must have a jumper placed between the top and bottom two pins on the left side and one placed between the top and bottom pins on the right side, the two middle pins should be left unconnected.
5. Go to Service>Diagnostics Service Menu and find S379. Set this option to *Feedback* and note that S380 will go to *Yes* and S381 will go to *Ongoing*. If *Feedback* is already selected, then go to line S380 and manually select *Yes*. This means that the Liebert iCOM is calibrating the valve using the feedback available through the potentiometer. When for S381 says *Idle*, the process is complete.
6. Turn the unit On at the Liebert iCOM.

3.2.3 Custom Dual Chilled Water Valve Staging

Special staging may be set to on units with dual chilled water valves. Chilled water valves may be staged in Parallel, Cascade or alternate lead operation.

Parallel control allows both chilled water valves to operate at the same time, following the same open/close command as the room condition deviates from setpoint.

Cascade control allows the valves to operate in stages. This means only one circuit will be operated to maintain the conditioned space temperature. If the room condition is not held with one circuit in operation, the Liebert iCOM will automatically stage a second valve on to maintain room conditions. An automatic timer may be used to alternate the lead valve to keep equal component run time.

Alternate operation allows one circuit to work as lead and the second circuit to act as backup. The lead valve will rotate based on valve run time, or the user can alternate the lead valve using a customer input connection.

3.2.4 Fluid Temperature Monitoring

Two supply and two return chilled water temperature sensors may be added per unit for local and remote monitoring of water temperature differential temperature. Temperature is monitored with 2T sensors (two sensors on dual circuit units).

The first step in setting up the additional supply sensors is to program the DIP switches using **Table 5** below. The DIP switches may be access by removing the rear housing or through the precut hole in the housing. See **Figure 69** for additional information.

Figure 24 DIP switches in 2T sensors

Switch Up = ON

Switch Down = OFF

Table 5 DIP switches in 2T sensors

	CANbus Node ID	DIP switch Position							
		1	2	3	4	5	6	7	8
Fluid Circuit 1	30	Off	On	On	On	On	Off	Off	Off
Fluid Circuit 2	31	On	On	On	On	On	Off	Off	Off

Circuit 1 and 2 fluid sensors are dual purpose CANbus ID's in software. These sensors also may be used for supply temperature monitoring of the conditioned space. Before considering installing fluid sensors, verify that the 2T supply sensors are not being used. See the Service Menus, Sensor calibration, page 11 of 12 for more information. Adding duplicate sensors will result in sensor communication loss.

After setting the DIP switches, see **4.3.3 - Terminate the Final Sensor on the CANbus Link** to complete the sensor installation.

Once the sensors have been connected, go to Service Menus> Sensor Calibration/Setup (**Figure 149**). Locate the line that reads *Chilled Water Sensor Type*. Change the right hand parameter to 2T or Dual 2T. Verify the fluid inlet and outlet temperature readings with a field-supplied temperature sensor. Compare the values measured with the meter and calibrate the temperatures as needed. Use the CW Temp Sensor C1 / C2 Placement feature to swap the inlet and outlet temperatures shown in the Liebert iCOM if the sensor probes are reading backward when measured with a field-supplied meter. (Supply in the Liebert iCOM represents the actual return or vise versa).

3.2.5 Fluid Flow Monitoring

Fluid flow meters are available for monitoring fluid flow in gallons per minute or liters per minute. When the flow meter is coupled with fluid temperature sensors, Liebert iCOM will calculate real time cooling capacity in kW or kBTU/Hr. Unit flow rate and capacity may be hidden or shown from the unit view and monitored through the Liebert IntelliSlot Unity Card. Contact your local Emerson representative to obtain a flow meter.

3.3 Temperature Control

The temperature control parameters are in Service > Setpoints. The Temperature Setpoint parameter is in both the User Menu and Service Menu under Setpoints.

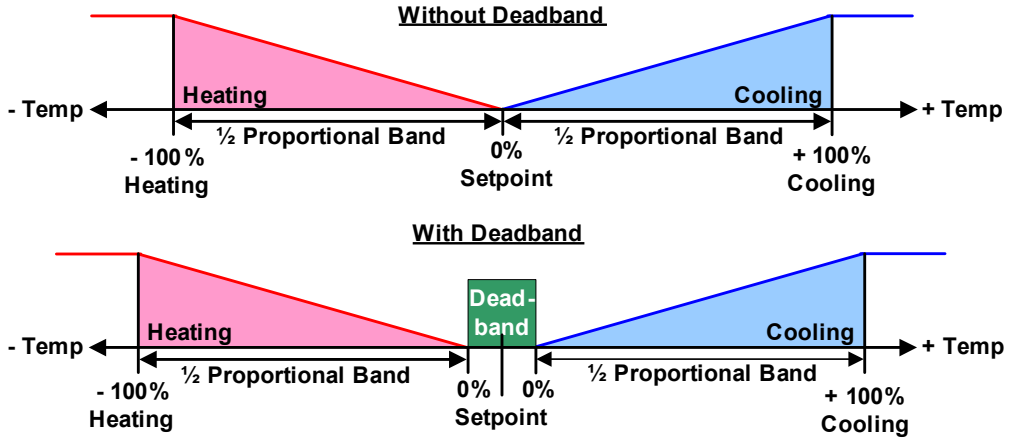
The Liebert iCOM has two temperature control types:

- Proportional
- PI
- Intelligent (chilled water models only)

Each control type affects the timing and intensity of the cooling/heating operations. The Control Type parameter is in Service>Setpoints.

Proportional—If *Proportional* control is selected, the percent cooling/heating requirement is determined by the difference between the air temperature sensor reading and the temperature setpoint. The Temperature Proportional Band is a user-defined range that is divided into two equal parts for cooling and heating. **Figure 25** illustrates how the temperature proportional band is evenly divided on either side of the temperature setpoint.

Figure 25 Temperature proportional band



The Temperature Setpoint is between these two equal parts. As the air temperature rises above the temperature setpoint, the percent cooling required increases proportionally (from 0 to 100%) over half the programmable temperature proportional band.

The percent heating requirement (0 to -100%) is determined the same way when the air temperature falls below the setpoint. The humidifying/dehumidifying operations are controlled in the same manner as the cooling/heating operations; however, the humidity sensors, setpoints and proportional bands are utilized.

When the air temperature reaches the end of the proportional band, either 100% or -100%, full cooling or full heating capacity is provided. No operation is performed when a 0% call is calculated or the temperature is within the deadband. The control varies the call for cooling and heating in 1% increments as the air temperature moves through the proportional band halves.

PI—PI Control functions with all type of compressors and valves. If PI Control is selected, the percent cooling/heating requirement is calculated by combining two methods, proportional and integral. The proportional term is calculated similar to the previously described Proportional control. The integral term (sometimes called "reset action") is calculated by measuring how much and how long the air temperature/humidity has been above or below the setpoint. If the actual air temperature/humidity is above the setpoint, the percent requirement is slowly but continuously increased until the total is sufficient to bring the return room air back to the setpoint. The control helps to ensure temperature setpoint is achieved while efficiently operating the equipment. The Proportional and Integral concepts work together to prevent excessive valve oscillation, compressor short cycle and temperature fluctuations. From an idle state (compressor[s] Off, chilled water valve closed, etc.), the call for cooling is based on proportional temperature increase from setpoint. As temperature deviates further from or closer to setpoint, the call for cooling is increased or decreased, respectively. The amount of cooling staged depends on how far the actual temperature has deviated from the setpoint on the proportional (P) band.

***Example**: Temperature Setpoint= 70°F (21°C)*
*Temperature Proportional Band= 20°F (11.11 K; see **Note** below)*
Room Temperature= 75°F (24°C)

Because cooling accounts for half of the proportional band, the call for cooling in this example is 50%. If the room temperature increases to 80°F, the call for cooling would be 100%. Proportional only control will not function satisfactorily in some applications as shown in this example, because the room temperature would increase 10°F (5.5 k) above the setpoint before cooling is staged to 100%.

Proportional Control requires a much tighter proportional band to hold the unit closer to the setpoint, which often results in compressor(s) short cycling or valve hunting.

NOTE

k is the unit of measure used when U404, Temperature Indication, is set to degrees Celsius.

K is the conversion from degrees Fahrenheit to degrees Celsius without the -32°F offset. If the proportional band is 20°F, then (20/1.8) = 11.1K

The integration (I) time works with the proportional band in PI Control to stage call for cooling before the actual temperature increases far above the temperature setpoint. The "I" portion does this by doubling the current "P" deviation for every time the "I" has elapsed.

***Example**: If the "P" deviation is 50% within the "I" time (e.g., 5 min), the call for cooling will be doubled, giving 100% in 5 minutes.*

While this happens, the real temperature "P" deviation will decrease. If the "P" deviation drops to 40% and the previously calculated "I" was already on 55%, it will shift back to 45% following "P." From this point the "I" will continue to calculate the call for cooling, but will do so more slowly because the room temperature has dropped. Opening the valves or staging compressor(s) to 62% may decrease the temperature from 40% to 20%, which would drive the "I" down from 62% to 42%. At this point, "P" is 20% and "I" is 42% (call for cooling, valve opening, compressor[s] stage). This continues until "P" is 0—on the setpoint or within the deadband.

3.3.1 Setting Up PI Control

Three to 5 minutes integration time is adequate for most applications. The proportional band setting will vary depending on the heat load and compressor/chilled water valve type. Some additional tuning of the PI loop in Service > Setpoints after the unit has been started up may be required. Factors such as room heat load, chilled water temperature and external heat gains may affect PI control loop performance. Use **Table 6** as a guide for the PI control settings.

Table 6 PI control troubleshooting

Problem	Solution
Unit is too slow to activate cooling.	Decrease the proportional band slightly and monitor operation.
Compressor short cycle alarm.	Increase the proportional band slightly and adjust the integration time to 3-5 min. Monitor compressor run time. Run must be higher than 3 minutes to avoid short cycle from occurring.
Excessive valve oscillation or hunting.	Widen the temperature proportional band and/or consider increasing the integration time.

Intelligent—If Intelligent Control is selected, the air temperature/humidity is controlled at or near the setpoint. The percent temperature/humidity adjustment required is calculated based on logic that is programmed into the control. This logic simulates the actions that a human would take if manually controlling the system. This control type is used only on chilled water units.

Temperature Deadband

The deadband range is used to widen the setpoint and prevents small temperature changes from activating compressors and valves. When the air temperature falls within the deadband, the control operates the same as if the temperature equaled the setpoint exactly. This setting helps maximize component life by preventing excessive component cycling. **Figure 25** illustrates how the temperature proportional band and deadband is evenly divided on either side of the temperature setpoint.

The parameter AutoSet Enable, found in Service Menu, Setpoints, automatically sets the proportional bands for temperature and humidity, and both the integration time factors according to the type of unit (chilled water, single or dual compressor).

NOTE

Before the proportional or integral setpoints can be changed, the Auto Set Enable must be changed to NO.

3.3.2 Compressor Control

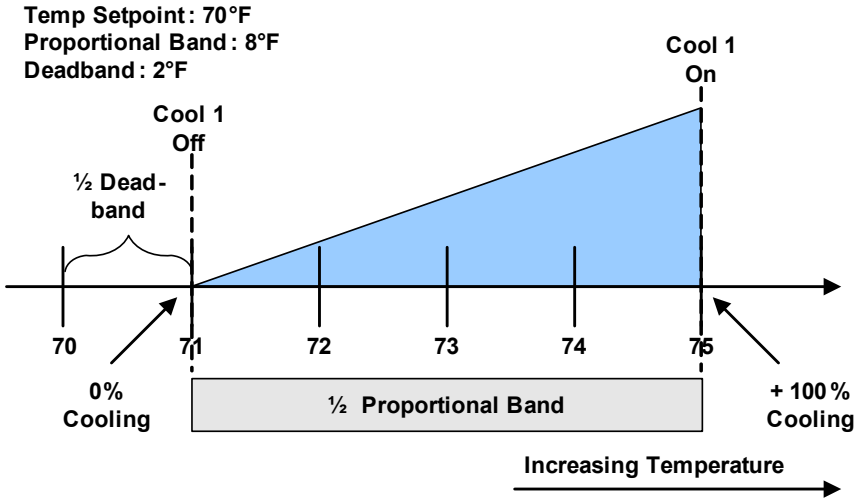
Depending on its type, a Liebert cooling unit may have one or two compressors with or without unloaders or variable capacity.

Compressor Proportional Bands

One Single-Step Compressor Without Unloaders—One-Step

One single-step compressor, Cool 1, is started at 100% call for cooling from the temperature proportional band and stopped at 0% (see **Figure 26**).

Figure 26 One single-step compressor without unloaders



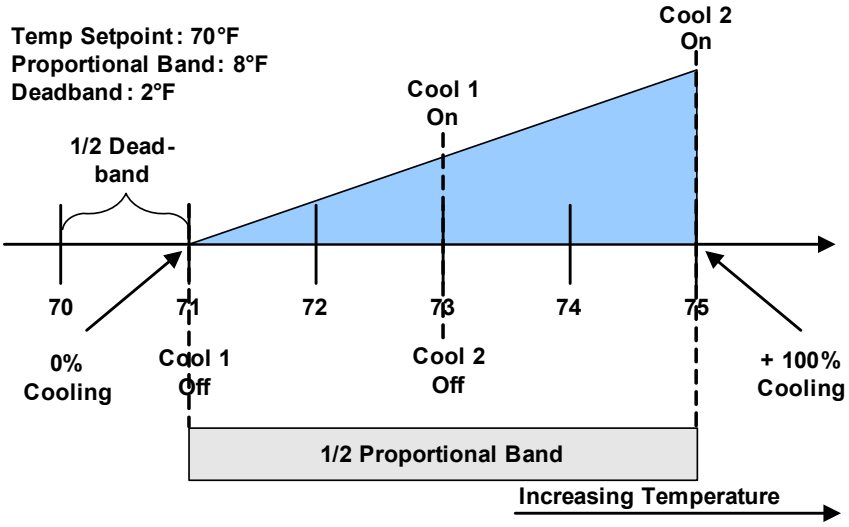
Two Single-Step Compressors Without Unloaders—Two-Step

First single-step compressor, Cool 1, is started at 50% calculated output from the temperature proportional band, and stopped at 0%. The second compressor, Cool 2, starts at 100% and stops at 50% (see **Figure 27**).

One Compressor With an Unloader—Two-Step

The two-step compressor is started unloaded at 50%, Cool 1, calculated output from the temperature proportional band and stopped at 0%. At 100% the compressor starts fully loaded, Cool 2, and returns to unload operation at 50% (see **Figure 27**).

Figure 27 Two single-step compressors without unloaders or one compressor with an unloader (two-step)



Two Compressors With Unloaders—Four-Step

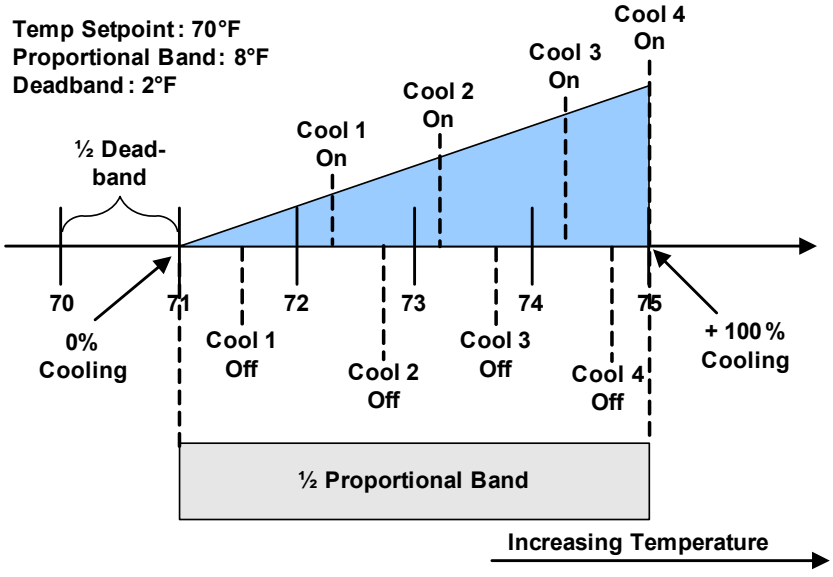
The first two-step compressor is started unloaded at 33% calculated output from the temperature proportional band and stopped at 17%. At 80%, Compressor 1 will be loaded, at 70% unloaded.

The second compressor starts unloaded at 63% and stops at 47%. At 100%, Compressor 2 will be loaded, at 90% unloaded (see **Figure 28**).

The four stages of cooling are accomplished in the following manner:

- 1 stage: One compressor, unloaded - Cool 1
- 2 stages: Both compressors, unloaded - Cool 2
- 3 stages: One compressor, loaded and one compressor, unloaded - Cool 3
- 4 stages: Both compressors, loaded - Cool 4

Figure 28 Two compressors with unloaders (four-step)

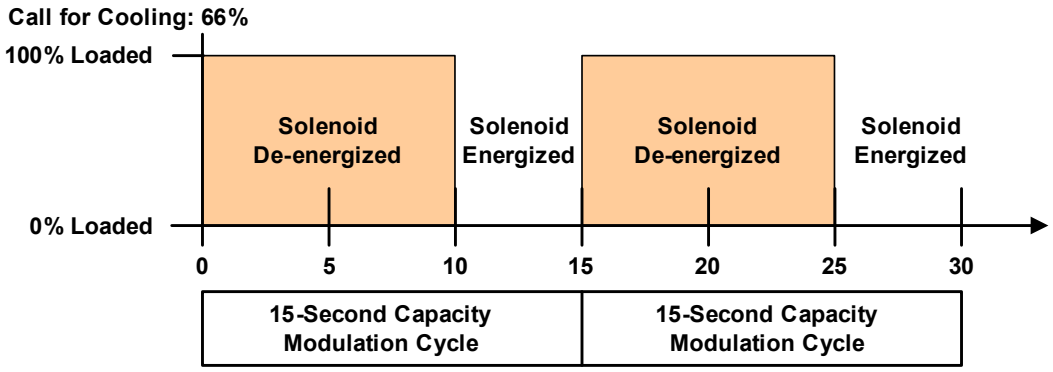


Digital Scroll Compressors

A digital scroll compressor can modulate its capacity anywhere between 10-100%. This variable capacity modulation allows cooling units to control an environment more precisely.

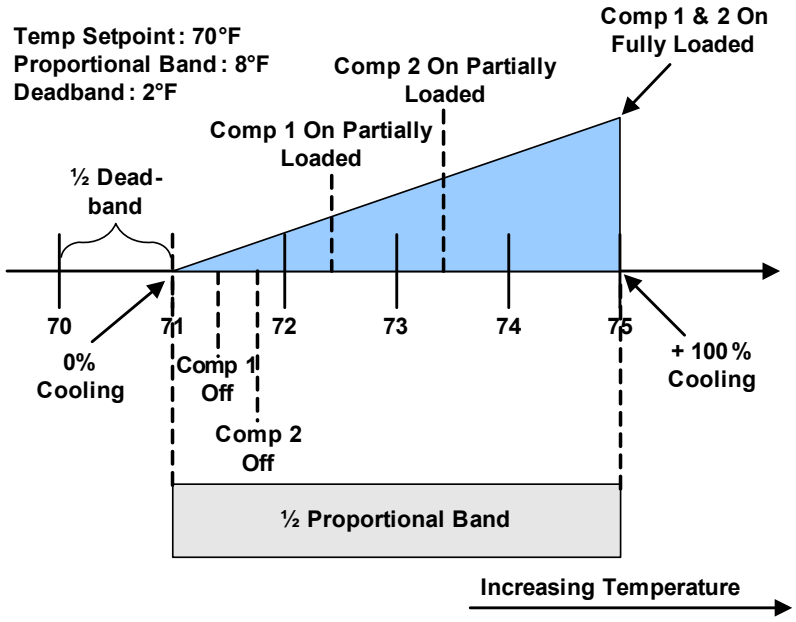
Digital scroll capacity modulation is achieved by energizing and de-energizing a solenoid valve on the compressor. When the solenoid valve is de-energized, the compressor capacity is 100%. When the solenoid valve is energized, the compressor capacity is zero. Therefore, the capacity of the compressor depends on how long the solenoid is de-energized for. If the solenoid is de-energized for 10-seconds, then energized for 5 seconds during a 15-second cycle, the resulting capacity will be 66% as shown in **Figure 29**.

Figure 29 Digital scroll capacity modulation, 10-100% variable



On single and dual digital scroll compressor systems, the first compressor is started at 25% calculated output from the temperature proportional band and stopped at 10%. On dual digital scroll compressor systems, the second compressor is started at 35% and stopped at 20%, see **Figure 30**. When a compressor is started, the solenoid is energized longer than it is de-energized to match the call for cooling. When the call for cooling increases to 100%, the solenoid is de-energized for the entire 15 second cycle.

Figure 30 Single and dual digital scroll compressor activation points



3.3.3 Chilled Water Control

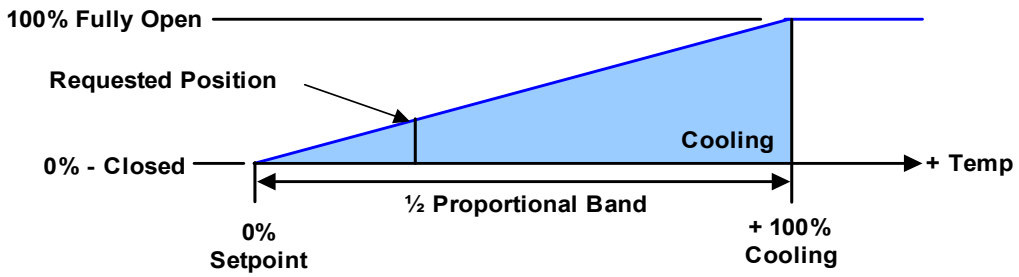
A variety of chilled water valves and actuators are offered depending on application requirements. Floating point and analog actuators are common to most applications.

Floating point actuators are driven through two digital outputs: Open and Close. As default, Liebert iCOM determines the valve position by timing how long the open or closed signals have been active based on the valve travel time set in the Service menu / Setup submenu. The valve response may be improved by implementing a valve feedback signal. See **3.2 - General Chilled Water Operation** for more information.

Analog driven actuators commonly work off a direct or indirect 0-10 or 2-10 VDC signal. Liebert CW181 models and larger units may contain two analog valves; as default, both valves will be controlled in parallel for cooling. Other valve staging options are available. See **3.2.3 - Custom Dual Chilled Water Valve Staging** for more information.

In all applications, the valves open and close according to a call for cooling as shown in **Figure 31**. The chilled water control valve is adjusted proportionally as the temperature control varies the requirement for cooling from 0% to 100%.

Figure 31 Chilled water valve control (example: cooling)



3.4 Liebert Fluid Economizer

Two types of fluid economizers are offered, GLYCOOL and Dual-Cool. GLYCOOL models are two-pipe systems. This means that two pipes enter the unit and feed the chilled water/free-cooling coil as well as the compressor(s) and heat exchanger (eg., Liebert Paradenser™, tube-in-tube condenser or brazed plate heat exchanger). Dual-Cool units can be either two-pipe or four-pipe systems. A two-pipe unit has two fluid lines dedicated to the secondary cooling source, and the compressor(s) heat rejection is an air-cooled condenser. Four-pipe Dual-Cool models have two fluid pipes dedicated to chilled water/free-cooling and two pipes for the compressor(s) heat exchanger. Each model offers a primary DX source and a secondary chilled water or free-cooling coil.

3.4.1 Differential Temperatures / Controls (Comparator Circuit)

Delta T (Temperature Difference) Between Room and Fluid

The comparator circuit determines if the glycol / chilled water temperature of the second cooling source is low enough to provide at least partial cooling capacity. Free-Cooling Fluid Temperature is controlled in the User - Sensor Data menu, **Figure 93**. The comparator circuit has four settings (DT Between Room / FC Type, [Service Menu, Setpoints]):

- Disabled
- Contact
- Value
- Set

The Disabled setting is for standard compressorized and chilled water units that do not have a second cooling source. The Disabled setting can also be used to disable the second source of cooling.

The Contact setting is used when an external input is being used to determine when the second cooling source is to be activated. The external control communicates to the Liebert unit via contact closure.

- Closed = activate second cooling source control
- Open = deactivate second cooling source control

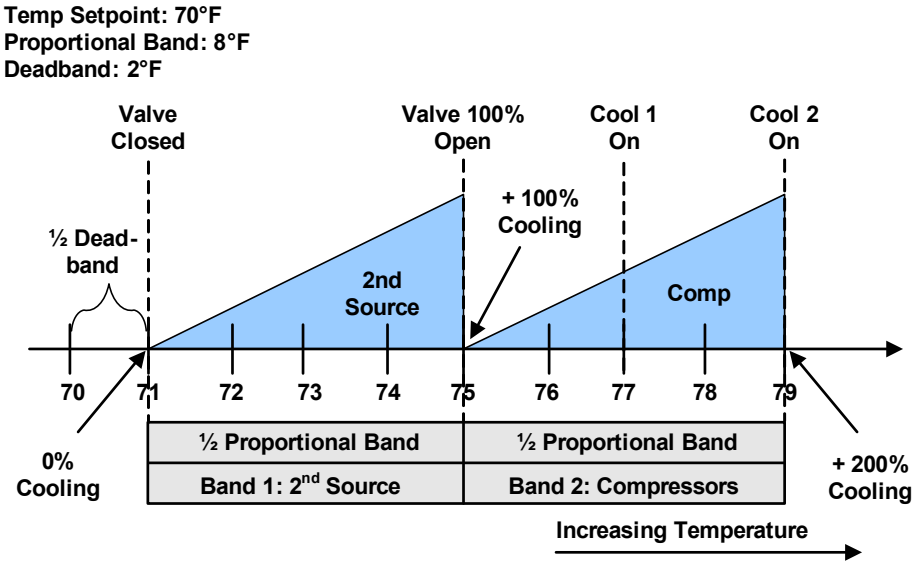
The Temp setting is the factory default (12°F [-11.1°C]) on free-cooling and dual cooling units. If the temperature difference between the second source cooling fluid parameter, Free-cooling Fluid Temperature (User Menu, Sensor Data) and room air is equal to or greater than the adjustable DT Between Room / FC Fluid (Service Menu, Setpoints) value, then the second source cooling fluid will be used to provide at least partial cooling.

The Set option allows free-cooling whenever the fluid temperature sensed (User Menu > Sensor Data) is colder than the temperature setpoint. The difference required between the temperature setpoint and the fluid temperature is adjusted on the following line DT2 Room / FC Fluid value (Service Menu, Setpoints). The second source cooling fluid will be used to provide cooling if the temperature difference between the second source cooling fluid parameter, Free-cooling Fluid Temperature and room air is equal to or greater than the adjustable DT Between Room / FC Fluid value.

Sensors used for this delta T are: room/local sensor or the return air sensor; and the glycol sensor.

If this delta T is true, the Free-cooling Status indication will show “On” instead of “Off”. The status is found in the User- Sensor Data menu, **Figure 93**. The primary and secondary source of cooling will stage accordingly. See the next sections for more information.

Figure 32 Second cooling source and two-step compressorized cooling



Minimum Chilled Water Temperature—This feature allows the user to select a minimum chilled water temperature to prevent simultaneous operation of the chilled water (free-cooling) and compressor(s) on units factory-programmed to operate both sources simultaneously. This feature is enabled in Service>Setpoints, parameter Minimum CW Temp.

If the fluid temperature sensed is below the Minimum CW Temp Value, (Service Menu, Setpoints), and the Delta T (Temperature Difference) Between Room and Glycol (see **3.4.1 - Differential Temperatures / Controls (Comparator Circuit)** is satisfied, the control will operate ONLY the chilled water for cooling. The compressor(s) is locked out. If cooling does not operate, (i.e., loss of chilled water flow), the control will override this setting and activate a compressor(s). When this happens, free-cooling will be locked out for one hour.

If the fluid temperature is above the minimum CW value, the control will operate the chilled water (free-cooling) and compressor(s) simultaneously if needed. If the Minimum CW Temp is disabled, the control may operate both sources as load requires.

GLYCOOL™ Cooling—Free-Cooling

GLYCOOL units may be programmed to stage cooling components in either of two ways:

- Operate free-cooling or compressor(s) to maintain temperature (factory default)
- Operate free-cooling and compressor(s) simultaneously

Caution must be taken when operating free-cooling and the compressor simultaneously on GLYCOOL units. Adequate flow must be provided to the unit to prevent high pressure when 100% free-cooling is required in addition to DX cooling. Running too cold of fluid temperature and compressor(s) simultaneously may cause refrigerant pressure to drop. Contact technical support at 800-543-2778 for more information on simultaneous operation setup.

When the unit is configured to operate free-cooling or compressors(s), free-cooling eligibility is based on the comparator circuit discussed in **3.4.1 - Differential Temperatures / Controls (Comparator Circuit)**. If the circuit determines free-cooling will condition the space, the valve will open and close as temperature deviates from the setpoint. If the comparator circuit determines that free-cooling is not capable of conditioning the space, control is automatically replaced by compressor(s).

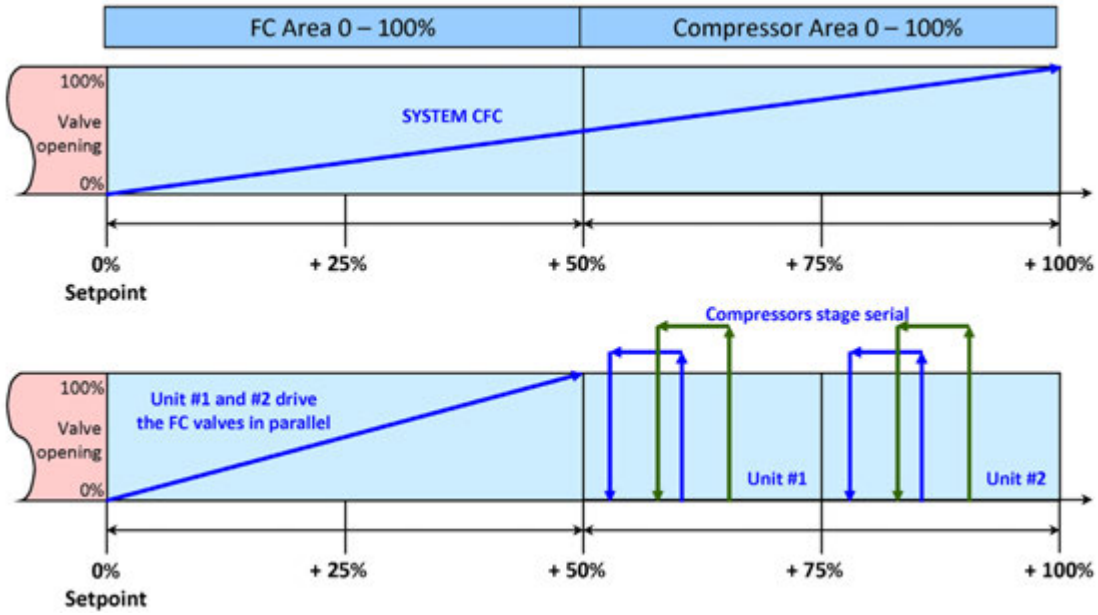
During either free-cooling or compressor operation, the control uses the temperature proportional band to determine which operation to perform (cooling/heating) and how much capacity to provide. The Temperature Proportional Band is a user-defined range that is divided into two equal parts for cooling and heating. The Temperature Setpoint is between these two equal parts. An optional temperature and heating deadband range can be defined, which is equally divided on either side of the setpoint and separates the two halves of the proportional band.

When the unit is configured to operate free-cooling and compressor(s) simultaneously, the comparator circuit determines free-cooling eligibility. Free-cooling and compressor(s) are staged based on temperature deviation from setpoint. The cooling proportional band is divided into two parts for simultaneous operation, the first portion is used for free-cooling and the second for DX operation. **Figure 32** illustrates how the cooling proportional band is broken out on a free-cooling unit with two step compressors.

Cooling Control Band for Simultaneous Operation = (Temperature Proportional Band/2) / 2 + (Temperature Deadband/2)

If the comparator circuit determines that free-cooling is ineligible for use, the compressor band will shift to the left.

Figure 33 Free-cooling and compressorized operation



Dual-Cooling Source

Dual-cooling systems operate in the same manner as a GLYCOOL system, except they are factory-configured to operate free-cooling and compressor simultaneously. If simultaneous operation is not desired, contact technical support at 800-543-2778 for assistance.

3.4.2 Liebert Air Economizer™

The Liebert Air Economizer is an option for Liebert downflow units. The Liebert Air Economizer uses cool outdoor air in mild climates to condition indoor spaces. It is functional only on cooling units with a Liebert iCOM that has been wired and configured to accommodate the Liebert Air Economizer.

The Liebert Air Economizer ships with sensors to determine the temperature and humidity of return air and outdoor air. The sensors and wiring to connect them are shipped inside the Liebert Air Economizer:

- Outdoor air sensor
- Return air sensor
- Supply air thermistor

These must be installed and connected to the primary cooling unit. The outdoor air sensor and return air sensor connections for the Liebert DS™ and Liebert CW™ are shown in **Figure 34**. Connect the supply air thermistor as shown in **Figure 35** (it must be routed from the cooling unit and secured). The illustration shows connections for the Liebert DS and Liebert CW.

NOTICE

Risk of improper wiring procedure. Can cause unit damage.

Turn Off all power to the indoor cooling unit before connecting cables or wires. Failure to do so may damage the equipment.

Figure 34 Temperature and humidity sensor connections—Liebert DS and Liebert CW

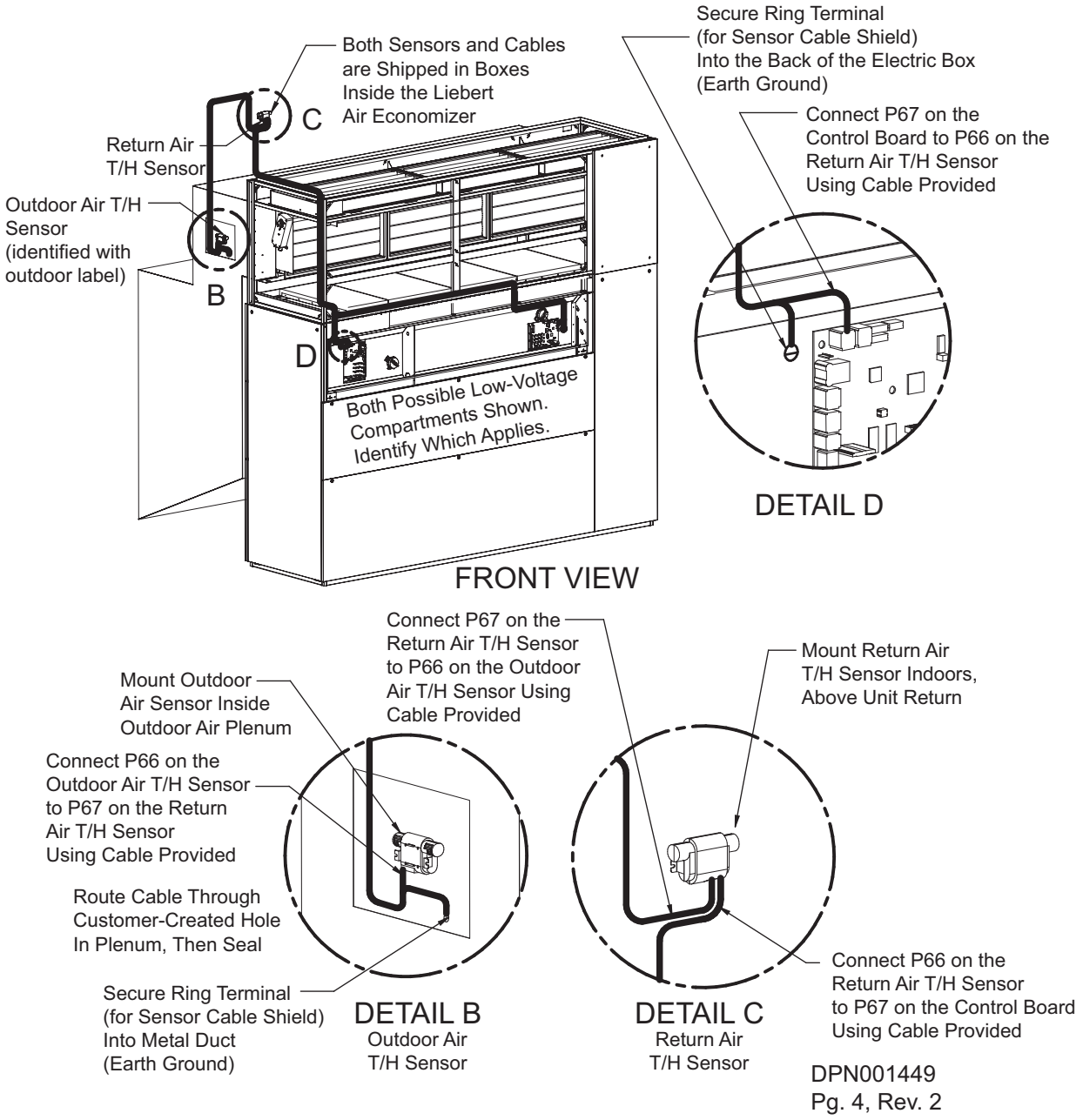
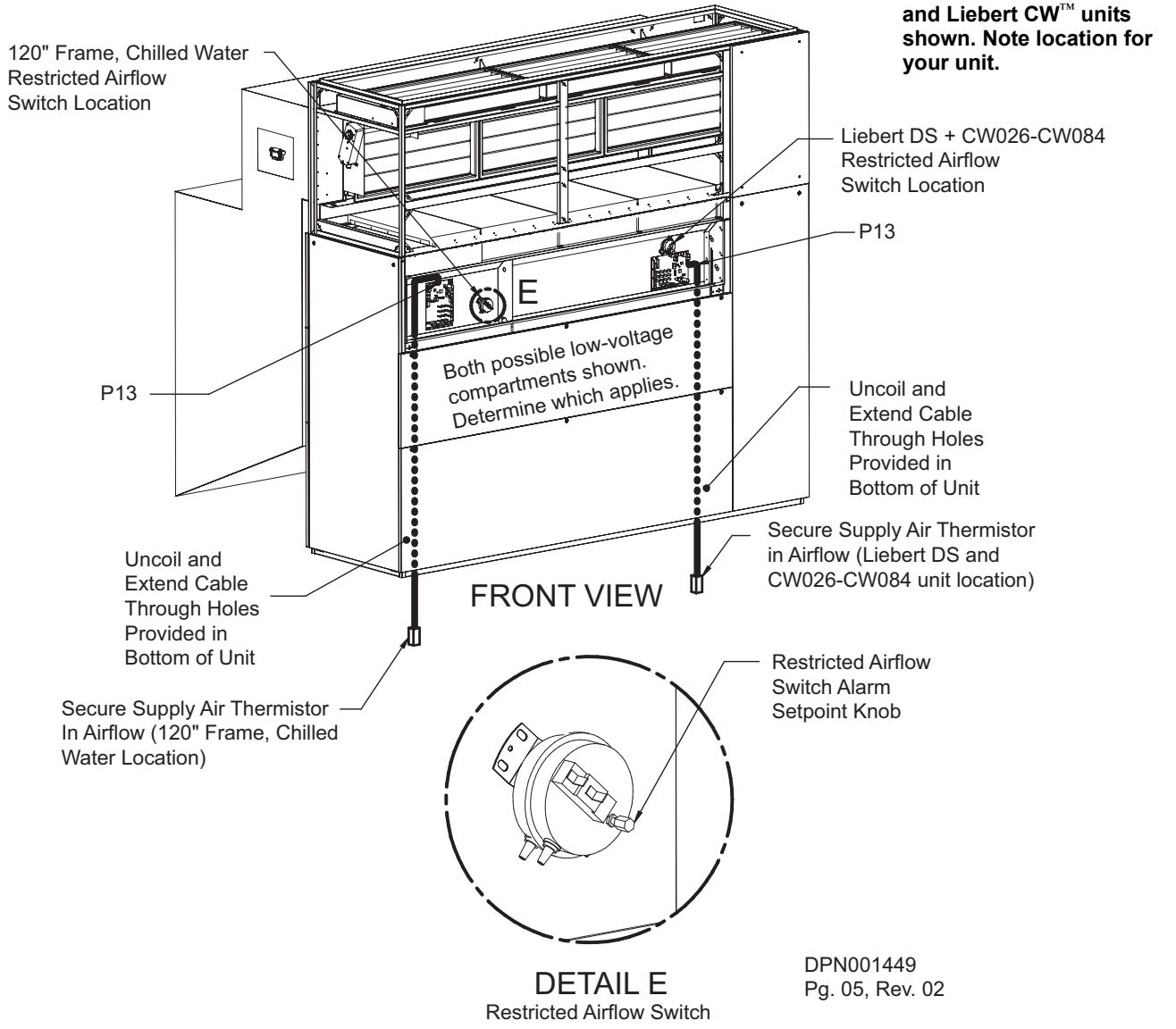


Figure 35 Supply limit thermistor wiring and restricted airflow switch location



3.5 Liebert Air Economizer™ Operation

Liebert cooling units control the Liebert Air Economizer with the analog outputs of the Liebert iCOM control. The Liebert iCOM can be used with a Liebert Air Economizer or with a air economizer supplied by others if equipped with 0-10VDC or 2-10VDC dampers. The Liebert iCOM is capable of driving two independent damper motors or can be set up through the software to output a single signal where the dampers are inversely driven.

The primary cooling unit responds to sensors that monitor the temperature and humidity of the outdoor air, return air and supply air. If outdoor conditions are within the tolerances set, the primary cooling unit opens the Liebert Air Economizer's dampers varying amounts to use outdoor air for cooling. When outdoor conditions are too warm or humid for cooling, the primary cooling unit closes the Liebert Air Economizer's dampers, taking it out of the cooling process. Humidification and dehumidification are disabled when the Liebert Air Economizer is operating.

NOTICE

Risk of high or low humidity. Can cause environmental conditions that are outside equipment requirements.

While the Liebert Air Economizer is operating, the primary cooling unit's humidification and dehumidification are inhibited. If humidity level is important to operational requirements, it must be controlled by other methods during operation of the Liebert Air Economizer. While the primary cooling unit is cooling without the Liebert Air Economizer, the primary cooling unit will control humidity levels according to its setpoints.

NOTICE

Risk of freezing temperatures. Can cause equipment and property damage.

Low outdoor temperatures can produce freezing conditions that adversely affect cooling systems employing water, particularly when the water is not moving through the pipes. When cooling system water is not moving, frozen waterlines, burst coils and water damage are possible. The outside damper must be set so that it is fully closed when freezing temperatures are possible and the cooling system is not operating (see **3.5.3 - Disable the Liebert Air Economizer**). This can be achieved by either connecting a freeze stat that interrupts the economizer signal or by wiring a freeze stat directly into the Liebert iCOM's customer input.

The risk of freezing is increased unless the proper amount of glycol is added to the chilled water unit loops.

NOTICE

Risk of infiltration of odors, smoke and particulates from outside air. Can cause environmental conditions that are outside equipment requirements.

The Liebert Air Economizer does not remove odors, smoke, gases or particulates from the outside air used for cooling. These must be controlled by other methods.

When the Liebert Air Economizer is being used for cooling, both the outside air damper and the room return air damper are active in an opposing relationship. The cooling requirement and temperature of the outdoor air will determine the position of the outside air damper. It will range from fully closed to fully open. As the outside air damper moves toward fully open, the return air damper will close to a minimum of 15%. The 15% minimum is to make sure that air remains circulating near the return air sensor. If the return air sensor is moved to another position where there is constant circulation of air in both outdoor and indoor modes, then the minimum 15% indoor damper position can be removed.

NOTICE

Risk of improper operation. Can cause degraded cooling and ventilation operation because of improper building air pressure.

The incoming air from the outside damper requires expelling an equal volume of air through a field-provided powered relief air vent. The volume that must be expelled will vary from 0 to 80% of the total airflow for all Liebert Air Economizer™ units. The powered relief system should be sized for 80% of the total airflow for all Liebert Air Economizer units in the conditioned space and to maintain minimal building air pressure.

3.5.1 Liebert Air Economizer™ System Overview

The objective of the Liebert Air Economizer is to expel warm air from the conditioned space and bring in cooler air through the Liebert Air Economizer. This function is monitored continuously by the Liebert iCOM.

Figure 36 shows an example of the air flow pattern of a Liebert Air Economizer system. The indoor sensor must be positioned where there is airflow when the system is in full economizer operation and when the system is operating in non-economizer mode.

If the indoor damper position has been changed to 0% from the factory default of 15%, then the indoor sensor must be moved, preferably to the hot aisle.

Figure 36 Air flow pattern of a Liebert Air Economizer system-regular ceiling

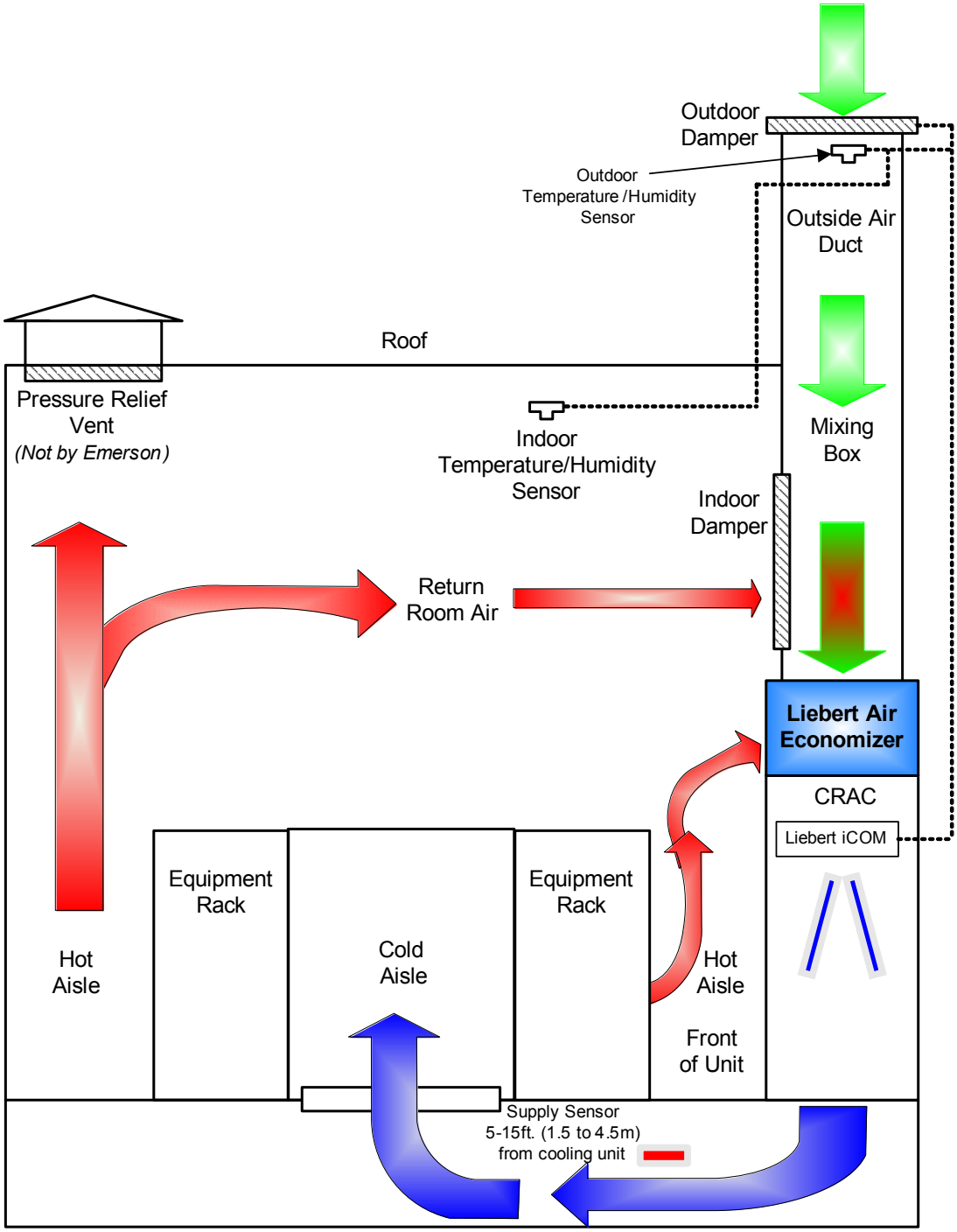
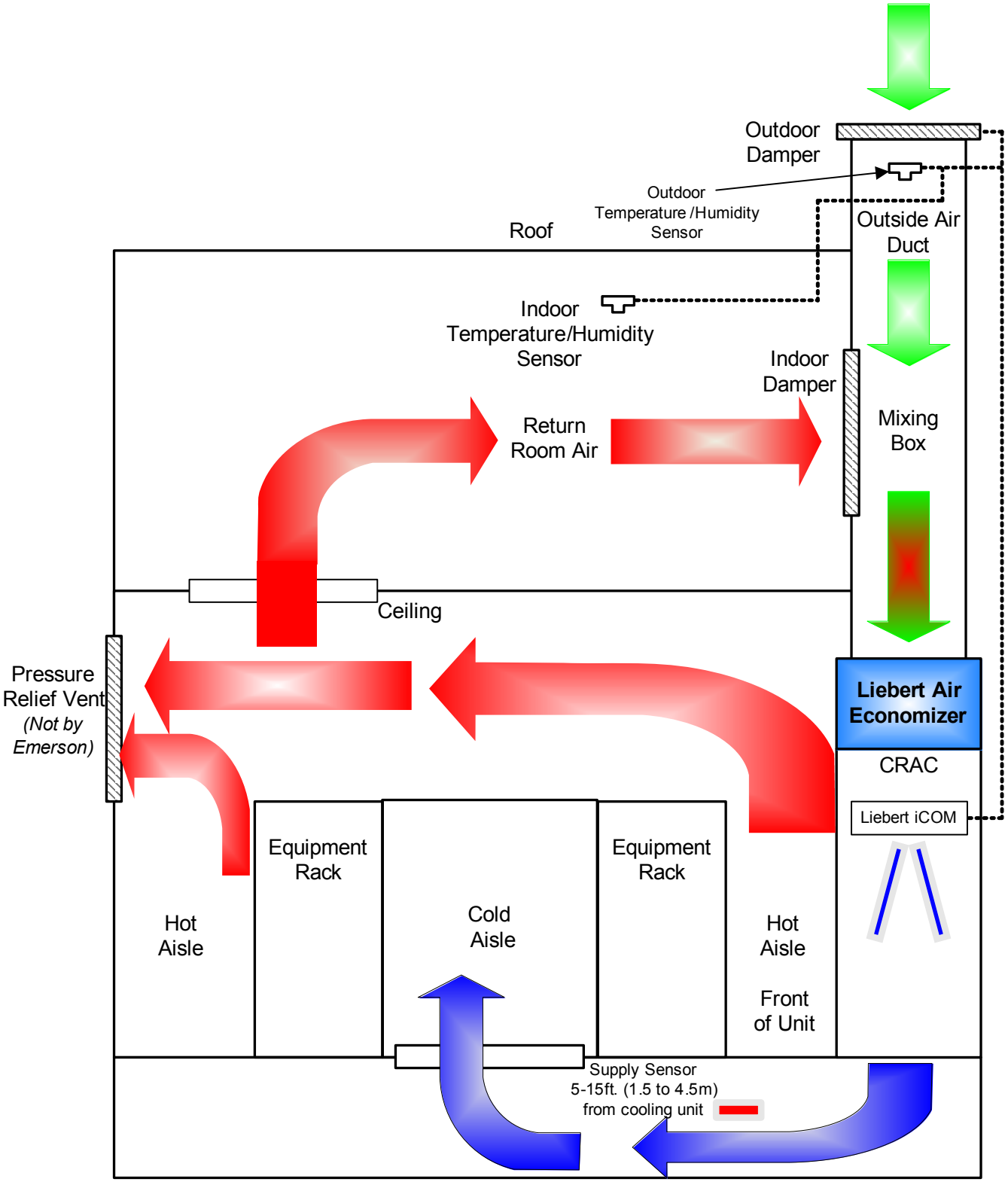


Figure 37 Air flow pattern of a Liebert Air Economizer system-dropped ceiling



Not in Operation

When the Liebert Air Economizer™ is not operating, the outside air damper is closed, the return air damper is open and the relief air vent fan is shut down. This permits air from the conditioned space to be drawn into the primary cooling unit, cooled and expelled into the conditioned space. The relief air vent is not required while the Liebert Air Economizer is not in service because no air volume is being brought into the conditioned space.

Startup Configurations

When a non-Liebert mixing box and damper motors are used, make sure that the following configurations are verified before a unit is placed into service.

- Verify that spring-closed return dampers are installed and operating properly. Without a spring return motor, the dampers will remain in the position they were in when power was present.
- While the Liebert Air Economizer is not operating, which could be due to the outdoor air conditions, a manual lockout through the Liebert iCOM or a Unit Off state will result in 2VDC (3.5VDC on 2-10V actuators) being present on the associated indoor and outdoor analog outputs. The 2VDC (3.5VDC on 2-10V actuators) signal must result in the outdoor damper being closed and return damper opened.
- During full Liebert Air Economizer operation, the Liebert iCOM will send 10VDC to the return and outdoor damper that must open the outdoor damper and close the return damper to its minimum position of 15%.

NOTICE

Risk of improper operation. Could cause frozen coils, resulting in degraded operation, water leaks, equipment damage and building damage.

Failure to verify that the indoor and outdoor damper operation is correct could freeze the chilled water coils, cause condensation within the data center or overload the main fan.

3.5.2 Liebert Air Economizer Control Settings

The Liebert Air Economizer control uses an outdoor temperature humidity sensor to detect when outdoor conditions are within the operating range. The outdoor sensor can be monitored from the Service/Economizer data menu on page 2 of 3 (see **Figure 161**).

The Liebert iCOM control is equipped with a series of setup parameters to allow adjustment and monitoring of the Liebert Air Economizer's dampers and sensor. To access these parameters from the main unit screen:

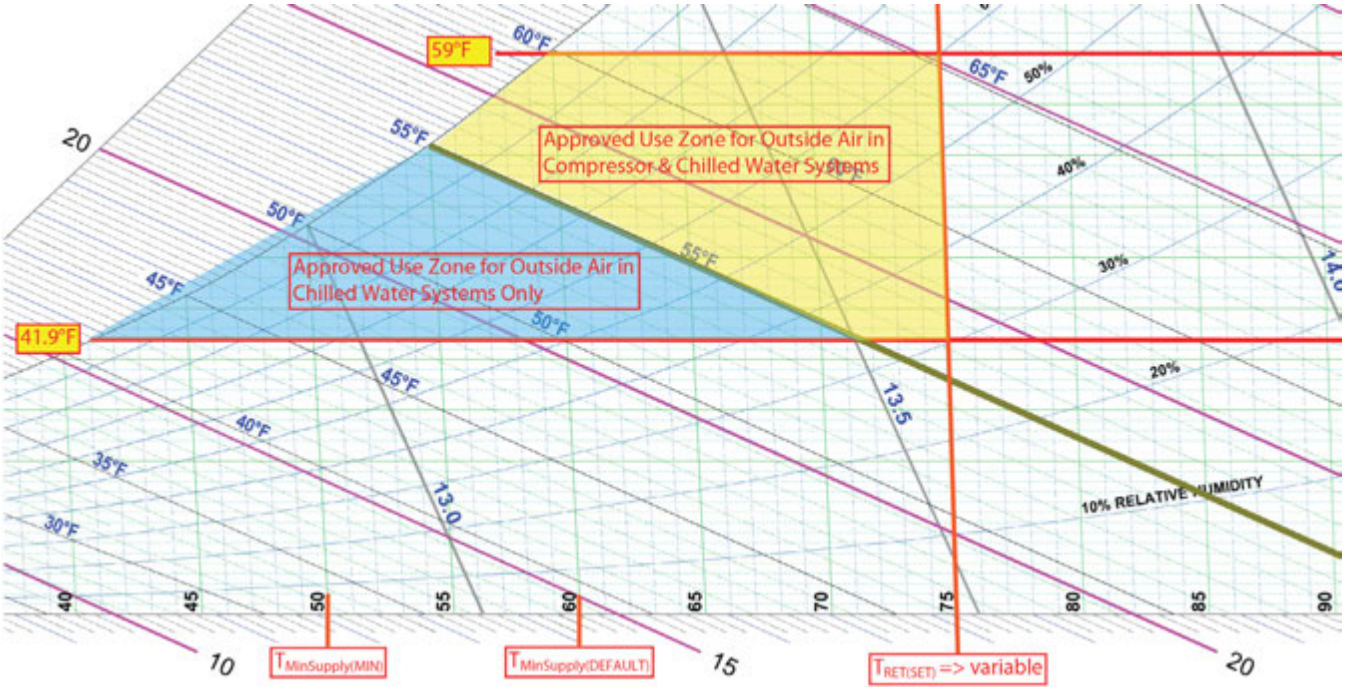
1. Press the Down arrow key until User Menu is displayed.
2. From the User Menu screen, press the Right arrow key to enter the Service Menu.
3. Press the **Enter** key once in the Service Menu and use the arrows to navigate to the **ECO** icon on the bottom row.
4. Select this icon and press **Enter**.

The parameters for the Liebert Air Economizer are now viewable.

Parameters SA03 through SA06 of the Liebert Air Economizer screen are used to determine if outside air is eligible for use. Outside air requirements will vary slightly depending on if the Liebert Air Economizer is connected to a chilled water or direct expansion system. See **Figure 38** for more information.

Figure 38 Operational ranges for chilled water systems and compressor systems

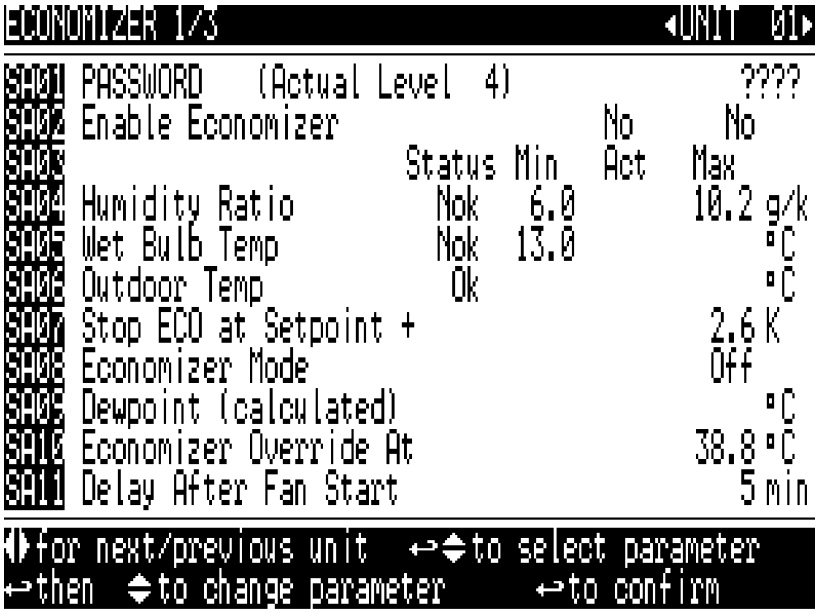
Operation range is based on ASHRAE 90.1



If the Liebert iCOM determines that the outside air is unacceptable for use, one or more of the status parameters on SA04 through SA06 will indicate 'No' and SA08—Economizer Mode will show Off. The Liebert Air Economizer will be activated if:

- All temperatures and ratios are within the outdoor sensor range
- The outdoor air is cooler than the indoor return air temperature

Figure 39 Service/Economizer, page 1 of 3



SA04 and SA05 (DX systems only) Min and Max parameters can be fine tuned to fit the special applications. Refer to a psychrometric chart before adjusting humidity ratios.

The status column for SA06 Outdoor Temp, is based on S135 and S136 of the Service Menus > Setpoints.

S135 DT1 (Room / Outdoor) Type sets the activation point of the ambient dry bulb outdoor temperature as it relates either to an indoor actual temperature or to the temperature setpoint programmed on line S136. If S135 is set to "Temp," the outdoor dry bulb temperature is compared to the return temperature actual value. If set to "Set," the outdoor dry bulb temperature is compared to the return temperature setpoint. If set to "Disable," the outdoor temperature will not be compared to the return sensor value for activation. When set to "Temp" or "Set," the outdoor temperature must be lower than the room temperature setpoint or the actual return temperature sensor reading.

In most applications, this parameter will be set to "Temp" because the outdoor air temperature will reduce cooling costs as long as the outdoor air is below the return air temperature to the primary cooling unit. This remains true even when the outdoor temperature is higher than the supply control setpoint. The following examples assume that the unit is set for supply air control and that the moisture content of the outdoor air is within the allowable range.

Example 1

- *Return Temperature: 90°F (32°C)*
- *Outdoor Temperature: 80°F (27°C)*
- *Supply Air Temperature: 60°F (16°C)*

The conditions in this example would result in a reduction of 10°F entering the unit and would extend the operating range of the Liebert Air Economizer™. The outdoor damper would be 100% open and the mechanical cooling would be utilized to achieve the 60°F (16°C) supply temperature setpoint.

Example 2

- *Return Temperature: 75°F (24°C)*
- *Outdoor Temperature: 80°F (27°C)*
- *Supply Air Temperature Setpoint: 60°F (16°C)*

In this example, the cooling unit would not use outdoor air because it is warmer than the actual return temperature to the CRAC.

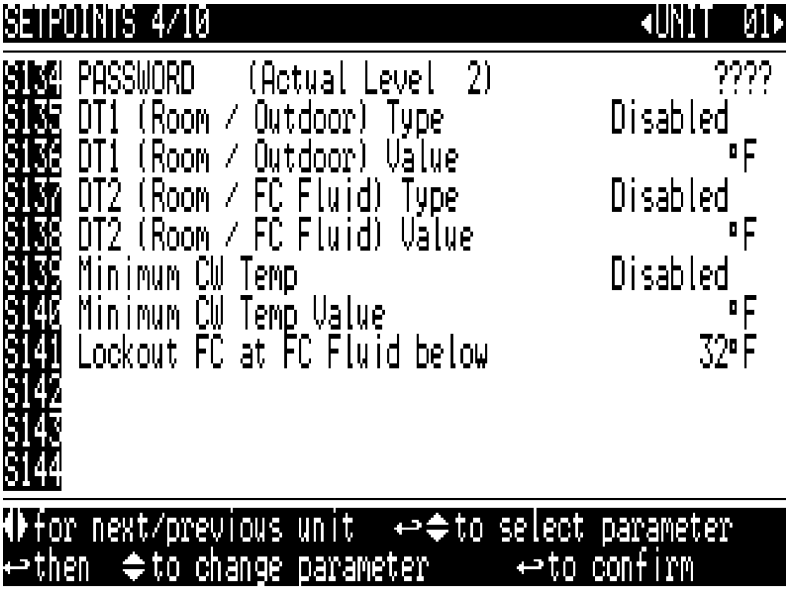
Example 3

- *Return Temperature: 75°F (24°C)*
- *Outdoor Temperature: 40°F (4°C)*
- *Supply Air Temperature: 60°F (16°C)*

In this example, the cooling unit would open the outdoor damper based on the amount of cooling needed to satisfy the supply air temperature setpoint. The unit should be able to satisfy the supply air setpoint with Liebert Air Economizer operation only.

If SA04 through SA06 status indicate OK, but the room temperature is not maintained, SA07 Stop ECO at Setpoint + will disable the Liebert Air Economizer and activate the next cooling source.

Figure 40 Setpoints screen, page 4 of 10



NOTE
Lines S137 through S141 are not applicable to the Liebert Air Economizer.

Outdoor Sensor Sharing

When multiple cooling units with Liebert iCOM and Liebert Air Economizer are networked, the control can be set up to share the outside air sensors of all the units connected in the U2U group. Outdoor air sensor sharing is enabled on SA16. When set to Shared, all the outdoor temperature and humidity readings are averaged among all connected units. The average calculation is used to determine air economizer eligibility on lines SA04 through SA06.

Upon startup after a loss of power to the Liebert iCOM control board, the main fan will operate at 100% for 5 minutes. After the fan has run at 100% for 5 minutes, the standard fan control will be able to modulate the fan. For other control modes, refer to **Variable Speed Fans—EC or Variable Frequency Drives on page 20**.

3.5.3 Disable the Liebert Air Economizer

The Liebert Air Economizer can be disabled using a hard-wired deactivation switch, through the iCOM display, or through a remote monitoring system using a Liebert IntelliSlot® card.

A field-installed and wired normally closed deactivation switch may be connected to Terminals 24 and 51 in place of the factory-supplied jumper. Removing a factory-installed jumper will deactivate the unit's air economizer function (see **Figure 41**) and produces an FC Lockout warning. A normally open deactivation switch may also be used. Line S227 of the Service Menu > Set Alarms must be changed from Opened to Closed.

The Liebert Air Economizer may be disabled by changing SA02 Enable Economizer to No.

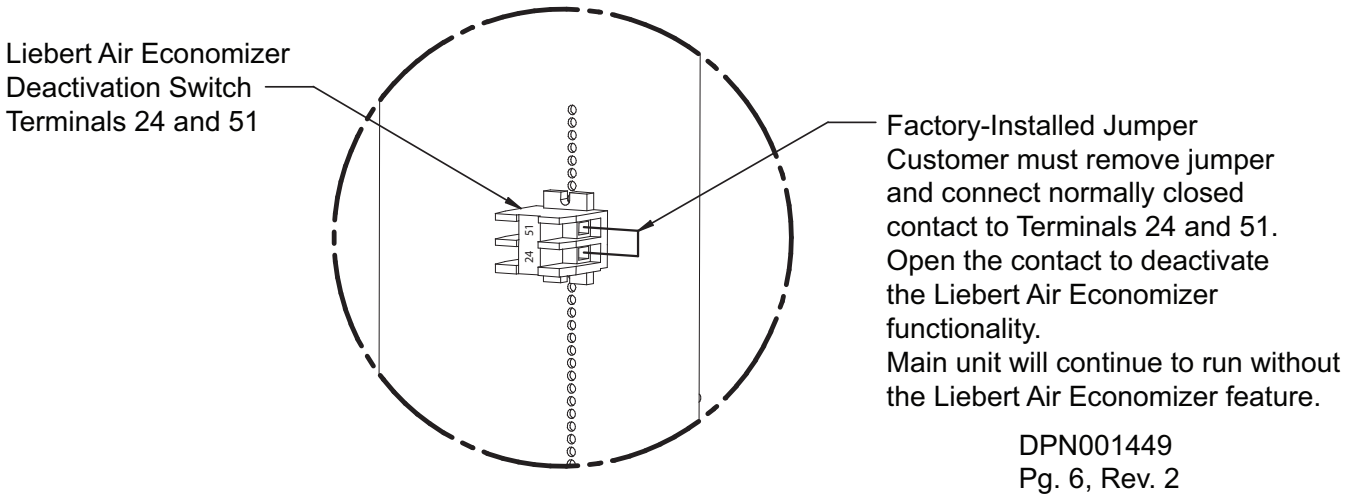
The Liebert Air Economizer may be disabled through a remote monitoring system by writing a disable command to data label *Air Economizer Control*. When disabled, SA02 status will read No. The building management system may override SA04 through SA07 by writing an enable command. When the enable command is written, SA02 will read Remote. Refer to the Liebert IntelliSlot® Modbus 485, Modbus IP and BACnet IP Reference Guide, SL-28170, for additional information. The manual is available at the Liebert Web site: **www.liebert.com**

Deactivating the Liebert Air Economizer will transfer all cooling to the secondary source.

Air Economizer Remote Status Indication

The K11 relay can be activated when the Liebert iCOM determines that the conditions are acceptable for the Liebert Air Economizer™ to operate. This relay will remain active during a BMS remote deactivation of the Liebert Air Economizer.

Figure 41 Deactivation switch



Air Economizer Emergency Override

The Liebert Air Economizer can be configured to override SA04 through SA07 in the event the facility gets too hot. This override becomes active if the room temperature exceeds an adjustable high temperature high return temperature threshold set on line SA10. The emergency override will open the outdoor air damper and close the indoor air damper. The override function can be delayed after a fan start on line SA11, allowing airflow to pass over the room sensor to get an accurate reading before any emergency modes are activated. When the economizer is operating in emergency mode, an Eco Emergency Override event will be triggered.

3.5.4 Adjust the Restricted Airflow Switch on the Liebert Air Economizer

The restricted airflow switch inside the cooling unit must be adjusted for the Liebert Air Economizer to operate properly and efficiently. To adjust the switch:

1. Inspect all connections, restore power to operate the unit's blower.
2. Go to the Service Menus, Diagnostic / Service Mode.
3. Enter the Service Menu password **5010.**
4. Enable manual mode on line S313. The unit will shut Off.
5. Go to line S314 Motors and change the value displayed from No to Yes. This will allow the evaporator fan to run with the outside air damper at minimum position.
6. Confirm the fan is running at minimum speed. This is shown on line S343 "Analog Out 3" of the Diagnostics / Service Mode.
7. Confirm the outside air damper has moved to the minimum position by visually checking damper position.
8. Find the restricted airflow switch in the cooling unit (**Figure 35** shows the switch location in both the Liebert CW™ and Liebert DS™).
9. Turn the restricted airflow switch alarm setpoint knob clockwise until it trips. The cooling unit will also alarm.
   a. Place a voltmeter on Terminal 56 and on the chassis ground.
   b. Turn the airflow sensor counterclockwise until the voltmeter indicates 0VAC.
   c. Turn the airflow sensor adjustment screw clockwise until the voltmeter indicates 24VAC.
   d. When the voltmeter shows 24VAC, turn the screw counterclockwise one full turn.

Once the airflow switch has been calibrated, go to the Service Menus, Diagnostics / Service Mode. Using the Service Menus password 5010, disable manual mode on line S313.

Cycle power Off to the unit using the I/O button, then turn the unit Off at the disconnect. Cycle power back On to the disconnect, then press the I/O button once the control has finished booting up. Verify unit operation as the fan starts and outside damper opens. If a 'Reduced Eco Airflow' alarm occurs during when the unit starts, the alarm time delay located in Service, Set Alarms may need to be adjusted higher.

The reduced airflow alarm is latched in the control for 90 minutes after calibration. Acknowledge this alarm and allow it to clear by pressing the horn button on the control once. The alarm may also be cleared by shutting Off power to the Liebert iCOM and cycling power to the cooling unit. The unit will now resume normal operation.

3.6 Temperature Control—Reheat

If the room air temperature becomes too cold, the control will call for heating. Heating mode is controlled by the Temperature Proportional Band, explained in **3.3 - Temperature Control**.

NOTE

Electric Reheat is not allowed during dehumidification. Staged Reheat is used when normal reheat control is selected, the reheats are turned On at the normal control points of 33%, 66% and 100% without influence if or how the compressors are in operation.

Delayed Reheat is permitted only when one compressor is it operation. As soon as both compressors are working, the electric reheats are turned Off.

3.6.1 Electric, Hot Gas and Hot Water Reheat

Different types of cooling units feature different types of standard electrical heating. Not all types offer hot gas or hot water reheat. The number of electrical heating stages also varies—some types of cooling units have single-stage electrical heating as standard and offer two-stage electrical heating as an option. Other types feature three-stage heating as standard.

The Reheat Proportional Band is divided into three equal parts, each representing one reheat stage. As the Temperature Proportional Band increases the call for heating from 0% to -100%, stages 1 through 3 are switched On, as shown in **Figure 42**. Your unit will have one of the nine reheat configuration types shown in **Table 7**.

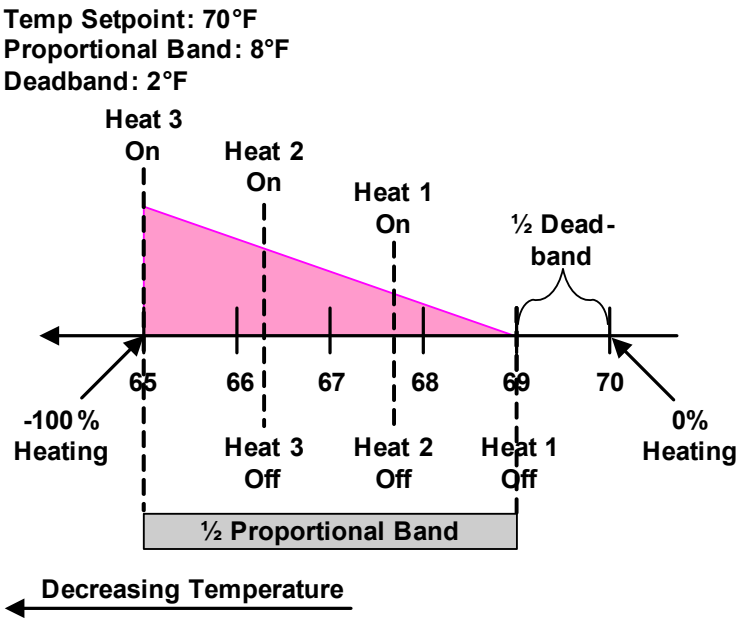
Table 7 Reheat configuration types

Type	A	B	C	D	E	F	G	H	I
Stage 1	Electric 1	Electric 1	Electric 1	Hot Gas	Hot Gas	Hot Gas	Hot Water	Hot Water	Hot Water
Stage 2	-	Electric 2	Electric 2	-	Electric 1	Electric 1	-	Electric 1	Electric 1
Stage 3	-	-	Electric 3	-	-	Electric 2	-	-	Electric 2

NOTE

1. *Hot gas / hot water are not influenced by the setting of electric reheat during dehumidification.*
2. *Hot gas output will be set only if the selected compressor is in operation.*

Figure 42 Three-stage heating



3.6.2 SCR Reheat

SCR reheat is a type of electric reheat that provides tighter temperature control than staged electric reheat. SCR reheat capacity modulation is achieved by pulsing the reheat On and Off. Full capacity is achieved by constantly energizing the reheat. Units equipped with SCR reheat can operate in Tight or Standard mode. By default, cooling units with SCR reheat are factory-set to operate in Tight mode. The mode of operation can be set by adjusting the SCR Control Type parameter (Service Menu, Setpoints).

Tight Mode

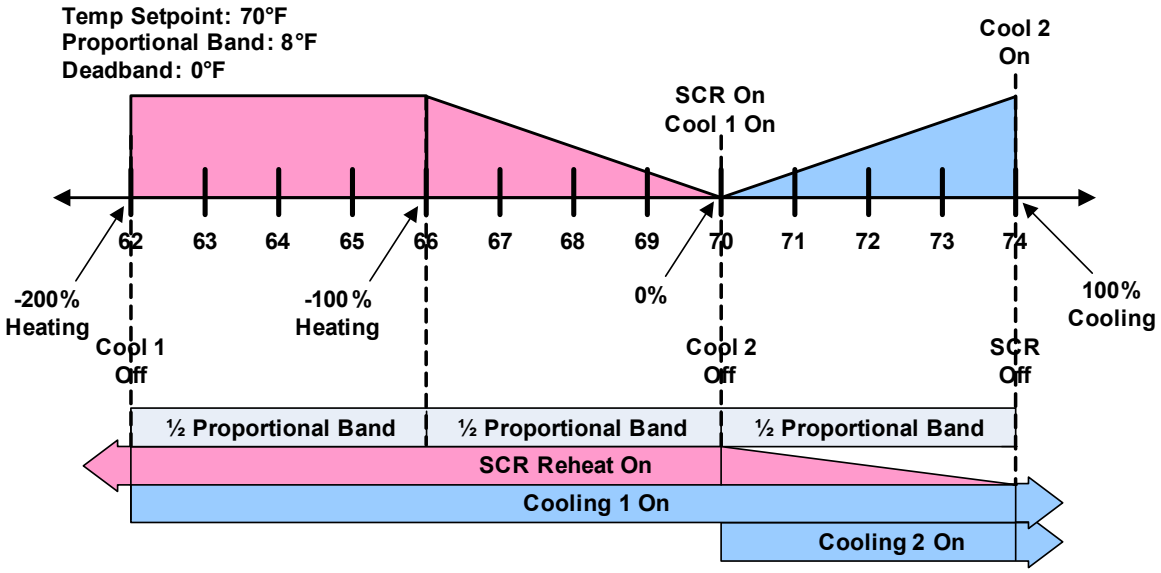
NOTE
Tight Mode is not available on chilled water units, units with variable speed fans or units with digital scroll compressors.

In Tight mode, the compressors and reheats are operated at the same time to provide maximum temperature control. The temperature deadband is set to zero at the factory. In a cooling unit with SCR reheat and two single-step compressors, the first single-step compressor is started and full reheat capacity is provided at 0% calculated output from the Temperature Proportional Band. As the call for cooling increases from 0% to 100%, the reheat capacity is slowly reduced by pulsing the reheat. At 100% call for cooling, the reheat is deactivated and the second single-step compressor is started. As the call for cooling is reduced, the reheat capacity is slowly increased. When the call for cooling returns to 0%, the second single-step compressor is deactivated.

If the Temperature Proportional Band calculates a call for heating from 0% to -200%, the first single-step compressor remains activated and full reheat capacity is provided. Based on the factory defaults, the first single-step compressor is deactivated when the control reaches -200% call for heating. The compressor remains deactivated until the control calls for 0% heating. The compressor activation and deactivation points can be adjusted in the Service menu under Setpoints. **Figure 43** illustrates how a cooling unit with two single-step compressors and SCR reheat operates when the SCR Control Type is set to Tight mode.

NOTE
Some cooling units are not suited for a strict NO LOAD application. These cooling units require a minimal load in the space. Consult factory for verification.

Figure 43 Two single-step compressors with SCR reheat set to Tight mode

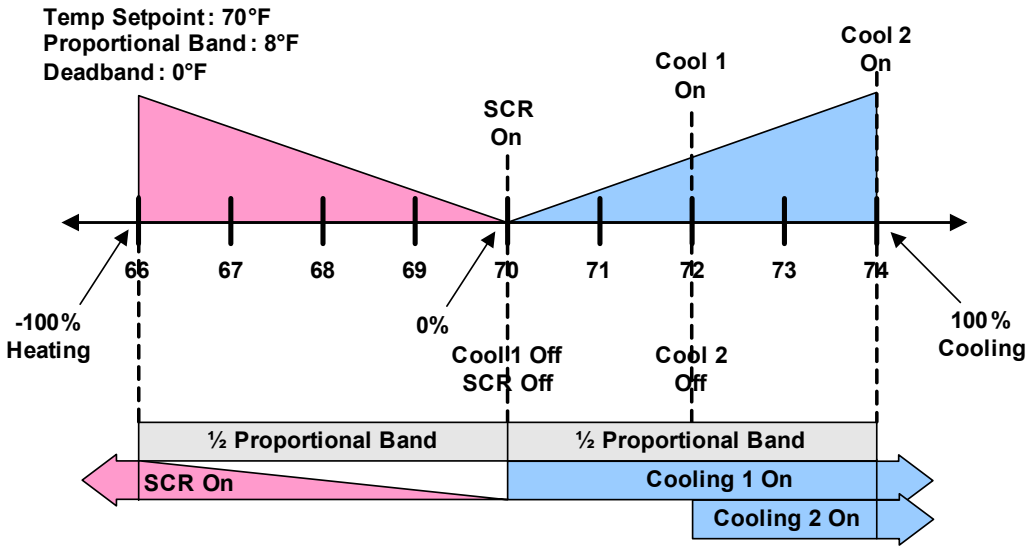


Standard Mode

In Standard mode, the SCR reheat operates only when the Temperature Proportional Band calls for heating. SCR reheat output is adjusted proportionally as the Temperature Proportional Band varies the requirement for heating from 0% to -100%. Compressors operate only when there is a call for cooling as described in **3.3.2 - Compressor Control**.

Figure 44 illustrates how SCR reheat operates when SCR Control Type is set to Standard mode.

Figure 44 Two single-step compressors with SCR reheat set to Standard mode



NOTE

Using SCR in Standard mode in conjunction with variable cooling capacity (e.g., chilled water valve or digital compressor) provides ultimate capacity control and energy-efficiency gains.

3.7 Humidity Control

There are a variety of humidifier options depending on model unit and application requirements. In all humidifier applications, operation is limited to 80°F (26°C) return air temperature. If the return air temperature reaches 80°F (26°C) or higher during operation, the humidifier will be disabled. After reaching the lockout threshold, the temperature must fall to 75°F (24°C) or below 80°F (26.7°C) for 20 minutes before the humidifier is permitted to operate.

This safety routine does not apply to externally mounted humidifiers.

Contact technical support need assistance adjusting the humidifier lockout and/or reset point or if there are humidification problems as a result of this routine.

The Liebert iCOM has four humidity sensor control types: Dew Point, Relative, Compensated and Predictive. The humidity sensor adjusts how the Temperature and Humidity Control determines the percent requirement for humidification/dehumidification. The humidity sensor control type parameter, Humidity Control Type, is in both the User and Service menus under Setpoints.

Dew Point—The actual return temperature and humidity measured by Liebert iCOM is used internally to determine the dew point. When dew point control is selected, the user will set the humidity setpoint in degrees dew point and will also adjust the proportional band in degrees dew point.

Relative—The actual return air humidity sensor reading is sent to the Temperature and Humidity Control to determine whether and how much humidification/dehumidification is required. The actual return air humidity reading is displayed on the Status menu. Unnecessary dehumidification can result when overcooling occurs during a dehumidification cycle. This is because a higher than normal relative humidity (RH) reading is caused by overcooling the room. This extends the dehumidification cycle. Later, when the dehumidification ends and the return air temperature rises to the setpoint, the RH reading falls. The final RH reading will then be lower than desired. If significant overcooling occurred, the RH could be low enough to activate the humidifier.

Compensated—The actual return air humidity sensor reading is sent to the Temperature and Humidity Control where the Humidity Setpoint is adjusted based on how much the return room air temperature deviates from the temperature setpoint. The adjusted humidity setpoint is used for humidification percent requirement determination. For every 1°C deviation from the temperature setpoint, the humidity setpoint is changed by 3% RH, inversely proportionally: if the temperature increases, the humidity setpoint is decreased, and vice versa. The recalculated humidity setpoint is shown as the Actual Humidity Setpoint (User Menu, Sensor Data). As the humidity setpoint is automatically adjusted, the high and low humidity setpoints (User Menu, Set Alarms) are adjusted accordingly. The unadjusted humidity sensor reading is displayed on the Status menu.

Predictive—The actual return air humidity sensor reading is adjusted before it is sent to the Temperature and Humidity Control. The humidity sensor reading is adjusted based on how much the return room air temperature deviates from the desired temperature setpoint. For every 1°C deviation from the temperature setpoint, the humidity sensor reading is changed by 3% RH, directly proportionally: if the temperature increases, the humidity reading is increased and vice versa. The adjusted humidity sensor reading is displayed in the Status menu. Predictive humidity control is set at the factory as the default.

If Compensated or Predictive humidity sensor control is selected, overdehumidification is avoided. When overcooling occurs, causing an increase in the relative humidity sensor reading, the humidity control program predicts what the RH will be when the dehumidification cycle ends and return air temperature returns to the setpoint. This allows the dehumidification cycle to end at the proper time. The Compensated and Predictive humidity sensor control can reduce energy consumption by minimizing compressor and reheat operation, and eliminating unnecessary humidifier operation.

NOTE

The historical humidity sensor graphs will display the real (unadjusted) sensor readings, no matter which Humidity Control Sensor Type is selected. The graphical sensor data is in the User menu under Graphics.

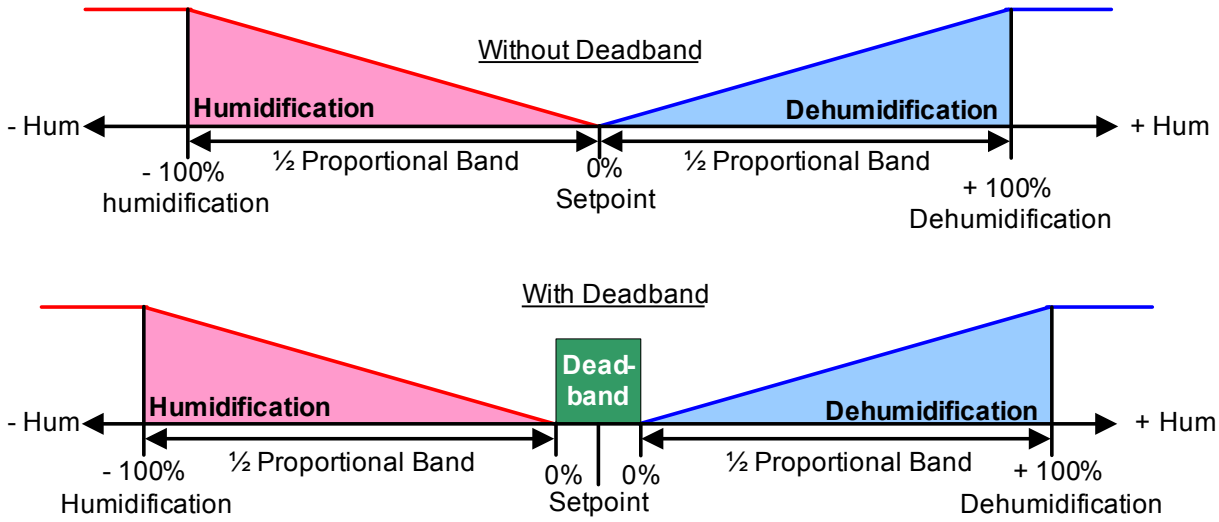
Humidity Control Types

The Liebert iCOM has two Humidity Control Types:

- Proportional
- PI

Proportional—The control uses the humidity proportional band to determine whether to humidify or to dehumidify and how much capacity to provide. The Humidity Proportional Band is a user-defined range divided into two equal parts for humidifying and dehumidifying. The Humidity Setpoint is located between these two equal parts. An optional Humidity Deadband range can be defined, which is equally divided on either side of the setpoint and separates the two halves of the proportional band. **Figure 45** illustrates how the humidity proportional band is evenly divided on either side of the humidity setpoint, with and without a deadband.

Figure 45 Humidity proportional band



When the return air humidity deviates from the setpoint, either humidification or dehumidification is activated. If the return air humidity increases, the control calls for 0% (none) to 100% (full) dehumidifying capacity, based on how far the humidity penetrates the dehumidification portion of the proportional band. If the return air humidity decreases, the control calls for 0% (none) to -100% (full) humidifying capacity based on how far the humidity penetrates the humidification portion of the proportional band.

When the return air humidity reaches the end of the proportional band, either 100% or -100%, full humidification or full dehumidification capacity is provided. No operation is performed when a 0% call is calculated. The control varies the call for dehumidifying and humidifying in 1% increments as the return air humidity moves through the proportional band halves. The deadband range is used to widen the setpoint. When the return air humidity falls within the deadband, the control operates the same as if the humidity equaled the setpoint exactly. This setting helps maximize component life by preventing excessive component cycling. The Humidity Proportional Band and Humidity Deadband parameters are in the Service menu under the Setpoints submenu. The Humidity Setpoint parameter is in both the User menu and Service menu under Setpoints.

PI—If PI Control is selected, the percent humidification/heating requirement is calculated by combining two methods, proportional and integral. The proportional term is calculated in a manner similar to the previously described Proportional control.

The integral term (sometimes called “reset action”) is calculated by measuring how much and how long the air humidity has been above or below the setpoint. If the actual air humidity has deviated from setpoint, the percent requirement is slowly and continuously increased until the total is sufficient to bring the return room air back to the setpoint. The control helps to ensure humidity setpoint is achieved while efficiently operating the equipment.

From an idle state (compressor[s] Off, chilled water valve closed, etc.), the call for humidification/dehumidification is based on proportional humidity deviation from setpoint. As humidity deviates further from or closer to the setpoint, the call for humidification/dehumidification is increased or decreased, respectively. The amount of humidification or dehumidification applied depends on how far the actual temperature has deviated from the setpoint on the proportional (P) band.

The integration (I) time works with the proportional band in PI Control to stage call for components before the room humidity deviates far from the setpoint. The “I” portion does this by doubling the current “P” deviation for every time the “I” has elapsed.

3.7.1 Humidification

Infrared Humidifier

There are two types of infrared humidifiers: small pan (IFS) and large pan (IFL). The operating mode of each is similar, however, some of the variables or timings differ because of the size of the pan.

Infrared humidifiers are started at 100% humidification request and stopped at 0%. Infrared humidifiers cannot be driven in proportional mode.

Table 8 Parameters for infrared humidifier control

Parameter	IFS Default	IFL Default	Liebert Challenger
Humidity in Last xx Hours	15 hours	15 hours	15 hours
Fill Time	33 seconds	56 seconds	27 seconds
Humidifier On Time	440 seconds	576 seconds	568 seconds
Flush Rate	150%	150%	150%

An autoflush system automatically controls a water makeup valve to maintain proper levels in the infrared humidifier water pan during humidifier operation. If humidification is needed and 15 hours have elapsed since the last time the humidifier was on, then the humidifier is not turned On until the valve completes an initial fill of the humidifier pan. This pre-fill is about 30 seconds for a small pan and 60 seconds for a large pan. The valve continues to fill and flush the pan for about 4-1/2 minutes for a small pan or 7-1/2 minutes for a large pan. Pan size is selected based on unit specifications and the time is factory-set.

During humidifier operation, with the flush rate set at the default of 150%, the valve is opened periodically to add water to the pan (for a small pan, it opens about 45 seconds for every 7 minutes of humidifier operation; for a large pan it opens about 80 seconds for every 10 minutes of operation). This adds enough water to the pan to cause about a third of the total water used to be flushed out of the overflow standpipe in the humidifier pan. This helps to remove solids from the pan. The flush rate is adjustable from 110% to 500% in 10% increments. Default is 150%. If the water quality is poor, it may be desirable to increase the water flushing action above the normal 150% rate. Also, if the supply water pressure is low, the flush rate adjustment can be increased so that a sufficient water level is maintained during humidification. The flush rate parameter, Infrared Flush Rate (Service Menu, Options Setup), is adjustable from 110%-500% because the fill valve is controlled by time. It uses a factory-installed integral float to prevent overfilling if the humidifier drain or condensate pump fails.

External Humidifier Control—Optional

A factory-supplied option may be provided to allow a start-stop command to be sent to the control of a remote-mounted humidifier.

Steam Generating Canister Humidifier

The Steam Generating Humidifier has its own separate control board that manages the canister and steam rate. Liebert iCOM sends an On-Off command to relay a call for humidification.

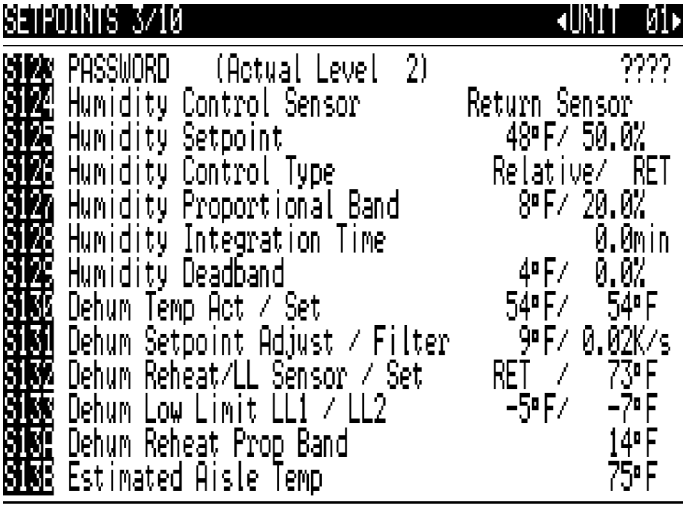
3.7.2 Dehumidification

The Dehumidification Enable parameter (Service Menu, Options Setup) allows for enabling/disabling the dehumidification function.

A call for dehumidification is calculated in the same way as a cooling request. The components (valves, compressors) will follow this dehumidification request as soon as it is higher than the request for cooling the hot gas bypass (if equipped) will disengage on the Liebert Challenger 3000™.

Dehumidification Low Limit

Figure 46 Setpoints screen, page 3 of 9



NOTE

When the unit is in relative humidity control, only the right side of the menu is displayed and dew point will display the left side of the menu.

Low Limit 1 and Low Limit 2 are used to avoid overcooling a room during dehumidification. When a low limit is reached, a compressor or the liquid cooling source that is used for dehumidification is disabled. It is re-enabled when the air temperature rises. The Low Limit 1 and 2 settings are in the Service menu under Setpoints.

Low Limit 1: Low Limit 1 will disable one of two compressors for dehumidification. If only one compressor is set for dehumidification, or if the dehumidification source is chilled water, this limit will not be visible and will be inactive.

Low Limit 2: Low Limit 2 will disable both compressors for dehumidification. This limit will also stop dehumidification in single compressor units and in chilled water units.

The limits become active when the air temperature drops below a temperature value equal to the sum of the dehumidification reheat setpoint plus the value set on Low Limit 1 and 2 (the Low Limit settings are negative values).The air temperature used for low limit is the same sensor used for controlling reheat during dehumidification (left hand value on line S132).

A dehumidification source is deactivated if the return air temperature drops below the Deactivation Temperature, as in this example:

S132 Dehumidification Temperature Setpoint:	70°F (21.1°C)
Low Limit Value:	-7°F (-3.8°C)
Deactivation Temperature:	63°F (17.2°C)

NOTE

If a cooling unit is equipped with SCR reheat and the SCR Control Type parameter is set to Tight mode, then Low Limit 2 will be ignored, see ***3.6 - Temperature Control—Reheat****.*

Dehumidification will not reactivate until:

- the air temperature is above S132 Dehumidification Reheat Setpoint
  OR
- at least one compressor is in a call for cooling, at least 10 minutes has elapsed since dehumidification was stopped and the Low Limit Sensor (S132) is greater than the Low Limit 2 (LL2) border.

To avoid the dehumidification lockout:

- Increase the heat load for efficient operation
- Decrease S133 LL settings slightly
- Where applicable, decrease the reheat proportional band. This will allow the reheats to activate sooner, helping to prevent the low return condition.

Dehumidification Compressor Quantity

Under Factory Settings in the Advanced menu there is an item called Dehumidification With Comp. This will be set to either 1, 2, 1 or 2, or BOTH. This setting determines which compressors are used for dehumidification. It also determines if Low Limit 1 will be available and impacts how the reheats will operate during dehumidification. The Dehumidification With Comp field is set when the cooling unit is built and should not be adjusted without first consulting the factory. **Table 9** outlines which Low Limit settings will be available, based on the Dehumidification With Comp selection.

Table 9 Dehumidification With Comp settings

Available to Set Value	Dehumidification With Comp Setting	Default Setting On
Low Limit 2 only	[blank] (units without compressors)	All Chilled Water Units
	1 or 2 (Compressor 1 and 2 alternate)	Liebert DS™
Low Limit 1 & 2	Both (both compressors dehumidify)	—

Low Limit 1 and 2 will be available only on cooling units with two compressors when Dehumidification With Comp is set to BOTH.

Low Limit defines the sensor and the setpoint used to determine the low limit thresholds for all cooling and dehumidification modes.

The value of the selected sensor is compared with the setpoint set in S132 + the LL1 / LL2 settings (S133).

Possible selections are:

- 0 = Supply Sensor (selectable only when S102 Temperature Control Sensor is set to “Supply”)
- 1 = Remote Sensor (selectable only when S102 Temperature Control Sensor is set to either “Remote” or “Supply”)

  Falls back to “Supply” when all Remote Sensors are set to “Disabled”
- 2 = Return Sensor - Default for all configurations, and the only allowable setting when S102 Temperature Control Sensor is set to “Return.”

Defaults: Any time the S132 sensor setting changes (away from the default “Return” or back to “Return”), the setpoint will take the same value of what is set in S103 Temperature Setpoint.

Reheat During Dehumidification

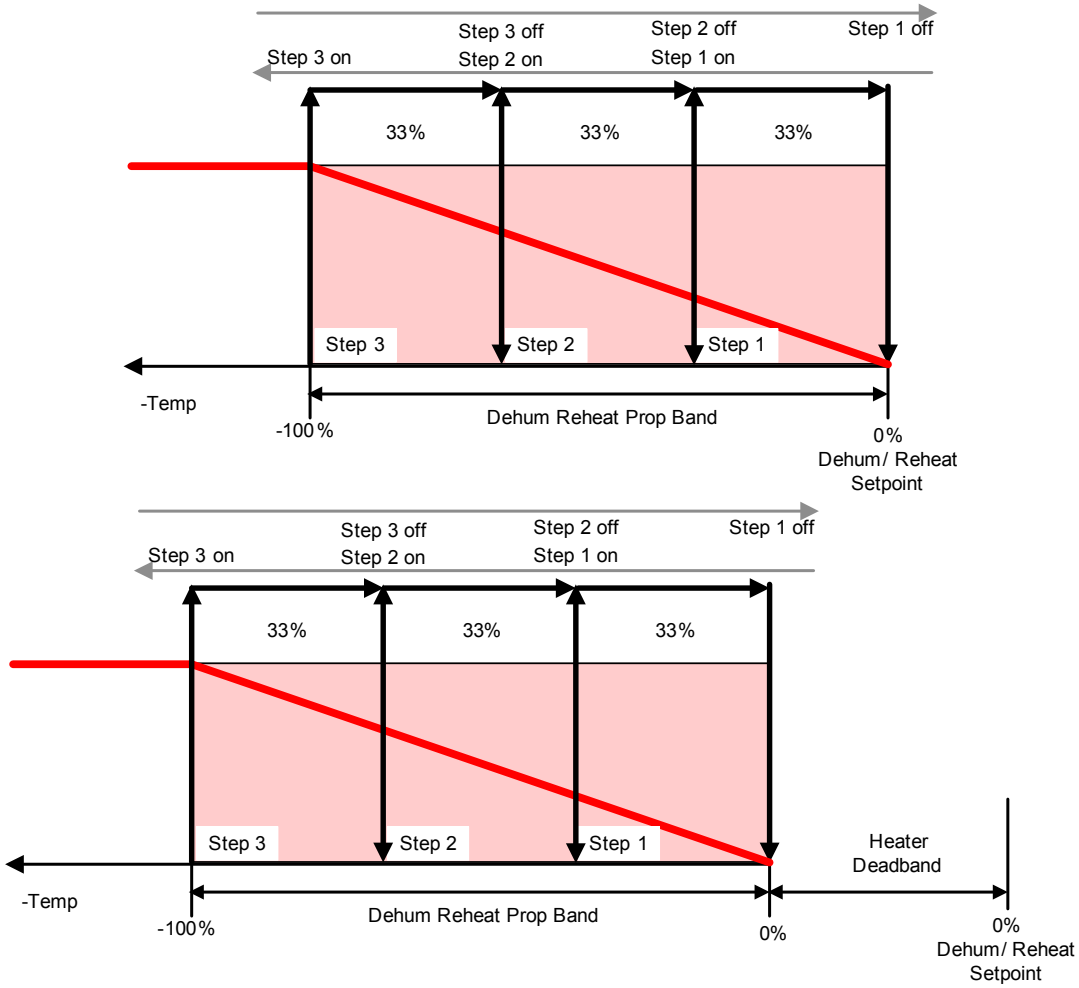
The parameter Electric Reheat Operation in Service Menus>Options Setup defines how the heaters react if the temperature decreases during dehumidification. This parameter does not affect SCR reheat operation. The Electric Reheat Operation parameter is in the Advanced and should not be changed without factory approval.

No—No electric reheat allowed during dehumidification process.

Delayed—This setting applies only to two-compressor units with BOTH compressors selected for dehumidification. The electric reheats are prevented from turning On until Low Limit 1 is reached. At this condition, one stage of dehumidification is disabled and the reheats are activated. At Low Limit 2, both stages of dehumidification are disabled. When *Delayed* is selected on units with a single compressor selected for dehumidification (Dehumidification With Comp Setting: 1, 2, and 1 or 2), the reheats will operate the same as they do for *Staged* as described below. *Delayed* is the default setting for Liebert DS units.

Staged—This setting applies to one or two compressor units. Electric heaters will stage as illustrated in **Figure 47**. *Staged* is the default setting for Liebert Challenger 3000 units. On two-compressor units with *Staged* reheat selected and Dehumidification With Comp set to BOTH, the control allows operating two compressors and reheats simultaneously. The electrical service to the unit must be sized and wired for this option if selected.

Figure 47 Dehumidification and reheat control bands



The call for heating is based on the deviation between the dehumidification reheat setpoint (S132 right hand value) value of the selected sensor (S132 left hand value).

Return Sensor is the default for all configurations and the only allowable setting when S102 Temperature Control Sensor is set to "Return". Supply Sensor is selectable only when S102 Temperature Control Sensor is set to "Supply." Remote Sensor is selectable only when S102 Temperature Control Sensor is set to either "Remote" or "Supply." The reheat activation points are based on the dehumidification temperature control band. Dehumidification temperature control band is established using these parameters:

- S132 (right hand value)
- S111 Heater Deadband
- + 1/2 (S13A-Dehum Reheat Prop Band)
- Dehumidification Temperature Control Band

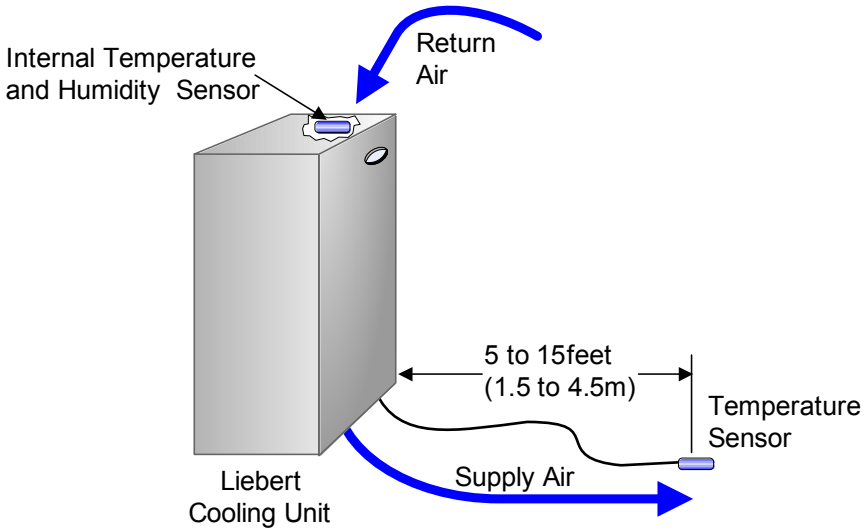
Hot gas reheat or hot water reheat will start as shown in **Figure 47**, when the temperature decreases during the dehumidification process. Reheats operate only as proportional control. As the room temperature deviates further from setpoint on the dehumidification control band, the more reheats are activated.

3.8 Supply Control

Up to 11 supply air sensors thermistors may be connected per unit, used as control or reference of the discharge air temperature of the cooling unit. The supply temperature sensors should be installed in an area that is influenced only by the unit it is connected to. The supply sensor should be 5-15 ft. (1.5-4.5m) from the cooling unit to provide an accurate reading for the control. Two sensor types are available for purchase. The sensor types can be used together based on user reference.

The standard supply air thermistor connects to P13 Pins 1 and 2. A 50 ft. (15m) extension cable is available from Emerson if the sensor must be more than 15 ft. (4.5m) from the Liebert iCOM. The sensors require no configuration, just connection to the Liebert iCOM. Connectivity can be confirmed through the unit view or sensor data.

Figure 48 Placing the supply air temperature sensor



For systems with larger supply air plenums, optional 2T supply air sensors may be connected via CANbus to obtain a precise supply air temperature. Each 2T sensor reports two temperature values to the Liebert iCOM. Up to five 2T sensors may be connected in addition to the standard supply air thermistor. The Liebert iCOM will aggregate the readings and convert them into a user-defined average or maximum sensor value for control purposes.

The first step in setting up the additional supply sensors is to program the dip switches using **Table 10**. The DIP switches may be accessed by removing the rear housing or through hole in the housing. See **Figure 71** for additional information.

Table 10 DIP switches in 2T sensors

Supply Sensor #	CANbus Node ID	DIP switch Position							
		1	2	3	4	8	6	7	8
Sensor A	17	On	Off	Off	Off	On	Off	Off	Off
Sensor B	18	Off	On	Off	Off	On	Off	Off	Off
Sensor C	19	On	On	Off	Off	On	Off	Off	Off
Sensor D	30	Off	On	On	On	On	Off	Off	Off
Sensor E	31	On	On	On	On	On	Off	Off	Off

Sensors A through E are dual purpose CANbus ID's in software. Sensors A-C (IDs 17-18) may alternatively be used for temperature and humidity monitoring of the space. Sensors D and E (ID's 30 and 31) may be used for fluid inlet and outlet temperature monitoring. Verify application setup before installing additional supply air sensors. Adding duplicate sensors will result in sensor communication loss.

After setting the DIP switches, follow the directions in **4.3.3 - Terminate the Final Sensor on the CANbus Link** to complete the sensor installation.

Once the sensors have been connected, go to Service Menus> Sensor Calibration/Setup (**Figure 149**). Locate the line that reads Supply Sensor Aggregation. Change the right hand parameter to Enabled.

Enable the corresponding sensors to be included in the aggregate temperature measurement. Set the aggregation method to average or maximum. The aggregated temperature will be displayed at the bottom of the screen.

- **Supply Control**: When the supply sensor is set to Control, the unit will control the amount of cooling / heating being provided based on maintaining the discharge air temperature. The return air sensor may still be used to control fan, humidity or as temperature/humidity reference of the room.

NOTE
*On units equipped with a 3P actuator type valve, response can be improved by using the feedback signal. Feedback is not required for supply air control and is not available on units with fluid economizer. See **3.3.3 - Chilled Water Control**.*

- **Supply Limit**: The supply limit can be enabled only when the unit's temperature control sensor is set to either Remote Sensor or Return Sensor. The unit may be set up with the supply air sensor to maintain a minimum air temperature under a raised floor to help prevent condensation. To avoid supply temperatures that are too low, the supply limit can influence the opening of three-point or analog actuators, or compressor capacity. The control compares the deviation from the return air setpoint and the supply limit setpoint and calculates the output to the actuator from the smaller deviation.

NOTE
Supply control and limit are calculated on each unit, independent of the other sensor readings on the network.

When the supply air sensor is set for Temperature control, additional Supply Air configuration parameters (valve pulse, cooling filters and return compensation) can be used to enhance the supply air control.

- **Valve Pulse and Cooling Filter Timer**: The valve pulse and cooling filter timer can be adjusted to prevent oscillation around the supply setpoint and still allow for rapid cooling capacity adjustments to compensate for heat load changes. Contact your local Emerson Network Power Liebert Services personnel for adjustments.

3.9 Liebert Optimized Aisle Control

The Liebert iCOM Optimized Aisle Control has been developed to take advantage of the variable fan speed (EC or VFD Fans) and variable capacity (Chilled Water, 4-Step and Digital Scroll) components that are available on some units. This new control scheme uses this variable capacity technology and applies it to ensure that the inlet air temperature to the server is maintained while providing the greatest amount of energy savings. Maintaining the rack inlet air temperature ensures that the IT equipment operates trouble free and keeps the server fans from ramping up from their minimum speed.

Each Liebert cooling unit is equipped with a Liebert iCOM controller that has the ability to collect and control a supply (Discharge) air temperature sensor, a return temperature and humidity sensor and up to 20 rack temperature sensors. The Liebert iCOM Optimized Aisle control utilizes each of these sensors to determine how to adjust the cooling, heating, humidification and dehumidification capacity of the unit.

All floor mount cooling units equipped with Liebert iCOM can communicate with each other through standard Ethernet connectivity. This communication between the units allows coordination of cooling capacity, zoned air flow distribution, fail over protection and different modes of standby operation. To reach the full benefit of the Liebert iCOM Optimized Aisle Control, the units must have this network connected.

Upgrades are available for most Liebert cooling units that are not equipped with the Liebert iCOM or with a variable speed fan. Contact local Emerson representative for additional information.

3.9.1 Operation

Inlet Rack Temperature Control

The Liebert iCOM Optimized Aisle control monitors the inlet temperature to the racks using up to 20 rack temperature sensors that are connected to a Liebert iCOM control. These inlet rack temperature sensors are used to control the air flow (fan speed) of each unit. The air flow is increased when the inlet rack sensors detect a temperature higher than the setpoint and will decrease air flow when the head load decreases or changes to the application are modified (eg., Containment).

Additional Details of Rack Temperature Operation

Refer to **Application and Configuration of Rack Sensors on page 81** for rack sensor setup details.

- The cooling unit's fan speed is determined based on the amount of deviation from temperature setpoint (Proportional) and the length of time the actual temperature has deviated from temperature setpoint (Integral)
- The fan speed control takes into account the actual temperature as it compares to the temperature setpoint and will modify how fast the fans can change speed to avoid overshooting the setpoint.

  In addition to the speed filters, the fan speed also has programmed independent acceleration and deceleration rates

  These control tuning parameters allow the fans to speed up quickly to match rapid heat load changes and react to containment doors being opened and closed while still providing stable control when the application returns to steady state operation.

Temperature Compensation

Temperature compensation links between the cold aisle temperatures, cooling capacity and air flow. Changes that could invoke temperature compensation would be the removal of floor tiles in non-cold aisle areas, incorrect supply temperature setpoint, unit failure in another zone or heat load changes greater than expected heat load changes in rack equipment. As a further protection, the temperature compensation routine also ties into the cascade /standby operation when Teamwork Mode 3 is selected.

There are three selectable compensation routines to choose from: Return, Supply or Return + Supply.

Return Compensation: This temperature compensation monitors the return air condition and automatically adjusts the supply air setpoint if return temperatures become too cold. Return compensation can be enabled in all fan and temperature control sensor configurations, with the exception of fan and cooling set for return air control (Enable Return Compensation falls back to *No*). With return air compensation enabled, S103 "Temperature Setpoint" remains unchanged as long as the air temperature is above S114 "Return Compensation Setpoint."

If the return air temperature falls below S114 "Return Compensation Setpoint," S103 "Temperature Setpoint" will be increased. The calculated compensation setpoint is displayed as the left hand value (Act) of line S103 (see **Figure 49**). Return compensation is also indicated from the unit view as shown in **Figure 50**.

Figure 49 Return Compensation Setpoint in Service Menu

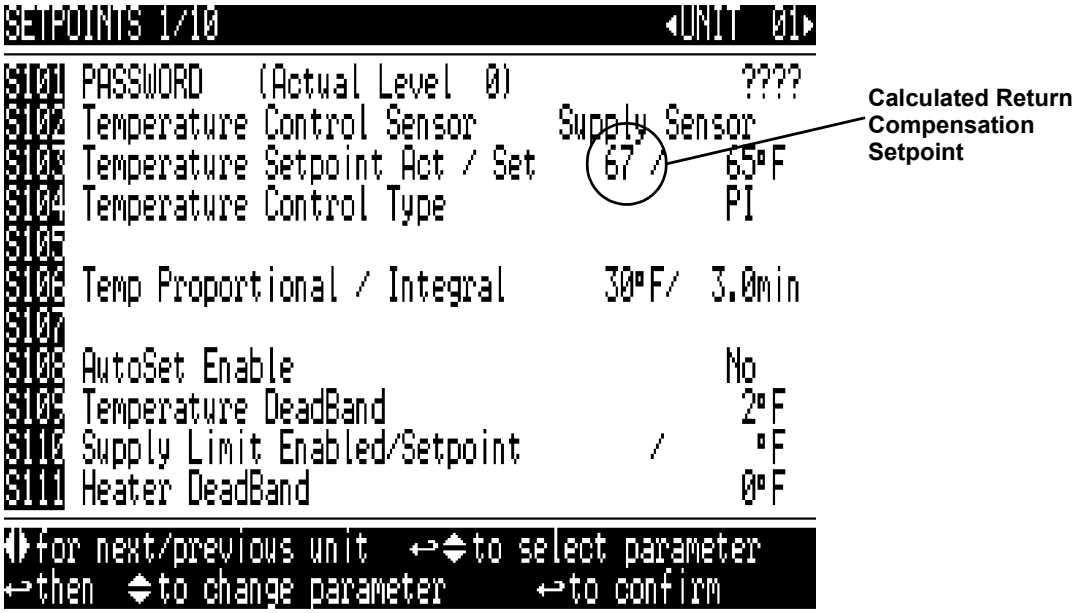


Figure 50 Return Compensation in Unit View

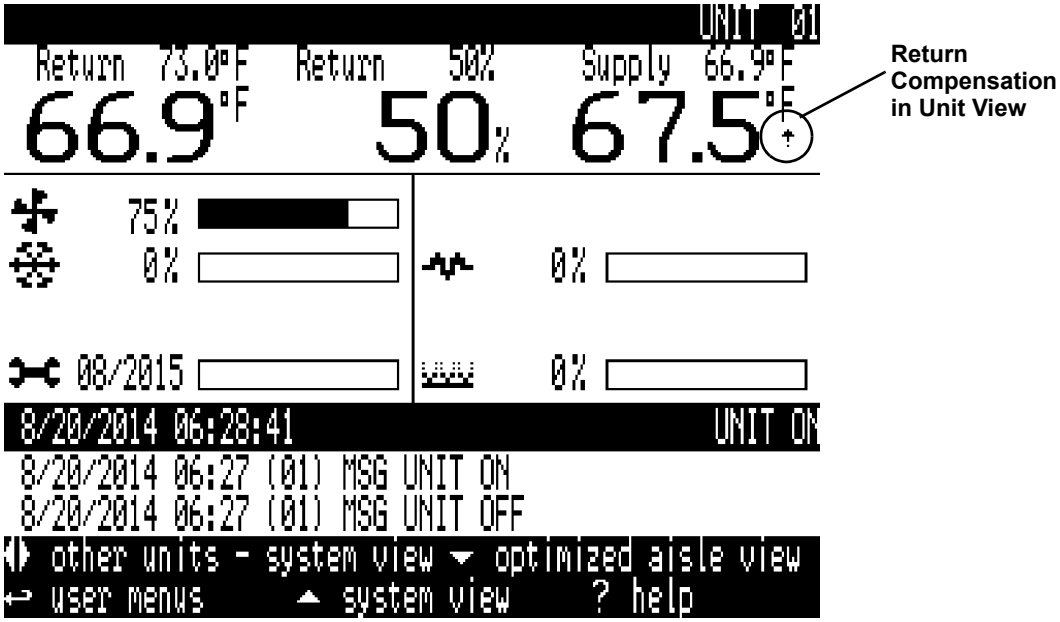
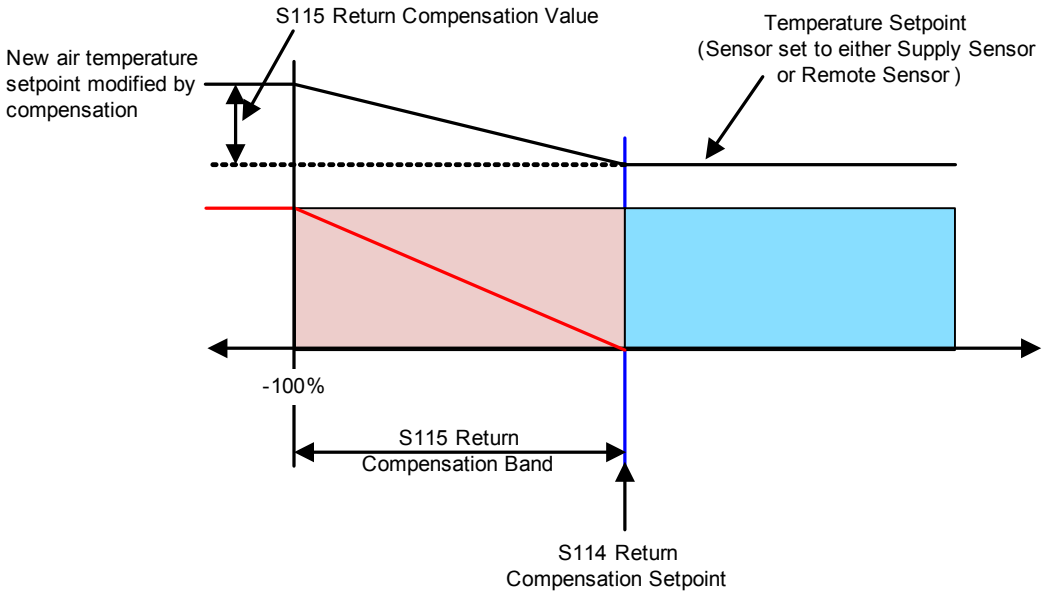
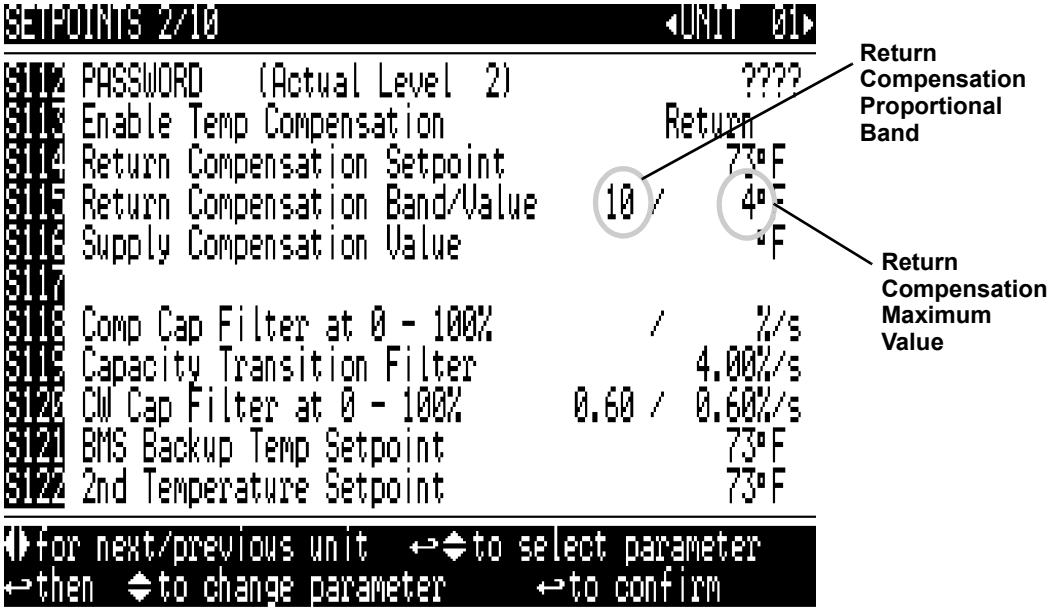


Figure 51 Return Compensation control band



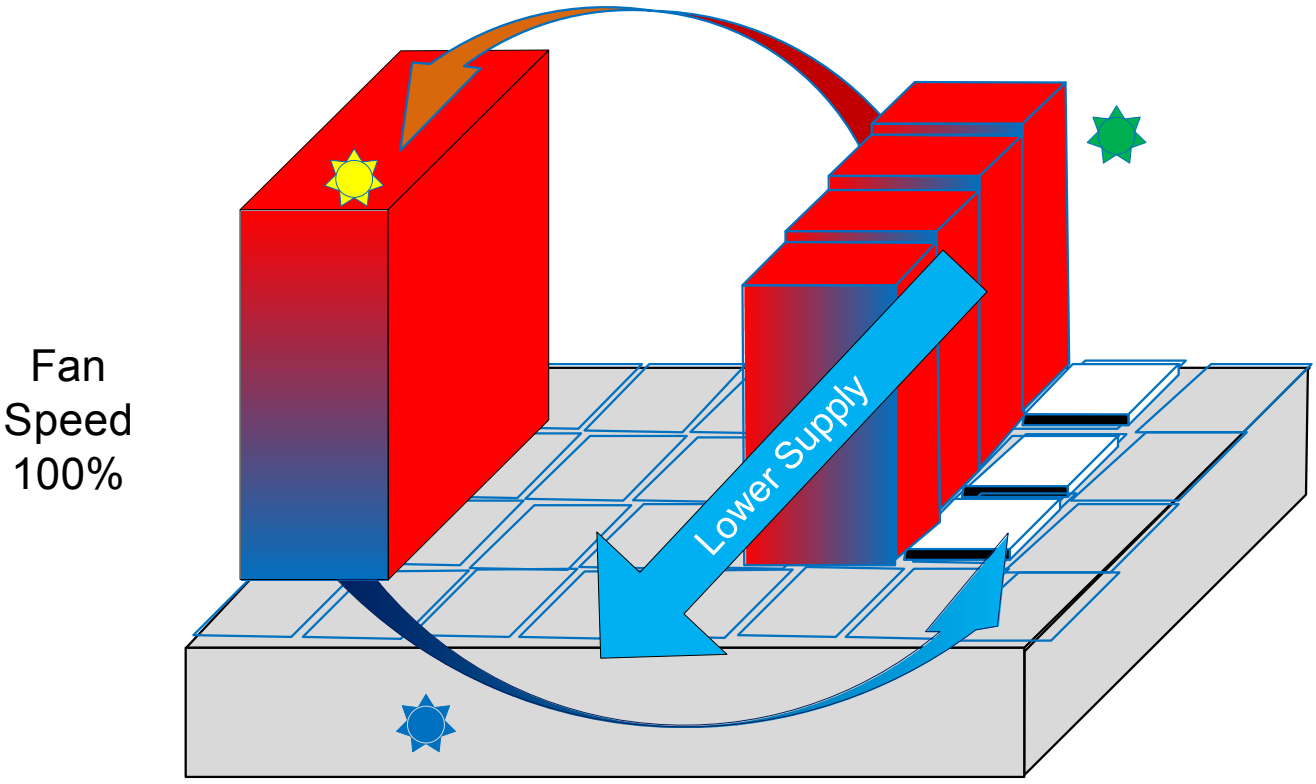
The return compensation setpoint will proportionally increase as the return temperature deviates below S114 "Return Compensation Setpoint." The compensation proportional band is set on line S115. The compensating proportional band defines the maximum value the air temperature setpoint will increase during return compensation. See **Figure 51**.

Figure 52 Return Compensation setpoint deviation



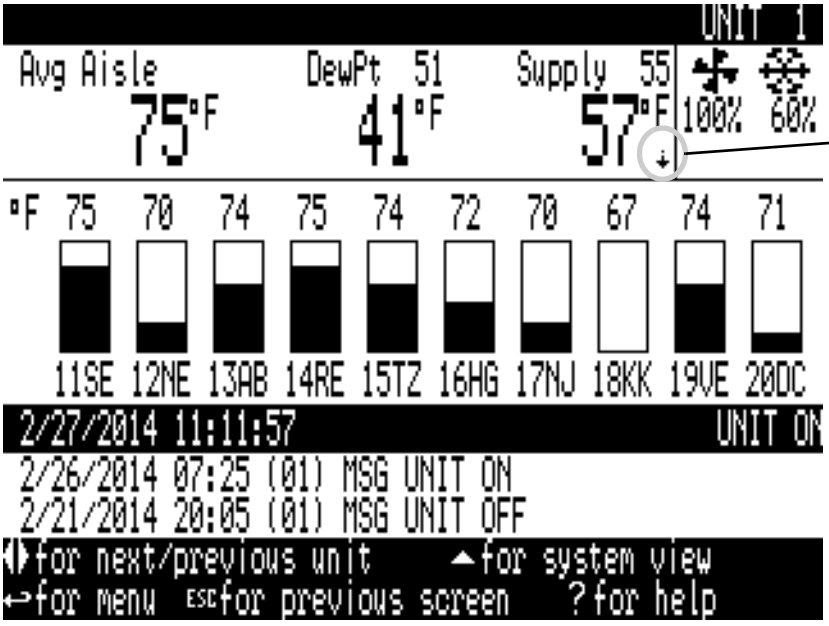
Supply Compensation: Supply temperature compensation allows units to automatically adjust the supply air temperature setpoint when the unit has reached its maximum airflow of 100% and the cold aisle temperature remains above the cold aisle setpoint. In this situation, the temperature compensation feature will proportionally decrease the supply air setpoint until the Inlet rack temperature reaches the setpoint.

Figure 53 Supply compensation



When supply air compensation has been invoked, it will be indicated on the unit view by a small downward-pointing arrow. See **Figure 54**.

Figure 54 Supply Compensation in Unit View



During normal operation, as the rack temperature increases above the fan temperature setpoint, the fan speed will increase until it reaches 100% speed. 100% fan speed is achieved once the controlling temperature reaches a value equal to 100% of the fan control band, or S116 Fan Setpoint + 1/2(S150 Fan Deadband) + 1/2(S149 Fan Temp Prop Band).

How many degrees the supply temperature will be lowered while supply compensation is invoked depends on how many degrees the fan controlling temperature has exceeded the control band compared to S116 Supply Compensation Value.

Example: With a Fan Setpoint of 70ºF and Proportional band of 10ºF, 0ºF deadband, the fan speed is 100% when the rack temperature is 75ºF. If S116 Supply Compensation value = 10ºF, the supply air temperature will lower one degree for every degree the rack temperature increases outside the fan control band. This means if the air temperature setpoint is 65ºF, and the rack temperature increase to 77ºF, the supply air temperature will lower to 63ºF.

Return + Supply Compensation: This selection provides the ability to enable both supply and return compensation settings as described above.

Figure 55 Supply compensation

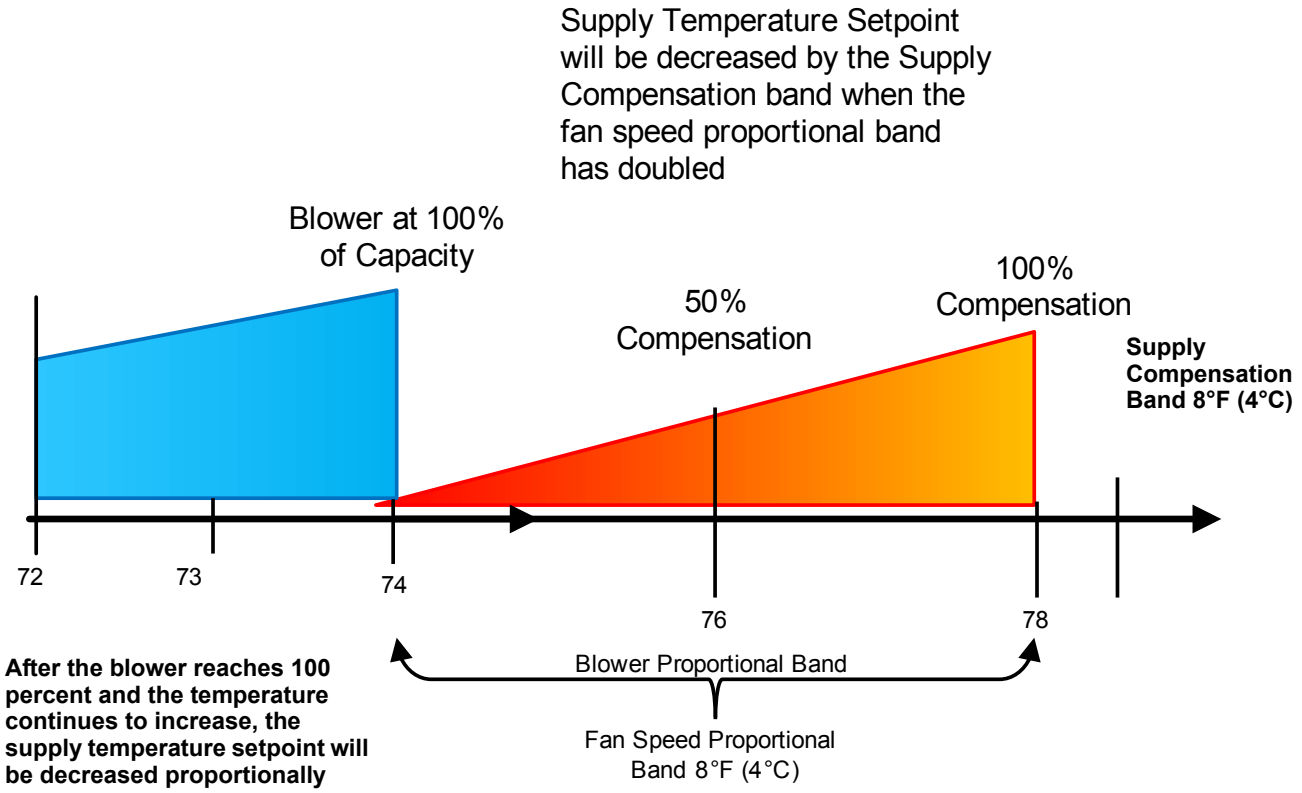
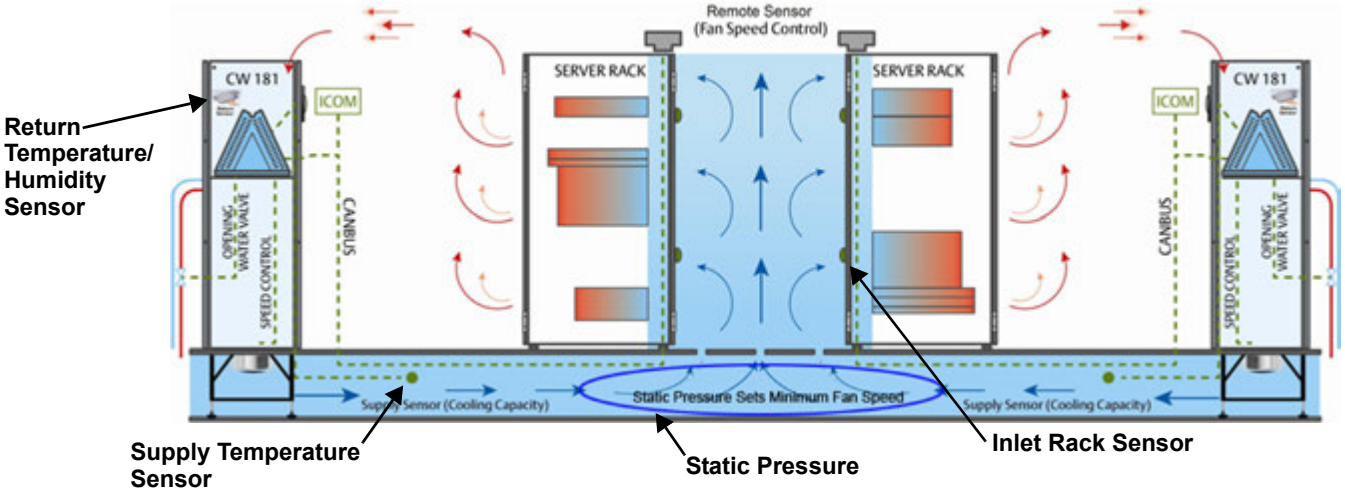


Figure 56 Temperature/humidity/static pressure control sensors in Optimized Aisle

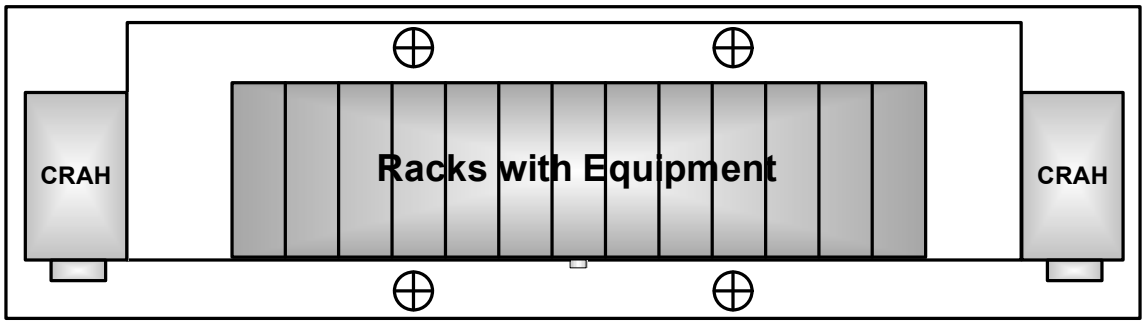


3.9.2 Static Pressure Control

Static pressure control normally refers to the control of a variable air flow device that will maintain a differential static pressure between two points. The two points of measurement are typically a point(s) below the raised floor in comparison to a point(s) above the raised floor, also known as ESP (External Static Pressure). There are other static pressure points within the data center that have also been used for control like the pressure differential between the inlet of a server rack as it compares to the outlet of a server rack in a containment application. No matter where the differential pressure is measured for control, the objective behind the control is to achieve the same result. Since static pressure measures the potential to flow air from the area of a higher pressure to a lower pressure, the result static pressure is trying to achieve is air flow.

The control method of static pressure is to define a setpoint in either inches of water column or in Pascal's that a controller will use to compare the actual differential pressure reading from either a single pressure sensor or multiple pressure sensors. The actual reading from the sensor is then compared to the static pressure setpoint and the fan speed is adjusted to keep the actual pressure reading at setpoint. The static pressure setpoint is selected by determining the amount of pressure it takes to produce air flow across a specific component. The components in a data center are normally a perforated floor tile or a contained hot / cold aisle.

Figure 57 Senor placement



Static pressure control in a data center has been derived from the building air management systems with the promises of a consist CFM or air flow from perforated floor tiles as they are added or removed from the white space. Using static pressure to control fan speed within an air handler with VAV (Variable Air Volume) systems has been applied successfully for many years. The key component that allows the system to work so well within an air handler system is the VAV box. In this type of system the VAV box controls the flow of air by adjusting a damper based on the local temperature that the VAV box serves. As the VAV box opens and closes to maintain its zone temperature a secondary control speeds up and slows down the supply fan to maintain a specific supply duct static pressure. As the zone heats up, the damper opens which lowers the static in the duct and the fan speeds up. Keep in mind that the zones are still controlled by temperature while the static pressure is only providing the potential to flow air by keeping a higher pressure in the duct than the area being conditioned.

For a data center to be as effective using static pressure control to maintain fan speed each perforated floor tile would need to act as a VAV damper box. Unfortunately, many of the data centers operating today do not have automatically adjusting dampers that adjust the air flow from each perforated tile.

Without the VAV part of the system, a raised floor data center application becomes a manual process to fine tune perforated tile locations based on server CFM demand. Static pressure control is also very dependent on the sensor position under the floor as floor obstructions like piping and cables can affect static pressure readings. In addition CRAH unit location and perforated tile placement can cause vortexes under the floor that would also affect the static pressure readings.

Understanding the limitations for static pressure to automatically adjust the fan speed based on the IT equipment demand should prompt an initial CFD (Computational Fluid Dynamics) evaluation of the site to determine high and low pressure areas under the floor. In addition CFD's should be performed when the floor tile arrangement changes or the IT equipment demand changes. The under floor environment will also change based on the floor tile arrangement changes and may not relate to above floor air flow expectations. The SixSigma® and Tile Flow® simulations in the next sections will illustrate under floor airflow in relation to tile flow and how the two variables change based on a unit being turned Off or in standby.

Contact your local Emerson representative for more information or to order the static pressure kit.

The Liebert iCOM control can accept up to four static pressure sensors connected to available analog inputs to modulate the fan speed as part of Optimized Aisle Control. The user can aggregate multiple sensor readings to control server airflow based on an average, maximum or minimum reading of the connected sensors.

Figure 58 Single static pressure sensor Liebert iCOM installation

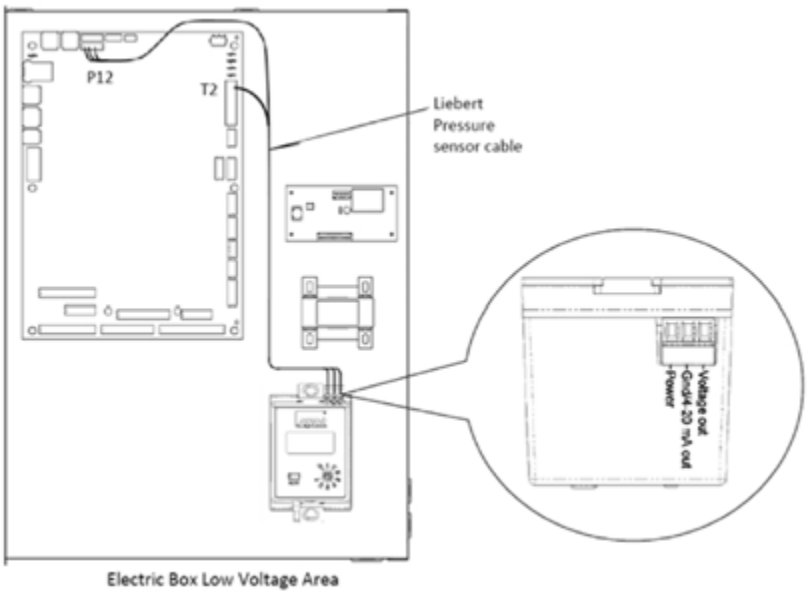
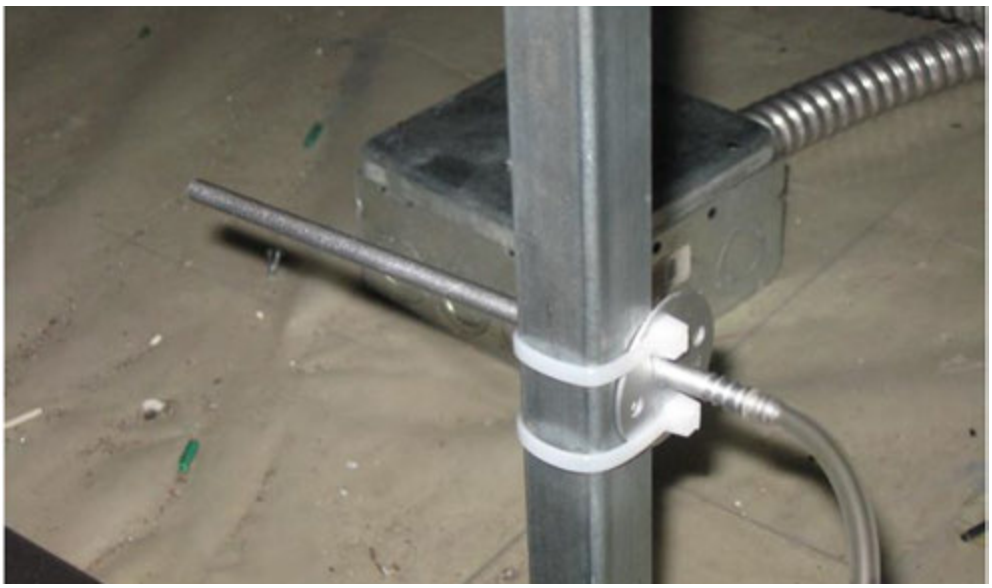


Figure 59 Static pressure sensor placement



Two modes of control can be selected when using static pressure to modulate EC and VFS fans with Optimized Aisle Control: limit and control. This choice can be made at S190 in the Service Setpoints Menu. The limit control method modulates the fan to ensure that the static pressure never falls below the static pressure setpoint, S191. If the static pressure is above the setpoint the fan will not be ramped down. The control method modulates the fan to ensure the static pressure setpoint is maintained. It will increase and decrease the fan speed to maintain the static pressure setpoint.

To help protect rack equipment, the Liebert iCOM may be programmed to override static pressure control if the return or remote temperature gets too warm. This feature will provide additional airflow to hot spots in the conditioned area if the static pressure setpoint is no longer suitable to maintain the required temperature.

Figure 60 S190 Limit

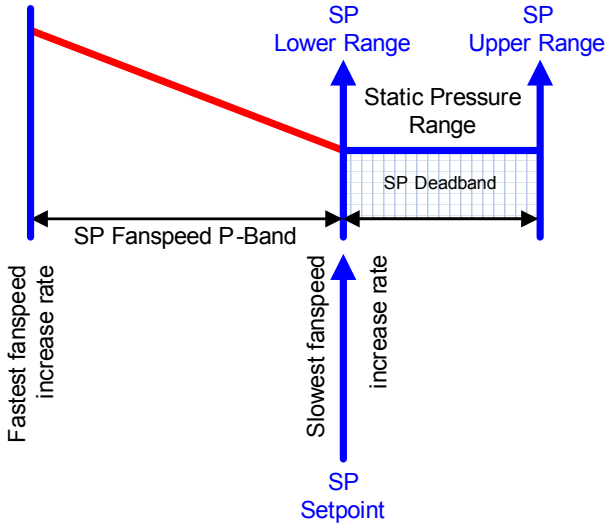
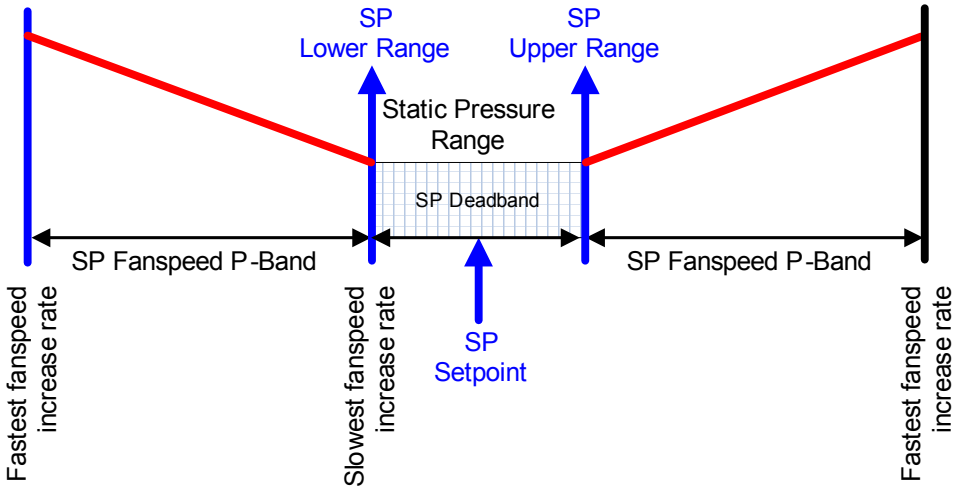


Figure 61 S190 Control



3.10 Event Types and Properties

Liebert iCOM events are used to inform the user of cooling unit operational status. All events are recorded in the Event Log, which is in the User Menu. The user can change the type (alarm, warn, message) and time delay of some events and can also enable or disable some events. These event settings are in the Service Menu under Set Alarms, pages 3 to 10. If an event has a safety function (high pressure, low pressure, main fan overload, etc.), the safety function will be executed in any case, independent of the selected event type or if enabled or disabled. The timing will function as set.

NOTE
Not all critical event properties can be adjusted.

Event Types

- **Message**: If this event occurs, it will only be entered into the event log.
- **Warning**: If this event occurs, a warning will be generated and entered into the event log. The common alarm relay will be activated only if parameter Warning Activates Alarm Relay located in the Service menu under Alarm Setup is set to Yes. The factory default is Yes.
- **Alarm**: When an alarm is received, a red light on the Liebert iCOM will blink and an alarm will sound, unless turned Off in the User Display Setup Menu. Pressing the alarm button will acknowledge the alarm but not clear it. The alarm will not be cleared until the issue has been corrected, reset internally by the control or reset manually by the user. For instance, alarms such as High Pressure can be cleared by changing the alarm counter to 0. If this event occurs, an alarm will be generated and entered into the event log. An alarm does not necessarily switch Off the whole cooling unit; that depends on which alarm occurs. If a standby unit is set, any alarm will stop the faulty unit and start the standby unit. Standby activation functions only on alarms; messages or warnings will not start a standby unit. For more on standby units, see **4.0 - Teamwork**.

Time Delay

Delays the event reaction once it is triggered. The time delay applies to safety functions and is entered in seconds.

Enable or Disable

Disabled events do not show up in the event log, on the display or on monitoring devices. Also, the common alarm relay will not be activated if a disabled alarm occurs. Safety functions, such as lockout compressor in case of high pressure are still performed.

NOTE
Once an event, either Warn or Alarm type, has been set to Disable, the associated alarm condition will not be annunciated. Disabled events may be reset only through the menu item Reset Disabled Alarms.

NOTE
The value of the external delay includes the internal delay if it is greater than the internal delay.

*The minimum setting of the external delay is the value of the internal delay. This is valid only for values marked with *.*

Table 11 Possible event settings—some events not available in all units

Event	Internal Delay (Before Action Occurs)	Default Delay / Selectable (Before Action Occurs)	Type (default)
MAIN FAN OVERLOAD	2 seconds	5 seconds / 0 – 9999 *	ALM
LOSS OF AIRFLOW	3 seconds	3 seconds / 0 – 9999 *	ALM
CLOGGED FILTERS	2 seconds	2 seconds / 0 – 9999 *	WRN
HIGH ROOM TEMP	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
LOW ROOM TEMP	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
HIGH ROOM HUM	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
LOW ROOM HUM	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
HIGH TEMP SENSOR A	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
LOW TEMP SENSOR A	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
HIGH HUM SENSOR A	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
LOW HUM SENSOR A	1 Min After Fan On	30 seconds / 0 – 9999	Fixed to WRN
COMP 1 OVERLOAD	Internal Calc.	no	ALM
COMP 2 OVERLOAD	Internal Calc.	no	ALM
COMP 1 HIGH PRESSURE	Internal Calc.	no	ALM
COMP 2 HIGH PRESSURE	Internal Calc.	no	ALM
COMP 1 LOW PRESSURE	Internal Calc.	no	ALM
COMP 2 LOW PRESSURE	Internal Calc.	no	ALM
COMP 1 PUMPDOWN FAIL	Internal Calc.	no	ALM
COMP 2 PUMPDOWN FAIL	Internal Calc.	no	ALM
DIG SCROLL1 HIGH TEMP	Internal Calc.	no	ALM
DIG SCROLL2 HIGH TEMP	Internal Calc.	no	ALM
EL HEAT HIGH TEMP	5 Sec	0 sec / 0 – 9999	WRN
WORKING HRS EXCEEDED	0 Sec	0 sec / 0 – 9999	Fixed to WRN
SMOKE DETECTED	2 Sec	2 sec / 0 – 9999 *	ALM
WATER UNDER FLOOR	2 Sec	2 sec / 0 – 9999 *	ALM
COND PUMP-HIGH WATER	2 Sec	2 sec / 0 – 9999 *	ALM
LOSS OF FLOW	5 Sec Reset Delay: 10 Sec	2 sec / 0 – 9999 *	ALM
STBY GLYCOL PUMP ON	2 Sec	2 sec / 0 – 9999 *	ALM
STANDBY UNIT ON	2 Sec	2 sec / 0 – 9999 *	ALM
HUMIDIFIER PROBLEM	2 Sec	2 sec / 0 – 9999 *	ALM
NO CONNECTION w/Unit1	Internal Calc.	-	WRN
UNIT X DISCONNECTED	Internal Calc.	-	WRN
LOSS OF POWER	0 Sec	No	ALM
CUSTOMER INPUT 1	2 Sec	2 sec / 0 – 9999 *	ALM
CUSTOMER INPUT 2	2 Sec	2 sec / 0 – 9999 *	ALM
CUSTOMER INPUT 3	2 Sec	2 sec / 0 – 9999 *	ALM
CUSTOMER INPUT 4	2 Sec	2 sec / 0 – 9999 *	ALM
CALL SERVICE	2 Sec	2 sec / 0 – 9999 *	MSG
HIGH TEMPERATURE	2 Sec	2 sec / 0 – 9999 *	MSG
LOSS OF AIR BLOWER 1	2 Sec	2 sec / 0 – 9999 *	ALM
REHEAT LOCKOUT	2 Sec	2 sec / 0 – 9999 *	WRN
HUMIDIFIER LOCKOUT	2 Sec	2 sec / 0 – 9999 *	WRN

Table 11 Possible event settings—some events not available in all units *(continued)*

Event	Internal Delay (Before Action Occurs)	Default Delay / Selectable (Before Action Occurs)	Type (default)
FC LOCKOUT	2 Sec	2 sec / 0 – 9999 *	WRN
COMPRESSOR(S) LOCKOUT	2 Sec	2 sec / 0 – 9999 *	WRN
COMP 1 SHORT CYCLE	0 Sec	0 - 9999	MSG
COMP 2 SHORT CYCLE	0 Sec	0 - 9999	MSG
No Power	0	0 seconds / 0-9999	WRN
Condensate 1 Failure	0	5 seconds / 0-9999	WRN
Condensate 2 Failure	0	5 seconds / 0-9999	WRN
EC Fan Fault	0	10 seconds / 0-9999	ALM
HIGH SUP TEMP	0	30 seconds / 0-9999	WRN
LOW SUP TEMP	0	30 seconds / 0-9999	ALM
REDUCED ECO AIRFLOW	0	3 seconds / 0-9999	WRN
ECO HI TEMP OVERRIDE	0	10 seconds / 0-9999	WRN
TEMP CTRL SENSOR FAIL	0	3 seconds / 0-9999	ALM
HIGH DEW POINT	0	30 seconds / 0-9999	WRN
LOW DEW POINT	0	30 seconds / 0-9999	WRN
HI DEW POINT SENSOR A	0	30 seconds / 0-9999	WRN
LOW DEW POINT SENSOR A	0	30 seconds / 0-9999	WRN
HIGH REMOTE SENSOR	0	30 seconds / 0-9999	WRN
POWER “A” FAILURE	0	10 seconds / 0-9999	ALM
POWER “B” FAILURE	0	10 seconds / 0-9999	ALM
AIRFLOW SENSOR FAILURE	0	10 seconds / 0-9999	WRN
HUM CTRL SENSOR FAIL	0	30 seconds / 0-9999	WRN
LOSS OF FLOW	0	5 seconds / 0-9999	ALM
STAT PRES SENSOR FAIL	0	120 seconds / 0-9999	ALM
LOW STATIC PRESSURE	0	120 seconds / 0-9999	WRN
HIGH STATIC PRESSURE	0	120 seconds / 0-9999	WRN
STATPRES OUT OF RANGE	0	150 seconds / 0-9999	WRN
DAMPER FAILURE	0	10 seconds / 0-9999	ALM
BMS DISCONNECTED	0	ENABLED / DIS - ENAB	WRN

3.10.1 High- and Low-Temperature and Humidity Events

High- and low-temperature and humidity alarms can be set for both the internal and optional external sensors. If a sensor reading exceeds a preset threshold, a warning will appear. These warnings are ignored after unit startup for a minimum of 1 minute. To increase the delay to warn, see **3.10 - Event Types and Properties**. The threshold settings are located in both the User and Service menus under Set Alarms.

To apply threshold limits on the internal cooling unit sensors, the Return Sensor Alarms must be enabled. The high and low temperature and humidity internal sensor thresholds can then be set. To apply threshold limits on the optional external sensors, the Sensor A alarms must be enabled. The high and low temperature and humidity external sensor thresholds can then be set. If no external sensors are connected to the unit, it is recommended that the Sensor A Alarms be disabled.

NOTE

The event messages will automatically reset if the temperature/humidity stays 1.8°F (1°C)/ 2% RH below or above the threshold for one minute.

3.10.2 User Inputs

The user can connect and specify up to four custom alarm inputs, also known as remote alarm devices (RAD), depending on unit configuration. Two optional customer inputs are available on some cooling units. The optional inputs are not available on units equipped with low-pressure switches on Liebert DX equipment. Low-pressure transducers may be field-installed in lieu of low pressure switches if additional customer inputs are desired.

Each input can be programmed to provide information about an event associated with the unit or space.

Each standard inputs is wired to Terminal 24 through a dry contact to locations 50, 51, 55 and 56, respectively, for Alarms 1 through 4 (see the unit's electric schematic and installation manual terminal location).

The customer input configuration settings are in the Service menu under Set Alarms, Screen 3 of 11. The choices for the customer inputs are shown in **Table 12** along with their associated reaction. The customer inputs can be programmed as normally open or normally closed to alarm.

NOTE

To enabled/disabled, delay activation and set event type (alarm, warn, message) see ***Event Types on page 68****.*

Table 12 Customer inputs

Setting	Reaction
Smoke	Event Only
Water Alarm	Event Only
C PMP Alarm	Event Only
Flow Alarm	Event Only
Stdby G Pmp	Event Only
Stdby Unit	Event Only
C-Input 1	Event Only
C-Input 2	Event Only
C-Input 3	Event Only
C-Input 4	Event Only
Rht Lockout	Event + Electrical Heaters Disabled
Hum Lockout	Event + Humidifier Disabled
Rht+Hum Lock	Event + Electrical Heaters and Humidifier Disabled
Comp Lockout	Event + Compressor(s) Disabled w/o Pump Down
Call Service	Event Only
High Temp	Event Only
Air Loss	Event Only
FC Lockout	Event + Free-Cooling Disabled
Heater Alarm	Event + Heaters Off
Flow AL SD	Event + Shut Down the Unit
Flow AL LC	Event + Lockout Compressors, No Pump Down (enabled only if at least one compressor is On; auto-reset depends on input status)
Comp Lock PD	Event + Compressor(s) Disabled w/ Pump Down
Enable FC	Forces Free-Cooling to On
HTRJ VFD	Activates the HEAT REJ VFD ALARM; no other function
HTRJ SPD	Activates the HEAT REJ SPD ALARM; no other function
FIRE ALARM	Event + Shuts the Unit Down
2^{ND} SETPOINT	No Event But Switches To The Second Setpoint
NO POWER	Event + Disables Unit
LSI	Event + Activates Humidifier Problem Alarm and Stop Filling Bottle When Full

Table 12 Customer inputs *(continued)*

Setting	Reaction
COND 1 FAIL	Event Only
COND 2 FAIL	Event Only
D-SCROLL RED	Event + Reduces the Requested Compressor Capacity by 20%
SWAP VALVE	No Event -Active X Valve Closes and Y Opens / Inactive Y Closes and X Opens
EC FAN FAULT	Event + Sets Analog Output to 10V
ECO AIRFLOW	Event + Reduces Liebert Air Economizer Airflow
DAMPERSWITCH	Damper + End Switch
POWER A	Event Only
POWER B	Event Only

3.10.3 Analog Inputs

The Liebert iCOM allows an external sensor or analog device to be connected, scaled and viewed on the Liebert iCOM large display. These external devices require optional analog input connections that can be installed on new units at the factory or added to existing units in the field. The option provides the electrical connection from the Liebert iCOM control board to the required factory-supplied plug, harness and terminal strip. For parts, contact Liebert Services at (800) 800-543-2778. If a unit is equipped with this option, then a 0-10VDC, 0-5VDC, 4-20mA, or a device such as a sensor or a damper can be connected to terminals 41 and 42, 43 and 44, 45 and 46 or 47 and 48. See **Table 13** for analog input availability.

Table 13 Number of analog inputs

Unit Type	Number of Analog Inputs
Liebert CW™ with MBV	4; 2 may be used for valve feedback
Liebert CW with 3P (Floating Point Actuator)	4; 2 may be used for valve feedback
Liebert DS™ Air-Cooled	2; 2 used for low-pressure transducers
Liebert DS Water/Glycol Cooling	0; models without high-pressure transducers may have two
Liebert Challenger 3000™ Air-Cooled	3; one used for low-pressure transducers
Liebert Challenger 3000 Water/Glycol Cooled	2; one used for a low pressure transducer and a second potentially for a high-pressure transducer

NOTE

The analog inputs must be configured with the large display. The small display can only view them.

Follow the settings in **Figure 62** and **Table 14** to set the input type based on the sensor output used. The default analog input is 0-5VDC. Only properly trained and qualified service technicians should change the analog input type.

Figure 62 Analog connection control board switch

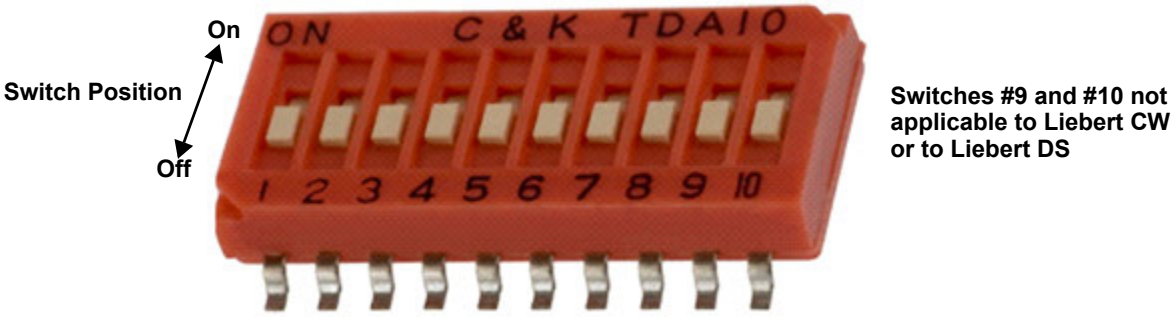


Table 14 Analog connection control board switch position

Analog Input #		Input #1		Input #2		Input #3		Input #4	
Control Board Switch Number		1	2	3	4	5	6	7	8
Analog Input Device Value	0 to 10VDC	Off	Off	Off	Off	Off	Off	Off	Off
	0 to 5VDC	On	Off	On	Off	On	Off	On	Off
	4 to 20mA	On	On	On	On	On	On	On	On

Switches #9 and #10 not applicable; 4 to 20mA settings supported only for manual fan control.

3.10.4 Liebert iCOM-DO™

The Liebert iCOM-DO is an optional discrete output relay card that can be connected to a Liebert iCOM for providing dry alarm contact outputs for monitoring systems. The Liebert iCOM-DO is a direct replacement of the Liebert ENV-DO™ card that was supported on previous Liebert control systems. The Liebert iCOM-DO allows simultaneous use of the Liebert IntelliSlot® cards as the Liebert iCOM-DO communicates over the CANbus network instead of the IGMnet or Velocity interface.

Liebert iCOM-DO card provides up to 15 configurable alarms through relay outputs. For the ratings and additional data, refer to the Liebert iCOM-DO manual, SL-28096. Each alarm output has three terminals: N/C, N/O and common. The Liebert iCOM-DO setup can be found in the Service, Liebert iCOM-DO menu (large display only). The Liebert iCOM-DO is pre-configured and its present is automatically detected by the Liebert iCOM once it is connected to the CANbus line. The default alarm configuration matches the original Liebert ENV-DO card alarm mapping.

For information on setting up this relay card, refer to the Liebert iCOM-DO manual, SL-28096, available at the Liebert Web site: **www.liebert.com**

Table 15 Alarm mapping

#	Alarm	Notes
01	Cooling Status	The output is active when cooling is on.
02	Heating Status	The output is active when heating is on.
03	Humidifying Status	The output is active when humidification is on.
04	Dehumidifying Status	The output is active when dehumidification is on.
05	High Temperature	The output is active when high temperature alarm is active.
06	High Humidity	The output is active when the high humidity alarm is active.
07	Low Temperature	The output is active when the low temperature alarm is active.
08	Low Humidity	The output is active when the low humidity alarm is active.
09a	High Head Pressure C1	The output is active when the compressor 1 high head pressure alarm is active.
09b	High Head Pressure C2	The output is active when the compressor 2 high head pressure alarm is active.
10	Loss of Airflow	The output is active when a loss of air flow alarm is active.
11	Change Filters	The output is active when a change filter alarm is active.
12	Water Alarm	The output is active when a water alarm is active.
13	Condensing Pump Alarm	The output is active when the condensing pump alarm is active.
14	Glycool Status	The output is active when is free-cooling active.
15	Unit On	The output is active the unit is turned On.

An event is active as long as it is not acknowledged. Once acknowledged, an alarm remains active until the event situation is not true anymore and the event is reset by the board, which switches Off the red LED and the general alarm relay.

3.10.5 Possible Event Notifications

Table 16 lists examples of alarms and warnings that can be configured for a cooling unit. When any of these occur, they will appear on the Liebert iCOM Status menu and will be recorded in the Liebert iCOM Event log.

Table 16 Event notifications—large or small display

Event	Type
COMP 1 HRS EXCEEDED	WRN
COMP 2 HRS EXCEEDED	WRN
EL HEAT1 HRS EXCEEDED	WRN
EL HEAT2 HRS EXCEEDED	WRN
EL HEAT3 HRS EXCEEDED	WRN
FC HRS EXCEEDED	WRN
GENERAL ALARM	ALM
GLYCOL TEMP SENSOR	WRN
HIGH CW TEMP	WRN
HUM HRS EXCEEDED	WRN
HUMIDIFIER PROBLEM	—
HW/HG HRS EXCEEDED	WRN
LOSS OF CW FLOW	ALM
NETWORK FAILURE	WRN
ON-OFF KEY DISABLED	WRN
POWER ON	MSG
POWER OFF	MSG
ROOM SENSOR FAILURE	ALM
UNIT DISABLED	MSG
UNIT HRS EXCEEDED	WRN
UNIT ON	MSG
UNIT OFF	MSG
UNIT DISABLED	MSG
UNIT SHUTDOWN	MSG
UNIT SYNCHRONIZATION	MSG
SENSOR A FAILURE	WRN
SLEEP MODE	MSG
STANDBY MODE	MSG
SUPPLY SENSOR FAILURE	WRN

3.11 Wellness—Next Maintenance Calculation

The next maintenance calculation, as well as the diagnostics feature, will help keep the cooling unit running at peak performance to ensure minimum component stress and maximum reliability. The diagnostics will help the service engineer evaluate the unit's operation since the last maintenance.

3.11.1 Calculating Next Maintenance and Diagnostics

If the unit includes any of the following components, they are included in the calculation:

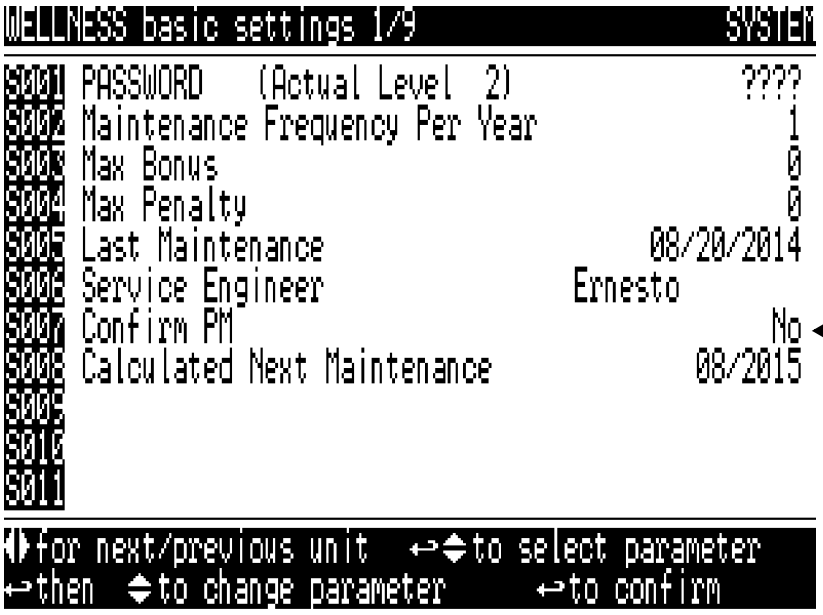
- Fan(s)
- Compressor 1
- Compressor 2
- Electric Heaters
- Humidifier

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

- Standard service interval (1, 2 or 4 times a year) (to be set)
- Working hours (counted)
- Number of starts (counted)
- Average running time (calculated)
- Optimum number of starts per hour (to be set)
- Maximum number of starts per hour (to be set)
- Maximum bonus to enlarge time to next maintenance (to be set)
- Maximum penalty to reduce time to next maintenance (to be set)

Calculating Unit Wellness

Figure 63 Wellness—Basic settings screen, page 1 of 9



To confirm that preventive maintenance has been performed:

1. Go to line Service>Wellness>Basic settings>S007 and select YES.
2. Press the enter button. This will confirm the preventive maintenance. Line S005 will change to the date of the preventive maintenance was performed. Line S008 will update to show the next calculated maintenance date.

Liebert iCOM keeps tabs on the condition of a cooling unit, determining its wellness and projecting when service will be needed, for the entire unit as well as for individual components. This assists in scheduling maintenance calls and helps pinpoint components likely to require service.

Liebert iCOM displays a graphic for needed maintenance. It begins with the standard maintenance interval—12 months, six months or three months—and adjusts that based on its calculation of components' wellness.

To calculate wellness, Liebert iCOM keeps a running total of component working hours and the number of times it has been started. Liebert iCOM relates that data to the optimum/maximum starts per hour. Accordingly, Liebert iCOM will increase or decrease the time before the next service call.

The more frequently a component starts, the sooner it is likely to need maintenance. If, for example, a unit's fan runs continuously, but it's compressor starts and stops often, Liebert iCOM records that and calls for maintenance based on the compressor's wellness factor.

Alarms and warnings, such as clogged filters or high or low pressure, reduce the time till the next maintenance to zero. If the alarm is cleared and reset, Liebert iCOM recalculates wellness. It begins with the pre-alarm maintenance time and factors in the alarm.

Parameters for Next Maintenance Calculation

General Maintenance Settings

- **Maintenance Frequency**—can be set as one to 12 months or to zero, which disables maintenance calculation
- **Max. Bonus**—increases the time to next maintenance with the set value, if all components run optimally (number of starts, average running time)
- **Max. Penalty value**—decreases the time to next maintenance with the set value, if some components run in non-optimum way (number of starts, average running time)
- **Last Maintenance**—date can be set from service-engineer; informational
- **Service-Engineer**—name of the service engineer; editable
- **Reset**—puts all counters of all components, such as (motor, compressors, heaters and humidifier), at zero and starts a new maintenance calculation (reset to be done after maintenance)

Fans / Heaters / Humidifier Settings and Diagnostics

- Number of starts and Working hours are counted separately since the last maintenance. Total working hours can be read in the standard working hours window (customer window).
- Average Working Hours is the calculation, resulting from starts and working hours.
- Starts per Day Optimum is the number of starts considered as optimum.
- Starts per Day Worst is the number of starts considered as hunting (worst case).
- Number of Alarms counts the alarms, happened between two service intervals.
- Actual Bonus is calculated from number of starts and average working time. Can be positive (bonus) or negative (penalty). This value influences the time remaining to the next maintenance.

Compressor 1 / 2 Settings and Diagnostics

- Number of starts and Working hours are individually counted since the last maintenance. Total working hours can be read in the standard working hours window (customer window).
- Average Working Hours is the calculation, resulting from starts and working hours.
- Starts per Day Optimum is the number of starts considered as optimum.
- Starts per Day Worst is the number of starts considered as hunting (worst case).
- Number of HP Alarms counts the high-pressure alarms, happened between two service intervals.
- Number of LP Alarms counts the low-pressure alarms, happened between two service intervals.
- Number of TH Alarms counts the thermal protection alarms, happened between two service intervals.
- Actual Bonus is calculated from number of starts and average working time. Can be positive (bonus) or negative (penalty). This value influences the time remaining to the next maintenance.

4.0 TEAMWORK

Unit-2-Unit (U2U) communications via a private network will allow the following functions to be placed into operation when the requirement exists. The user must install the correct hardware (see **5.0 - Installing a Liebert iCOM Unit-to-Unit Network**) and properly program the units for the selected functionality.

The Liebert iCOM network can perform the following functions:

The **Teamwork Mode** functions allow for multiple stages of cooling/heating and humidification/dehumidification. Teamwork Mode can be used to prevent environmental units from "fighting," where one environmental unit might be cooling while another unit is heating.

The **Standby (Lead/Lag)** function allows one or more units to be set as "Running" and "Standby" for activation in case of an alarm. This function also allows the units to be programmed in a rotation to help ensure "Standby" unit operation.

The **Cascade Operation** function allows additional units to be staged-on based on the temperature or humidity requirement.

The **Virtual Master** function provides smooth control operation if the group's communication is compromised. When the lead unit, which is in charge of component staging in teamwork, unit staging and standby rotation, becomes disconnected from the network, the Liebert iCOM automatically assigns a virtual master. The virtual master assumes the same responsibilities as the master until communication is restored.

NOTE
All connected units in the group must have iCOM software PA2.01.48R or later for the Virtual Master feature to function.

4.1 Compatibility With Previous Liebert iCOM Controls

Extensive upgrades to the Unit-to-Unit communication software prevent Liebert iCOM controls with PA2.01.48R software from being compatible with Liebert iCOM controls that have earlier versions of Liebert iCOM software. Liebert iCOM controls with PA2.01.48R software will not communicate with Liebert iCOM controls with PA**1**.XX.XXXSTD software.

Customers who have Liebert iCOM controls with the PA**1**.XX.XXXSTD software and who need additional Liebert iCOM units can:

- Purchase new units with the previous software installed at the factory
- Purchase new units with the PA2.01.48R software and have a properly trained and qualified technician downgrade the units to PA1.04.043.STD
- Have a properly trained and qualified technician upgrade the older unit(s) with PA2.01.48R

For further information, contact your local Emerson representative.

4.2 Teamwork Modes

Groups of cooling units connected to a network can be set up to work together in any of these teamwork modes:

- No Teamwork
- Teamwork Mode 1
- Teamwork Mode 2
- Teamwork Mode 3 (software Rev. PA2.00.05R or higher required)

All Liebert iCOM-controlled cooling units on a network must be set to run in the same teamwork mode.

4.2.1 Application of Teamwork Modes

All units in a network will run in the same Teamwork Mode.

- **No Teamwork**: Multiple zones in one room
- **Teamwork Mode 1**: Balanced load (small groups of units inside the same environment)
- **Teamwork Mode 2**: Unbalanced load (large rooms, not all units will have the same load) (work well for most applications)
- **Teamwork Mode 3**: Allows the cooling capacity (Supply Sensor) to operate as a local control by removing only the amount of load required to maintain the discharge air temperature at each unit. This allows for an unbalanced room load while maintaining a consistent discharge air temperature. The fan speed is controlled by the remote rack sensors (return, supply, under floor static pressure) of all units, providing a controlled delivery method of the air to the cold aisle. In raised floor applications, Liebert iCOM units will share sensor information to achieve even under-floor air distribution. This distribution is achieved by operating all fans in parallel, which will also yield the greatest energy efficiency.

4.2.2 No Teamwork

All cooling units work independently, responding to their own sensors. Standby function and unit rotation are possible, but cascading is not (see **Standby and Cascade on page 90**). Autoset will not adjust the proportional band in this mode.

4.2.3 Teamwork Mode 1

Teamwork Mode 1 works best in small rooms with balanced heat loads. The return temperature and humidity sensor readings of all units in operation (fan on) are averaged by the master unit, Unit #1, and used for control. The master unit will send the operating requirements to all operating units according to unit numbers, rotated by one unit every 24 hours.

In this teamwork mode, most of the parameters are shared; if set in any one of the units, all other units will follow with the same settings. AutoSet will adjust the proportional band in Teamwork Mode 1, see **3.3 - Temperature Control**.

The master unit evenly divides the system proportional band among the number of available units. Each unit will receive instruction on how to operate from the master unit based on how far the system deviates from the setpoints.

The number of available units is calculated like:

- In non-standby configuration: all units with fan on
- In typical standby function (no cascade): all units with fan on
- In cascade mode: all units that could operate (no alarm, which forces the unit to switch Off, unit not switched Off, etc.)

NOTE

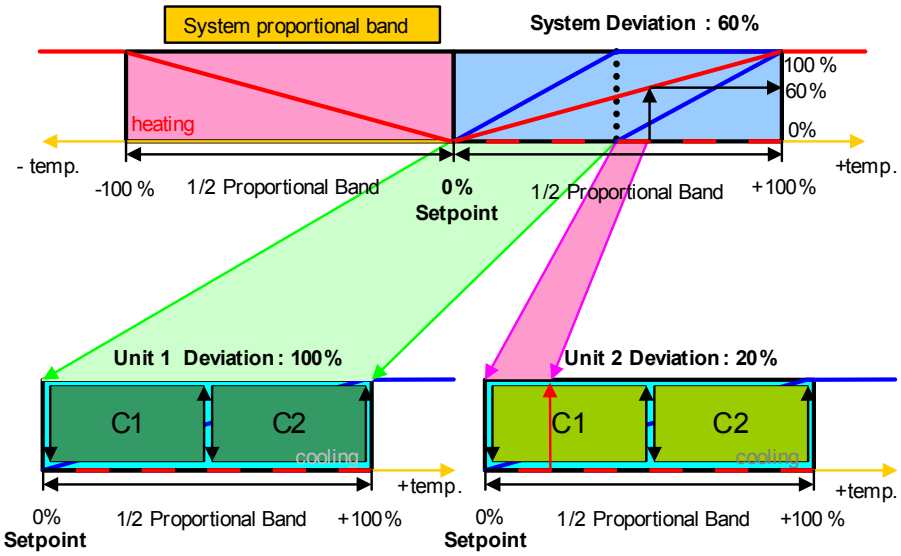
1. *Proportional actuators (chilled water valves and free-cooling valves) are driven in parallel.*
2. *Dual-cool and free-cooling units cannot be set in Teamwork 1 if compressors and free-cooling valves are set for simultaneous operation.*
3. *On free-cooling or dual-cool units where simultaneous operation is set to No, chilled water valves ramp in parallel. If free-cooling is not possible for one unit, the group will switch to compressor operation. Compressor staging may work serially or in parallel depending on compressor type. See below for compressor ramping.*
   - *The compressors will ramp in parallel if all units in the group are digital scroll.*
   - *Compressor staging will be done serially if all the units in the group are four-step, two-step semi-hermetic or standard scroll.*
   - *Compressor staging will be done in parallel if there is a mix of digital scroll compressors with four-step, two-step semi-hermetic or standard scroll.*
4. *Low limit and dehumidification are managed from each unit independently.*

Figure 64 shows how two cooling units work together in Teamwork Mode 1,staging compressors serially. Since Unit 1 and Unit 2 are available to operate, the master unit, Unit 1, collects the average or maximum (based on S804 “Teamwork is based on” programming) temperature and humidity sensor readings from each unit. Settings in S804 “Teamwork is based on” programming determines whether the unit uses the average or maximum temperature and humidity sensor.

The master unit determines that a 60% call for cooling is required for the system. Since there are two available cooling units, each unit makes up half of the system proportional band; Unit 1 handles 0-50% system call for cooling and Unit 2 handles 51-100%. For every 1% system call for cooling, each unit provides 2% of its total cooling capacity.

The 60% system call for cooling exceeds the 50% Unit 1 can provide, so Unit 1 operates at full capacity. The remaining 10% system call for cooling (60% - 50% = 10%) is handled by Unit 2. Unit 2 responds by operating at 20% cooling capacity (50% - 10% = 40%).

Figure 64 Teamwork Mode 1, serial staging



4.2.4 Teamwork Mode 2

Teamwork Mode 2 is designed to prevent units within a group from working in opposing modes, some cooling and some heating. It is best applied in large rooms with unbalanced heat loads. In Teamwork Mode 2, all temperature and humidity parameters are shared. Unit #1 monitors all of the available unit sensor readings on the network to determine the greatest demand, whether it be for cooling, heating, dehumidification or humidification.

For example, if most of the units connected in the group have a cooling request and a smaller number have a call for heating, the units requesting cooling are released to start cooling. The units with a call for reheat will not reheat, but will operate only their evaporator fans.

Teamwork Mode 2 does not rotate; unevenly distributed working hours are to be expected. Autoset will not adjust the proportional band in this mode.

NOTE

In Teamwork Mode 2, all units must have the same setpoints. The units' proportional band, deadband and related settings may differ.

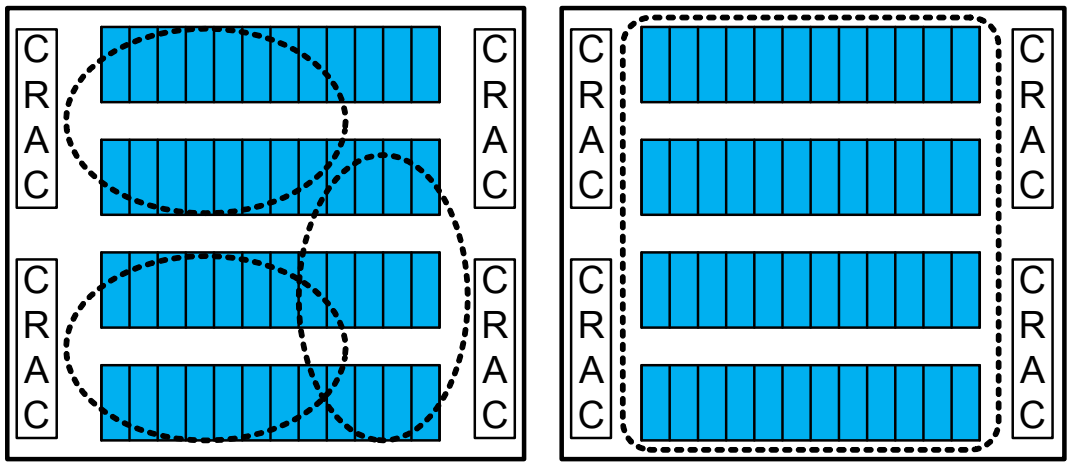
4.2.5 Teamwork Mode 3 (Optimized Aisle)

Teamwork Mode 3 can be selected when the units are set to operate in Optimized Aisle Control mode and have been connected in a unit-to-unit network. Teamwork provides coordination between the units that will prevent "fighting" by not allowing units to operate in conflicting modes of operation at the same time by selecting which mode to operate within based on the average of the collective unit sensors (Cooling vs. Heating and Humidifying vs. Dehumidifying). For additional details, see **3.9 - Liebert Optimized Aisle Control**.

Teamwork Mode 3 allows the cooling capacity (Supply Sensor) to operate as a local control by removing only the amount of load required to maintain the discharge air temperature at each unit. This allows for an unbalanced room load while maintaining a consistent discharge air temperature. The fan speed is controlled by the remote rack sensors of all units, providing a controlled delivery method of the air to the cold aisle. In raised floor applications, Liebert iCOM units will share sensor information to achieve even under-floor air distribution. This distribution is achieved by operating all fans in parallel, which will also yield the greatest energy efficiency.

Figure 65 shows the difference in both under-floor air distribution and energy consumption when Variable Fan speed and Teamwork Mode 3 are applied to the Liebert cooling units. The example on the left is using the standard standby configuration; the example on the right is utilizing Teamwork Mode 3. The units below are assuming that the fan power consumed at each unit is 8.1kW when operating at 100%.

Figure 65 Teamwork Mode 3—Fixed speed vs. variable speed



Cascade

When data center environments require the cooling equipment to modulate from very low loads to the full design load, iCOM can coordinate unit capacity and unit activation in accordance with the Teamwork Mode 3 operation described above. The Liebert iCOM optimized aisle controlled units that are placed into Standby mode will activate as the room environment demands more cooling capacity. iCOM will monitor the rack sensors and current operating state of each unit to determine when to activate a standby unit.

To provide the most efficient operation from a system perspective, the Liebert iCOM will first ramp the operating units fans and chilled water valve to compensate for the increased heat load. Once the operating units have reached a set fan speed, the supply compensation (see **Figure 107**) may be activated to determine if a lower supply temperature can compensate for the load increase. Once the supply compensation routine has reached its threshold then the Liebert iCOM will activate a standby unit within the group.

Lead / Lag - Failure Scenarios

When redundancy configurations are required, the Liebert iCOM unit-to-unit network has built in fail-over conditions that require no building management interaction. The first and possibly most common failure scenario is a single unit or component failure. In this situation, the Liebert iCOM will automatically activate a standby unit in the place of the failed unit.

Unit-to-Unit and sensor failure scenarios have also been programmed into the Liebert iCOM controller. For example if the remote sensors fail at the unit level, the unit will continue to operate using the other unit's remote sensor values. If all remote sensors fail, then the fan speed will begin to operate from the supply sensor. If the supply air sensor fails, then the unit will default to 100% fan and cooling capacity. In the event of a unit to unit network switch failure, each unit will operate from its sensor network.

If one unit becomes disconnected from the network, the disconnected unit will run independently according to the local sensor readings. If U2U address No. 1 becomes disconnected from the group, each unit will run independently according to the local sensor readings.

Application and Configuration of Rack Sensors

The inlet rack temperature sensors should be placed on a rack that is within the area of influence of the connected cooling unit. The following floor plan shows how the sensors should be placed. The sensors and units are color matched to show the location of each unit's sensors. This particular floor plan shows how the sensors can be interlaced with one another to provide redundancy of the different unit's sensors. Remember that the sensor data from each unit is shared at the teamwork level so placement of the sensors is flexible with your specific application. So even when one unit fails the other units are still able to react based on the failed units sensors.

Each unit can connect up to 10 sensor modules with each module allowing for two temperature probes for a total of 20 temperature readings per cooling unit. Each of the two probes allows for 6 feet of distance between the temperature probe and the module. This provides the flexibility to either place both temperature sensor probes at the top of two different racks or to place one sensor probe in the middle of the rack and one at the upper two thirds of the rack. Sensors can be placed in other locations like the hot aisle but should be set as a reference sensor and not a controlling sensor. This will allow the sensor to be monitored by the Liebert iCOM display and building management system but will not affect unit operation.

The rack sensors that are set to control have the flexibility to be set in different averaging schemes. There are three different levels of sensor calculations; at the sensor level, at the unit level and at the system level (unit to unit network). At the sensor level, the two probes on each rack sensor can be set to average or take the maximum value of the two sensors. The setting at the unit level allows the operator to select how many of the controlling sensors are averaged. If the unit has 10 rack sensors connected for control, the operator can elect to average 1 through 10 of the sensors. For example, selecting 3 sensors to average would use the 3 highest sensor readings out of the 10 possible sensors. Even though only three sensors are being used for the average, all 10 are being dynamically monitored with Liebert iCOM's rack sensor scanning routine. This means that the three highest sensors today might not be the three highest sensors tomorrow.

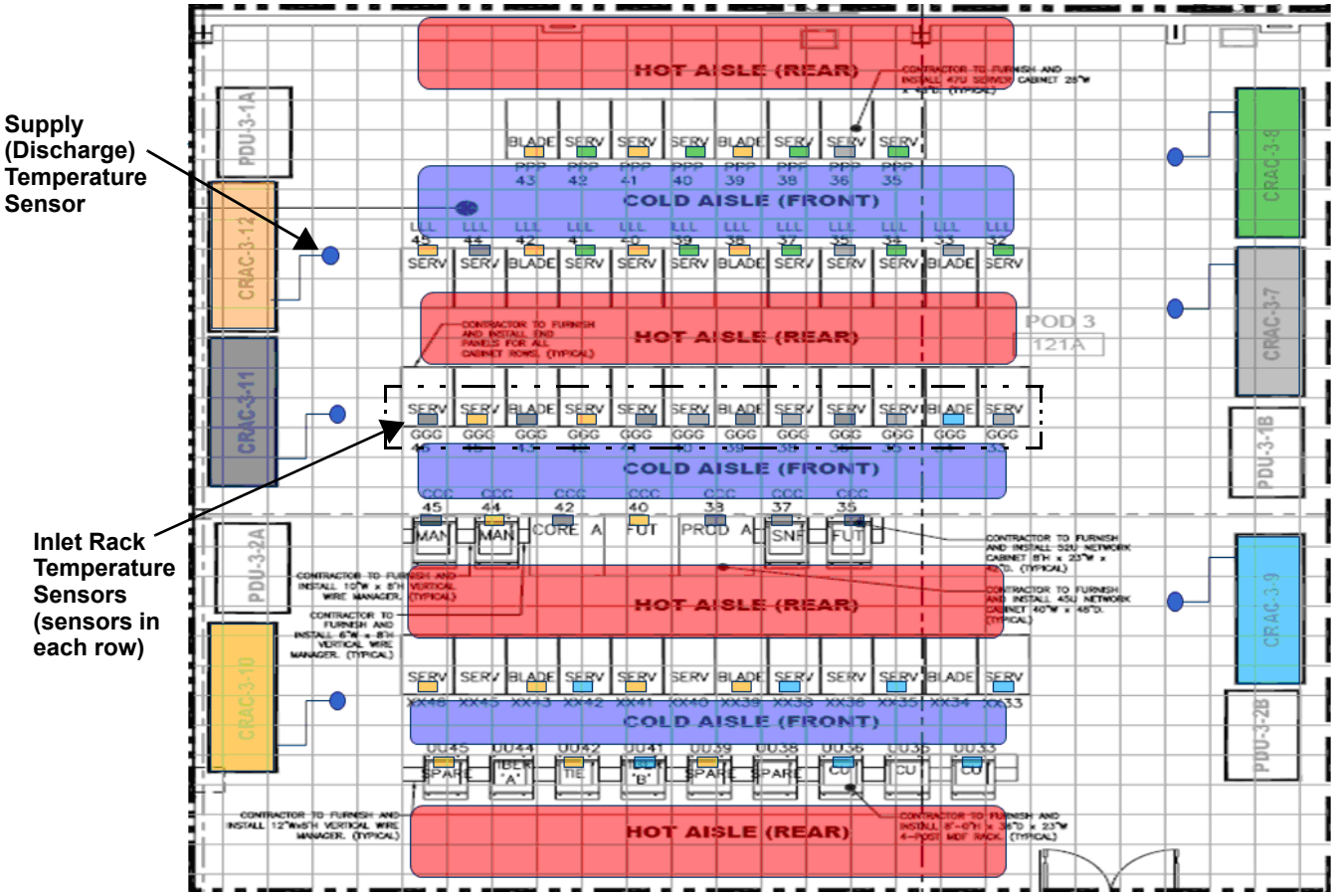
The system level calculation provides the same level of flexibility as described above for the unit level sensor configuration. All remote sensor values, including values from sensors connected to standby units, are shared among units in the group. Providing this level of configuration at the unit and system level coupled with the rack sensor scanning allows the units and system to be setup for a variety of applications, including no containment, end containment and total containment. In addition it also allows Liebert iCOM to adjust airflow and cooling capacity as the environment changes or if the heat load shifts, increases or decreases.

Figure 66 Remote sensors

REMOTE SENSORS 1/2 ◄UNIT 01►

SB01	PASSWORD (Actual Level 2)			????
SB02	Individual Remote Sensors Mode			Maximum
SB03	Unit Remote Sensors Mode/AVG incl			Average / 10
SB04	Remote Sensor Node 01	11SE	75°F	Control
SB05	Remote Sensor Node 02	12NE	70°F	Control
SB06	Remote Sensor Node 03	13AB	74°F	Control
SB07	Remote Sensor Node 04	14RE	75°F	Control
SB08	Remote Sensor Node 05	15TZ	74°F	Control
SB09	Remote Sensor Node 06	16HG	72°F	Control
SB10	Remote Sensor Node 07	17NJ	70°F	Control
SB11	Remote Sensor Node 08	18KK	67°F	Control
SB12	Remote Sensor Node 09	19VE	74°F	Reference
SB13	Remote Sensor Node 10	20DC	71°F	Disabled

Figure 67 Sensor positioning



4.2.6 Hardware Setup

The Liebert Optimized Aisle Control requires:

- A temperature/humidity sensor in the cold aisle and connected to the Liebert iCOM via CANbus. This can be done by:
  - Moving the return temperature sensor from the cooling unit to the cold aisle with a longer CANbus cable
    —OR BY—
  - Obtaining a remote temperature sensor and addressing it to operate as the return temperature sensor.
- An additional supply temperature sensor placed under the raised floor.

4.3 Liebert Optimized Aisle Rack Sensor Installation

Each 2T sensor has two wires leaving the housing with temperature sensors on the end of each wire; see **Figure 68**.

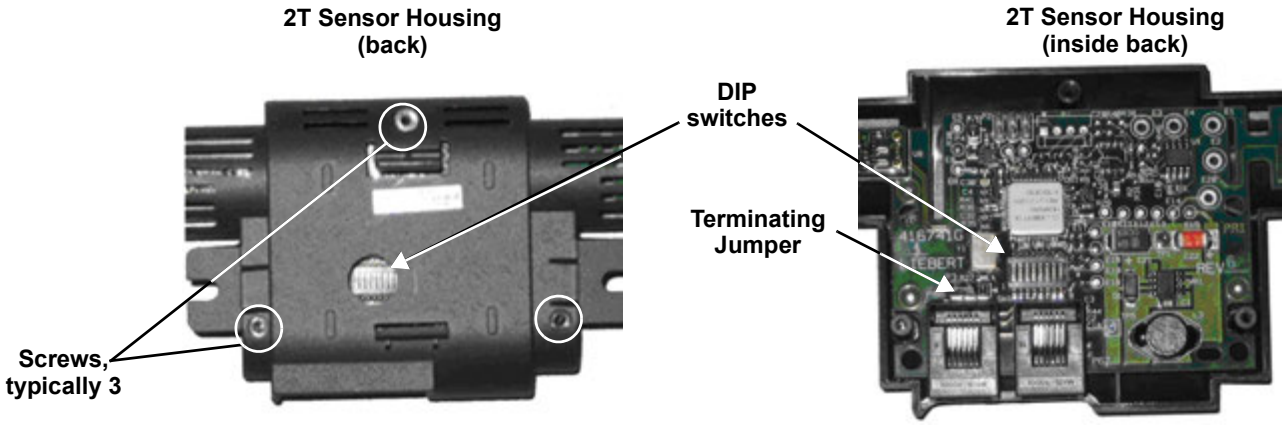
Figure 68 2T sensor

Sensors shown may differ depending on equipment installed

To install the Optimized Aisle Control 2T Sensor Array:

1. Set the DIP switch settings for the 2T sensors.
2. Terminate the final sensor on the CANbus link.
3. Install the 2T sensors on racks to be monitored.
4. Install the CANbus cable between 2T sensors.
5. Install the CANbus cable at the unit.

Figure 69 Setting DIP switches for 2T sensors



4.3.1 Tools Required for Installation

- Small, non-conductive tool for setting control DIP switches
- Medium flat-head screw driver for opening electric panel protective dead-front.
- Cutting tool to trim cable ties
- Small Phillips-head screwdriver to open 2T housing

4.3.2 DIP Switch Settings

The individual 2T sensor must be given a unique address on the CANbus cable run to the associated Liebert unit. DIP switches are used to give the 2T sensor its unique address. It is important to confirm that the DIP switches have been set correctly using **Table 17**. Although it is not required, it is recommended that the DIP switch sensor number settings correspond to the number of 2T sensors on the CANbus run. For example, if there are only four 2T sensors used for a particular Liebert CW unit then the individual DIP switch settings should correspond to address #1, #2, #3 and #4. If the DIP switches are not set correctly, the control will not operate properly.

Figure 70 DIP switches in 2T sensors

Switch Up = ON

Switch Down = OFF

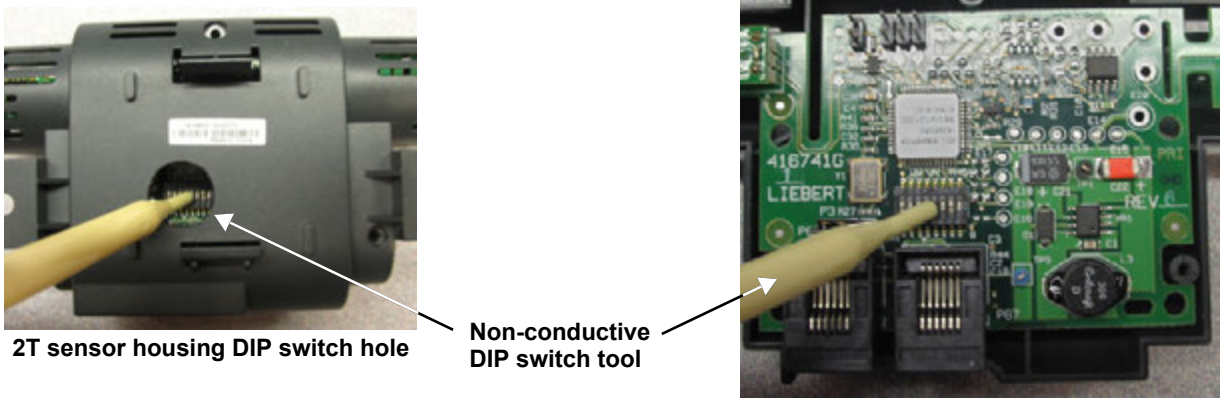
Table 17 DIP switch settings for remote sensor applications

2T Sensor #	DIP switch Position							
	1	2	3	4	5	6	7	8
1	Off	Off	On	Off	On	Off	Off	Off
2	On	Off	On	Off	On	Off	Off	Off
3	Off	On	On	Off	On	Off	Off	Off
4	On	On	On	Off	On	Off	Off	Off
5	Off	Off	Off	On	On	Off	Off	Off
6	On	Off	Off	On	On	Off	Off	Off
7	Off	On	Off	On	On	Off	Off	Off
8	On	On	Off	On	On	Off	Off	Off
9	Off	Off	On	On	On	Off	Off	Off
10	On	Off	On	On	On	Off	Off	Off

Set 2T Sensor Identities - DIP Switch Settings

1. Confirm that the DIP switches are set correctly for all 2T sensors.
2. Apply numbered stickers to the sensor housings, corresponding to sensor chain position.
3. Based on the sensor number, use the included DIP switch tool to set the DIP switches according to **Table 17**. If the settings are difficult to make through the opening in the housing or if the hole is not present, open the case by removing the three Phillips-head screws. Reassemble housing once the settings are made.

Figure 71 Setting 2T Sensor DIP Switches

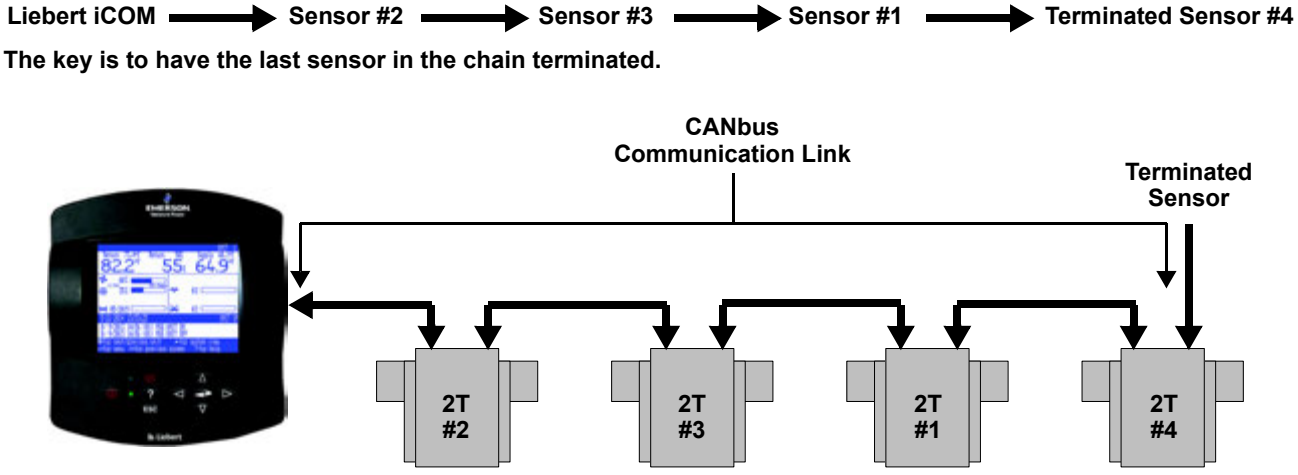


NOTE
Use included DIP switch tool (or similar tool). DO NOT insert any metal object into the sensor case.

4.3.3 Terminate the Final Sensor on the CANbus Link

2T Sensors do not need to be addressed in numerical order. For example, if four sensors are purchased, they can be connected as shown in **Figure 72**.

Figure 72 2T sensor arrangement and termination



In the above example, if additional sensors are added to extend the existing sensor network, Sensor #4 must be unterminated. The additional sensors can be connected. The last sensor in the extended network must be terminated.

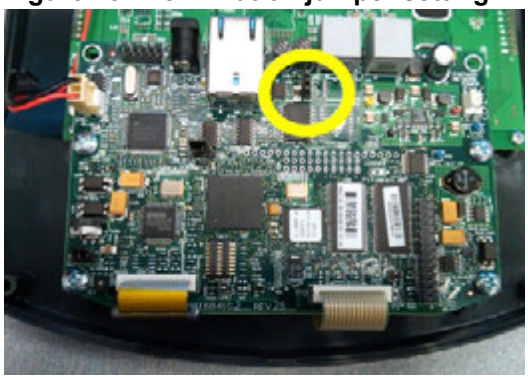
Terminating Last 2T Sensor

The last 2T sensor on the network, which can be identified by only having one CAN cable plugged into it, must be terminated. All other 2T sensors on the network must remain unterminated. The following pictures show the location of the jumper that determines if the 2T sensor is terminated.

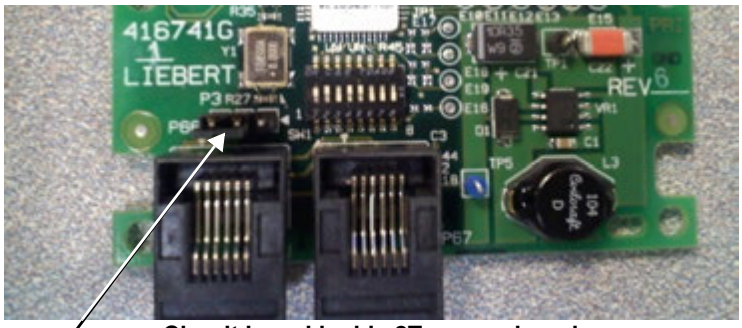
To terminate a 2T sensor:

1. Open the sensor's case by removing the three screws that hold it together.
2. Pull the black jumper off the circuit board from Pins 1 and 2 (see **Figure 73**).
3. Install the jumper on Pins 2 and 3.
4. Reassemble the sensor housing.

Figure 73 Termination jumper setting

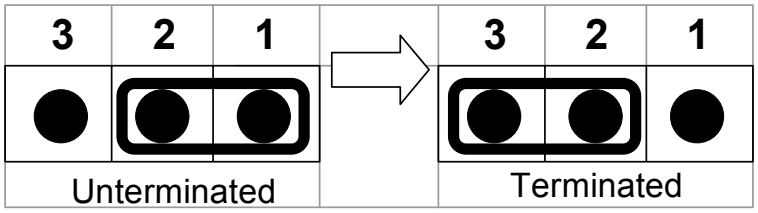


Circuit board inside display housing



Circuit board inside 2T sensor housing

Termination Jumper
in the Terminated Position



4.3.4 Install 2T Sensors on Racks to be Monitored

Both temperature sensors attached to a 2T sensor housing are to be installed on the same rack. The sensor can be attached to the inside or outside of the rack's front door.

- One temperature sensor is to be attached near the top of the rack's front door by using a cable tie to secure the wire to the perforation (approx. 12 inches [305mm] from the top). Do not wrap a cable tie around the actual sensor on the end of the wire. This sensor will monitor for hot air wrapping over the top of the rack from the hot aisle.
- The other temperature sensor is to be attached to the rack's front door, centered in front of the heat-generating equipment that will be drawing in air.
- If the rack is completely filled with equipment, attach the sensor to the middle of the door as determined by both width and height.
- If the rack is partially filled with equipment, locate the sensor in the center of the equipment on the front door.
- Do not:
  - Install a sensor in the hot aisle.
  - Leave a sensor coiled on top of or inside the rack.
- With the temperature sensors in place, neatly route the wires up the rack door and into the rack using the supplied cable ties. Be sure to leave an appropriate amount of slack in the cable to allow the rack door to open and close without binding or pinching the wires.
- Affix the 2T sensor housing to the rack using the supplied hook-and-loop fastener. It is recommended that the housing be installed in an easily accessible space with the sensor number label visible in case the housing needs accessed at a later time.

Repeat this process until all sensors have been installed.

4.3.5 Install CANbus Cable Between 2T Sensors

No special considerations are required for cable up to 150 ft. (45m) long. A CANbus isolator is required for cables between 150 ft. and 300 ft. (45m and 91m). Contact the factory if using CANbus cables longer than 300ft (91m).

The CANbus cable network requires a ground wire. The grounds are connected at each 2T sensor and must be terminated to a field-installed ground ring in the low-voltage electrical panel. **Figure 74** shows the connected grounds on a 2T sensor.

Figure 74 Connect CANbus cable

Follow these guidelines when routing CANbus cable to ensure reliable communication.

- Use approved hangers, such as telephone wire/RG-6 coaxial wired hangers; do not secure cables with any method that might damage them.
- Limit bends to less than four times the diameter of the cable.
- Avoid deforming cables when securing in bundles and when hanging them.
- Keep cables away from devices that may introduce interference, such as high-voltage wires, machines, fluorescent lights, and electronics. High-voltage sources must be at least 12 inches (305mm) from CAN wires.
- Avoid stretching cables.
- Ensure that cables have the correct pin-outs. Mismatching wire pins at the RJ12 connection will damage the CAN device.

Cables may be purchased from your local Emerson distributor.

4.3.6 Connecting the CANbus cable at the Unit and Securing the CANbus Cable to Ground

WARNING

Risk of electrical shock. Can cause injury and death.

Disconnect local and remote power supplies before working within.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the name® microprocessor does not isolate power from the unit, even in the Unit Off mode.

Some internal components require and receive power even during the Unit Off mode of the Liebert iCOM control.

The factory-supplied optional disconnect switch is inside the unit. The line side of this switch contains live high voltage.

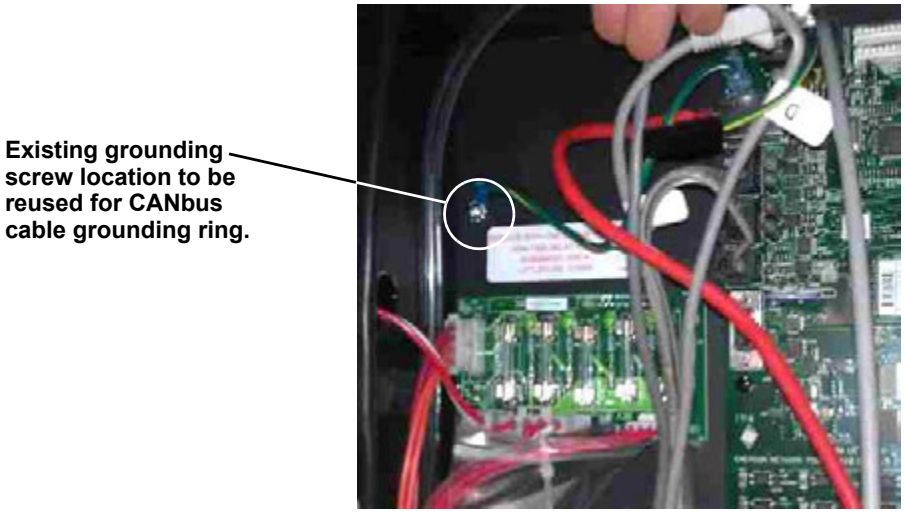
The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to the unit electrical schematic.

Follow all local codes.

The grounding wire on the CANbus cable must be used to ensure reliable communication. Connect the ground wire to the metal frame of the unit. The CANbus cable ground wire must be connected to an unpainted metal area of the unit chassis.

Connecting the CANbus sensors may require working in the high voltage electrical compartment of the cooling unit.

Figure 75 Install grounding ring connector



4.3.7 Software Setup

Cooling units to be set up for Teamwork Mode 3 (Liebert Optimized Aisle Control) must be connected in a Liebert iCOM U2U network and must have:

- Digital scroll compressors, tandem compressors chilled water valves or four-step compressors. (Two-step semi-hermetic compressors and standard scroll units cannot be configured for Teamwork 3.)
- Variable speed fans
- Supply air sensors connected for temperature control.

1. Go to the Service Menu > Remote Sensors and verify that all the connected 2T sensor readings are shown.
2. Set the corresponding sensors' nodes to either control or reference. These settings are based on rack setup or customer preference.
3. Determine the appropriate setting for SB03 Unit Remote Sensor Mode/AVG incl. The values set here will determine how the Liebert iCOM monitors inlet rack temperature to control the fans.

   Max: controls fan(s) based on the maximum rack temperature.

   Average: controls fan(s) based on an average rack temperature. The number of sensors to be used to calculate the average is determined to the far right. If the number of sensors to be used to calculate the average is less than the number of rack sensors programmed for control, the Liebert iCOM will average only the highest sensor readings.
4. Set Service Menus > Setpoints S103 Temperature Control Sensor to *Supply*. This parameter must be set at each unit.
5. Go to Service Menu > System/Network Setup S803 Teamwork Mode. Change the value to the right to *3 Optimized Aisle*.
6. Go to Service Menu > Setpoints S146 Fan Control Sensor and set this to Remote. This parameter only needs to be set for one unit. The other connected units in the group will auto-set themselves.
7. Adjust the rack temperature Setpoint at S147 to the desired value. This is typically set to 75, but is customer preference.
8. Adjust S103 Temperature Setpoint to the desired value. This will must be set on a unit-to-unit basis depending on the unit's area of influence.
9. Monitor operation and adjust corresponding setpoints and control bands as needed.

4.3.8 Standby—Rotation

Typical Standby (Lead/Lag) Function

This function can be performed in any teamwork mode, including NO Teamwork.

One or more units can be defined to be Standby; the normal status of standby units is Standby Off (fan Off).

In case one regular unit has an alarm that is defined (to be defined in the alarm configuration), to switch On a standby unit, the faulty unit will switch Off and the standby unit will switch On.

If the next unit has an alarm, the next standby unit will be started. If no more standby units are available, the unit with a non-critical alarm that permits unit operation will be switched On again (water detection, fan alarm, fire alarm etc. will not permit unit restarting).

The standby function can be rotated daily (setting the time), weekly (setting the day of the week and time) or monthly (setting the first weekday of the month and time).

The rotation is performed with a selectable number of units: if 1 is selected, to standby rotates from 1-2 to 2-3 in a 4 units configuration with two standby units, and rotates from 1-2 to 3-4 in the same configuration, when the rotation parameter is set to 2.

NOTE

Before entering standby mode, units may operate the fan only for 3 minutes if previously calling for heat or humidification to cool components and remove steam from the unit.

Standby and Cascade

Cascade is possible in Teamwork Mode 1 and 3 only.

Line S508 Cascade Units has the options of Yes, Cool / Heat, Cooling, Fan

Yes—Based on a call for heating, cooling, humidification or dehumidification. TW1

Cool / Heat—Based on a call for heating or cooling. Teamwork Mode 1

Cooling—Based on a call for cooling. Teamwork Mode 1

Fan—The only selection available for Teamwork Mode 3; not available in Teamwork Mode 1. Uses fan control deviation to stage on standby unit fans / cooling. Fans stage serially according to the system fan control band and temperature control is based on the local supply deviation. (Fan proportional band / number of connected units)

The standby unit will remain On for the time set in the parameter. The default is 30 minutes; range is from 2 to 360 minutes.

Standby units will start if an alarm occurs in one of the operational units. If the standby units are cascaded or in Teamwork Mode 3, they will also start and work with the regular operational units if the temperature or humidity cannot be controlled by the operational units; before a high or low temperature / humidity condition occurs. Cascaded units are switched Off again as soon as the temperature / humidity returns back to normal.

The master unit defines its proportional band according to the number of available units (see **4.2.3 - Teamwork Mode 1**).

When a standby unit receives a request for full heating or cooling from the master unit (see **3.3 - Temperature Control**), it will respond to the request after its control delay.

NOTE

Cascaded units are not included in the calculation of the average temperature / humidity.

5.0 INSTALLING A LIEBERT iCOM UNIT-TO-UNIT NETWORK

Connecting multiple Liebert iCOM-controlled cooling units in an Ethernet Unit-to-Unit (U2U) network enables the units to work together to achieve efficient cooling and humidity control of the conditioned space. Networking enables setting up the cooling units to exchange data for various modes of operation:

- Teamwork
- Lead/Lag-Standby
- Rotation
- Cascade

However the cooling units are set up, a large display may be used to control and view the operational status of individual units or of the entire system.

NOTE
The maximum number of cooling units that may be interconnected is 32.

5.1 Placement of Cooling Units

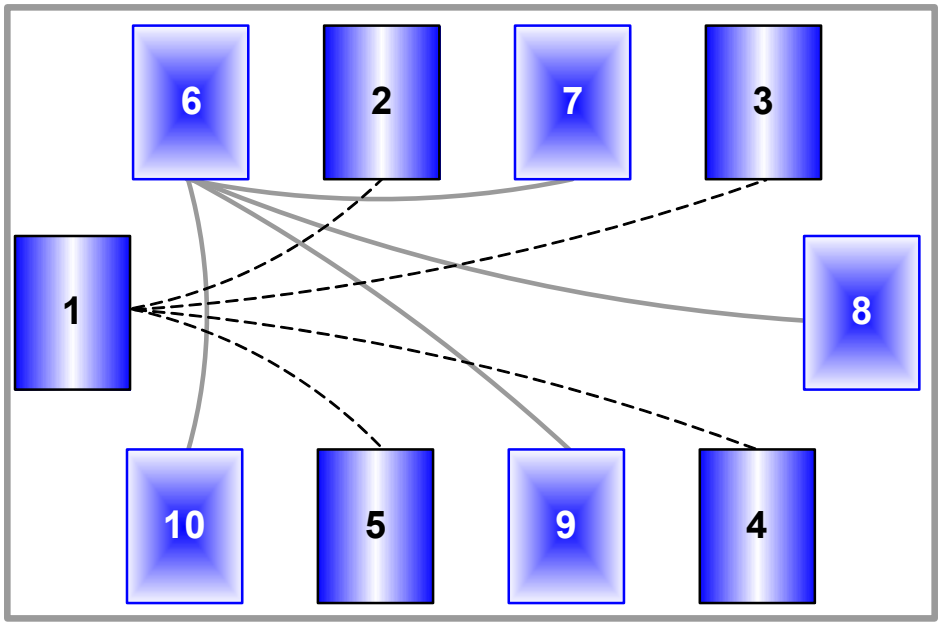
Refer to the cooling unit product manuals for details on installation. Also consider these factors when planning for installation of cooling units with Liebert iCOM controls:

- heat load in the conditioned space
- cooling air distribution
- number of operating units versus number of standby cooling units
- location of the network switch—An Ethernet cable cannot exceed 328 feet (100m)

5.1.1 Balancing Operating and Standby Units

Assign identification to the units in a manner that balances the operating units and standby units according to room layout and heat-load requirements. For example, identify the operating units with numbers 1 through 5 and the standby units 6 through 10. Refer to **Figure 76**.

Figure 76 Standby unit layout example—10 cooling units in room



5.2 U2U Hardware: Cables and Network Switch

Plan wiring runs for U2U communication when designing the layout of your conditioned space. In addition to general good wiring practices, take into account:

- Ethernet CAT5 or greater cable is required for interconnecting the units.
- Maximum distance must not exceed 328 feet (100m).
- A device to boost the Ethernet signal may be used to exceed the 328 feet (100m) length limitation.
- Ethernet network should be private—set up only for management and control of the cooling units.
- Keep control and communication cables away from power cables to prevent electromagnetic interference.
- Do not bend cables to less than four times the diameter of the cable.
- Do not deform cables when securing in bundles or when hanging them.
- Keep cables away from devices that can introduce noise into them, such as machines, fluorescent lights, and electronics.
- Avoid stretching Ethernet cables—tension when pulling cables should not exceed 25 pounds (11kg).
- Do not secure Ethernet cables with any method that might damage them; use approved hangers, such as telephone wire/RG-6 coaxial wire hangers, available at most hardware stores.

Minimum Network Switch Requirements

- IEEE 802.3; IEEE 802.3u
- 10/100 Mbps speed
- Multiple 10/100 RJ-45 ports—one shared; RJ-45 Uplink port

The Liebert vNSA™ is an approved powered network switch designed to support Liebert iCOM U2U networks. See **Liebert vNSA™ on page 98** for details.

5.3 Wiring for Unit-to-Unit Communications—U2U

Cooling units come from the factory-wired for stand-alone operation.

Liebert iCOM U2U Ethernet Network

The Liebert iCOM U2U network must be isolated from other network traffic. The network switch(es) that connect Liebert iCOMs need to be dedicated to supporting only Liebert iCOM communication. The U2U network cannot be connected to the building or IT network. If network communication is ever lost (failed network switch, etc.), all Liebert iCOM-controlled cooling units will continue to operate as independent units.

The Liebert iCOM can support up to 64 nodes on one network. An input/output board, large display, and large wall-mount display are each considered one node. Of the 64 nodes that may be connected, no more than 32 may be input/output boards (32 cooling units). A small display is not considered a node. Small displays connect directly to input/output boards that do not have large displays attached to them. **Table 18** illustrates how a network can be configured.

Table 18 Sample Liebert iCOM network configurations

Sample Configuration	Input/Output Boards	Large Displays	Small Displays	Wall Mount Large Displays	Private Switch Required
1	2	0	2	0	No
2	2	0	2	1	Yes
3	3	0	3	0	Yes
4	2	1	1	0	Yes
5	8	4	4	1	Yes
6	32	32	0	0	Yes
7	32	27	5	5	Yes
8	32	0	32	32	Yes

Network communication can be configured during system startup by a Liebert-trained technician. For technical issues contact:

Emerson Technical Service
1050 Dearborn Drive
Columbus, Ohio 43235
Telephone: 1-800-LIEBSRV (800-543-2778)
E-Mail: **technicalservice@emersonnetworkpower.com**

5.3.1 Wiring a Liebert iCOM U2U Network

Small Displays

Two cooling units, each with a small display: To network two cooling units, each with a small display, connect a crossover CAT5 cable between the P64 connectors on each cooling unit's Liebert iCOM input/output board. A network switch is not needed (see **Figure 77**).

Figure 77 Connecting two cooling units, each with a small display, using a crossover Ethernet cable

Three or more units with small displays: To network three or more cooling units, each equipped with a small display. **Figure 80** shows that one plug of the CAT5 cable is connected to P64A connector and the other to the network switch. The P64A, which is connected to port P64 on the control board, is located near it on each cooling unit's Liebert iCOM input/output board to a common network switch. The P64A connector is a crossover coupler that on DS, CW and Challenger units.

NOTE
If P64A is not available on a unit, connect directly to the Liebert iCOM board on P64.

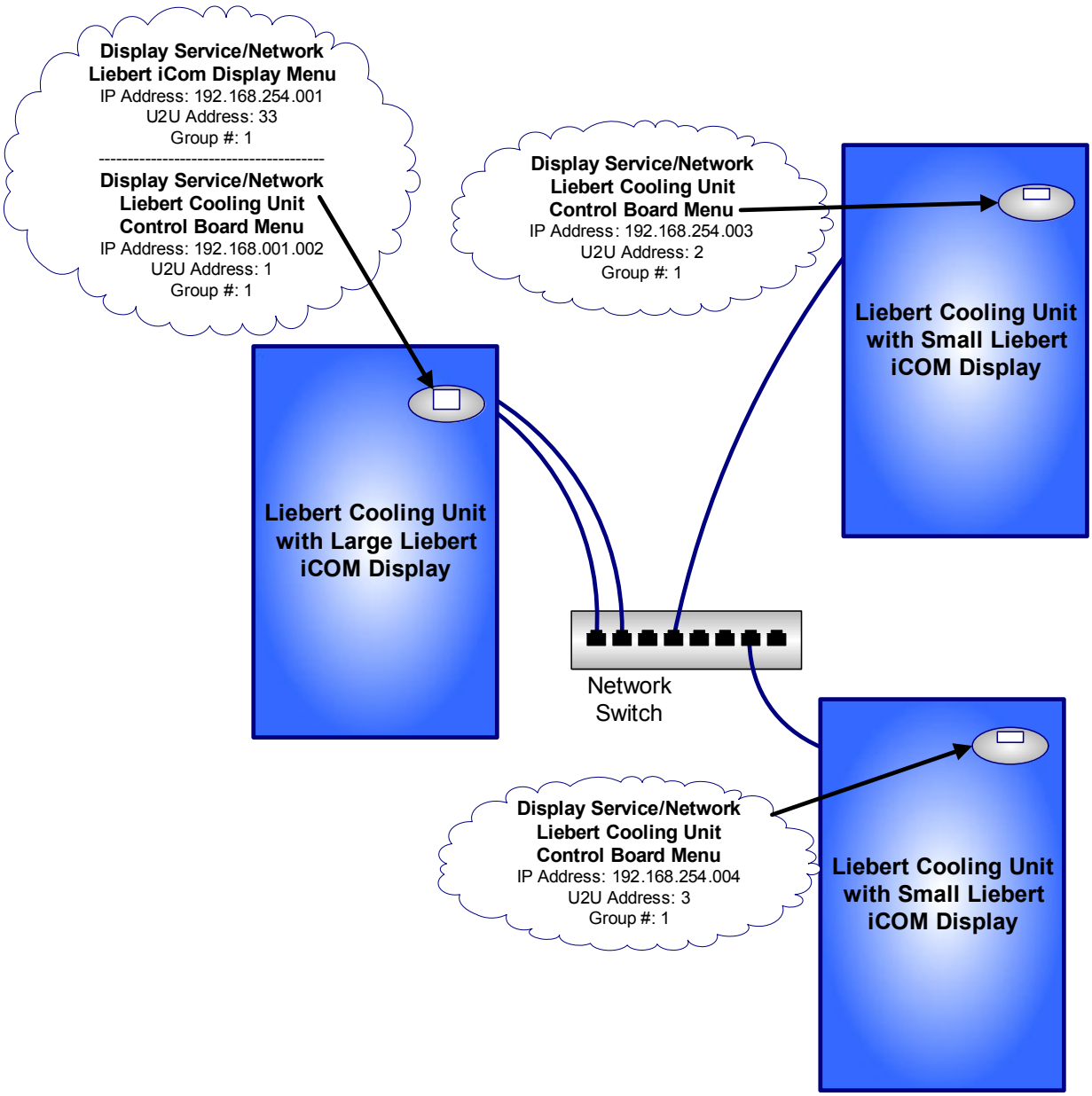
Large Displays

A network switch is required to enable Ethernet communication on one or more cooling units with large displays. Each cooling unit with a large display requires two straight-through Ethernet cables from a network switch. One cable connects to port P64 on the Liebert iCOM input/output board and the other straight-through cable connects to the female-female coupler, if the female-to-female coupler is provided with the unit. Connect the red crossover cable, which is provided with the cooling unit, between the coupler and the P64 port on the back of the large display (see **Figure 81**). If the female-to-female coupler is not provided, connect the straight-through cable to Port P64 on the large display.

NOTE

A female-to-female coupler is factory-supplied on some cooling units equipped with a large display.

Figure 78 U2U network setup diagram



NOTE

The first three octets of the units' IP addresses must match for proper communication. In the illustration above, these are the matching octets: 192.168.254

Wall-Mount Large Display

Only large displays can be used for remotely monitoring and controlling cooling units connected on the same network. Each wall-mount large display requires 120VAC or 230VAC input power; Emerson® provides an AC adapter wall plug. A straight-through Ethernet cable must be connected between the network switch and the P64 port on the back of the display. This will enable control and monitoring capabilities to any cooling unit connected to the network.

Combining Large and Small Displays on a U2U Network

Setting up a network of cooling units equipped with large and small displays requires a network switch. The controls are to be connected to the switch as described above.

Figure 79 Wiring a small display for stand-alone operation

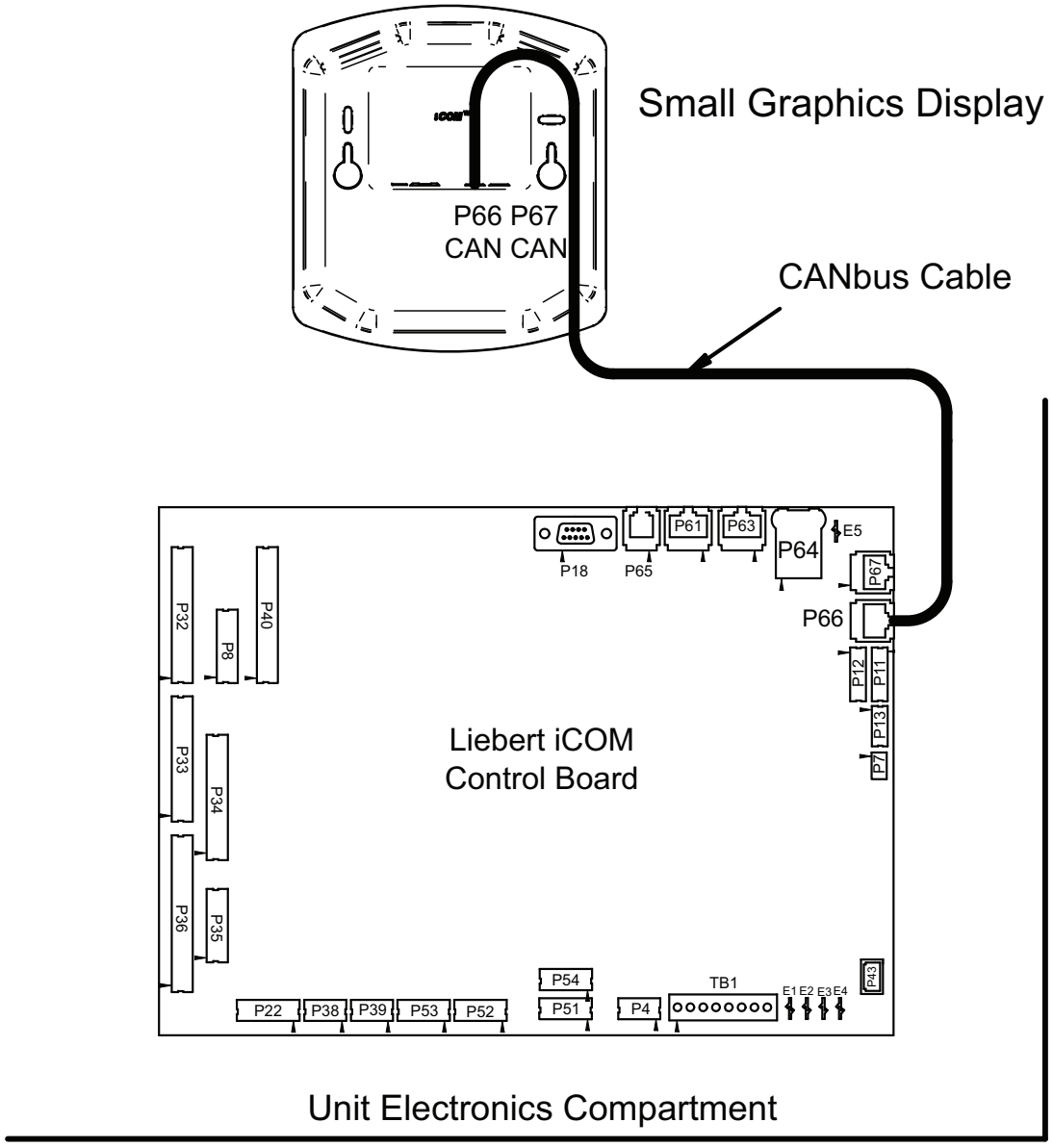


Figure 80 Wiring a small display for U2U network operation

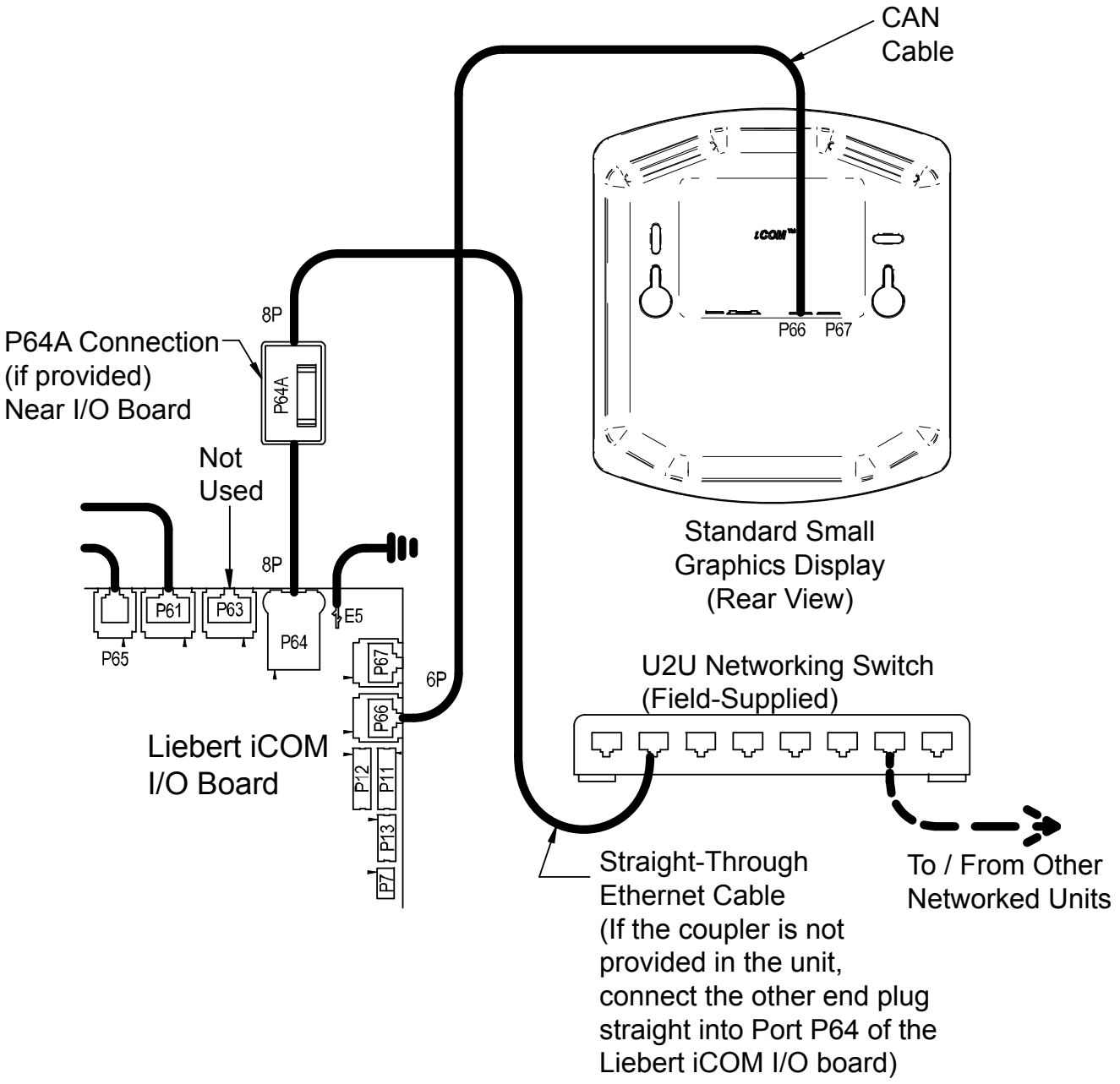
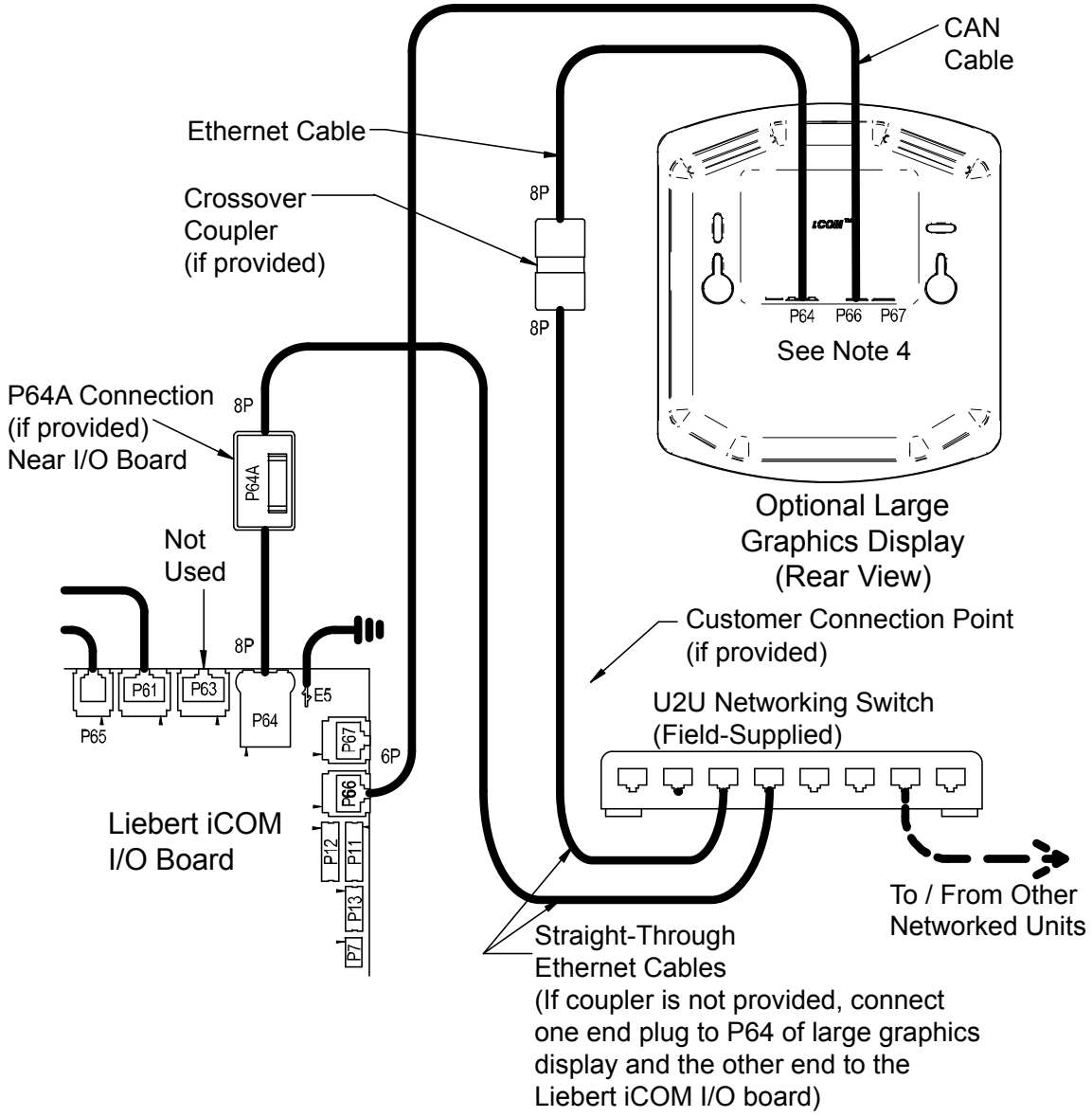


Figure 81 Wiring a large display for U2U network operation



Liebert vNSA™

The Liebert vNSA is designed to connect multiple Liebert iCOMs. The Liebert vNSA contains either one or two powered industrial rail switches. An optional remote large display can be attached to the front door as well. All models have a power supply that requires connection to a single phase 120VAC or 230VAC power source. The enclosure features a key lock for security.

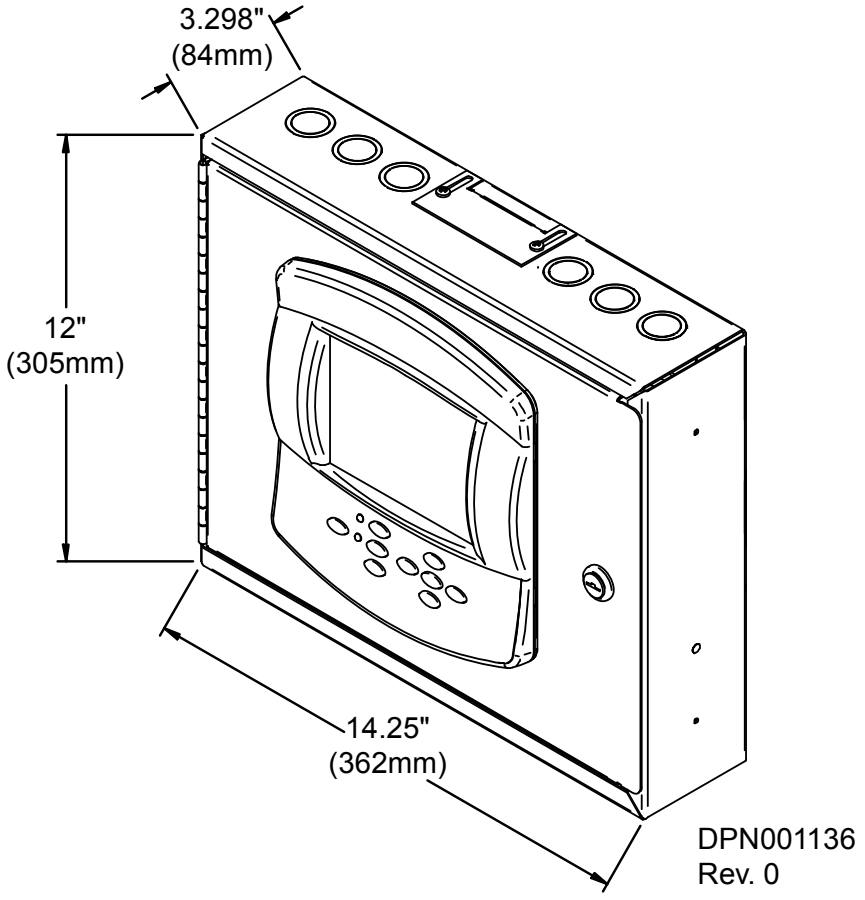
The Liebert vNSA supports autonegotiation, autopolarity and autocrossing, allowing for the use of standard network cables for connection to each port, rather than special crossover cables. The switch detects and makes adjustments for the network's speed and transmission mode, polarity and transmit-and-receive pins. See the Liebert vNSA user manual, SL-18840, for more details.

The number of ports available for connecting Liebert iCOMs varies by model as shown in **Table 19**. Models with a remote large display attached to the front door utilize one of the available Ethernet ports in the Liebert vNSA. Models with two switches utilize two ports to connect the switches.

Table 19 Ports available for connecting Liebert iCOMs

Model	Liebert vNSA With Remote Large Display	Total Number of Ports	Number of Ports Used to Connect Remote Large Display	Number of Ports Used to Interconnect Switches	Number of Ports Available to Connect Liebert iCOM Control Devices
Liebert vNSA8-Liebert iCOM	Yes	8	1	-	7
Liebert vNSA16-Liebert iCOM		16	1	2	13
Liebert vNSA8	No	8	-	-	8
Liebert vNSA16		16	-	2	14

Figure 82 Liebert vNSA with optional remote large display



6.0 EXTERNAL COMMUNICATION—BUILDING MANAGEMENT SYSTEMS, LIEBERT SITESCAN®

Liebert iCOM is capable of communicating with external monitoring systems, such as Building Management Systems (BMS), Network Monitoring Systems (NMS), Liebert's SiteScan® Web and others.

Each Liebert iCOM-controlled cooling unit is equipped with Liebert IntelliSlot® plug-in slots for use with optional communication cards. Two hot-swappable cards are available to provide remote communication to the Liebert iCOM.

The Liebert IntelliSlot™ IS-UNITY-DP communication card monitors and manages a range of operating parameters, alarms and notifications. Unity cards deliver:

- Emerson Protocol for Trellis™, Liebert SiteScan™ and Liebert Nform®
- Embedded LIFE™ Technology for Remote Service Delivery
- SNMP (v1/v2c/v3) for Network Management Systems
- HTTP/HTTPS for Web page viewing
- SMTP for e-mail
- SMS for mobile messaging
- Modbus RTU-Modbus Remote Terminal Unit (RTU) communication protocol for Building Management Systems over a RS-485 serial network (also called Modbus RTU RS-485)
- Modbus TCP-Modbus Transmission Control Protocol for Building Management Systems over an Internet or LAN
- BACnet IP—BACnet over Internet Protocol for Building Management Systems over the Internet or a LAN
- BACnet MSTP—BACnet Master-Slave/Token-Passing (MSTP) communication protocol for Building Management Systems over an RS-485 serial network (also called BACnet MSTP RS-485)

The Liebert IntelliSlot Unity platform supports communication with up to two third-party protocols simultaneously. Velocity V4 monitoring protocol is required to ensure monitoring connectivity with the Liebert IntelliSlot IS-UNITY-DP. Velocity V4 protocol is standard in Liebert iCOM software version PA1.04.033 and later.

Another communication option is the Liebert IntelliSlot SiteLink-E® CARD (IS-485EXI), which provides ground fault isolated connection to a Liebert SiteLink-E for monitoring and management. The IS-485EXI is compatible with all Liebert iCOM software versions. See the Liebert Web site for the latest supported protocols, monitoring reference information and SNMP MIBs: **www.liebert.com**

6.1 Building Management Failover Features

A Monitoring Timeout/Handshake can be used with a building management system to verify communication between the Liebert iCOM and the BMS. The handshake or communication test is performed through a timer in the Liebert iCOM. If communication is OK, the BMS will update the timer periodically. If the BMS fails to perform a handshake within the specified period (e.g., monitoring panel failed) the Liebert iCOM will generate a BMS TIMEOUT event.

The user can define fail-safe sequences if communication with the BMS is lost. These sequences help ensure that the conditioned space is not compromised if communication between the BMS and the Liebert iCOM is lost. These fail-safe modes include:

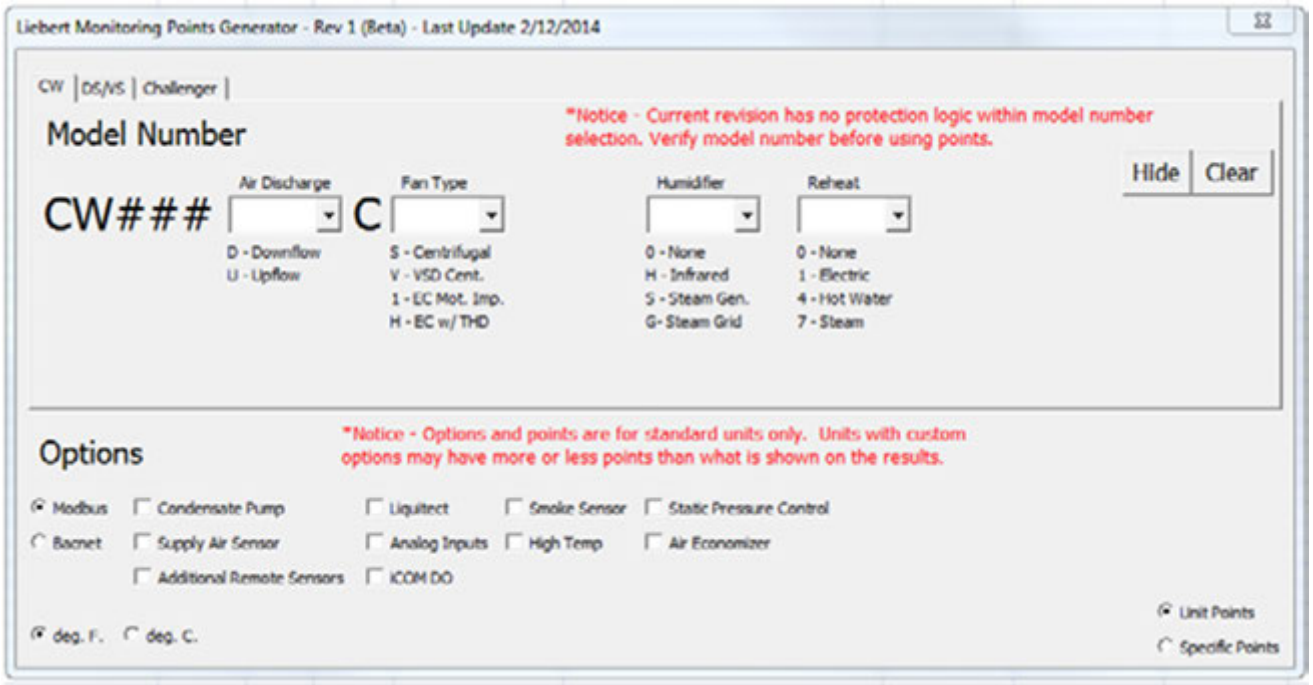
- BMS Backup Temp Setpoint—Allows the unit to operate off a predefined temperature setpoint.
- BMS Backup Fan Operation—Sets the default operation for the fan speed control when a BMS time-out occurs. Four options are available:
  - Disabled: The fan will continue controlling to the last value written by the BMS. This could be either the last fan temperature setpoint if controlling the fan by locally installed sensors or it could be the last value written fanspeed command (0-100%) hen fan control is set to manual.
  - BMS Backup Spd: Allows the user to program a fixed fan speed percentage setpoint. When the
  - BMS disconnect occurs, the fan speed will lock to this point. This setting is available when the fan control sensor is set to Manual.
  - Coupled: Allows the fan speed to be controlled by the air temperature setpoint. The fan speed will follow the call for cooling as described in 3.1.1 - Unit/Fan Control.
  - Backup Set: Allows the user to program an alternate fan setpoint that takes the place of S147 Fan Setpoint and is used to establish a new fan control band.
- Restart at BMS Off and Disconnected—Allows the cooling unit to automatically turn On if the BMS has shut the unit Off and the BMS loses communication.

6.2 Monitoring Points

The Liebert Monitoring Points Generator assists in locating the exact monitoring points needed for a specific unit communicating using the Liebert IntelliSlot® IS-UNITY-DP. Contact your local Emerson representative to have this run for your unit. Once this generation is run, it can be saved in various formats—.pdf, .xls or .csv—to be provided with the submittals, price quotations and to the BMS commissioning agent for point mapping.

The Monitoring Points Generator will not provide points for units connected to the Liebert SiteLink®. Each Liebert Site-Link panel is programmed based on specific job requirements so points may vary site to site. The Liebert SiteLink technician will provide a BMS points list after the panel has been setup. Contact the Customer Resolution Center at 1-800 LIEBERT (543-2378) with your site ID or tag number to obtain a points list or for assistance with Liebert SiteLink.

Figure 83 Liebert Monitoring Points Generator interface



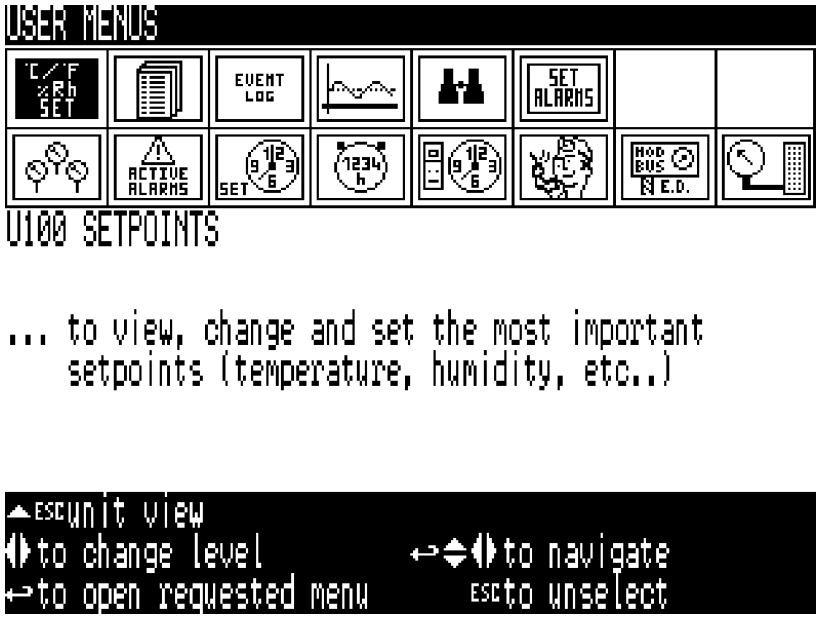
7.0 User Menu Parameters

User menus report general cooling unit operations and status. The user menu password is **1490**.

The User menu parameter tables in this manual may differ from the display on your cooling unit. The Liebert iCOM functions with several Liebert Precision Cooling units, each with its own set of control commands. In addition, the Liebert iCOM firmware is being updated constantly. As a result, the User menu parameter tables in this manual may differ from the display on your cooling unit. Check **www.liebert.com** for the latest Liebert iCOM user manual updates.

Figure 84 User menu icons

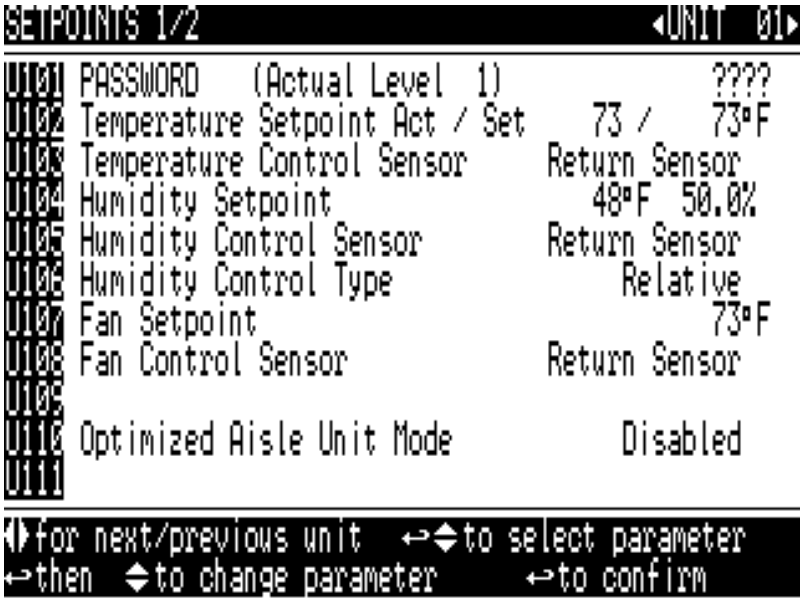
User Menu password: 1490



7.1 User-Setpoints Screens

Setpoints allows the user to view, change and set the most important setpoints (temperature, humidity, etc.) in a central location.

Figure 85 Setpoints screen, page 1



U102 Temperature Setpoint—Selects a temperature that the cooling unit will maintain by applying cooling and or reheats. There are two values in this field. The Temp Set value is the temperature that has been set by the user to control the temperature. The Temp Act value is a read only value that indicates if another routine, like supply compensation has internally modified the Temp controlling value. If compensation has not been activated, then ACT and SET will always match. This parameter is adjustable from 41-104°F (5-40°C). The factory default value for Supply is 64°F. The factory default value for Return & Remote=73°F.

U103 Temperature Control Sensor—Selects the sensor that will control the cooling capacity. Cooling capacity is either the Chilled Water Valve, Compressor, FreeCooling Valve or Air Economizer. Unloading type compressors can be set to any sensor type, however fixed style compressors can only be set to Return or Remote control type l. This parameter can only be changed in the service menu. The range should be Supply, Return or Remote Sensor. The factory default is Return.

U104 Humidity Setpoint—Selects a humidity that the cooling unit will maintain by removing or adding moisture to the air. The humidity setpoint will either be set in percent RH or as a Dew Point Value depending on what the humidity control type is set for. This parameter is adjustable from 20-80%. The factory default is 50%.

U105 Humidity Control Sensor—Defines which humidity value the humidity setpoint is compared with. The return sensor is equipped with a Temp / Hum sensor and can calculate the dew point based on Liebert iCOM's internal lookup table. If a sensor other than the return sensor is selected, then iCOM will calculate the correct RH% based on the sensor selected and its actual temperature. The range is Remote or Return Sensor. The factory default is Return Sensor.

U106 Humidity Control Type—Selects the humidity control calculation. Setting this parameter to "Relative" will control the humidity without considering any temperature deviations. "Predictive" and "Absolute" control consider the temperature deviation from temperature setpoint so that a constant level of moisture is kept in the area based on the humidity sensor reading and the temperature deviation from setpoint.

Dew Point allows Liebert iCOM to calculate the actual dew point of the room and to control the humidity based on a user-entered dew point temperature. The range is Relative, Absolute, Predictive and Dew Point. The factory default is Predictive.

U107 Fan Setpoint—Needed anytime the fan operates from a different sensor than the temperature setpoint. Example: The temperature setpoint is set to Supply Air and the fan control is set to Remote Sensor.

This is considered "Optimized Aisle" control, which decouples the fan and cooling capacity modulation. In the above example, this value would set the remote sensor setpoint to control the fan speed. This parameter is adjustable from 41-104°F (5-40°C). The factory default is 73°F.

U108 Fan Control Sensor—Determines the sensor which will control the speed of the fan. This parameter works in conjunction with the Fan Control Setpoint.

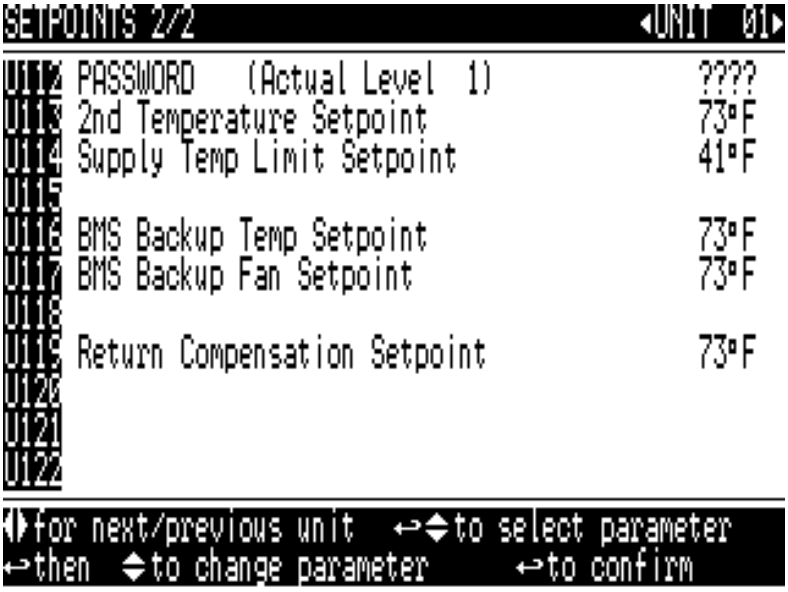
The Liebert iCOM control also has the ability to control the fan speed manually. This means that the fan control can be set through the local Liebert iCOM display or via a building management system through one of the various Liebert IntelliSlot® monitoring cards. The range is Supply, Return, Remote or Manual. The factory default is Return Sensor.

U110 Optimized Aisle Enabled—This read-only value indicates if the Liebert iCOM controller is setup in a Optimized Aisle configuration.

To enable optimized aisle within Liebert iCOM, the Supply Air sensor must be set to control the cooling capacity and the remote sensor must be set to control the fan speed. This allows the cooling unit to maintain inlet rack temperatures while still maintaining an even under-floor air temperature when controlling unbalanced rooms.

Optimized Aisle will automatically adjust based on the application (None, End or Full Containment).

Figure 86 Setpoints screen, page 2



U113 2nd Temperature Setpoint—Provides a way to program an alternate temperature setpoint that is activated by a dry contact through the customer inputs connections. When a customer input connection is set to "2nd Setpoint" and the input is wired to that input is active, then the value set in this parameter sets the active temperature setpoint. This parameter is adjustable from 41°F to 81°F (5 to 27.2°C). The factory default is 41°F (5°C).

This temperature may affect fan speed if the control is setup to operate in a coupled mode during normal operation (see **Table 4**).

U114 Supply Temp Limit Setpoint—Selects the minimum discharge air temperature. When the actual sensor reading approaches this parameter, the cooling capacity will be limited to avoid going below the Supply Limit Temperature value. This parameter must be enabled in the Service / Setpoints menu prior to setting a supply limit setpoint. This parameter is adjustable from 41°F to 81°F (5 to 27.2°C). The factory default is 41°F (5°C)

U116 BMS Backup Temp Setpoint—Selects a temperature setpoint that will be active in the event of a BMS time-out. The BMS timer must be configured for this parameter to activate. If the unit is operating in "Coupled" mode, located in Service Menus>Setpoint, S163, then this setpoint will affect the fan control setpoint. This temperature may affect fan speed if the control is setup to operate in a coupled mode during normal operation (see **Table 4**). This parameter is adjustable from 41-104°F (5-40°C). The factory default is 73°F (23°C).

U117 BMS Backup Fan Setpoint—Selects a temperature setpoint that will be active in the event of a BMS time-out. The BMS timer and S163 must be configured to "Backup Set" for this parameter to activate. This parameter is adjustable from 41-104°F (5-40°C). The factory default is 73°F (23°C).

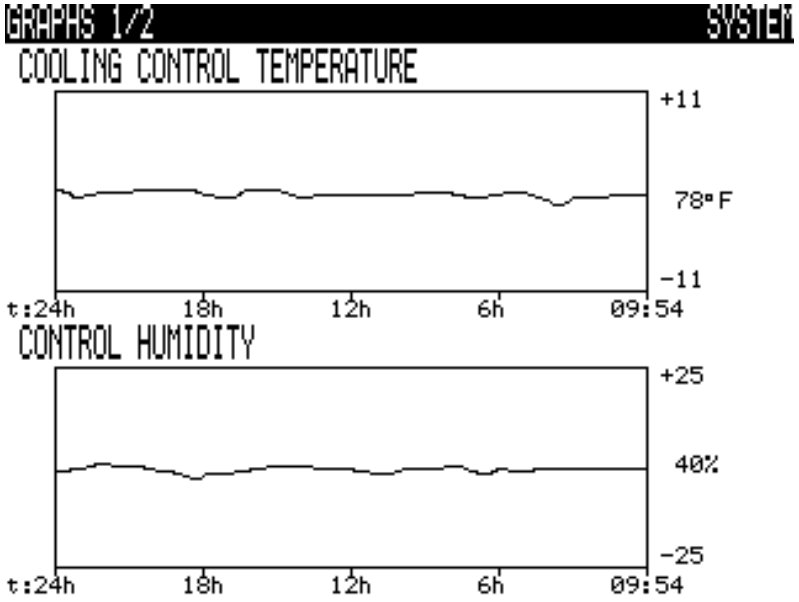
U117 BMS Backup Fanspeed—Selects a fixed fan speed percentage that will be active in the event of a BMS time-out. The BMS timer and S163 must be configured to "BMS Backup Spd" for this parameter to be visible. This parameter is adjustable based units preconfigured low and high limit fan speed thresholds. The factory default is 100%.

U119 Return Compensation Setpoint—Allows the return air sensor to be used even when in Supply or Remote temperature control mode. Return Compensation modifies the temperature setpoint to ensure that the return air temperature is kept above a specific temperature. If the return compensation value is set to 80°F and the actual return temp falls to 75°F, then the controlling temperature setpoint will be increased and will reflect in the *Control Temp Act*." This parameter is adjustable from 41-104°F (5-40°C). The factory default is 73°F (23°C).

7.2 User-Graphic Menu Screens

Graphic screens allow the user to view temperature and humidity graphs. Nine flexible time scales with ranges up to 16 days are available.

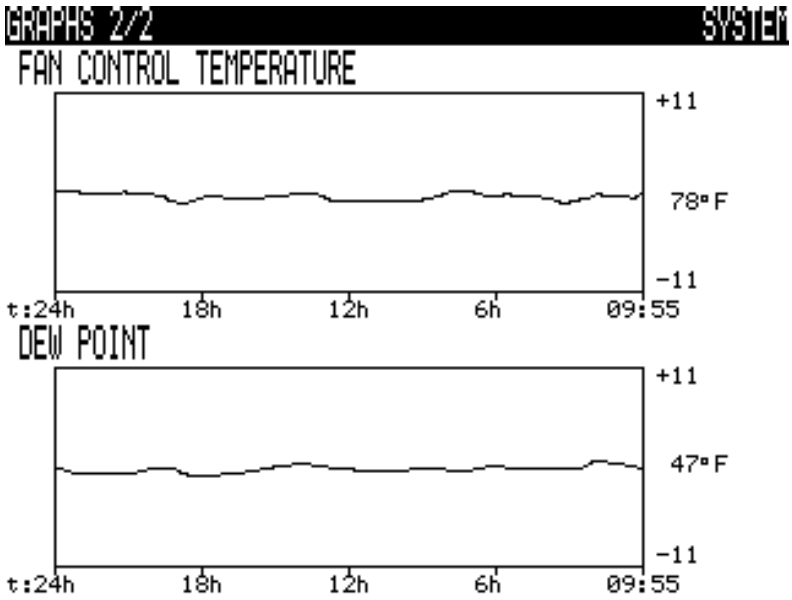
Figure 87 Graphs, page 1



There are two line trend graphs in Liebert iCOM. The upper graph displays temperature data and the lower graph displays humidity data. Each graph can be customized by changing the span of time and the range of the sensor readings.

Each unit has its own temperature and humidity graphs as well as a system graph which displays an average of all connected sensors in the network of units.

Figure 88 Graphs, page 2



Spare Part List

Spare Parts—The spare parts lists contains a detailed description and part number that can be used to order parts for the unit. These part numbers are specific to each model and option installed on the unit.

Event Log

Event Log—The event log displays all events and actions generated by the unit. When multiple units are networked the event log shows results for the whole system. Each event shows the unit that generated the alarm, time and date stamp, a description and the event type.

The event log contains the last 400 events generated by the unit. Events include such occurrences as unit On/Off commands, alarms, warnings and messages. The event log has two views: system view and unit view. When the event log is first entered, the system view is displayed. The system view lists events that have occurred at the unit and other units, if configured in a U2U network. Pressing the Right arrow while viewing the event log for the system view allows the user to see unit-specific events. The unit name and number will appear in the upper right corner for the unit selected. Each event shows the unit that generated the alarm, time and date stamp, a description and the event type. As new events are stored in the log, older events are pushed further down the list.

Once the event log reaches 400 events, the oldest events are erased as new events are stored.

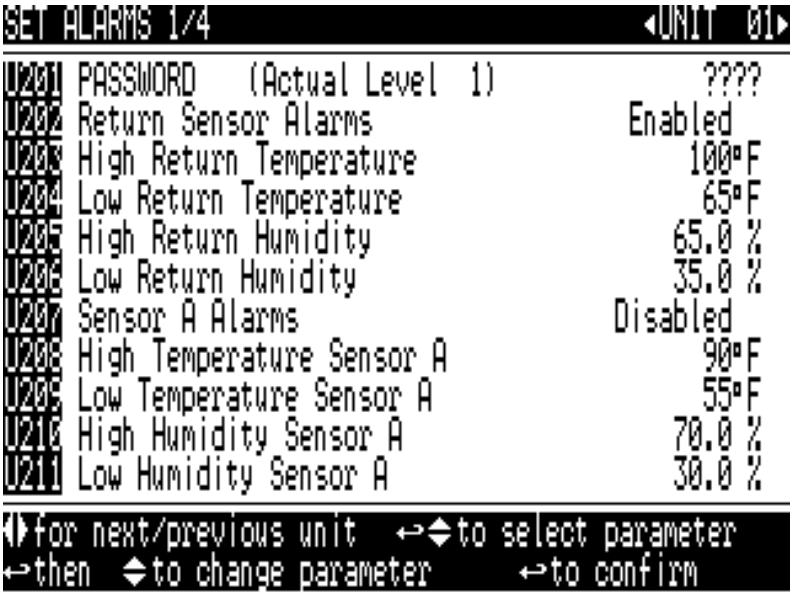
View Network

View Network—The view network screen provides an overview of the Liebert iCOM network and a status of each unit. This screen will provide the unique unit name given to the unit. If no name is given, then only the unit number will be displayed.

7.3 User-Set Alarms Menu Screens

Set Alarms allow the user to view and modify basic temperature and humidity alarms and thresholds

Figure 89 Set alarms screen, page 1



U202 Return Sensor Alarms—Enables or disables the return sensor alarms. When enabled, the return temperature and humidity values will be compared to a high and low setting.

U203 High Return Temperature—Allows a user to adjust the point at which the actual return temperature activates a High Temperature Alarm. This parameter is adjustable from 34°F to 210°F. The factory default is 80°F.

U204 Low Return Temperature—Allows a user to adjust the point at which the actual return temperature activates a Low Temperature Alarm. This parameter is adjustable from 34°F to 210°F. The factory default is 65°F.

U205 High Return Humidity—Allows a user to adjust the point at which the actual return humidity activates a High Humidity Alarm. This parameter is adjustable from 1% to 99%. The factory default is 60%F.

U206 Low Return Humidity—Allows a user to adjust the point at which the actual return humidity activates a Low Humidity Alarm. This parameter is adjustable from 1% to 99%. The factory default is 40%F.

U207 Sensor A Alarms—Enables or disables the alarms for reference Sensor A. When enabled, the Sensor A temperature and humidity values will be compared to a high and low setting.

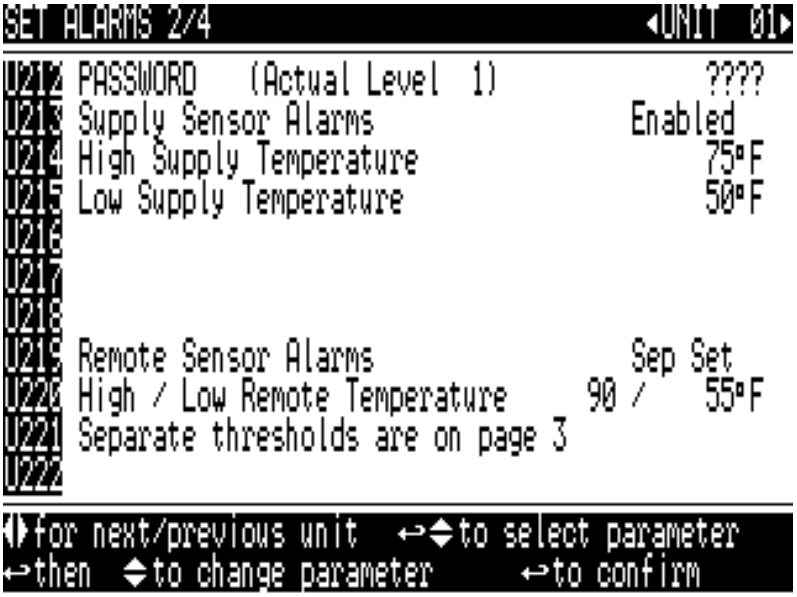
U208 High Temperature Sensor A—Allows a user to adjust the point at which the actual Sensor A temperature activates a High Temperature Alarm. This parameter is adjustable from 34°F to 210°F. The factory default is 80°F.

U209 Low Temperature Sensor A—Allows a user to adjust the point at which the actual Sensor A temperature activates a Low Temperature Alarm. This parameter is adjustable from 34°F to 210°F. The factory default is 65°F.

U210 High Humidity Sensor A—Allows a user to adjust the point at which the actual Sensor A humidity activates a High Humidity Alarm. This parameter is adjustable from 1% to 99%. The factory default is 60%F.

U211 Low Humidity Sensor A—Allows a user to adjust the point at which the actual Sensor A humidity activates a Low Humidity Alarm. This parameter is adjustable from 1% to 99%. The factory default is 40%F.

Figure 90 Set alarms screen, page 2



U213 Supply Sensor Alarms—Enables or disables the supply sensor alarms. When enabled, the supply temperature and humidity values will be compared to a high and low setting.

U214 High Supply Temperature—Sets the temperature at which the High Supply Temperature Alarm is activated. This parameter is adjustable from 34°F to 210°F. The factory default is 75°F.

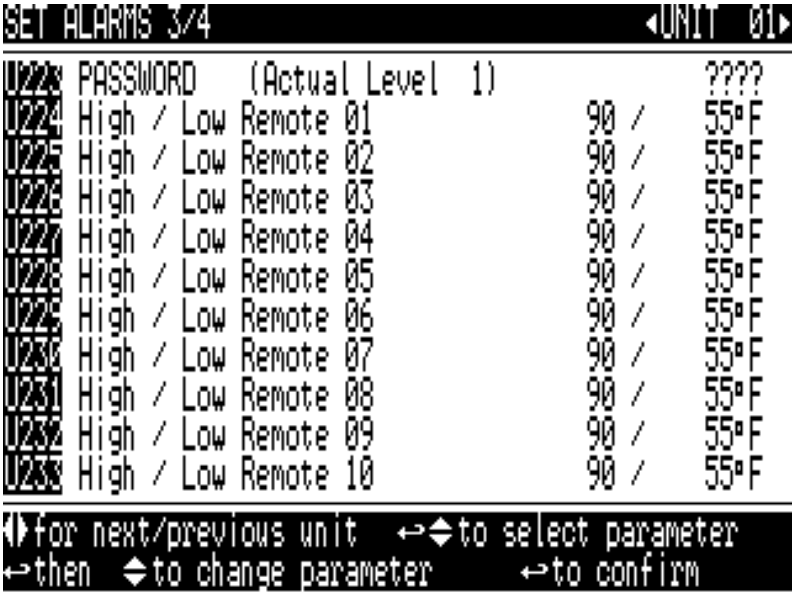
U215 Low Supply Temperature—Sets the temperature at which the Low Supply Temperature Alarm is **U21**activated. This parameter is adjustable from 34°F to 210°F. The factory default is 50°F.

U219 Remote Sensor Alarms—Enables or disables the Remote sensor alarms. When enabled, the Remote temperature values will be compared to a high and low setting.

U220 High/Low Remote Temperature—Enables or disables remote air alarm. When enabled, the high and low temperature alarm will allow a user to adjust the point at which the actual remote temperature activates a Low Remote Temperature Alarm. This parameter is used when common alarm points will be shared by all sensors. Otherwise, the remote sensors can be set individually on page 3. This parameter is adjustable from 34°F to 210°F. The factory default 50°F.

U221 Separate thresholds are on page 3—Informational

Figure 91 Set alarms screen, page 3



U224-U233 High/Low Remote 01 - 10— Sets the High and Low remote temperature sensor alarm points individually for each sensor when the parameter separate thresholds is set to disabled. The range for both parameters is 34°F to 210°F. The default setting for low alarm is 55°F. The default setting for high alarm is 90°F.

Figure 92 Set alarms screen, page 4

U235 Static Pressure Messages—Enables or disables the static pressure alarms.

U236 High Static Pressure—Sets the pressure at which the High Static Pressure Alarm is activated. This parameter is adjustable from 0.000 - 1.405 inWC. The factory default is 1.284 inWC.

U237 Low Static Pressure—Sets the pressure at which the Low Static Pressure Alarm. This parameter is adjustable from 0.000 - 1.395 inWC. The factory default is 0.000 inWC.

U238 SP Messages During Unit Off—Enables or disables the static pressure alarms when the unit is OFF.

U239 SP Messages on Fan Adjust—Enables or disables the static pressure alarms when the fan has been adjusted due to special events. These events include an adjustment for heating, humidification, dehumidification, motor overload / EC fan fault or loss of airflow.

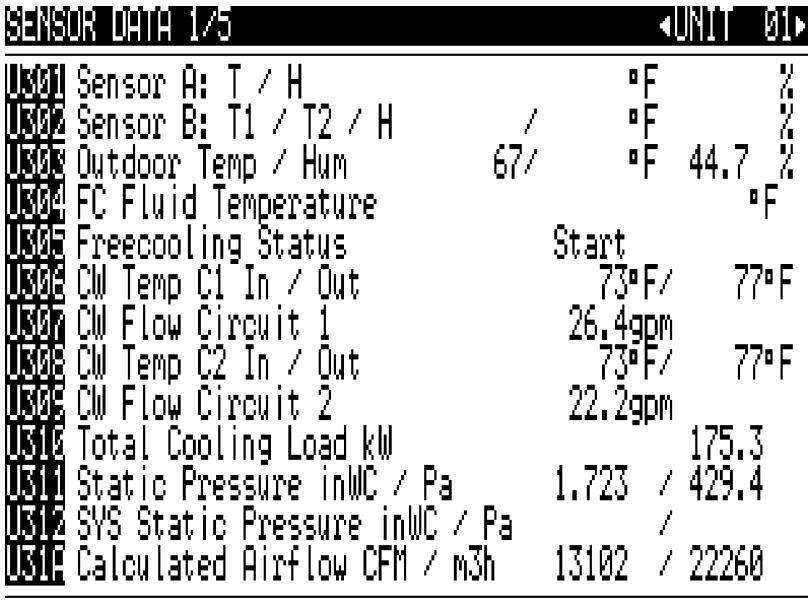
U240 SP Transducer High Range—Sets the pressure range at which the High Static Pressure Out of Range Alarm is activated. This parameter range is adjustable from 0.000 - 1.405 inWC. The factory default is 1.284 inWC.

U241 SP Transducer Low Range—Sets the pressure range at which the *Low Static Pressure Out of Range Alarm* is activated. This parameter range is adjustable from 0.000 - 1.395 inWC. The factory default is 0.000 inWC.

7.4 User-Sensor Data Menu Screens

Sensor Data shows the readings and status of standard and optional sensors.

Figure 93 Sensor data screen, page 1



U301 Sensor A: T / H—Shows the calibrated Sensor A temperature (left hand value) and humidity (right hand value) if the optional reference sensor is connected to the Liebert iCOM controller area network (CAN) bus. A reference sensor can be connected to any type of Liebert iCOM unit. Sensor A is selected by setting the DIP switches on the temperature and humidity board. Refer to 4.3.2 - DIP Switch Settings.

U302 Sensor B: T1 / T2 / H—Shows the calibrated Sensor B temperature (left hand value), second temperature reading in the if sensor B is a 2T, and humidity (right hand value) if sensor B is a T/H sensor. Sensor B is an optional reference sensor connected to the Liebert iCOM controller area network (CAN) bus. A reference sensor can be connected to any type of Liebert iCOM unit. Sensor B is selected by setting the DIP switches on the temperature and humidity board. Refer to 4.3.2 - DIP Switch Settings.

U303 Sensor C: T1 / T2 / H—Shows the calibrated Sensor C temperature (left hand value), a second temperature reading if sensor C is a 2T (middle), and humidity (right hand value) if sensor C is a T/H sensor. Sensor C is an optional reference sensor connected to the Liebert iCOM controller area network (CAN) bus. Sensor C is selected by setting the DIP switches on the temperature and humidity board. Refer to 4.3.2 - DIP Switch Settings. A reference sensor 'C' can be connected to any type of Liebert iCOM unit unless the unit is equipped with an air side economizer. When the unit has an air side economizer, this parameter represents the outside air temperature and humidity. See the description below for more details.

U303 Outdoor Temp / Hum—Reads the calibrated outdoor temperature (left hand value) and humidity (right hand value) for air side economizer units. These readings are used to determine air side economizer eligibility. It is determined by comparing the temp between the room and outdoor air temperature.

U304 FC Fluid Temperature—Displays the calibrated temperature of the incoming water on units equipped with a free-cooling coil.

U305 FC Status / Amb Temp—Displays the operating status of air side economizer (left hand value) and displays the current outside air temperature (right hand value). The operating status values include: Off, Start and On.

U305 Freecooling Status—Displays the operating status of free cool or dual cool economizer (left hand value) and displays the current outside air temperature (right hand value). The operating status values include: Off, Start and On.

U306 CW Temp In / Out—Displays the calibrated chilled water inlet (left hand value) and outlet (right hand value) temperature. If two chilled water inlet/outlet sensors are connected, the description will change to 'CW Temp C1 In / Out.'

U307 CW Flow Circuit 1—Displays the calibrated fluid flow through the unit in gallons per minute or liters per minute. The description show will change depending on the unit type installed. Single Circuit chilled water units will read 'CW Flow', Dual Chilled water circuit units will read 'CW Flow Circuit 1', Free cooling or dual cool unit will display 'FC Fluid Flow' and DX units with water/glycol cooled heat exchangers will read “Glycol Flow.”

U308 CW Temp C2 In / Out—Displays the calibrated chilled water inlet (left hand value) and outlet (right hand value) temperature of the second circuit on a dual chilled water unit.

U309 CW Flow Circuit 2—Displays the calibrated fluid flow through the unit in gallons per minute or liters per minute.

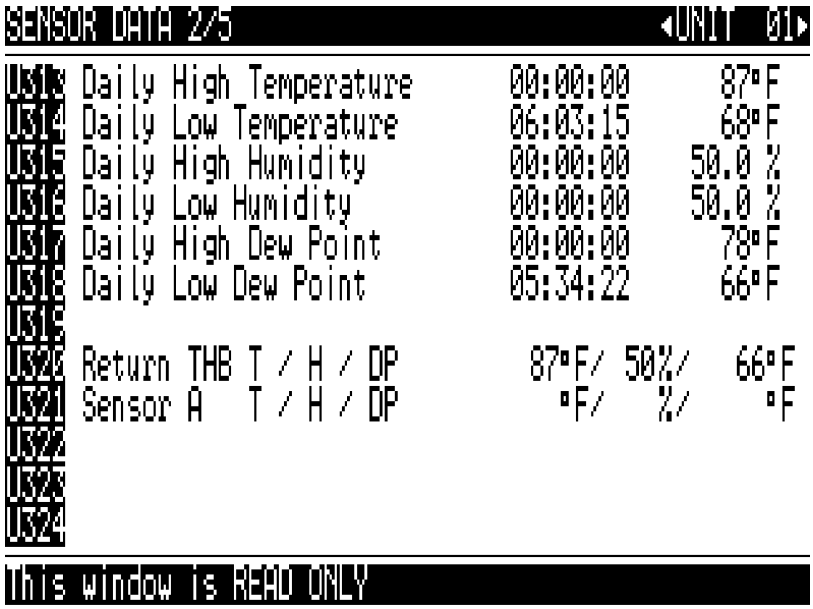
U310 Total Cooling Load kW—Displays the calculated chilled water cooling load based on the temperature difference from supply to return and the fluid flow rate. If the display is set to read KBtuH, the line description will update to “Total Cooling Load KBtuH.”

U311 Static Pressure inWC / Pa—Displays the calibrated static pressure in inWC (left hand value) and Pa (right hand value).

U312 SYS Static Pressure inWC / Pa—Displays the calibrated static pressure inWC (left hand value) and Pa (right hand value) where multiple static pressure sensor are shared across the iCOM U2U network. The reading displayed will be an average or minimum pressure of all connected units based on S197 SP Teamwork / Network mode setting.

U31A Calculated Airflow—Shows the calculated airflow based on an installed differential pressure transducer.

Figure 94 Sensor data screen, page 2 (return only)



U313 Daily High Temperature—The highest recorded temperature from the temperature controlling sensor between the hours of 12:00 a.m. to 11:59 p.m.

U314 Daily Low Temperature—The lowest recorded temperature from the temperature controlling sensor between the hours of 12:00 a.m. to 11:59 p.m.

U315 Daily High Humidity—The highest recorded humidity from the temperature controlling sensor between the hours of 12:00 a.m. to 11:59 p.m.

U316 Daily Low Humidity—The lowest recorded humidity from the temperature controlling sensor between the hours of 12:00 a.m. to 11:59 p.m.

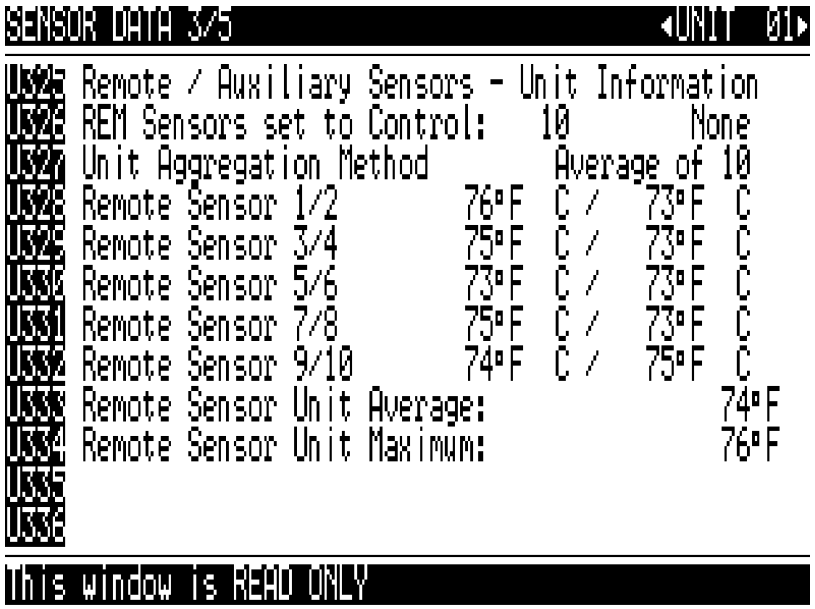
U317 Daily High Dew Point—The highest recorded dew point from the temperature controlling sensor between the hours of 12:00 a.m. to 11:59 p.m.

U318 Daily Low Dew Point—The lowest recorded dew point from the temperature controlling sensor between the hours of 12:00 a.m. to 11:59 p.m.

U320 Return THB T/H/DP—Displays the actual temperature relative humidity and calculated dew point at the return of the unit.

U321 Sensor A T/H/DP—Displays the actual temperature relative humidity and calculated dew point at the sensor A location.

Figure 95 Sensor data screen, page 3



U325 Remote / Auxiliary Sensors - Unit Information—read only text describing screen features.

U326 REM Sensors set to Control—Read-only parameter that shows the number of sensor set to control (left hand value) and the sensor control type used (right hand value). If the sensors are used for reference only, the right hand value will display *None*. Otherwise the right hand value will display the sensor control mode such as *Cool, Fan* or *Cool + Fan*.

U327 Unit Aggregation Method—Read=only parameter that describes the sensor level control or aggregation method used for control. The left hand value will display *Maximum* or *Average of* based on the Service Menus>Remote SB03 programming. If set to *Average*, a number will appear to the right. This number represents the highest number of remote sensors used for calculating the average temperature. This number is also based on the programming in Service Menus>Remote SB0.3.

U328 Remote Sensor 1/2—Displays the actual remote sensor reading for each remote sensor. The actual value reported here depends on how the sensor is set up. If the sensor is set to *Average*, then an average of the two temperature readings per sensor will be shown. If the sensor is set to *Maximum*, then the maximum value will be shown.

U329 Remote Sensor 3/4—Same as Remote Sensor 1/2

U330 Remote Sensor 5/6—Same as Remote Sensor 1/2

U331 Remote Sensor 7/8—Same as Remote Sensor 1/2

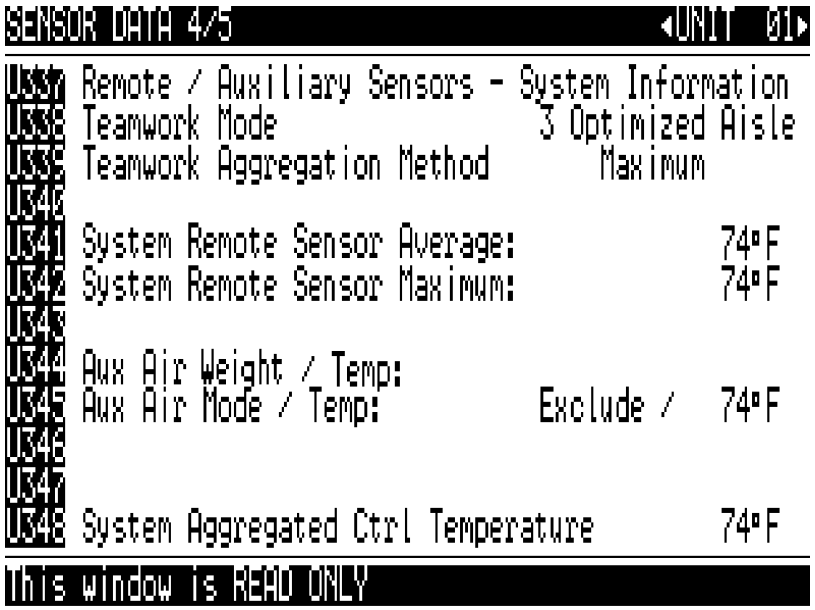
U332 Remote Sensor 9/10—Same as Remote Sensor 1/2

U333 Remote Sensor Unit Average—Displays the average remote sensor temperature taken from the total number of remote sensor readings above.

U334 Remote Sensor Unit Maximum—Displays the maximum remote sensor temperature taken from the remote sensor readings above.

U336 Unit Aggregated Ctrl Temperature—Displays the remote sensor temperature control temperature when cooling or fans are set to control based off remote temperature.

Figure 96 Sensor data screen, page 4



U337 Remote / Auxiliary Sensors - System Information—Read-only text describing screen features.

U338 Teamwork Mode—Read-only parameter describes what U2U teamwork mode the unit is operating in.

U339 Teamwork Aggregation Method—Read-only parameter is viewable only in Teamwork 1 and 3 with temperature or fan control sensor set to *Remote*. This parameter describes if the teamwork control is based on the average or maximum sensor readings in the group. If programmed to *Average*, the parameter will also display how many units are calculated in the average. Only the highest sensor readings will be used for the averaging.

U341 System Remote Sensor Average—Read-only parameter is viewable only in Teamwork 1 and 3 with temperature or fan control sensor set to *Remote*. This parameter displays the average remote sensor reading of all connected sensors.

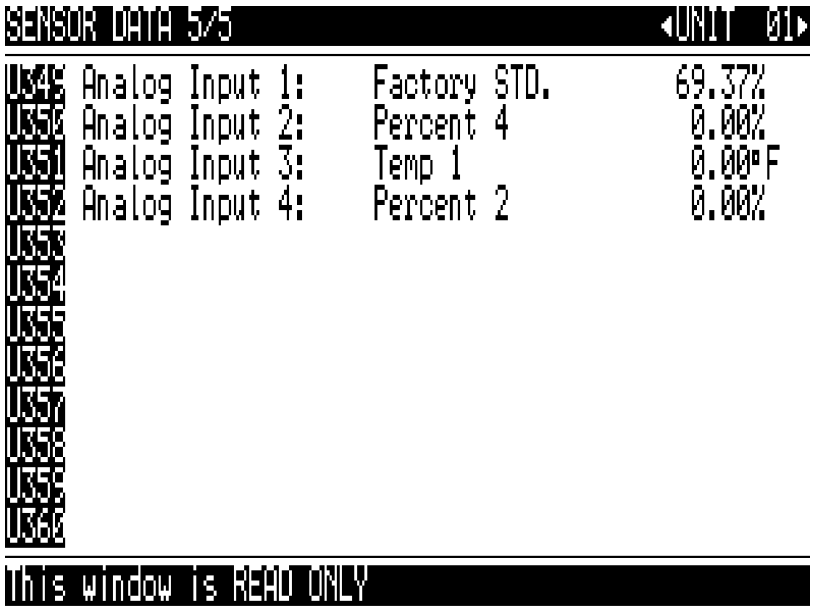
U342 System Remote Sensor Maximum—Read-only parameter is viewable only in Teamwork 1 and 3 with temperature or fan control sensor set to *Remote*. This parameter displays the average remote sensor reading.

U344 Aux Air Weight / Temp—Read-only parameter is viewable only when the unit is connected to wireless sensors, the unit is in Teamwork 1 or 3, temperature or fan control sensor set to *Remote* to view this parameter and teamwork is based on *Average* control. This parameter displays the weight applied to the wireless control (left hand value) and actual wireless sensor reading (right hand value). The left hand value represents the amount of influence the actual wireless sensor reading (right hand value) has relative other remote sensors for controlling component operation. The actual wireless sensor reading (right hand value) is the maximum or average wireless sensor reading transmitted from the auxiliary proxy or Liebert SiteLink®.

U345 Aux Air Mode / Temp—Read-only parameter is viewable only when the unit is connected to wireless sensors, the unit is in Teamwork 1 or 3, temperature or the fan control sensor set to Remote and teamwork is based on *Maximum*. This parameter describes how the wireless sensors are used in the teamwork calculation (left hand value) and what the actual wireless sensor reading (right hand value). Three possible statuses may be shown as the left hand value: *EXCL, INCL* and *ONLY. EXCL* indicates that the wireless sensor value is not used for determining the unit fan or cooling operation. *INCL* indicates the wireless sensor value is considered for controlling fan or cooling operation. *ONLY* indicates the wireless sensor value is used for determining fan or cooling operation. The actual wireless sensor reading (right hand value) is the maximum or average wireless sensor reading transmitted from the auxiliary proxy or Liebert SiteLink.

U348 System Aggregated Ctrl Temperature—Read-only parameter is control temperature for cooling or fan when the unit is in Teamwork 1 or 3.

Figure 97 Sensor data screen, page 5



These parameters show the analog input configured device and the value from the device that is connected to the Liebert iCOM control. Refer to the **Figure 167** through **172** for a list of analog input devices. The analog input device is setup in the Service menu and could consist of: Air *Pressure, Pressure, Temperature* or *Percent*.

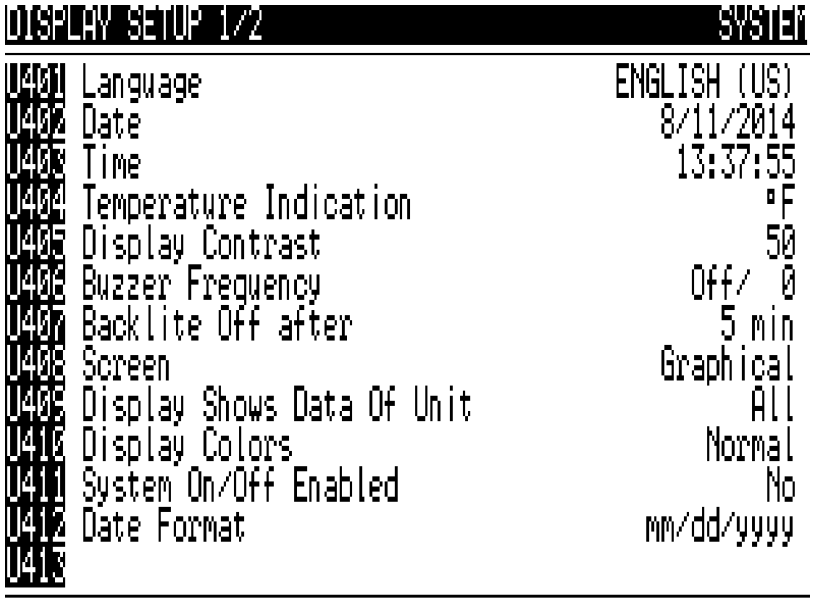
Active Alarms

Active Alarms—Permits viewing all current, active alarms.

7.5 User-Display Setup Menu Screen

Display Setup is where items such as date, time, screen type and temperature indication may be set according to user preference.

Figure 98 Display setup screen, page 1



U401 Language—Sets the language on the display. Changing this parameter changes all menu parameters to the selected language.Currently, the supported languages for this version of software is English, Chinese, Japanese and Spanish.

U402 Date—Sets the internal date of the unit. If this unit is connected to other units with the unit to unit network connection, all units will reflect the last date set.

U403 Time—Sets the internal time of the unit. If this unit is connected to other units with the unit to unit network connection, all units will reflect the last time set. The control tracks time using a 24-hour clock.

U404 Temperature Indication—Selects the actual and set point temperature indication. Selecting C will set the unit to display in Celsius and F will set the unit to display in Fahrenheit. When the temperature indication is set to display Celsius, proportional bands are displayed as K. This is a calculated value that converts Fahrenheit to Celsius without the -32°F offset.

Example: If the proportional band is 20°F, then (20/1.8) = 11.1K

U405 Display Contrast—Changes the contrast of the display to adjust for different viewing angles, low light and bright light conditions. As the display ages, the contrast may need to be adjusted. The factory default is 50.

U406 Buzzer Frequency—Changes the audible noise frequency of the built in buzzer. When adjusting the buzzer frequency, the buzzer will sound allowing selection of a frequency that is easily detected when an alarm occurs. The factory default is 50.

U407 Backlite Off After X Hours—Controls the length of time that the back-light remains active when the display is unused. When the buttons on the front display have not been pressed for the time selected in this parameter, the back-light will turn Off, extending the life of the display and saving energy.

U408 Screen—Determines the display mode: Graphical comma, Simple comma, Graphical and Simple

U409 Display Shows Data of Unit—Selects the layout of the main display. Selects if the main display shows the temperature and humidity actual values only, setpoint values only or both actual and setpoint. Selecting graphical and graphical comma will show a bar graph for each component regardless if the component is active. Simple and simple comma only show device icons that are active without a bar graph and hides components that are inactive. Selecting comma in either simple or graphical changes the resolution of the displayed values. The factory default is Graphical.

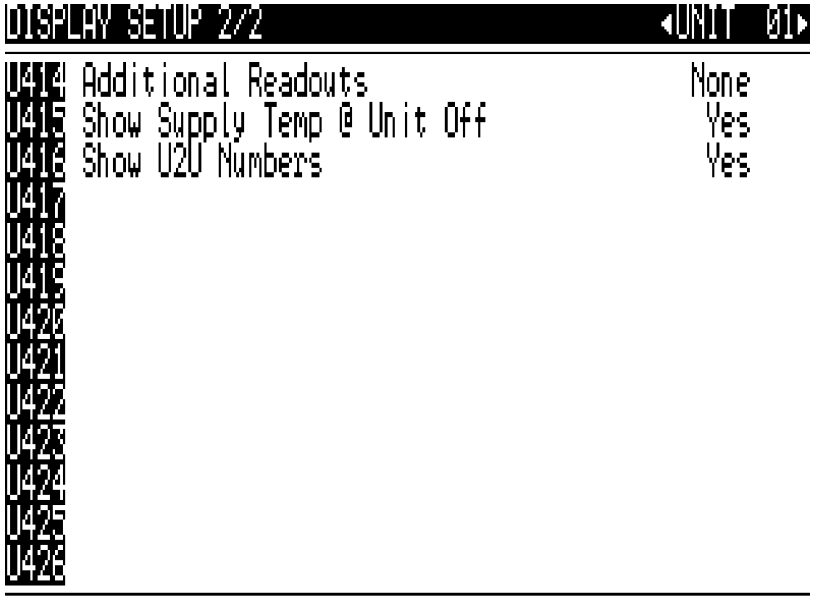
U410 Display Colors—Selects the background color. Inverted sets the display to show white font with blue background; Normal sets a white background with blue font.

U411 Date Format—Changes the month, day, and year arrangement shown on the front display and event time stamps.

Default: MM/DD/YYYY

Other selections: DD.MM.YYYY and YYYY-MM-DD

Figure 99 Display setup screen, page 2



U414 Additional Readouts—Selects whether fluid flow is displayed in the unit view.

U415 Show Supply Temp @ Unit Off—Hides or shows the supply air temperature when the unit is in monitoring Off, display Off, in remote shutdown or in standby mode. This feature is typically used by BMS integrators to prevent nuisance high supply temperature alarms while the unit is not cooling.

U416 Show U2U Numbers—Hides or shows the U2U number to the right of the unit name.

7.6 User-Total Run Hours Menu Screens

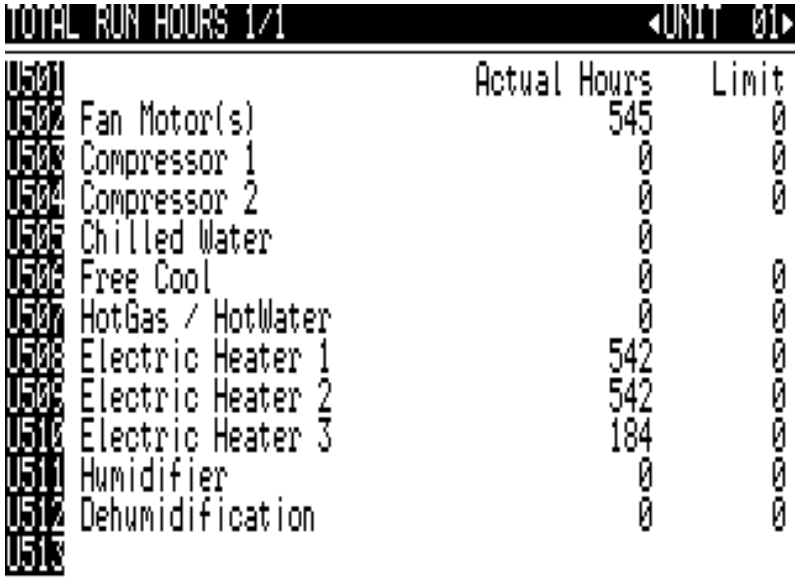
Total Run Hours displays the cumulative hours a particular component has been operating and the limit placed on the hours the component may operate.

Each main component of the unit has its own run hours counter and a threshold. The actual run hours can be reset to 0 by selecting the counter by pressing Enter, and then pressing the Down arrow key. The thresholds can be set the same way.

NOTE

The password needs to be entered in any other screen because this screen does not contain a password entry line.

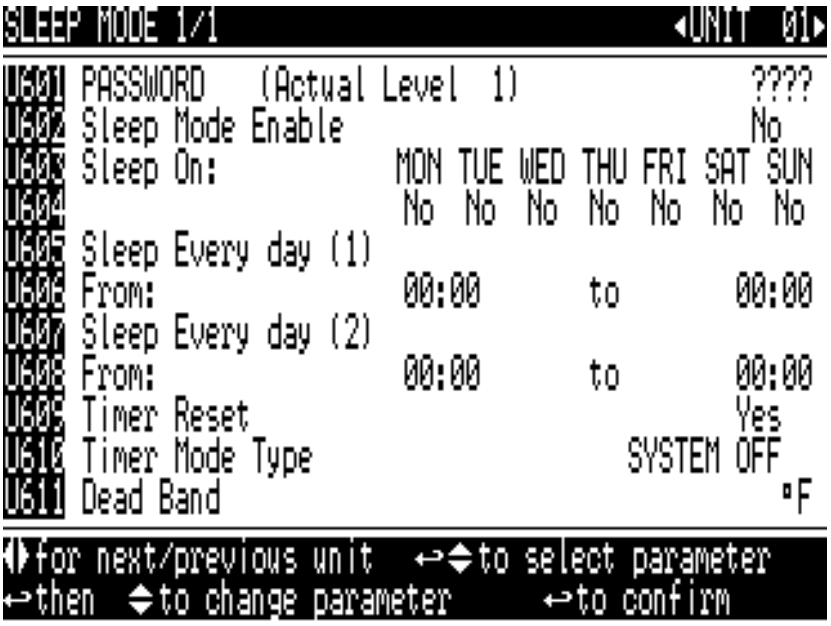
Figure 100 Total run hours screen



7.7 User-Sleep Mode Menu Screens

The Sleep Mode menu contains parameters to set back or allow unit to turn Off during non-peak hours. Sleep Mode may be interrupted if the temperature rises above threshold set in the Set Alarms menu.

Figure 101 Sleep mode screen



U609 Timer Reset—Defines when the unit changes back to Sleep Mode after having crossed the high or low temp threshold (Deadband setting on line U611). These values are available:

- NO: The user can use this setting to temporary interrupt a sleep mode interval while sleep mode is active. If the parameter is left at No, sleep mode will not resume until the next sleep mode interval occurs or the user sets the parameter back to Yes or Auto.
- YES: If the unit is brought out of sleep mode by a hi or low temperature event, the unit continue to operate and will go to Sleep Mode again at the next coming Interval.
- Auto: The unit will automatically return to sleep mode if interrupted by a high- or low-temperature event. The temperature must be within 50% of the temperature dead band before the unit will resume sleep mode.

U610 Timer Mode Type—Defines what will happen when sleep mode is active. Two options are available:

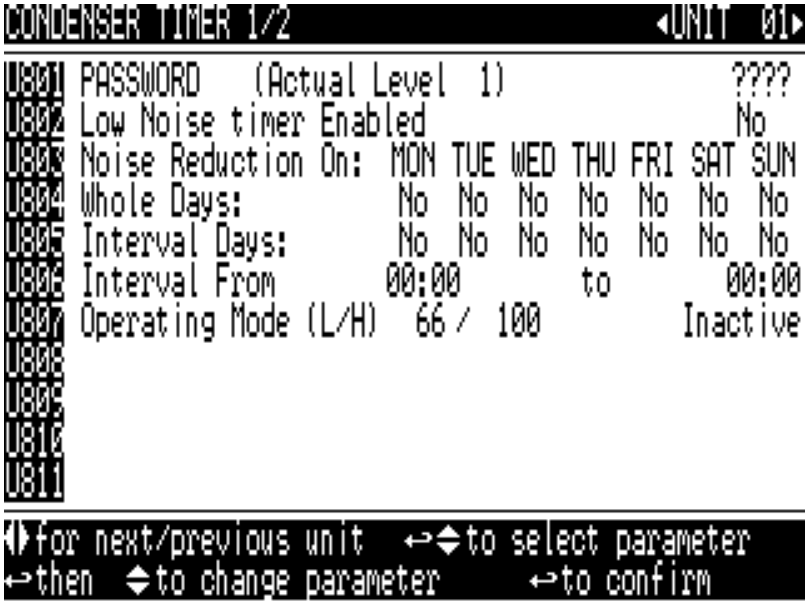
- System Off: the unit remains Off, no fans cooling etc. High- and low-temperature events will not bring the unit out of sleep mode.
- Deadband: Provides the user with a selectable deadband range to bring a unit out of sleep mode if the temperature in the space gets too high or low. The deadband is defined on line U611.This setting also allows the unit to come out of sleep mode if a high- or low-temperature alarm occurs. Temperature alarm thresholds are (internally) shifted lower / higher by the half value U611.

U611 Dead Band—Defines when a unit will come out of sleep mode when U610 is set for Dead Band. This deadband is added to the temperature dead band in Service Menu, Setpoints. Once the control temperature increases above Temperature Setpoint + (1/2 [Temperature Dead Band]) + U611, the unit will turn On. The unit will remain operating until the temperature is within 1/2 (Temperature Dead Band).

7.8 User-Condenser Timer Menu Screens

The Condenser Timer menu applies to Liebert units coupled to a Liebert MC™ outdoor condenser connected through CANbus communication.

Figure 102 Condenser timer screen—page 1



U802 Low Noise Timer Enabled—Sets the low noise operations of the condenser fan. When the parameter is set to *YES* the low noise operation is selected. When set to *NO*, the low noise will be disabled even if a schedule is set below. Low noise may be overridden by calculated gain sequence at the global condenser to prevent a high-pressure situation.

U803 Noise Reduction On—Lists the day(s) that low noise feature can be scheduled if U802 is set to *YES*.

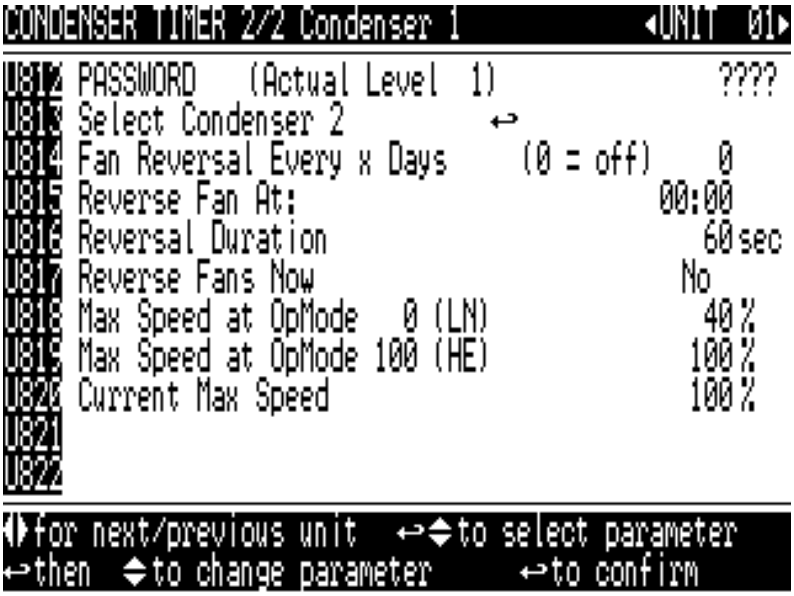
U804 Whole Days—Selects the whole day(s) low noise operations will be available for the condenser fan. When the parameter is set to *YES* the low noise operation is selected for the whole day. When set to *NO* the low noise will be disabled.

U805 Interval Days—Selects the interval day(s) low noise operations will be available for the condenser fan. When the parameter is set to *YES* the low noise operation is selected. When set to *NO* the low noise will be disabled even if an interval time is set below.

U806 Interval From—Selects the time of day that the low noise feature will be enabled between 00:00 and 24:00.

U807 Operating Mode (0=LN, 100=HE)—The first value represents the fan speed during low noise operation. The second value represents the fan speed during normal or high efficiency operation. The first value is linked to U818 and the second to U819.

Figure 103 Condenser timer screen—page 2



U813 Select Condenser #— # represents the alternate condenser connected. Toggles between Condenser 1 and 2. When *Select Condenser 2* is shown, the parameters U814 through U820 apply to Condenser 1. When *Select Condenser 1* is shown, parameters U814 through U820 apply to Condenser 2.

U814 Fan Reversal Every x Days— Sets the numbers of days between fan reversals; adjustable from 1-100 days. The default value is 0 days = OFF. Fan reversal can be performed only with both compressors off. Fan reversal interval should be performed during standby periods. If the compressor is operating, the control will skip the scheduled reversal and retry the next interval day. If the scheduled fan reversal is missed, the control will look for the next available time to do a fan reversal where the compressor's calls are met and initiate the reversal. If one or both of the compressor(s) is operating and/or the fan is in low noise operation, the request to reverse the fans will be ignored.

U815 Reverse Fan At:—Sets the time the fan reversal will be performed. The fan reversal time is set using a 24-hour clock.

U816 Reversal Duration—Sets how long the fan(s) will be operated in reverse; adjustable from 0-999 seconds. The default is 60 seconds.

U817 Reverse Fans Now—Performs a rotation when set to *YES*. When set to *YES,* the parameter will automatically change to *NO* when the timer, U816, elapses. If one or both of the compressor(s) is operating and/or the fan is in a low noise operation, the request to reverse the fans will be ignored.

U818 Max Speed at OpMode 0 (LN)—Linked to U807 0=LN column and defines the maximum speed during Low Noise operation.

U819 Max Speed at OpMode 100 (HE)—Linked to U807 100=HE column and defines the maximum speed during normal or High Efficiency operation.

U820 Current Max Speed—Parameter show the status of the actual maximum fan speed.

Configuring Low Noise Operation

First, determine the days and time of day low noise is required. This will be set U806 through U808 respectively. Second, determine the maximum fan speed setting during low noise operation.

In this example, the user does not want fan speed to exceed 35% max speed from 10 pm to 8 am weekdays.

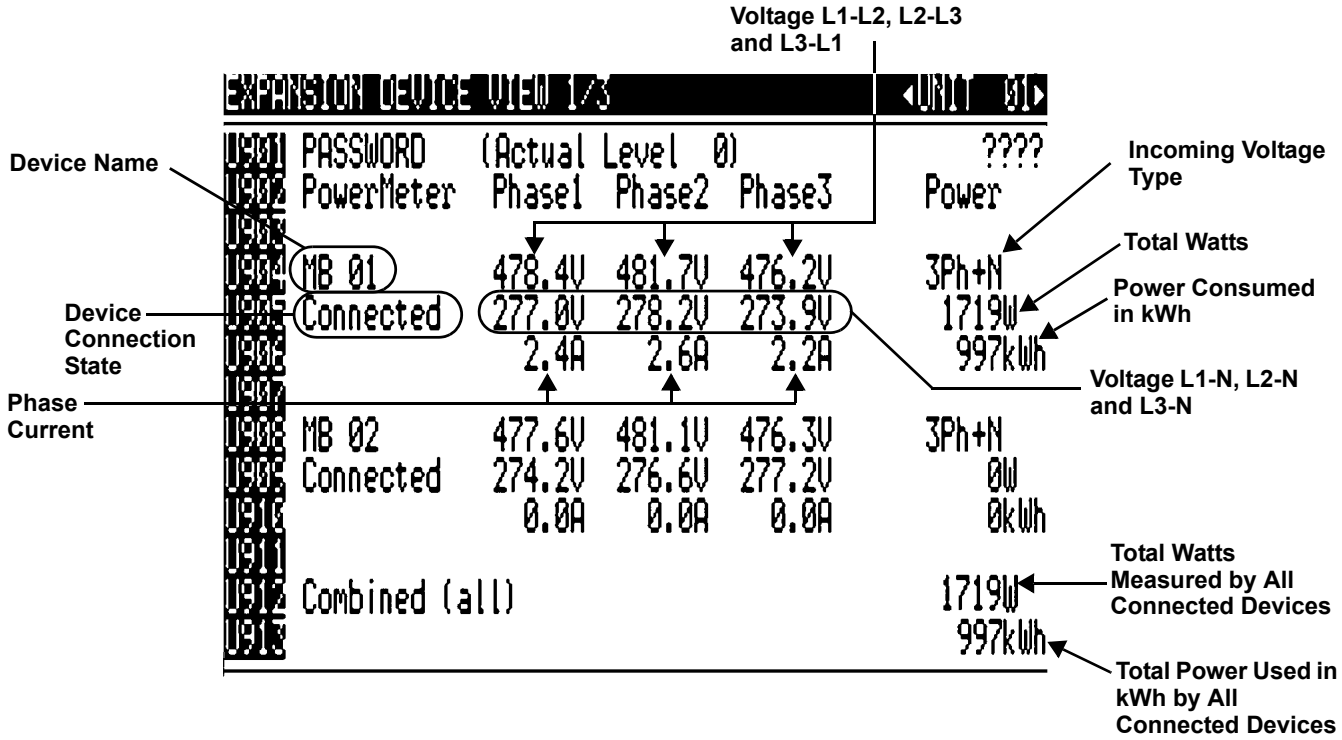
1. Set U805 Mon-Fri columns to yes.
2. Set U806 interval time from 22:00 to 8:00
3. U807 = 0% / 100%
4. U818 = 35% (Max fan speed low noise)
5. U819 = 100% (Max fan speed during normal operation)

The settings above result in a 35% maximum speed when the timer is active (i.e., at night) and will operate the fan between 0 and 100% maximum speed of when the timer is inactive (normal operation, during daytime).

7.9 User-Expansion View Menu Screens

The Expansion View menu applies to Liebert Thermal management units with Modbus Power Meter. This menu allows the user to see the connection status, voltage, operating current and power for up to six devices per unit.

Figure 104 Expansion Device View, page 1

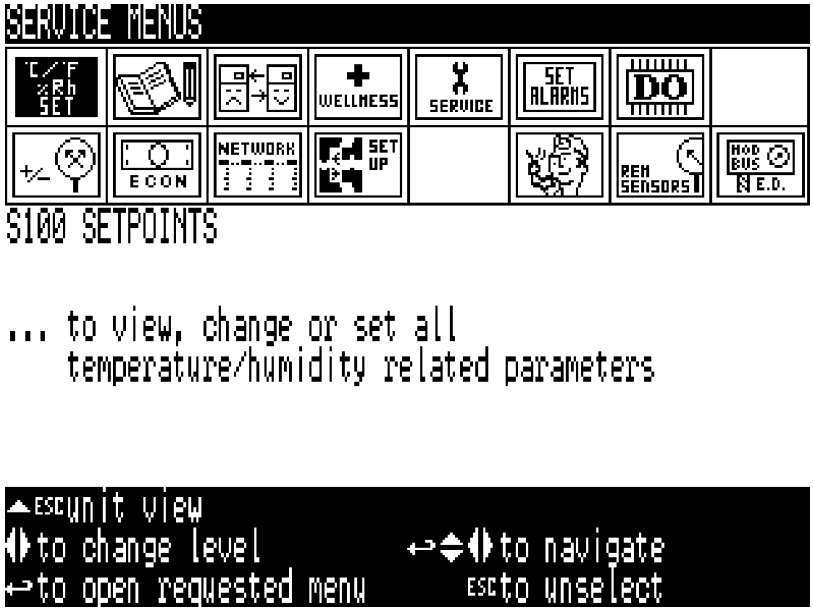


8.0 SERVICE MENU PARAMETERS

Service menus allow customized settings for site operations. The password for service menu parameters is **5010.**

The Liebert iCOM firmware is being updated constantly. As a result, the Service menu parameter tables shown in this manual may be slightly different than what is shown on your cooling unit's display. Please check **www.liebert.com** for the latest Liebert iCOM User manual updates.

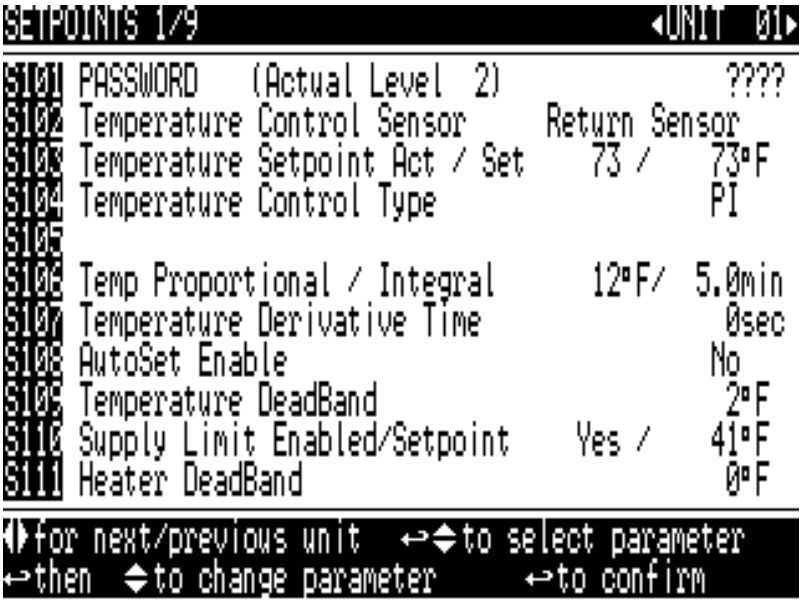
Figure 105 Service Menu Main Screen



8.1 Service-Setpoints Menu Screens

Setpoints allow the user to view, change and set all temperature- and humidity-related parameters.

Figure 106 Setpoints screen, page 1 of 10



S102 Temperature Control Sensor—Selects which sensor will be controlling the cooling capacity. Cooling capacity is either the Chilled Water Valve, Compressor, FreeCooling Valve or Air Economizer. Unloading type compressors can be set to any sensor type, however fixed style compressors can only be set to Return or Remote control type l. This parameter can only be changed in the service menu. The range is Supply, Return or Remote Sensor. The factory default is Return.

S103 Temperature Setpoint Act/Set—Selects a return temperature that the cooling unit will maintain by applying cooling and or reheats. This is adjustable from 41-104°F (5-40°C). The factory default is 73°F (22.7°C).

There are two values in this field. The Temp Set value is the temperature that has been set by the user to control the temp. The Temp Act value is a read only value that indicates if another routine, like supply compensation has internally modified the Temp controlling value. If compensation has not been activated, then the ACT and SET will always match. This parameter is adjustable from 41-104°F (5-40°C). The default set value for Supply is 64°F. The default set value for Return and Remote is 73°F.

S104 Temperature Control Type—Sets the type of control to be followed Proportional, PI or Intelligent.

S106 Temperature Proportional /Integral—The left hand value adjusts the activation points of compressors or rate of change based on the actual sensor values deviation from setpoint. The smaller this number the faster the compressors and valve(s) will increase capacity. Too small of a number may cause the unit to short cycle the compressors or excessively reposition the valve. The right hand value adjusts the capacity of the unit based on time away from setpoint so that accurate temperature control can be maintained. The proportional and integral work together to maintain setpoint. Large P-Band with Small I-Time is typical when controlling to supply air.

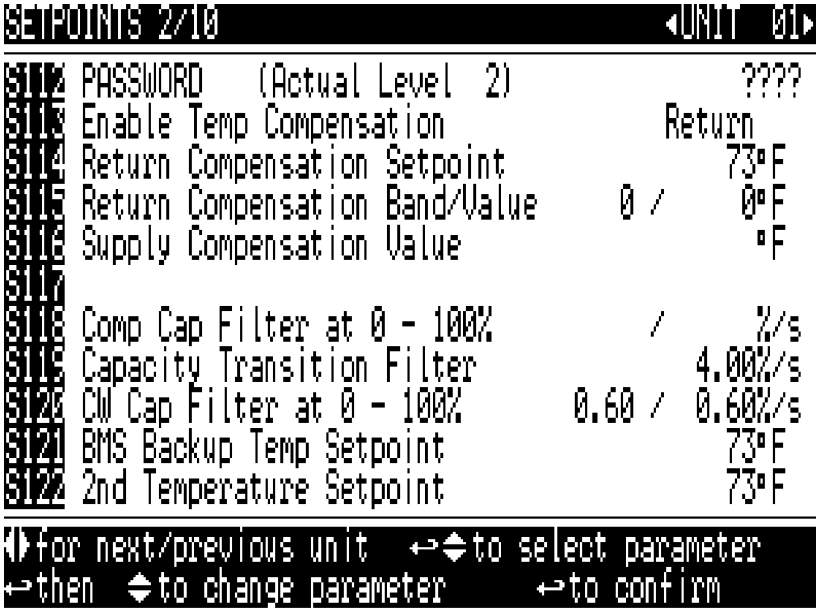
S108 AutoSet Enable—Sets the temperature and humidity proportional bands automatically based on the type of unit when this parameter is set to *YES* and if teamwork modes are selected. To change the proportional bands, this parameter must be set to *NO*. If supply or remote sensors are used, then this value is always set to *NO*.

S109 Temperature Deadband—Avoids overshooting or undershooting the setpoint and cycling between the reheats and cooling. The value entered in this field will be split in half by the temperature setpoint. Example: If the temperature setpoint is 70°F (21.1°C) and a 4°F (2.2°C) deadband is set, then no cooling will be activated until 72°F (22.2°C) and no heating will be activated until 68°F (20°C) is reached.

S110 Supply Limit Enabled/Setpoint—Chilled water units may be set up with the supply air sensor to maintain a minimum air temperature under a raised floor to help prevent condensation. In order to avoid supply temperatures that are too low, the Supply Limit can influence the opening of three-point or analog actuators or the output of analog valves. The control compares the deviation from the return air setpoint and the supply limit setpoint, and calculates the output to the actuator from the smaller deviation.

S111 Heater Deadband—Changes the amount of deviation below the temperature setpoint that the heaters will cycle On and Off. This value is added to the heating side of the normal temperature deadband.

Figure 107 Setpoints screen, page 2 of 10



S113 Enable Temp Compensation—Temperature compensation allows for a second or third sensor to be used that will influence the unit's cooling or heating. Three selectable values are available: Return, Supply, and Ret + Sup (Return + Supply). See **Temperature Compensation on page 60** for more information on temperature compensation.

S114 Return Compensation Setpoint—The temperature setpoint where compensation begins to operate by increasing the supply air setpoint.

S115 Return Compensation Band/Value—The return compensation band / value will determine how quickly the cooling capacity is adjusted as the return temperature drops below the return compensation setpoint.

S116 Supply Compensation Value—The Supply Compensation value determines how much the supply temperature setpoint will be reduced when the units fan speed is at 100% and the cold aisle is not able to maintain temperature setpoint.

Any modifications to the supply temperature setpoint will be shown at the temperature setpoint on parameter S103 as the actual active control point.

S118 Comp Cap Filter at 0-100%—Controls the rate of change during comp load changes to avoid overshoots. The filter value depends on the current control deviation from the setpoint.

On the setpoint (at 0%), it's typically set lower (slow), and at the end of the P-band (at 100%) it's typically set higher (faster). The value is given in % control output change per second.

S119 Capacity Transition Filter—This parameter should only be adjusted by a factory-service trained technician. The transition capacity filter controls how quickly the capacity changes between different modes of operation.

This filter helps with the transition to avoid overshoot.

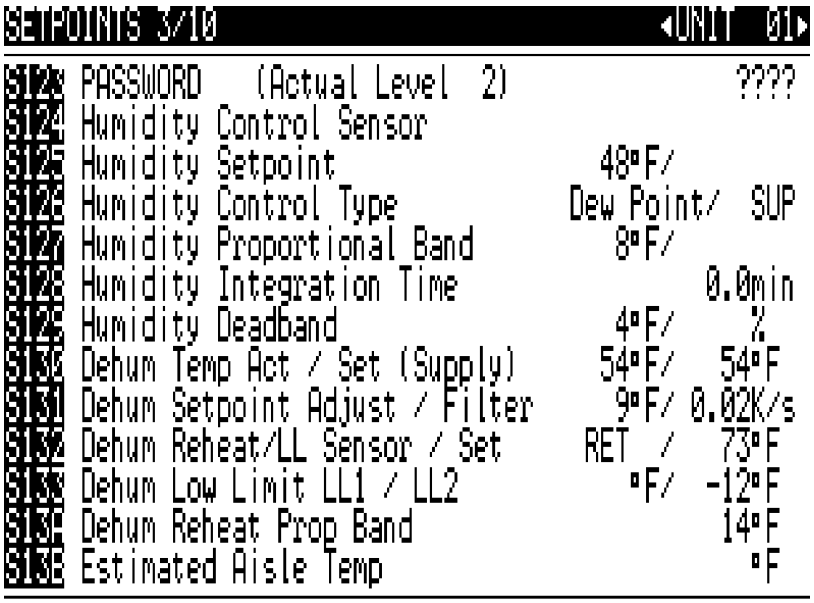
S120 CW Cap Filter at 0 - 100%— The CW Filter at 0% / 100% Controls the rate of change during a valve position adjustment to avoid overshoots. The filter value depends on the current control deviation from the setpoint. On the setpoint (at 0%), it's typically set lower (slow), and at the end of the P-band (at 100%) it's typically set higher (faster). The value is given in % control output change per second.

S121 BMS Backup Temp Setpoint—Selects a temperature setpoint that will be activated in the event of a BMS time-out. The BMS timer must be configured for this parameter to activate. If the unit is operating in Coupled mode, located in Service Menus>Setpoint, S163, then this setpoint will affect the fan control setpoint. This temperature may affect fan speed if the control is setup to operate in Coupled mode during normal operation (see **Table 4**). This parameter is adjustable from 41-104°F (5-40°C). The default setting is 73°F (23°C).

S122 2nd Temperature Setpoint—Provides a way to program an alternate temperature setpoint that is activated by a dry contact through the customer inputs connections. When a customer input connection is set to "2nd Setpoint" and the input wired to that input is active, then the value set in this parameter sets the active temperature setpoint. This parameter is adjustable from 41°F to 81°F (5 to 27.2°C). The factory default is 41°F (5°C).

This temperature may affect fan speed if the control is setup to operate in a coupled mode during normal operation (see **Table 4**).

Figure 108 Setpoints screen, page 3 of 10



NOTE

When the unit is in relative humidity control, only the right side of the menu is displayed and dew point will display the left side of the menu.

S124 Humidity Control Sensor—Determines which sensor is used to calculate the relative humidity. The humidity control type must be set to *relative* for the parameter to be active. The range is *Remote* or *Return Sensor*; the factory default is *Return Sensor*.

The right hand value allows choosing an alternate temperature control sensor for use during dehumidification. This sensor will replace the setting on line S102 while dehumidification is active. When the temperature control sensor (S102) is set to *Remote*, the default selection is *Remote* and the alternate selection is *Return*. When the temperature control sensor (S102) is set to *Supply*, the default selection is *Supply* and the alternate selection is *Return*.

S125 Humidity Setpoint—Selects a humidity that the cooling unit will maintain by removing or adding moisture to the air. The humidity setpoint will either be set in percent RH or as a Dew Point Value depending on what the humidity control type is set for. This parameter is adjustable from 20-80%. The factory default is 50%.

S126 Humidity Control Type—The left hand value selects the humidity control calculation. Setting this parameter to *Relative* will control the humidity without considering any temperature deviations. *Predictive* and *Absolute* control consider the temperature deviation from temperature setpoint so that a constant level of moisture is kept in the area based on the humidity sensor reading and the temperature deviation from setpoint. The factory default is *Predictive* (see **3.7 - Humidity Control**). The right hand value provides two options for controlling components during dehumidification if S102 Temperature Control Sensor is set to *Supply* or *Remote*. If the S102 is set for either of these values, the right hand value will be shown and can be selected as *Supply* or *Return*. If S102 is not set to *Supply* or *Remote*, both humidification and dehumidification will operate using the sensor assigned on S124.

S127 Humidity Proportional Band—Adjusts the activation points of the humidifier and compressors or cooling valves for dehumidification based on the actual sensor values deviation from setpoint. The smaller this number, the faster the compressors, cooling valves and humidifier will increase capacity. Too small of a number may cause the unit to short cycle or overshoot or undershoot the setpoint.

S128 Humidity Integration Time—Adjusts the capacity of the unit based on time away from setpoint so that accurate humidity control can be maintained. If the integration time is set to 0, the humidity control operates as a "proportional only" control. When an integration time is set, the control mode changes to "PI" control.

S129 Humidity Deadband—Prevents overshooting or undershooting the setpoint and cycling between humidification and dehumidification. This value will be split in half by the humidity setpoint.

S130 Dehum Temp Act/Set—Lowers the temperature control sensor reading to a predefined value during the call for dehumidification. The unit must be in supply air or remote humidity control. This should be set below the accepted dew point threshold of the conditioned space.

S131 Dehum Setpoint Adjust/Filter—Sets the amount that the Dehum Temp Setpoint is adjusted when the reheats activate. Example: If the unit is equipped with a reheat device, this parameter will increase the dehumidification temperature as the call for reheats are increased until the reheat call is at 100%. When the reheats are at 100%, the full Dehum Setpoint Adjustment will be applied.

S132 Dehum Reheat/LL Sensor/Set—The left hand value sets the temperature control sensor used for activating reheat during dehumidification and low limits in and out of dehumidification. To prevent the unit's heating and cooling modes from activating simultaneously, *Return Sensor* is the only allowable setting when S102 Temperature Control Sensor is set to *Return*. *Supply Sensor* is selectable only when S102 Temperature Control Sensor is set to *Supply* and *Remote Sensor* is selectable only when S102 Temperature Control Sensor is set to either *Remote* or *Supply*.

The right hand value is the user-programmed temperature setpoint used to activate reheat during dehumidification and low limits.

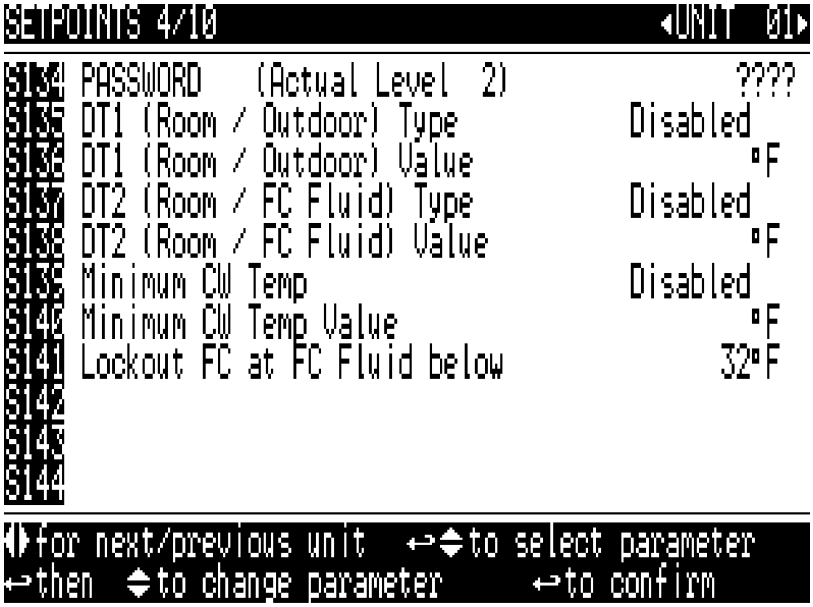
S133 Dehum Low Limit 1 LL1/LL2—Low limit 1 (left hand value) will disable one of the two compressors used for dehumidification in dual compressor dehumidification applications. If the humidity control sensor is set to *Supply* or *Remote* (S126 right hand value) or the unit is configured for single compressor or chilled water dehumidification, the LL1 value will not be visible and will be inactive.

Low Limit 2 will disable both compressors for dehumidification on units configured for dual compressor dehumidification. This parameter will disable the chilled water valve or compressor on units configured for single compressor dehumidification.

See **3.7.2 - Dehumidification** for more information on Low limit interaction.

S135 Estimated Aisle Temp—Sets an estimated cold aisle temperature when humidity control sensor is set to remote and no remote temp sensors are installed at the unit. This estimated temperature will be used to determine the humidity versus using an actual temperature in the cold aisle that may fluctuate during modes of dehumidification or load changes of the IT equipment. This provides a stable control point to reference the actual measured dew point from the return sensor.

Figure 109 Setpoints screen, page 4 of 10



S135 DT1 (Room/Outdoor) Type—Sets the activation point of the ambient dry bulb outdoor temperature as it relates to either an indoor actual temperature or temperature setpoint. See **3.5.2 - Liebert Air Economizer Control Settings** for more information.

S136 DT1 (Room/Outdoor) Value—Field-adjustable setpoint or temperature. Type (setpoint or temperature) is based on the setting on S135.

S137 DT2 (Room/FC Fluid) Type—Determines the method to activate the water circuit on Dual-Cool and free-cool units. It may be set to *CONTACT, TEMP* or *SET*. *CONTACT* which uses a dry contact to activate the free-cooling circuit. *TEMP* uses a sensor reading that can then be compared to the return temp to see whether free-cooling is possible. *SET* compares the temperature *SET* to the free-cooling sensor to determine free-cooling availability.

S138 DT2 (Room/FC Fluid) Value—Sets the delta between the actual temperature and fluid temperature that must be met before free-cooling will occur.

Example: Actual Temperature = 75°F

Free-cooling Temperature = 70°F

DT2 Value = 4

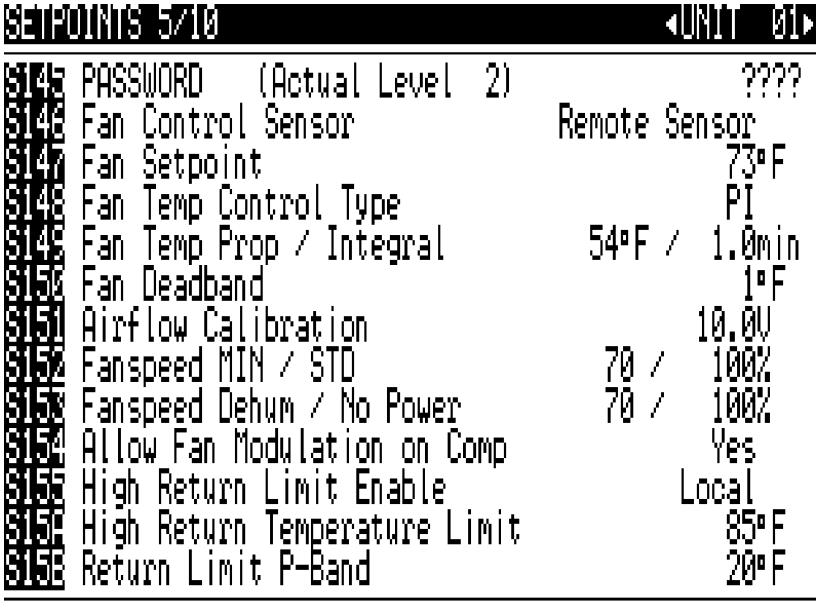
Since the difference between the free-cooling fluid and the actual temperature is 5°F and the DT2 value is set to 4°F, then free-cooling would be utilized.

S139 Minimum CW Temp—Enables the temperature at which free-cooling can operate independently without assistance of the compressor circuit(s).

S140 Minimum CW Temp Value—Sets the water temperature at which 100% free-cooling can be provided to handle the full room load. When the fluid temperature is below this setting, then the compressors will no longer turn On until the water temperature is above the minimum CW Temp.

S141 Lockout FC at FC Fluid below—Prevents frost from building up on the free-cooling pipes when the outdoor ambient is extremely low by turning Off the free-cooling circuit when the water temperature is too low.

Figure 110 Setpoints screen, page 5 of 10



S146 Fan Control Sensor—Controls the fan speed for modulation. Options for this setting are Supply, Return, Remote, and Manual Mode.

If manual mode is selected, then the fan speed can be controlled from the local display or through a building management system.

S147 Fan Setpoint—Activated when a temperature sensor is being used to control the fan speed. If the same sensor is used for temperature control and fan speed control, then this value will reflect the same setpoint as the temperature control setpoint. Manual mode uses the Fan Speed STD for control.

S148 Fan Temp Control Type—Sets the type of control the unit will use to control fan speed.

PI controls gain is set in the Temp Prop / Integral parameter.

PI control will operate the fan speed so that the actual temperature of the fan control sensor is equal to the fan temp setpoint. If proportional only is selected, the fan will change "ONLY" based on the deviation from setpoint which will allow the actual temp to settle higher than setpoint.

S149 Fan Temp Prop/Integral—Adjusts the fan speeds rate of change based on the actual sensor values deviation from setpoint. The smaller this number, the faster the fans will increase speed. Entering a number that is too small may cause the fans to increase and overshoot setpoint.

Temperature Integration Time—Adjusts the fans of the unit based on time away from setpoint so that accurate temperature control can be maintained. The proportional and integral work together to maintain setpoint. Large P-Band with Small I-Time is typical to achieve a stable control.

S150 Fan Deadband—Avoids overshooting and undershooting the setpoint. The value in this field will be split in half by the fan speed setpoint.

S151 Airflow Calibration—Defines the maximum voltage output at 100% fan speed. The default value is 10.0V. The value is commonly used when the unit airflow is tested and balanced. If the airflow is too high, the value displayed can be lowered to match design. This value cannot be set above the Analog Output High Limit or below the Analog Low Limit for the fan set in the Advanced Menu.

Caution must be taken when lowering the airflow calibration value. Setting it too low may cause excessive condensation, coil freezing and other problems. Contact your local Emerson distributor with any questions.

S152 Fanspeed Min/STD—Sets the range for the variable fans. Min sets the minimum speed that the fan will operate at. Fan speed is modulated between the MIN and STD based on which sensor is set to control, setpoint and the PI settings. If the controlling sensor is set to manual, then the STD setting will control the current fan speed and the Min value is hidden. This parameter is also adjustable through the BMS.

S153 Fanspeed Dehum/No Power—Sets the fan speed when a call for dehumidification is active. This allows the unit's fan speed to be reduced to help with any overcooling due to dehumidification. This also allows the coil to remove additional moisture faster.

S154 Allow Fan Modulation on Comp—Permits setting the fan to fixed speed if the unit is equipped with compressors. Two options are available: *No, Yes* (factory default).

- No: Sets the fans speed to S152 STD speed during compressor operation. Once this parameter is set at the local display, it must be removed at the local display before fan speed control can be re-engaged.
- Yes: Allows the fan speed to modulate during compressor operation according to the programmed fan control settings.

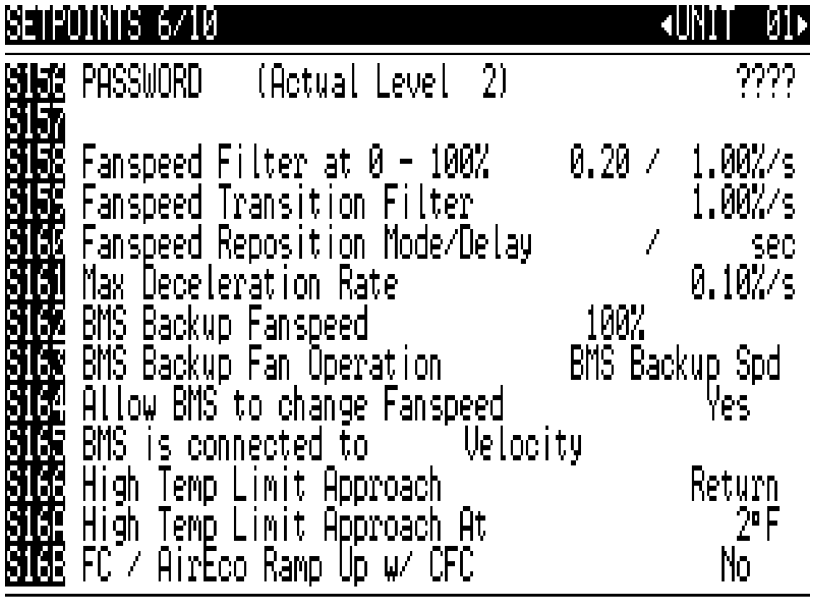
S155 High Return Limit Enable—Sets a control point that will increase the fan speed if the return temperature exceeds the limit set in the *High Return Temperature Limit* parameter. Three options are available:

- Disabled: The high return limit is disabled.
- Local: This setting uses the unit's factory-installed return air temperature sensor for applying the limit.
- Team: Applied in U2U networks only. Allows the high return limit to be applied to all units in the group based on the highest return temperature sensed by all connected and operating units. Values are hidden when the fan control sensor is set for return.

S15A High Return Temperature Limit—Sets the temperature limit that will increase the fan speed to decrease the return temperature. Some compressors may require this limit to prevent extremely high return temperatures that could degrade the compressor oil, which could decrease the compressor life expectancy.

S15B Return Limit P-Band—Sets the rate of fan speed increase as the actual return temperature approaches the limit set in the High Return Temperature Limit parameter.

Figure 111 Setpoints screen, page 6 of 10



S158 Fanspeed Filter at 0-100%—This parameter should be adjusted only by a factory-trained service technician. Fan Cap Filter at 0% / 100% controls the rate of change during fan speed changes to avoid overshoots. The filter value depends on the current control deviation from the setpoint. On the setpoint (at 0%), it's typically set lower (slow), and at the end of the P-band (at 100%) it's typically set higher (faster). The value is given in % control output change per second. This parameter sets the rate of change based on where actual temp is when compared to setpoint.

S159 Fanspeed Transition Filter—This parameter should only be adjusted by a factory-trained service technician. The transition fan speed filter controls how quickly the fan speed changes between

different modes of operation. For example, if the fans are operating based on a call for reheat which is normally 100% fan speed and the reheats are turned Off or no longer needed then the fan speed would instantly change if this filter is not applied, which may cause instability in the fan speed control. This filter helps with the transition to avoid overshoot.

S160 Fanspeed Reposition Mode/Delay Decel/—This parameter should be adjusted only by a factory-trained service trained technician. The fan speed reposition mode / delay is a one-time delay as the fan speed is requested to change direction. This delay will be applied only when the fan speed is commanded from an increasing to decreasing state or a decreasing to increasing state. This allows the fan to hold its current position while the temperature stabilizes.

S161 Max Deceleration Rate—This parameter should be adjusted only by a factory-trained service technician. Only slows the decreasing of the variable fan speed. The control will use the slower of this parameter and the fan speed filter.

S162 BMS Backup Fan Setpoint—Selects a temperature setpoint that will be activated in the event of a BMS time-out. The BMS timer and S163 must be configured to *Backup Set* for this parameter to activate. This parameter is adjustable from 41-104°F (5-40°C). The factory default is 73°F (23°C).

S162 BMS Backup Fanspeed—Selects a fixed fan speed percentage that will be activated in the event of a BMS time-out. The BMS timer and S163 must be configured to *BMS Backup Spd* for this parameter to be active. This is adjustable based the unit's preconfigured low and high limit fan speed thresholds. The default is 100%.

S163 BMS Backup Fan Operation—Sets the default operation for the fan speed control when a BMS time-out occurs. Four options are available:

- Disabled (factory default): The fan will continue controlling to the last value written. This could be either the last Fan Setpoint if controlling the fan by locally installed sensors or it could be the last value written to Fanspeed STD when fan control is set to manual.
- BMS Backup Spd: Allows the user to program a fixed fan speed percentage setpoint. When the BMS disconnect occurs, the fan speed will lock to this point. This setting is available when the fan control sensor is set to Manual.
- Coupled: Allows the fan speed to be controlled by the air temperature setpoint. The fan speed will follow the call for cooling as described in **3.1.1 - Unit/Fan Control**.
- Backup Set: Allows the user to program an alternate fan setpoint for the unit to use when a BMS disconnect occurs. The setpoint is programmed on S163 or U117 Backup Fan Setpoint. When active, this setpoint takes the place of S147 Fan Setpoint and is used to establish a new fan control band.

S164 Allow BMS to change Fanspeed—Enables or disables BMS fan speed control. When this parameter is disabled, the BMS will not have write capability to this point. The fan control type must be set to manual before value displayed on this line can be changed to *Yes*.

S165 BMS is connected to—Sets the BMS fan speed control signal. Two options are available:

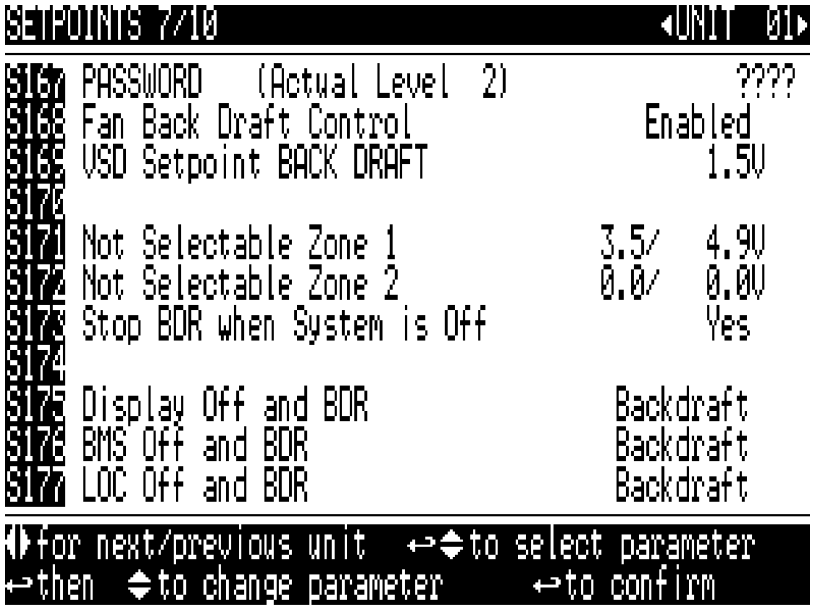
- **Velocity**—Used when fan speed is controlled using a Liebert IntelliSlot® UNITY-DP™ and legacy L-Cards (IPBML & 485L).
- **Ana In 1 - 4**—This setting is used when the fan speed command is provided using a hard-wired connection into one of the control boards available analog inputs. After the user has selected an available input, a new right hand parameter will populate allowing the user to select the analog input signal type. Input signal selections include 0-5 VDC, 0-10VDC and 4-20mA.

S166 High Temp Limit Approach—Sets the sensor to be used to increase the fanspeed value above the fanspeed setpoint STD to the value set in the Analog Out high limit. This parameter is selectable from *Disabled, Supply* and *Return*. The default is Return.

S16A High Temp Limit Approach At—Sets the temperature differential below the high supply and high return temperature limit where the fan speed would increase from fanspeed setpoint STD to fanspeed MAX. This parameter is selectable from 0 - 10°F. The default is 2°F.

S16B FC / AirEco Ramp Up w/CFC—Sets the selection to decouple the fan output from the call for cooling. This parameter is selectable from *No* or *Yes*. The factory default is *No*.

Figure 112 Setpoints screen, page 7 of 10



S168 Fan Back Draft Control—Enables or disables the Back Draft fan control. This feature allows EC fans (only) to operate at very low speeds to prevent airflow from cycling through the unit due to a higher under-floor static pressure than the above-floor static pressure. VFD's cannot be used with this feature because motor and or bearing degradation may occur at the low fan speeds required.

S169 VSD Setpoint BACK DRAFT—The variable speed device setpoint is set as a voltage reference. The lower the voltage, the slower the fans will spin. This parameter is set based on the application. Higher under-floor static pressure may require a higher setting to prevent air flow through the unit.

S171 Not Selectable Zone 1—The *Not Selectable Zone 1* and *2* are zones that the EC fans cannot operate within due to vibration harmonics that the fans may introduce to the unit. These parameters will be set from the factory based on model type and should not need adjusted in the field.

S172 Not Selectable Zone 2—The *not selectable zone 1* and *2* are zones that the EC fans cannot operate within because of vibration harmonics the fans may apply to the unit's frame. These parameters will be set at the factory based on model type and should not need adjusted in the field.

S173 Stop BDR when System is Off—The above is true when *S173 Stop BDR when System is Off* is set to *Yes*. If S173 is set to *No*, the BDR mode will not be interrupted, unless BDR is disabled or the unit is restarted.

WARNING

Risk of electrical shock. Can cause injury and death.

Never use any of these functions—Display Off, BMS Off, LOC Off—in place of lockout/tagout procedures.

Some internal components of Liebert cooling units require and receive power even during the Unit Off mode of the Liebert iCOM.

The factory-supplied optional disconnect switch is inside the Liebert cooling unit. The line side of this switch contains live high voltage.

The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to the unit electrical schematic.

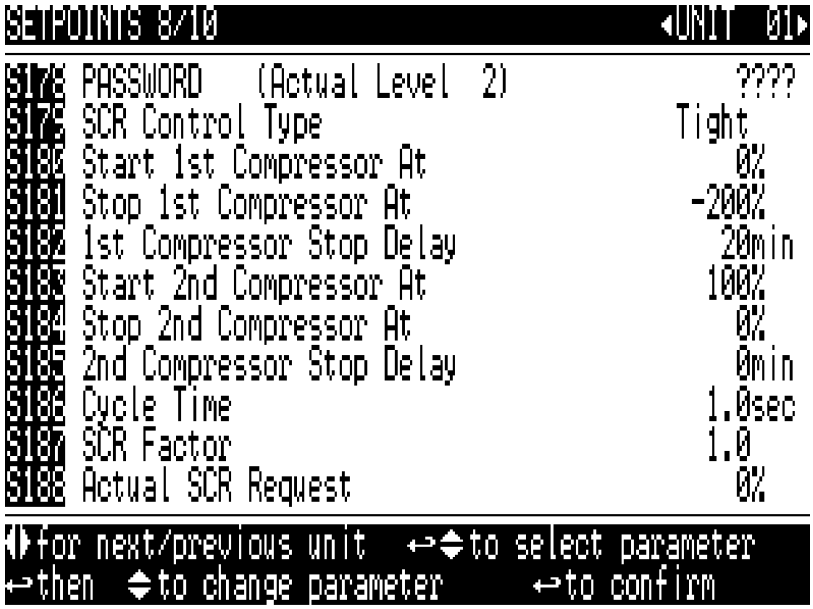
Follow all local codes.

S175 Display Off and BDR—When the back draft damper is enabled, different modes can activate this feature. Remote Off, Display Off, BMS Off and Local Off can all be set to activate the back draft damper operation. This is done pressing the I/O key at the unit to put the unit in a display Off condition.

S176 BMS Off and BDR—When the back draft damper is enabled, different modes can activate this feature. Remote Off, Display Off, BMS Off and Local Off can all be set to activate the back draft damper operation. This is done by sending a remote Off signal from the BMS to the unit to be remotely Off.

S177 LOC Off and BDR—When the back-draft damper is enabled, different modes can activate this feature. Remote Off, Display Off, BMS Off and Local Off can all be set to activate the back draft damper operation. This is done by sending a local Off signal from the unit by pressing I/O key.

Figure 113 Setpoints screen, page 8 of 10



S179 SCR Control Type—Sets the control type for the SCR reheats. If set to "Standard," then the reheats will modulate when the temperature is below setpoint based on the control settings. If this parameter is set to "Tight" control, then one compressor will be locked on and the reheats will modulate to offset the cooling capacity. To prevent component fighting, Tight control cannot be used with modulated components such as chilled water valves and digital scroll compressors.

S180 Start 1st Compressor At—Sets the activation point of the compressor. This parameter can be used when set to "Tight" control.

S181 Stop 1st Compressor At—Sets the deactivation point of the compressor. This parameter can be used when set to "Tight" control.

S182 1st Compressor Stop Delay—Sets the delay when the stop compressor setpoint for the first compressor is met.

S183 Start 2nd Compressor At—Sets the activation point of the second compressor. This parameter can be used when set to "Tight" control.

S184 Stop 2nd Compressor At—Sets the deactivation point of the second compressor. This parameter can be used when set to "Tight" control.

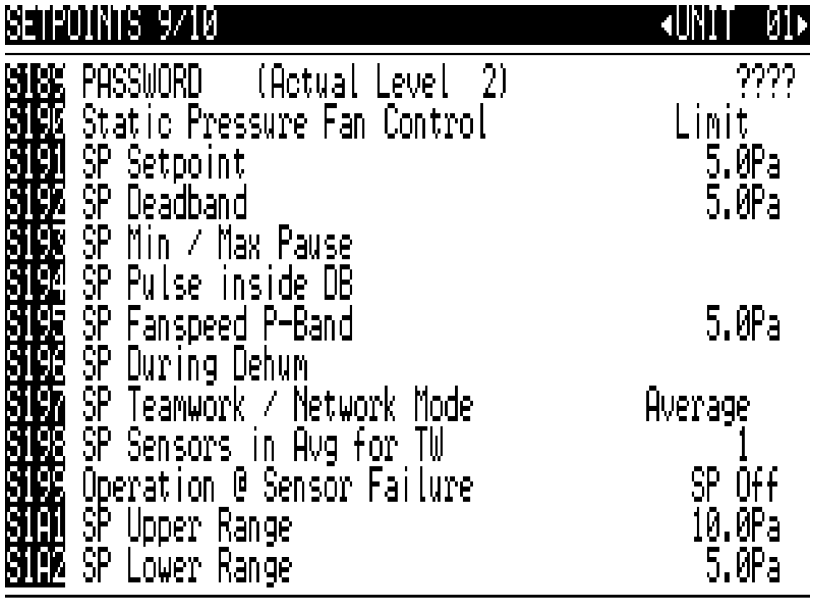
S185 2nd Compressor Stop Delay—Sets the delay when the stop compressor setpoint for the second compressor is met.

S186 Cycle Time—Set at the factory and should be changed only by an authorized Emerson representative.

S187 SCR Factor—Set at the factory and should be changed only by an authorized Emerson representative.

S188 Actual SCR Request—Displays the actual SCR reheat being requested.

Figure 114 Setpoints screen, page 9 of 10



S190 Static Pressure Fan Control—Enables or disables the use of static pressure control for fan modulation. This parameter is selectable between *Disabled* and *Enabled*. The default is *Disabled*.

S191 SP Setpoint—Sets the static pressure setpoint to be used by the control to modulate fan control. This parameter is selectable from 0.010 - 1.003 inWC. The default is 0.020 inWC.

S192 SP Deadband—Sets the static pressure deadband. This parameter is selectable from 0.010 - 1.003 inWC. The default is 0.020 in WC.

S193 SP Min / Max Pause—Sets the minimum and maximum pause times when the static pressure crosses into the deadband border. The fanspeed will stop increasing or decreasing based on the time set in these parameters. This parameter are selectable from 0-180 sec for SP Min and the default is 30 sec and parameter SP Max is selectable from 2-180 sec and the default is 60 sec.

S194 SP Pulse inside DB—Sets the pulse time that the speed filter, S158, will be performed to the fan analog output. This parameter is 2-15 seconds; the default is 3 seconds.

S195 SP Fanspeed P-Band—Sets the proportional band for which the fanspeed modulation output calculation is based upon in relation to the difference between the pressure reading and the *SP Setpoint*. This parameter is selectable from 0.010 - 1.003 in WC. The default is 0.020 inWC.

S196 SP During Dehum—Sets the use of static pressure control if dehumidification becomes active. If set to *Disabled,* then the static pressure routines will become inactive and the fan will be allowed to ramp to the dehumidification speed set on line S153. If set to *Enabled,* then the static pressure routines shall remain active during the call for dehumidification. The default is *Disabled*.

S197 SP Teamwork Mode—There are modes available for static pressure teamwork functionality: Average and Minimum. When selecting the Average Mode: the average of the lowest static pressure readings in the system will be averaged to generate a shared static pressure value for all units in the team. The number of static pressure sensors to be averaged is set on line S198. When this number is set to a value lower than the number of units in the team, the lowest static pressure readings will be averaged.

When selecting the Minimum Mode: the lowest static pressure reading in the team will be applied to the entire team. This parameter may be set to *Average* or *Minimum*. The default is *Average*.

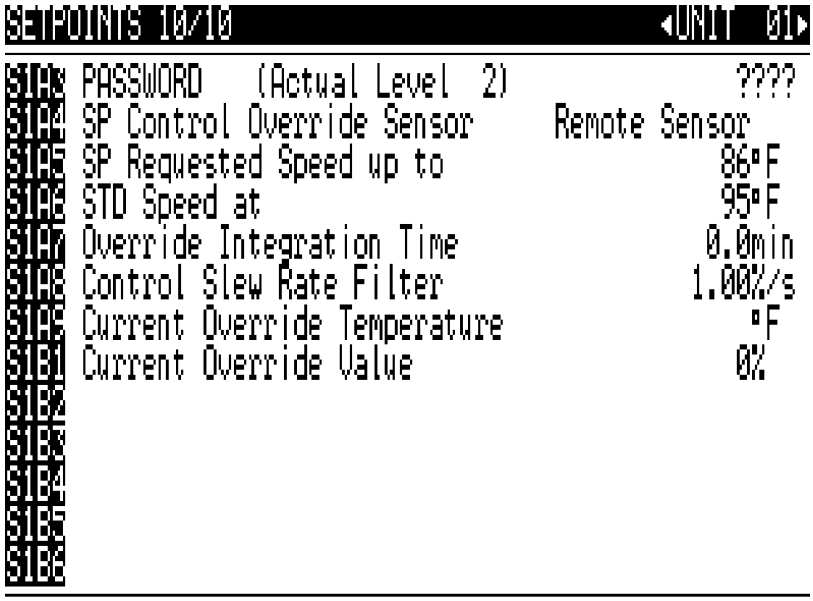
S198 SP Sensors in Avg for TW—Sets the number of sensors used when averaging sensors in the team work. This parameter is selectable from 1-32. The default is 2.

S199 - Operation @ Sensor Failure—This parameter determines what action to take if the static pressure sensor fails (non-teamwork). There are two options to use when handling a static pressure sensor failure, they are *SP OFF* = static pressure control Off, where the control will use S146 to control the fan when the sensor is lost or *Freeze Speed* = keep the fanspeed unchanged based on the last reading to Liebert iCOM. Functions that need to override fanspeed, such as freeze protection, can still change the fanspeed.

S1A1 SP Upper Range—The control calculates the Upper Range by using S191 *SP Setpoint* and S192 *SP Deadband*, the results on lines show both values, in WC and Pa.

S1A2 SP Lower Range—The control calculates the Lower Range by using S191 *SP Setpoint* and S192 *SP Deadband*, the results on lines show both values, in WC and Pa.

Figure 115 Setpoints screen, page 10 of 10



S1A4 SP Control Override Sensor—Programs override static pressure control the room temperature gets too warm. Three selections are available:

- None: Override capability is disabled
- Return: Allows the unit to monitor return air conditions. If the return air becomes warmer than the value set at *SP Requested Speed up to*, the evaporator fan speed will increase to help lower the air temperature.
- Remote: Allows the unit to monitor remote air conditions. If the remote temperature becomes warmer than the value set at *SP Requested Speed up to*, the evaporator fan speed will increase to help lower the air temperature.

  In No Teamwork and Teamwork 2 applications, fan override control is based on selected sensor value. In Teamwork 1 and 3 applications, the master collects all sensor values for the selected override sensors in the group and builds a maximum or average value (based on *S804 Teamwork is based on*) and uses this temperature for the static pressure control override.

S1A5 SP Requested Speed up to—Sets temperature at which static pressure fan control will be overridden from the current fan speed. This parameter establishes the beginning point of the fan override control band.

S1A6 STD Speed at—Sets the temperature at which the fan will operate at 100% if room temperature continues to increase. This parameter establishes the end point of the fan override control band.

S1A7 Override Integration Time—Adjusts the fan speed of the unit based on time above *SP Requested Speed up to* so that accurate temperature control can be maintained. The *SP Requested Speed up to* and integration time work together to stabilize room temperature above *SP Requested Speed up to*. The smaller the integration time, the quicker the unit will react to temperature increase.

S1A8 Control Slew Rate Filter—Controls the rate of fan speed change while the override is active to avoid fan hunting. The filter value depends on the current control deviation from the setpoint. On the setpoint (at 0%), it's typically set lower (slow), and at the end of the P-band (at 100%) it's typically set higher (faster). The value is given in percent control output change per second. This parameter sets the rate of change based on where actual temp is when compared to setpoint.

S1A9 Current Override Temperature—Shows the current temperature of the selected override sensor.

S1B1 Current Override Value—Shows the calculated fan override PI request.

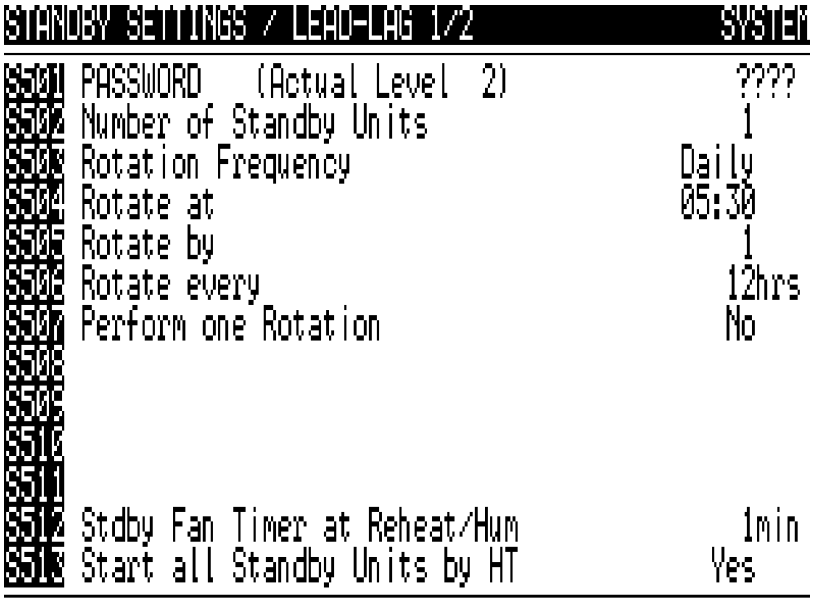
Service—Unit Diary Menu Screens (Large Display Only)

Unit Diary—Shows all entered program changes and maintenance performed on the unit. The Unit Diary serves as a note pad, where information can be added through the Liebert iCOM Service Tool.

8.2 Service—Standby Settings / Lead Lag Menu Screen

Standby Settings / Lead Lag allows the user program lead-lag setup when units are connected in a Liebert iCOM U2U network.

Figure 116 Standby settings / lead-lag screen, page 1



S502 Number of Standby Units—Selects the number of units that will be in Standby mode. When a unit is in Standby mode, the fan will be Off and no cooling will be provided.

S503 Rotation Frequency—Controls when a rotation will occur between the standby units and the operating units within a network.

S504 Rotate at—Sets the hour and minute of the rotation.

S505 Rotate by—Determines the number of positions to rotate by. Example: If there are six units in a unit-to-unit network and Units 1, 3 and 5 are in standby and this parameter is set to *1,* then at the next rotation Units 2, 4 and 6 will be placed in standby and Units 1, 3 and 5 will become operational.

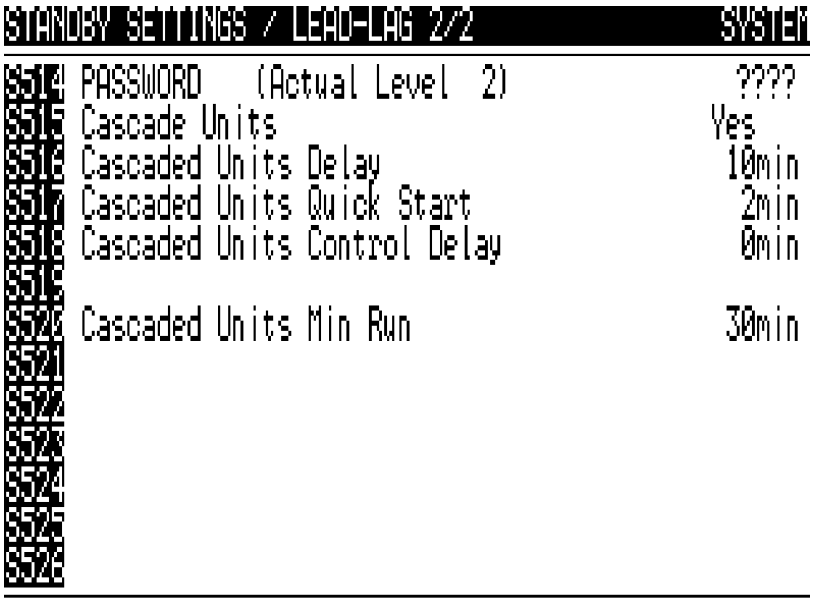
S506 Rotate Every—Selects 12- or 24-hour rotations when the *Rotation Frequency* is set to *Daily*.

S507 Perform one Rotation—Setting this to *YES* will perform one rotation without waiting on the rotation timer to expire.

S512 Stdby Fan Timer at Reheat/Hum—Sets the time that the fan will operate after a unit enters standby or sleep if the reheat or humidifier was operating when commanded to turn Off. The default is 1 minute; the range is 0 to 5 minutes.

S513 Start all Standby Units by HT—Activates all units to cool when a High Temperature Alarm occurs.

Figure 117 Standby settings / lead-lag screen, page 2



S515 Cascade Units—Allows units to activate in Standby mode if the room temperature cannot be maintained by the active units. If *Yes* is selected, the cascaded units can perform all functions when activated from standby. This parameter can also be set for *Cooling Only* or *Cool / Heat / Fan* (available in Teamwork 3 only).

S516 Cascaded Units Delay—Sets the delay time to stage on each unit as they are staged on during increased demand. When the first unit is started and the cooling request is high enough to start, the timer is started; once the timer has expired the next unit will start. The range is 0-30 minutes. The default is 5 minutes.

S517 Cascaded Units Quick Start—Sets a delay to the staging on each unit after a power cycle of the master unit. This is used to get the units to start faster after a power cycle and use this parameter instead of S516. When the master unit is started and the cooling request is high enough to start, the timer is started; once the timer has expired next unit will start. The control will not revert to S516 until all required units have been restarted in Cascade. The range is 0-30 minutes. The default is 2 minutes.

S518 Cascaded Units Control Delay

Teamwork Mode 1: Mode C: Once the unit was started, the fanspeed control will start immediately, but the cooling / humidity control will be delayed by the value set in S518 Cascaded Units Control Delay. Mode B: the S518 timer is ignored; a cascaded unit starts control w/ no delay.

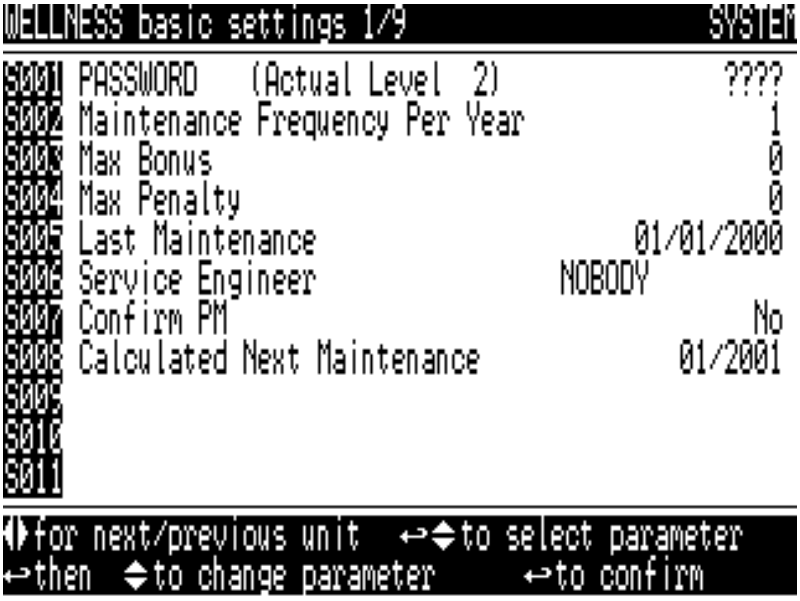
Teamwork Mode 3: All Modes: When the cascaded standby unit was started, the normal unit control is delayed by the value set in S518 Cascaded Units Control Delay. During this delay, the fanspeed control and the cooling control use the shared system values (based on AVG or MAX); heat, hum and dehumidification is disabled. When the S518 timer has elapsed, the unit transitions to normal unit control, which is depending on the operating mode. The range is 0-30 minutes. The factory default is 5 minutes.

8.3 Service-Maintenance / Wellness Menu Screens

Maintenance / Wellness Settings allow the user to set maintenance interval, maintenance message, read the number of starts / stops, and run hours since the last maintenance.

See below and **3.11.1 - Calculating Next Maintenance and Diagnostics** for additional details on these menu screens.

Figure 118 Wellness—Basic settings screen, page 1 of 9



S002 Maintenance Frequency Per year—Sets the number of expected maintenance visits in a one year time span.

S003 Max Bonus—Increases the time to the next maintenance cycle. Service personnel should assign a bonus when a service visit finds that all components are working optimally.

S004 Max Penalty—Decreases the time to the next maintenance cycle. Service personnel should assign a penalty when a service visit finds excessive wear on components.

S005 Last Maintenance—Indicates to service personnel the date of the last visit. This parameter is set during the service call.

S006 Service Engineer—Provides a label for the service representative to list either the company name or representative's name.

S007 Confirm PM—Confirms that the service representative has completed the preventive maintenance and resets the next maintenance date.

S008 Calculated Next Maintenance—Sets the date for the next expected maintenance based on the last confirmed maintenance, component starts, run hours and the penalty or bonus set in the Liebert iCOM.

Figure 119 Wellness—Motor settings screen, page 2 of 9

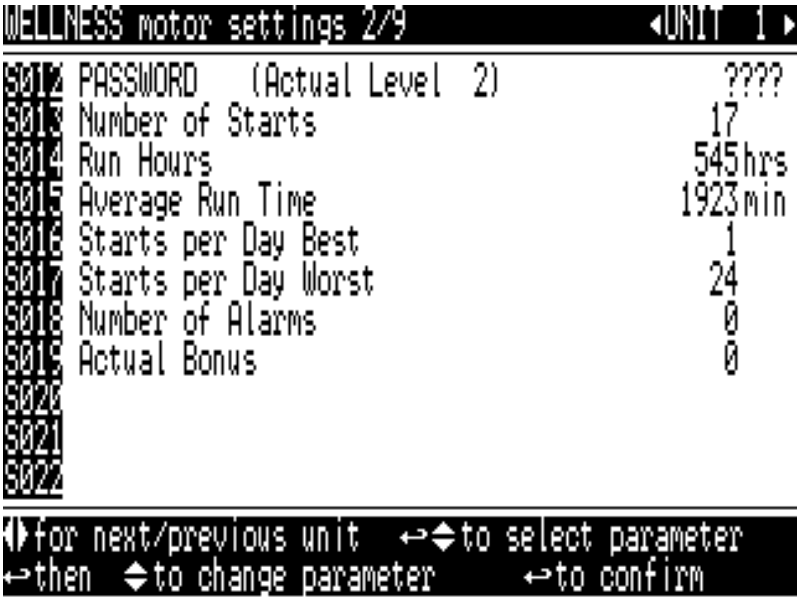


Figure 120 Wellness—Compressor 1 settings screen, page 3 of 9

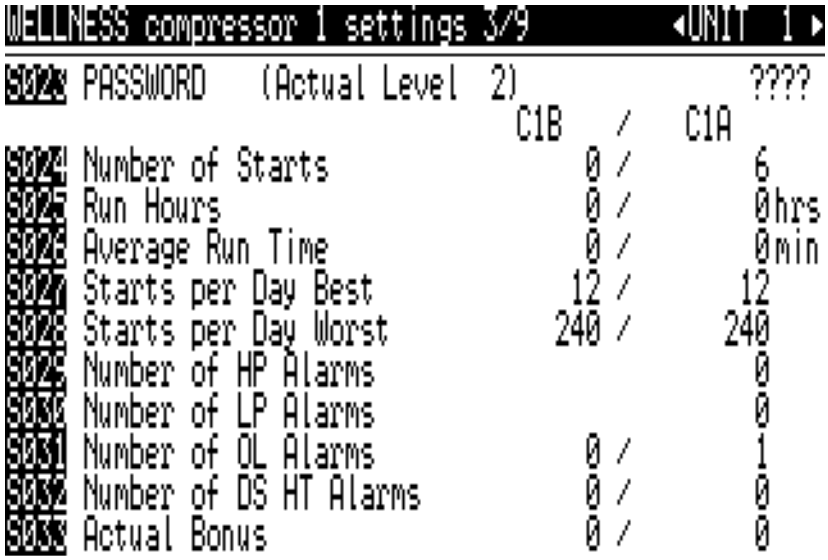


Figure 121 Wellness—Compressor 2 settings screen, page 4 of 9

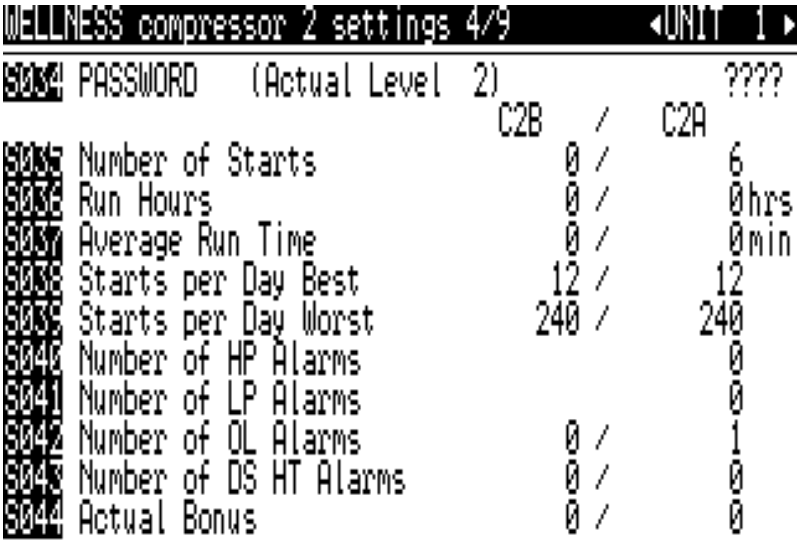


Figure 122 Wellness—Electric heater 1 settings screen, page 5 of 9

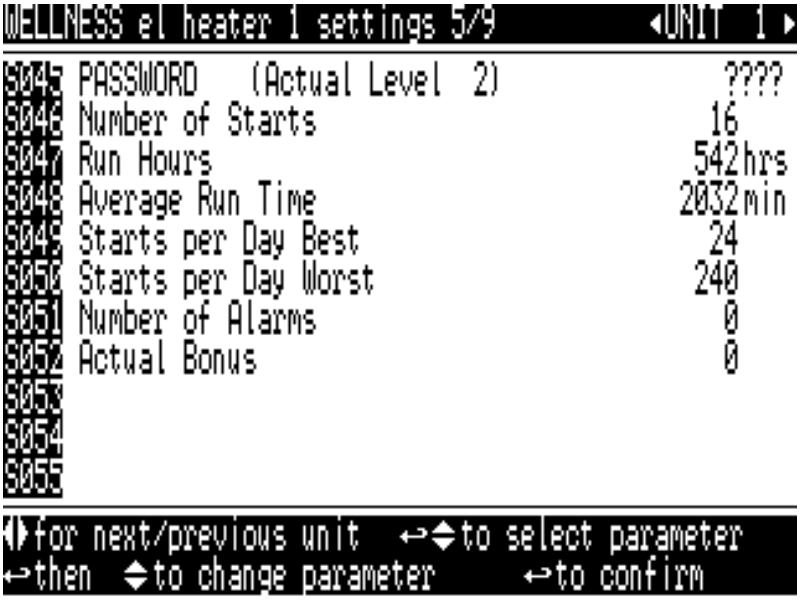


Figure 123 Wellness—Electric heater 2 settings screen, page 6 of 9

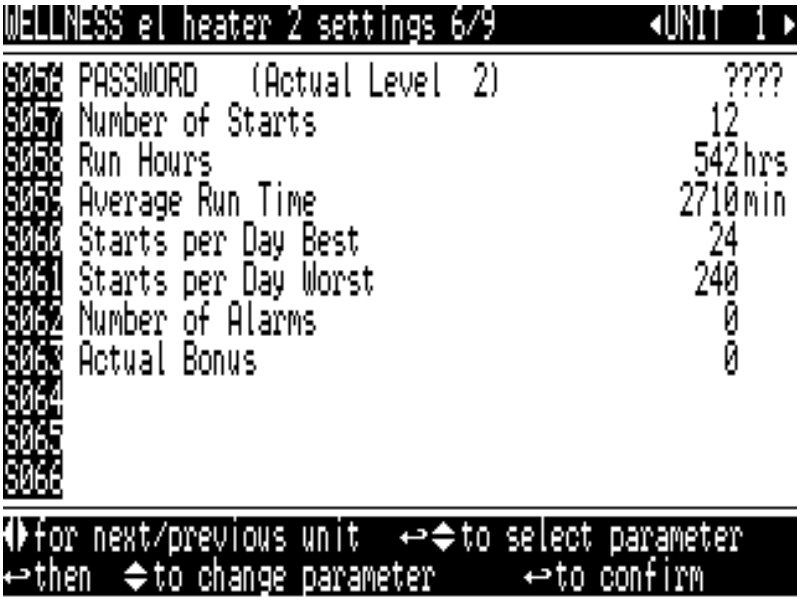


Figure 124 Wellness—Electric heater 3 settings screen, page 7 of 9

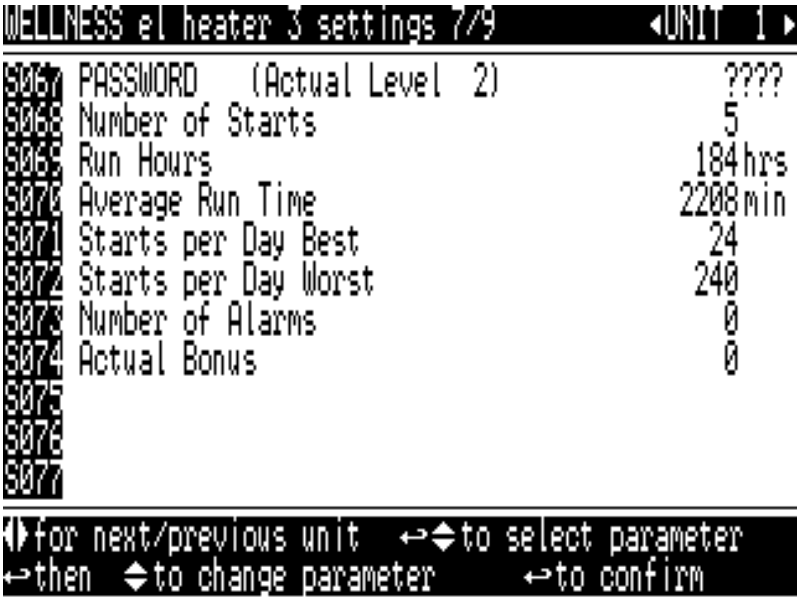


Figure 125 Wellness—Humidifier settings screen, page 8 of 9

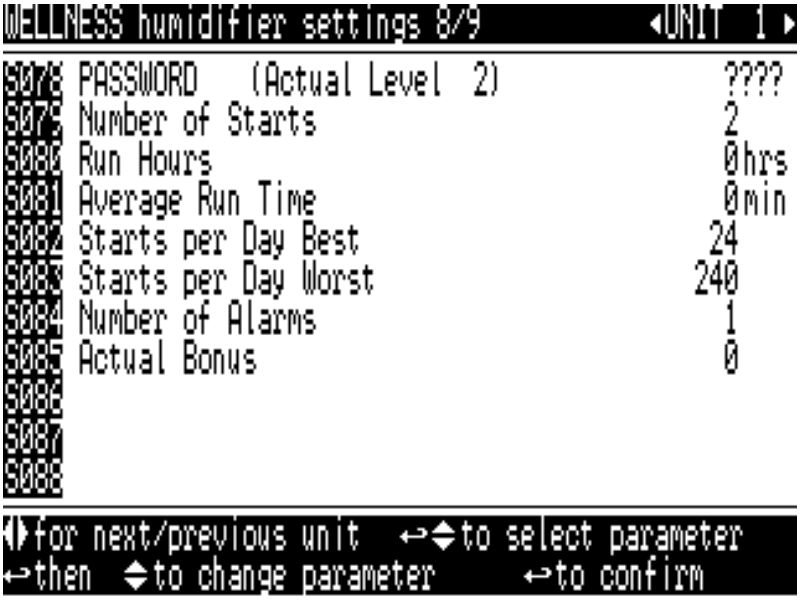
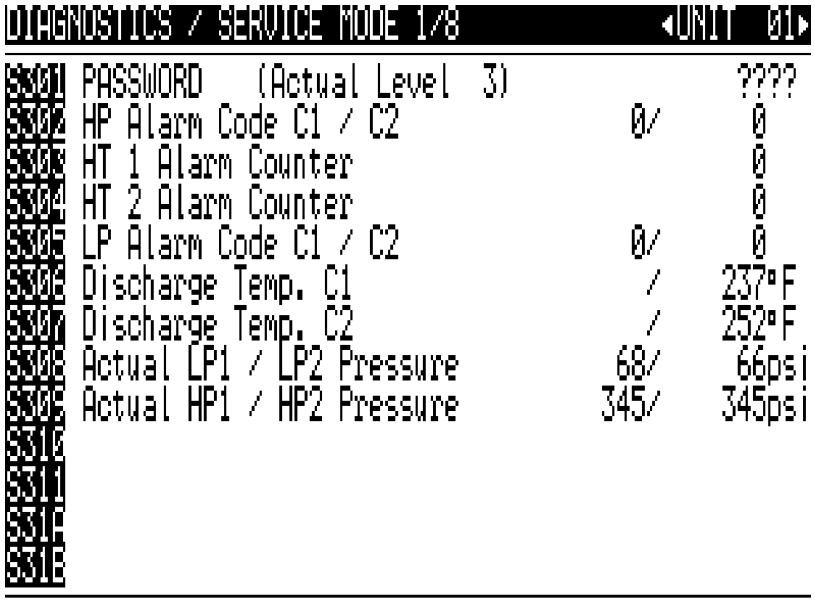


Figure 126 Wellness—Economizer settings screen, page 9 of 9

8.4 Service-Diagnostics / Service Mode Screens

Service-Diagnostics / Service Mode provides troubleshooting tools including alarm counters, manual mode, readable analog and digital inputs/outputs and other diagnostic features.

Figure 127 Diagnostics/service mode screen, page 1 of 8



S302 HP Alarm Code C1/C2—Compressor 1 high-pressure alarm code is the left hand parameter and Compressor 2 is the right hand parameter: 0 = no alarm; 2 = high-pressure alarm active.

S303 HT 1 Alarm Counter—Compressor 1 high temperature event alarm counter. If more than five events occur in a rolling 4 hour period, then the compressor will be locked out.

S304 HT 2 Alarm Counter—Compressor 2 high temperature event alarm counter. If more than five events occur in a rolling 4 hour period, then the compressor will be locked out.

S305 LP Alarm Code C1/C2—Compressor 1 low-pressure alarm code is the left hand parameter and Compressor 2 is the right hand parameter: 0 = no alarm; 2 = low-pressure alarm active.

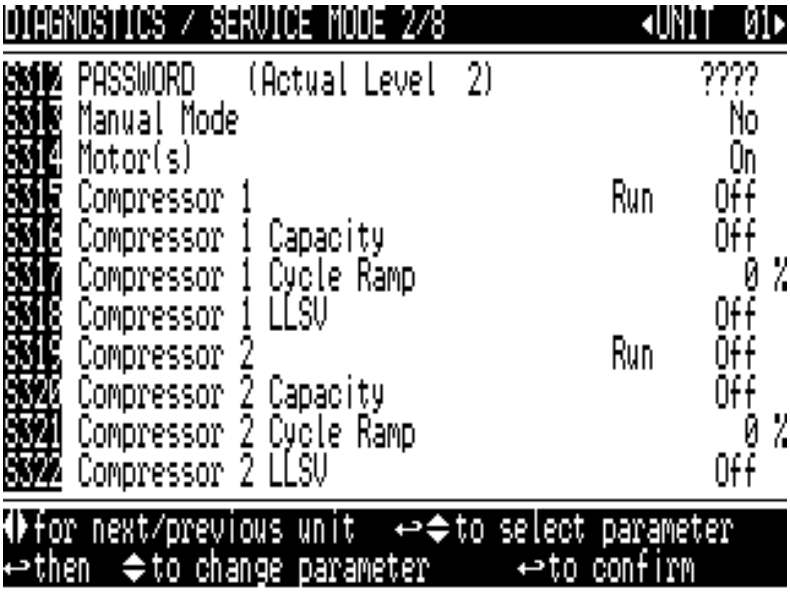
S306 Discharge Temp. C1—Current compressor discharge temperature reading (available only on compressors equipped with discharge temperature thermistors).

S307 Discharge Temp. C2—Current compressor discharge temperature reading (available only on compressors equipped with discharge temperature thermistors).

S308 Actual LP1 /LP2 Pressure—Current low side refrigerant pressure reading in gauge for Compressor 1 on the left hand side and Compressor 2 on the right.

S309 Actual HP1/HP2 Pressure—Current liquid line refrigerant pressure reading in gauge for Compressor 1 on the left hand side and Compressor 2 on the right (available only on water-cooled or glycol units equipped with motorized ball valves).

Figure 128 Diagnostics/service mode screen, page 2 of 8



S313 Manual Mode—Places the Liebert iCOM in manual mode. This is the initial setting necessary to activate any of the following items.

Manual Mode is used a diagnostic tool to test components and operation of the unit. This is useful when testing components such as fans, LLSV, compressors and actuators to validate operation and performance. To use manual mode, enter the Level 2 password, *5010*, and select YES on line S313. With the exception of compressor evacuate mode, Manual Mode will time out after 30 minutes of inactivity. When finished running components in manual mode, change line S313 back to *No*. All the corresponding components changed with Manual Mode enabled will go back to normal. The unit will resume operation as it was before Manual Mode was enabled. Safety routines, such as overload alarms, high-pressure lockout, etc., will prevent some features from being used. If an alarm has been disabled but is active, some Manual Mode functions will not work.

S314 Motor(s)—Starts the unit's main fan. The main fan must be On before any of the following overrides can be activated. Compressor evacuate mode does not require motor(s).

S315 Compressor 1—Turns on Compressor 1 and selects the mode of compressor operation. The choices are *RUN, EVACUATE* and *CHARGE*. To access each mode, press the Enter key while highlighted on S315. Press the Right arrow key to advance to the left. The compressor mode may be changed by pressing the Up or Down arrow key. Once the desired mode is shown, press the Enter key. The compressor state to the far right must be placed to On if run or charge modes have been selected. No further action is required for evacuate mode.

- Run: This function allows the compressor to run at any given capacity. The compressor capacity can be adjusted on line S317.
- Evacuate: This function allows all solenoid valves in the refrigerant circuit to open while the compressor remains in Off. This mode is can be used for either leak checking or evacuation. This mode does not have a timeout period.
- Charge Mode: This function allows the compressor to run at 100% loaded capacity for 30 minutes at a time. The suction pressure must be at least 15 psi or the compressor will be stopped.

S316 Compressor 1 Capacity—Enables Compressor 1 Cycle Ramp.

S317 Compressor 1 Cycle Ramp—Selects the capacity the compressor should run at. The range is 20 to 100%.

S318 Compressor 1 LLSV—Shows the status of the liquid line solenoid valve for Compressor 1.

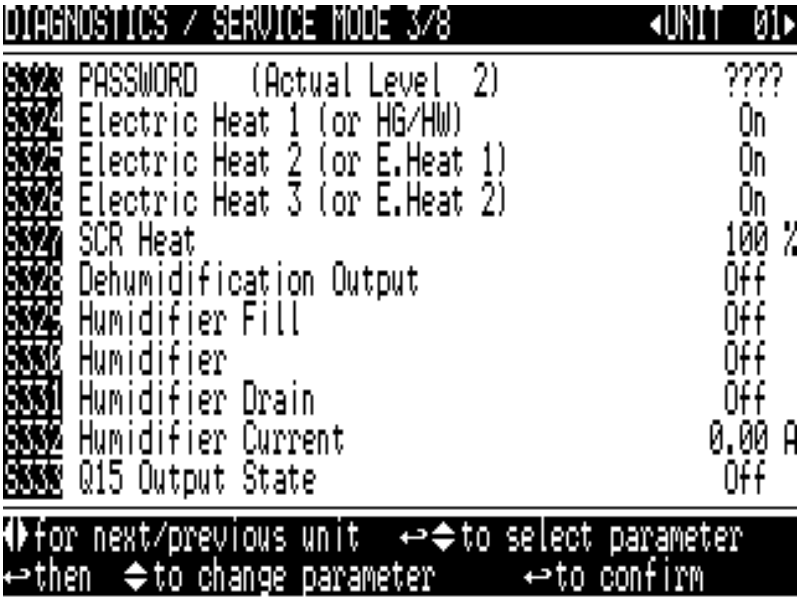
S319 Compressor 2—Turns on Compressor 2 and selects the mode of compressor operation. The choices are *RUN, EVACUATE* and *CHARGE.*

S320 Compressor 2 Capacity—Enables Compressor 2 Cycle Ramp.

S321 Compressor 2 Cycle Ramp—Selects the capacity the compressor should run at. The range is 20 to 100%.

S322 Compressor 2 LLSV—Shows the status of the liquid line solenoid valve for Compressor 2.

Figure 129 Diagnostics/service mode screen, page 3 of 8



S324 Electric Heat 1 (or HG/HW)—Activates Stage 1 of the unit's reheat system.

S325 Electric Heat 2 (or HG/HW)—Activates Stage 2 of the unit's reheat system.

S326 Electric Heat 3 (or HG/HW)—Activates Stage 3 of the unit's reheat system.

S327 SCR Heat—Specifies the pulse width the heating system should run at on units using silicon controlled rectifier type reheat.

S328 Dehumidification Output—(Read Only) On/Off status of dehumidification.

S329 Humidifier Fill—Activates the humidifier water source solenoid valve, which fills the humidifier pan or canister with water.

S330 Humidifier—Activates the entire humidifier system.

S331 and S332—Not applicable to Liebert North America units.

S333 Q15 Output State—Read-only; On/Off status of Q15.

Figure 130 Diagnostics/service mode screen, page 4 of 8

S335 Alarm Relay—Activates the Liebert iCOM's common alarm relay output.

S336 K11 Relay—Activates the Liebert iCOM's free-cooling relay output.

S337 3P 1/2 Actuator Open—Energizes the open circuit of the 3P type chilled or free-cooling control valve. The 3P valve is easily identified because it will be controlled from P22 of the main board. Both values must be programmed On for the valve to modulate open. In addition, both values must be set to Off on 3P 1/2 Actuator Close before the *Open* command will take effect.

S338 3P 1/2 Actuator Close—Energizes the close circuit of the 3P type chilled or free-cooling control valve. The 3P valve is easily identified because it will be controlled from P22 of the main board. Both values must be programmed On for the valve to modulate closed. In addition, both values must be set to Off on 3P 1/2 Actuator Open before the close command will take effect.

S339 BV Control—Activates the following two items allowing the motorized ball valve to be manually opened or shut.

S340 MBV Position—Specifies the percentage that Valve 1 should be open. The range is 0 to 100%.

NOTE

When the ball valve control is set to Auto, the motorized ball valve position will be adjusted to the set value, but the pressure control algorithm will immediately begin adjusting the valve to control the condenser pressure. When the ball valve control is set to Manual, the motorized ball valve position will be maintained as set. Emerson recommends against manually setting the motorized ball valve's during compressor operation because it might cause the compressor to trip on its high- or low-pressure protection controls.

S341-344 Analog Out 1, 2, 3 & 4—Specifies the analog output percentage subsequently controlling the device connected to that output. The range is 0 to 100%, but also depends on the output's assignment in factory settings.

An Analog Output will may be used for internal purposes or for signaling values for the customer. The control for the Analog Output can be found in the Advanced>Factory Setting starting on page 7. Only factory-trained personnel may make changes in the Advanced Menu.

Figure 131 Diagnostics/service mode screen, page 5 of 8

Status Remote Shutdown—Shows the status of the unit's remote shutdown input.

S346 Status Airflow Loss—Shows the status of the unit's air proof switch.

S347 Status Motor Overload / EC Fan Fault—Shows the status of the unit's main fan overload or EC fan fault input.

S348 Status Filter—Shows the status of the unit's filter clog switch input.

S349-352 Status Customer Input 1, 2, 3 & 4—Shows the status of the unit's customer inputs.

S353 through S355—Not applicable to Liebert North America units.

Figure 132 Diagnostics/service mode screen, page 6 of 8

S356 Status HP1—Shows the status of the unit's Compressor 1 high-pressure switch input.

S357 Status LP1—Shows the status of the unit's Compressor 1 low-pressure switch input.

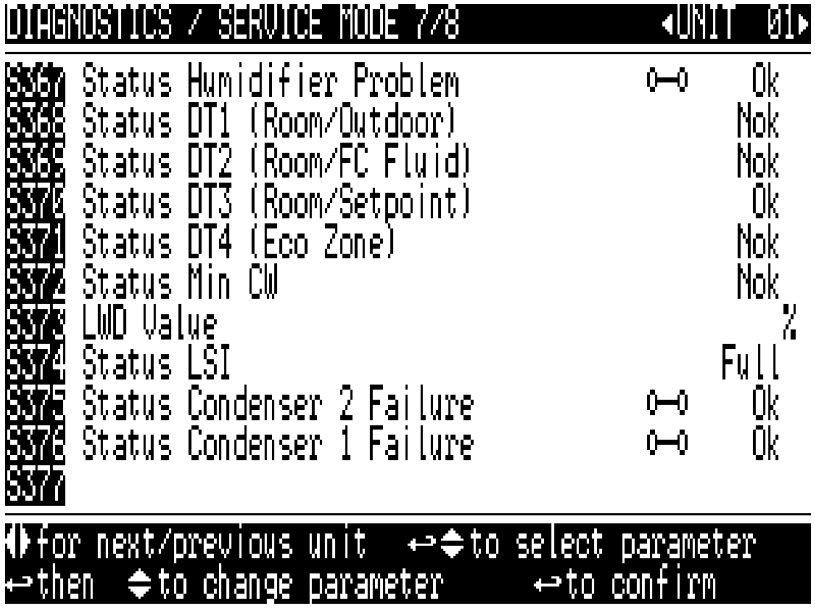
S358 Status C1 OL—Shows the status of the unit's Compressor 1 overload input.

S359 Status HP2—Shows the status of the unit's Compressor 2 high-pressure switch input.

S360 Status LP2—Shows the status of the unit's Compressor 2 low-pressure switch input.

S361 Status C2 OL—Shows the status of the unit's Compressor 2 overload input.

Figure 133 Diagnostics/service mode screen, page 7 of 8



S367 Status Humidifier Problem—Shows the status of the high water level indicator on an infrared humidifier.

S368 Status DT1 (Outdoor/Glycol)—Indicates if the delta T between outdoor air ambient temperature and glycol fluid temperature has been met.

S369 Status DT2 (Glycol/Room)—Indicates if the delta T between glycol and room return air temperature has been met.

S370 Status DT3 (Room/Setpoint)—Indicates if the delta T between room return air temperature and unit air temperature setpoint has been met.

S371 Status DT4—Indicates the status of the Economizers ability to operate when looking at outdoor air, humidity and wet bulb. (Wet bulb applicable only on DX units).

S372 Status Min CW—Indicates if the free-cooling or chilled water temperature is below the minimum chilled water setpoint.

S373 through S376—Not applicable to Liebert North America units.

Figure 134 Diagnostics/service mode screen, page 8 of 8

S379 Valve Control—Controls the 3P valve(s). Control can be by either of two methods:

- A time-driven signal that uses a 3P valve's travel time and the time that an open or closed output is provided to a 3P valve to estimate its current position.
- A feedback signal from the valve that is required for Supply Air Control. The feedback signal constantly provides the Liebert iCOM with the valve's position, eliminating the need to reset the valve(s) on a loss of power and provides a valve failure detection.

S380 Start Valve Calibration—Changing this value to *YES* starts the valve calibration procedure of the 3P Actuator. The unit must be powered down on the I/O key before calibration can be preformed. During this procedure, the valve is positioned to a fully closed and fully opened state while the feedback signal is monitored. The control then automatically saves the feedback signal voltage at the two end points as its calibration reference during normal operation.

S381 Calibration Status—Shows whether the calibration has been started: **idle** indicates calibration has not begun; **ongoing** indicates calibration has begun. When calibration has been completed, the status will return to idle.

S382 V1: 0% open = —Feedback voltage recorded when the valve is positioned at 0% during the calibration.

S383 V1: 100% open = —Feedback voltage recorded when the valve is positioned at 100% during the calibration.

S384 Current V1 Feedback—The valve's current feedback voltage. This value changes as the valve strokes to different open positions.

S385 V2: 0% open = —For an optional secondary valve; operates the same as the V1.

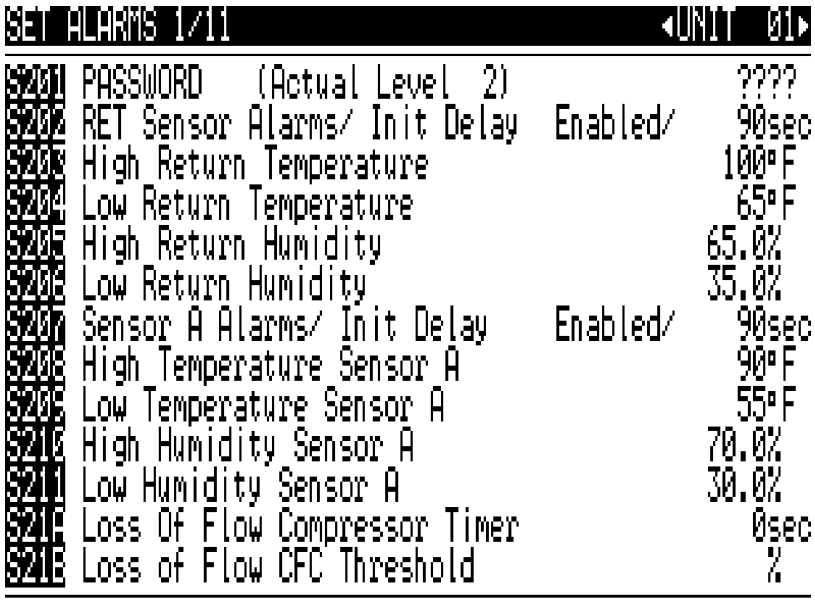
S386 V2: 100% open = —For an optional secondary valve; operates the same as the V1.

S387 Current V2 Feedback—For an optional secondary valve; operates the same as the V1.

8.5 Service-Set Alarms Menu Screens

Set Alarms allows the user to view and modify critical alarm thresholds, time delays, enable/disable alarms, modify event types and program custom alarm inputs.

Figure 135 Set alarms screen, page 1 of 11



S202 Return Sensor Alarms—Enables and disables the return temperature and humidity sensor alarms. Factory default is set to enable.

S203 High Return Temperature—Sets the threshold temperature when a return high temperature alarm will occur.

S204 Low Return Temperature—Sets the threshold temperature when a return low temperature alarm will occur.

S205 High Return Humidity—Sets the threshold humidity when a return high humidity alarm will occur.

S206 Low Return Humidity—Sets the threshold humidity when a return low humidity alarm will occur.

S207 Sensor A Alarms—Enables or disables the alarms associated with Sensor A if the unit is equipped with the optional temperature / humidity sensor.

S208 High Temperature Sensor A—Sets the threshold temperature when a Sensor A high temperature alarm will occur.

S209 Low Temperature Sensor A—Sets the threshold temperature when a Sensor A low temperature alarm will occur.

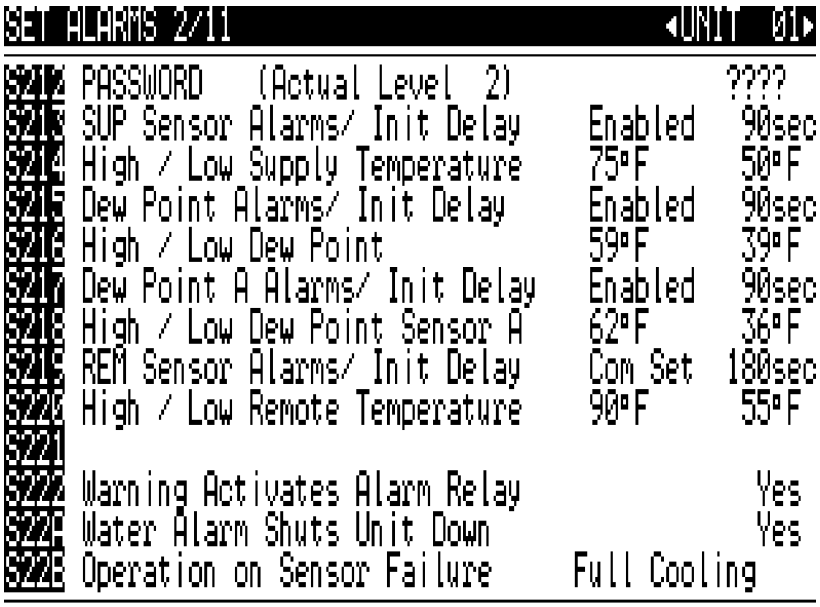
S210 High Humidity Sensor A—Sets the threshold humidity when a Sensor A humidity alarm will occur.

S211 Low Humidity Sensor A—Sets the threshold humidity when a Sensor A low humidity alarm will occur.

S21A Loss of Flow Compressor Timer—Allows setting a maximum pumpdown time during a loss of flow condition to prevent causing a high-pressure alarm due to pumpdown with no water/glycol flow to the condenser; hidden unless pumpdown is enabled; applies only to water-cooled systems.

S21B Loss of Flow CFC Threshold—Sets the threshold for CFC loss of flow.

Figure 136 Set alarms screen, page 2 of 11



S213 SUP Sensor Alarms/Init Delay—The parameter to the left enables or disables the supply sensor alarms. If the unit is not equipped with a supply temperature sensor, then this parameter will show **Disabled**. The parameter to the right sets the alarm activation delay for when a supply alarm will become active after either the high or low threshold has been exceeded.

S214 High/Low Supply Temperature—Sets the high and low supply temperature threshold that will trigger a **High/Low Supply Temperature** alarm.

S215 Dew Point Alarms/ Init Delay—The parameter to the left enables or disables the return air dew point alarms. Dew point alarms can be enabled with any humidity control type. Dew point alarms may be used with or without humidification and dehumidification options selected. The parameter to the right sets the alarm activation delay for when a dew point alarm will become active after either the high or low threshold has been exceeded.

S216 High/Low Dew Point—Sets the high and low dew point threshold that will trigger a **High/Low Dew Point** alarm.

S217 Dew Point A Alarms/Init Delay—The parameter to the left enables or disables the optional Sensor A dew point alarms. Dew point alarms can be enabled with any humidity control type. Dew point alarms may be used with or without humidification and dehumidification options selected. The parameter to the right sets the alarm activation delay for when a dew point alarm will become active after either the high or low threshold has been exceeded.

S218 High/Low Dew Point Sensor A—Sets the high and low dew point alarm thresholds for Sensor A.

S219 REM Sensor Alarms/ Init Delay—Three selectable options are available for the parameter displayed on the left: **Disabled, Com Set** and **Sep Set**. Disabled prevents remote temperature sensor alarms from occurring. Com Set or common setting, allows remote alarm activation based on a common alarm setting located on line S220. Sep Set, or Separate Setting, allows the user to program unique temperature alarm settings. These setting are located in the User Menu> Set Alarms, page 3. The parameter to the far right (Init Delay) is the alarm activation delay for both Com Set and Sep Set. The default setting is 180 seconds with an adjustable range of 0-9999 seconds.

S220 High/Low Remote Temperature—The high and low temperature limits can be set here when the remote sensors all share common high and low temperature thresholds.

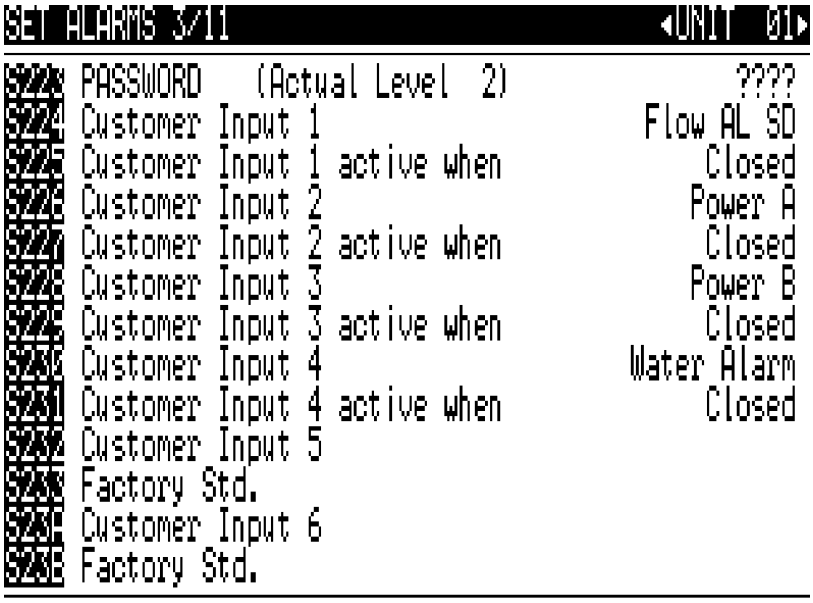
S221 Separate thresholds: User/Set Alarms—Read-only informational parameter that is hidden when S219 Rem Sensor Alarms are set for Com Set. When S219 is programmed for Sep Set, the S221 is visible. This indicates separate remote sensor alarm thresholds may be set in User Menus> Set Alarms, page 3

S222 Warning Activates Alarm Relay—Sets the alarm relay (K3) to activate when a warning occurs.

S22A Water Alarm Shuts Unit Down—Turns the unit Off if a water alarm occurs.

S22B Operation on Sensor Failure—Selects function to occur if the temperature control sensor fails. This parameter allows the user to default the unit to *Full Cooling* mode or *Unit Off* when a sensor fails.

Figure 137 Set alarms screen, page 3 of 11



S224, S226, S228, S230, S232 & S23A Customer Input 1, 2, 3, 4, 5 & 6—Selects the device and operation of the customer inputs. Each event reflects a different alarm and possible action to the unit. Refer to **Table 11** for a description of selectable options.

S225, S227, S229, S231, S233 & S23B Customer Input 1, 2, 3, 4, 5 & 6 active when—Selects whether the input is normally closed or normally open. If the parameter name reads *Factory Std.*, this indicates the input is factory-configured and is not configurable in the field.

Set Alarm Screens, Pages 4-11

The Set Alarm Screens, pages 4 through 10 (**Figures 138** through **144**) permit setting the operation of an active alarm. Each event can be enabled or disabled and can be set to operate as an alarm, warning or message. The delay is the time the control waits before reporting the event.

Alarm: Annunciates the buzzer, triggers a monitoring event, triggers the alarm relay and flashes the red LED on the display.

Warning: Annunciates the buzzer, triggers a monitoring event, shows the event in the event viewer / front display and flashes the red LED on the display.

Message: Shows the event in the event viewer and on the front display.

Delay—The delay selection for each alarm.

EN-DIS—The enable / disable selection for each alarm provides the ability to individually select the alarms that will or will not activate when the alarm condition occurs.

Type—Sets the type of action for each event listed. There are three different types of events: Alarm, Warning and Message. When an event is triggered and the type is set to "Alarm," then the light and buzzer on the display will activate, an event will be written to the event log and the (K3) alarm relay will close. If the type is set to "Warning," then the light and buzzer on the display will activate, an event will be written to the event log and the (K3) alarm relay can be configured to close or provide no reaction. If the type is set to "Message," then the event is only written to the event log.

Figure 138 Set alarms screen, page 4 of 11

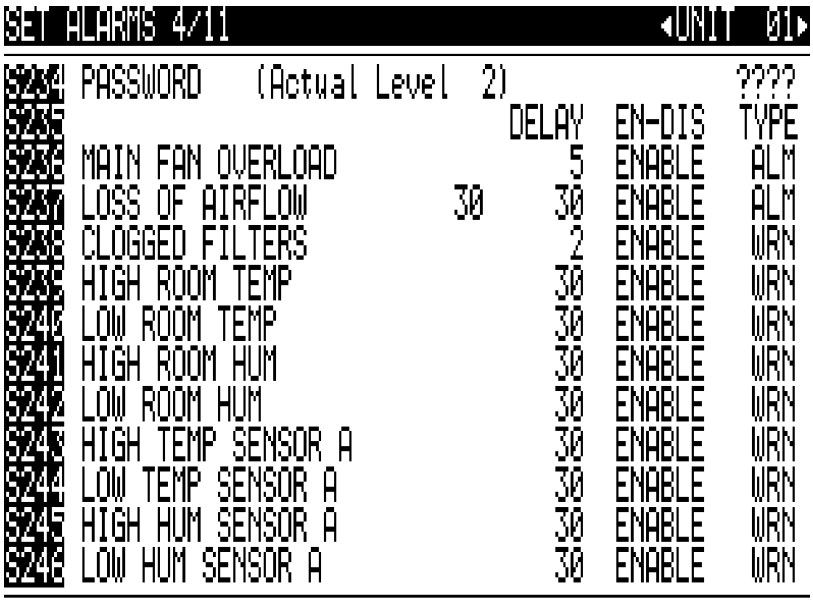


Figure 139 Set alarms screen, page 5 of 11

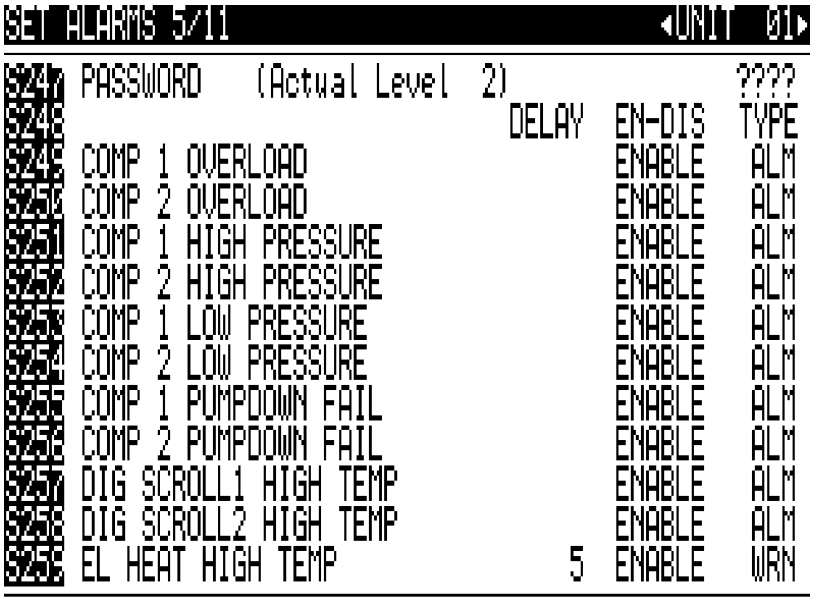


Figure 140 Set alarms screen, page 6 of 11

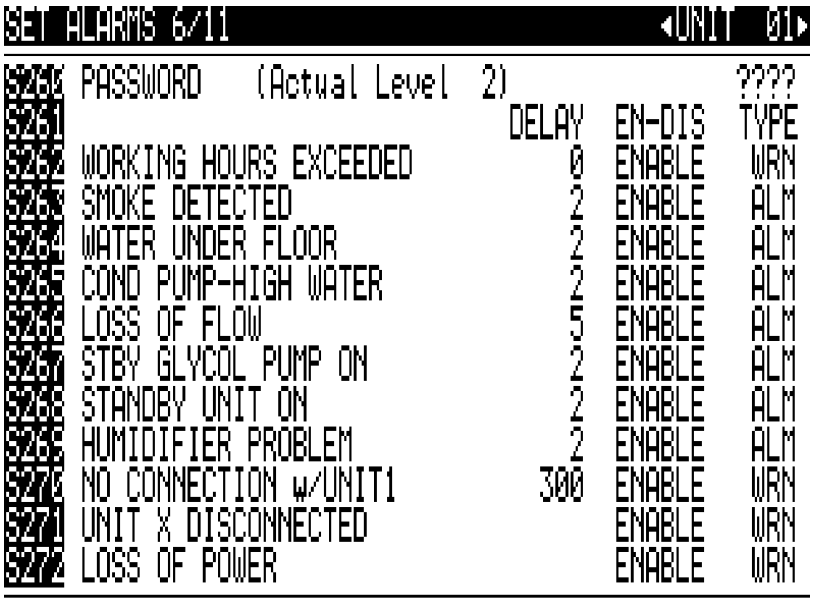


Figure 141 Set alarms screen, page 7 of 11

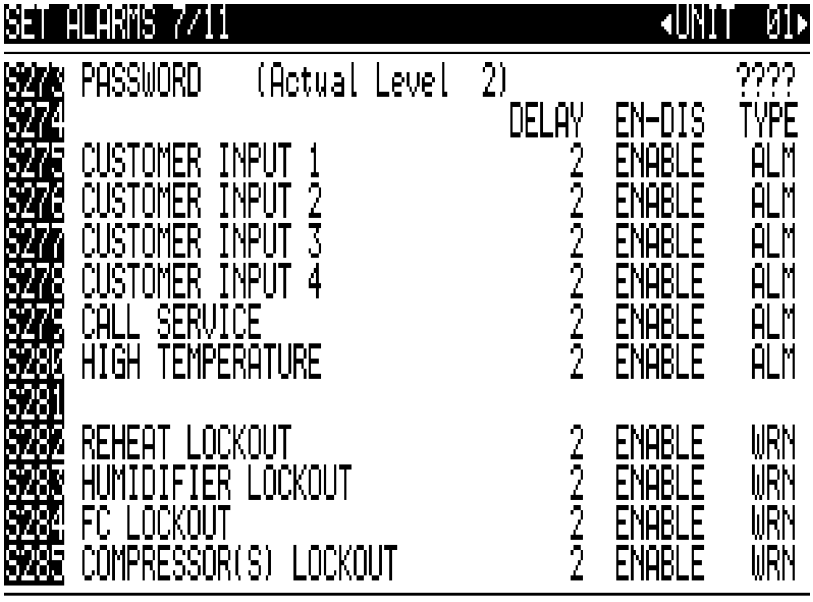


Figure 142 Set alarms screen, page 8 of 11

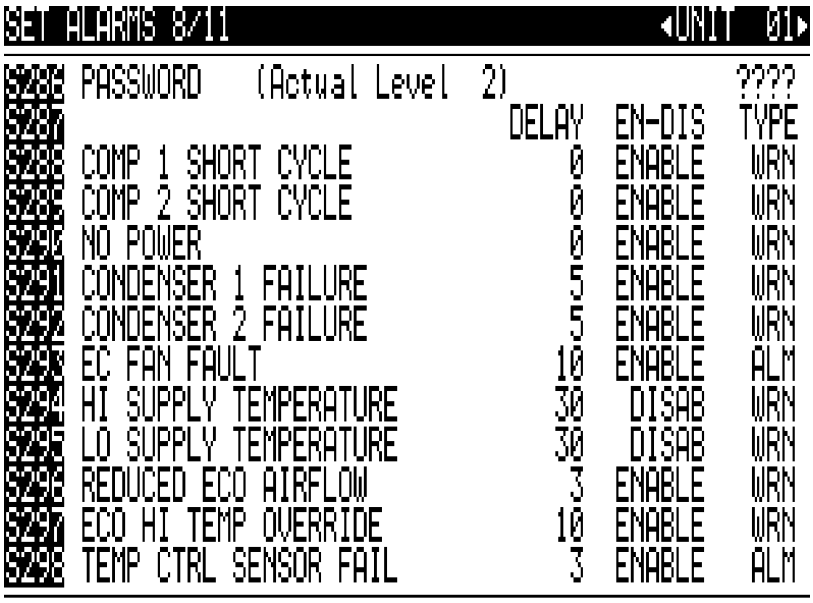


Figure 143 Set alarms screen, page 9 of 11

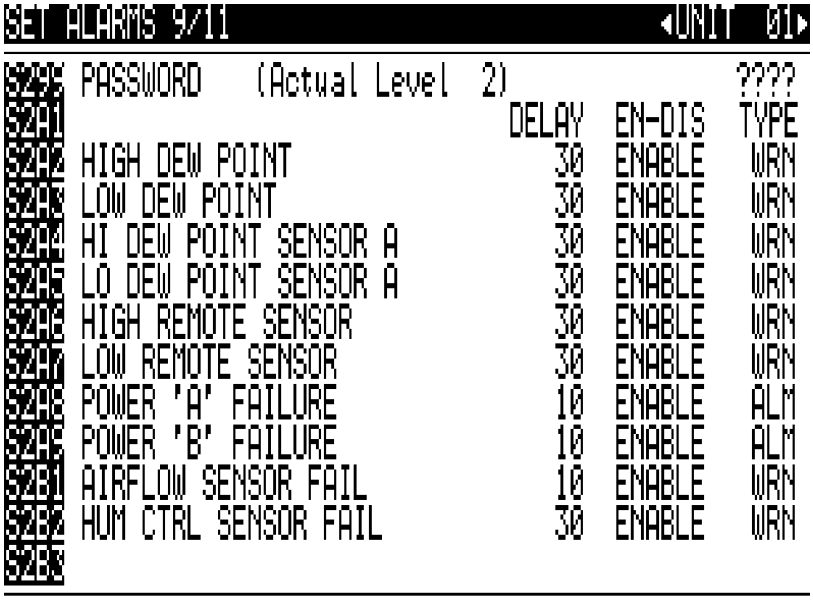


Figure 144 Set alarms screen, page 10 of 11

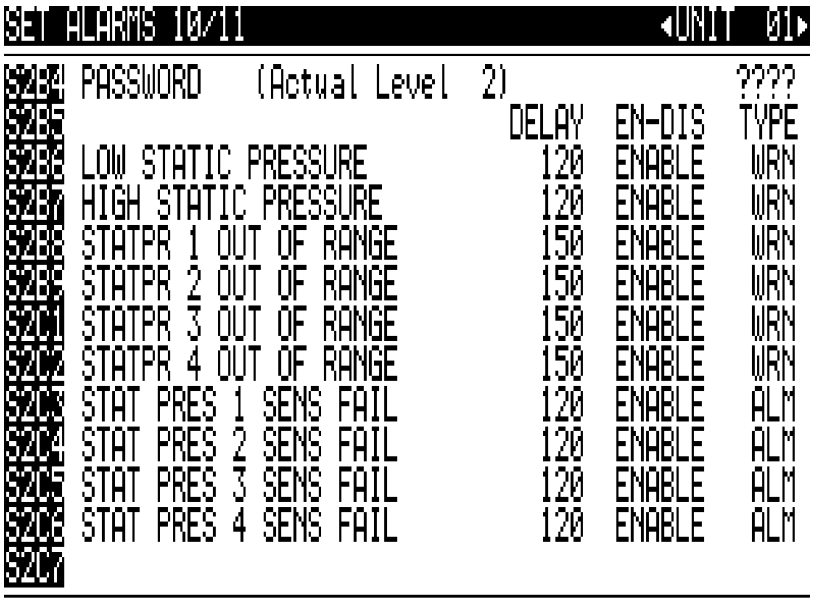
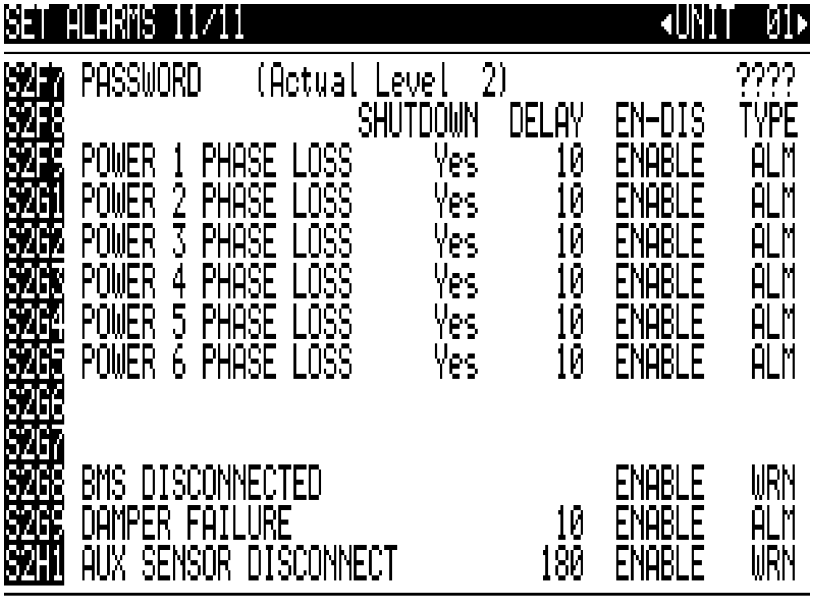


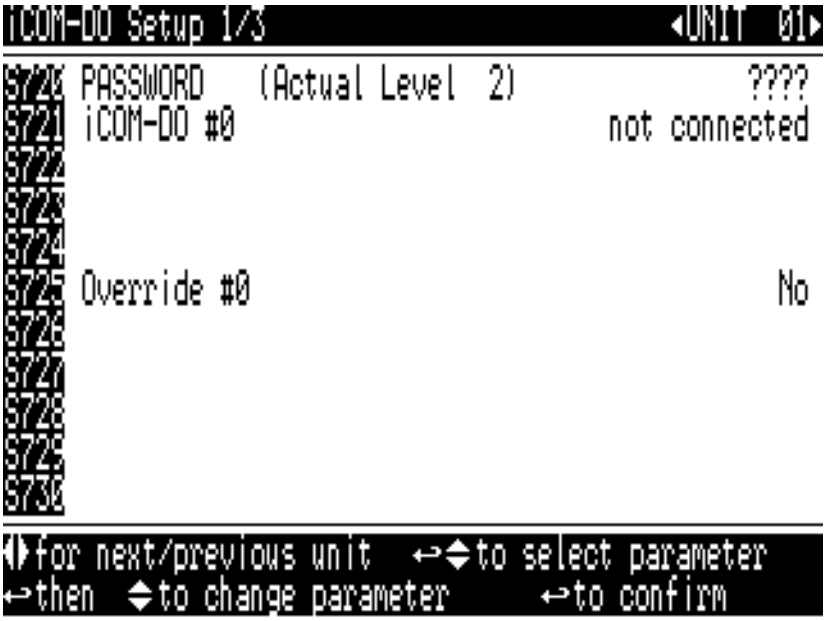
Figure 145 Set alarms screen, page 11 of 11



8.6 Service-iCOM-DO Setup Menu Screens

The iCOM-DO Setup menu is used to configure the Liebert iCOM-DO.

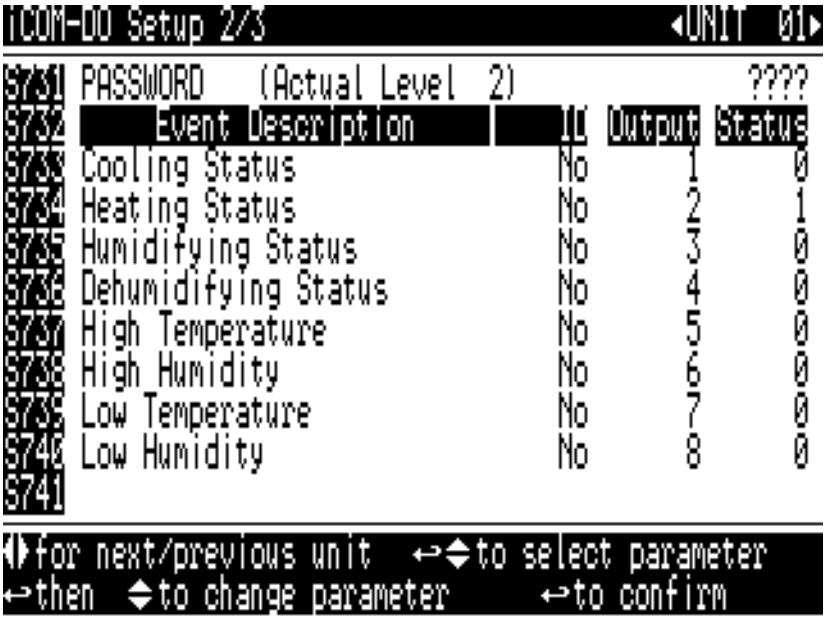
Figure 146 iCOM-DO overview and override screen, page 1 of 3



S721 Liebert iCOM-DO™—Shows the connection status of a Liebert iCOM-DO card. It displays "connected" when a Liebert iCOM-DO card has been set up and connected to the Liebert iCOM via the controller area network (CAN) bus.

S725 Override—Permits manual testing the Liebert iCOM-DO by activating each output on the following screen.

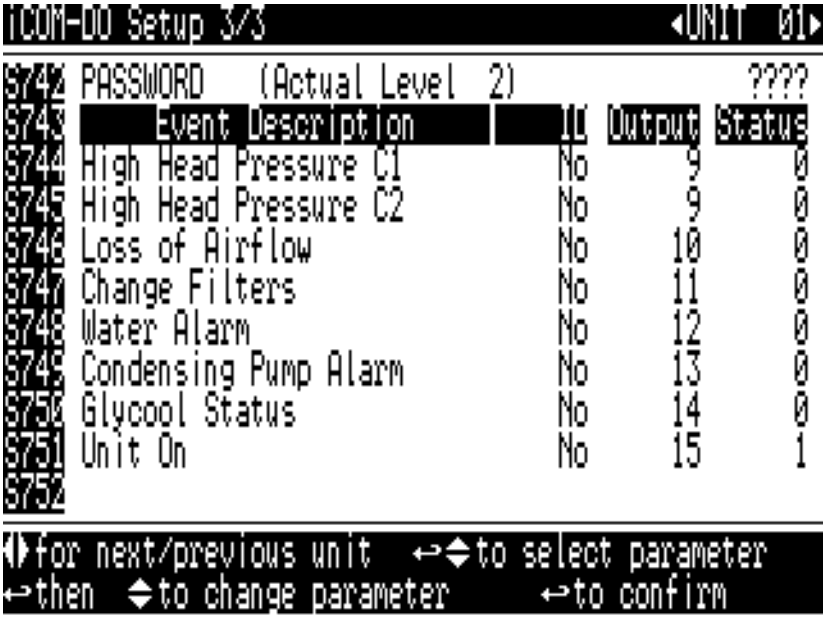
Figure 147 iCOM-DO events setup screen, page 2 of 3



S733-740, S744-S751—The lines are divided into four columns.

- **Event Description**—Read-only parameter that describes the event type that may activate an output on the Liebert iCOM-DO™. Each event description may reflect a status or alarm, depending on the line.
- **ID**—Displays the number of the Liebert iCOM-DO. Currently only one Liebert iCOM-DO card is supported. The ID must match the S721 to function.
- **Output #**—Shows which output is tied to a particular alarm. The default values are set to be the same output as the Liebert ENV-DO™ card, the predecessor to the Liebert iCOM-DO. The ID's are linked to S725.
- **Status**—Read-only value that shows the state of the output.

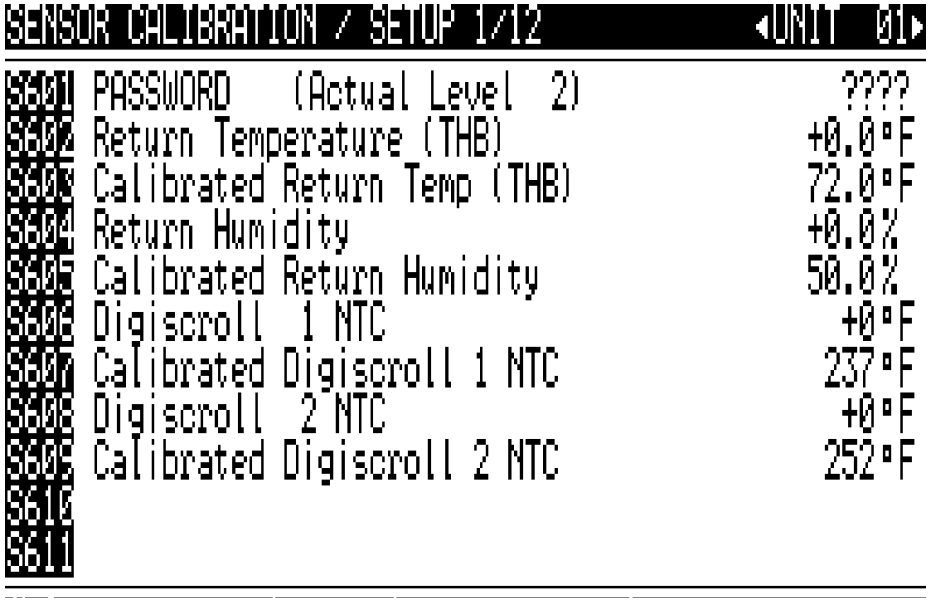
Figure 148 Liebert iCOM-DO events setup screen, page 3 of 3



8.7 Service-Sensor Calibration Menu Screens

Sensor Calibration allows the user to view readings of connected sensors and calibrate values as needed.

Figure 149 Sensor calibration setup screen, page 1 of 12



S602 Return Temperature—Adjusts the return temperature reading from the actual sensor to compensate for any error of the sensor or to match other sensors in the room.

S603 Calibrated Return Temperature—Shows the adjusted temperature value of the return sensor. This value is the actual sensor reading (+ or -) the offset "Return Temperature".

S604 Return Humidity—Adjusts the return humidity reading from the actual sensor to compensate for any error of the sensor or to match other sensors in the room.

S605 Calibrated Return Humidity—Shows the adjusted humidity value of the return sensor. This value is the actual sensor reading (+ or -) the offset "Return Humidity".

S606 DigiScroll 1 NTC—Adjusts the digital scroll 1 NTC reading from the actual sensor to compensate for any error or drift of the sensor.

S607 Calibrated Digiscroll 1 NTC—Shows the adjusted Digital Scroll 1 NTC sensor value. This value is the actual sensor reading (+ or -) the offset "Digital Scroll 1 NTC".

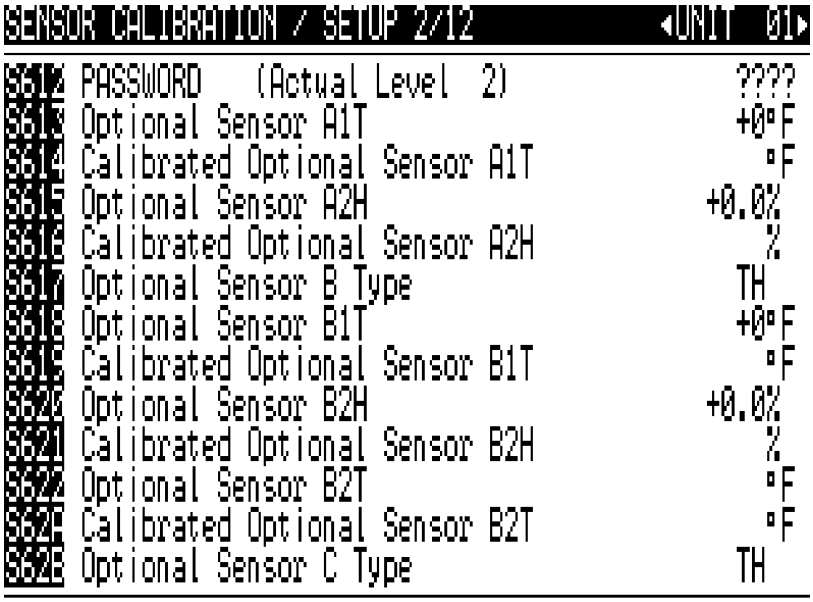
S608 Digiscroll 2 NTC—Adjusts the digital scroll 1 NTC reading from the actual sensor to compensate for any error or drift of the sensor.

S609 Calibrated Digiscroll 2 NTC—Shows the adjusted Digital Scroll 1 NTC sensor value. This value is the actual sensor reading (+ or -) the offset "Digital Scroll 1 NTC."

S610 Outdoor Sensor—Adjusts the outdoor temperature reading from the actual sensor to compensate for any error of the sensor or to match other sensors in the room.

S611 Calibrated Outdoor Sensor—Shows the adjusted temperature value of the outdoor sensor. This value is the actual sensor reading (+ or -) the offset "Outdoor Sensor."

Figure 150 Sensor calibration/setup screen, page 2 of 12

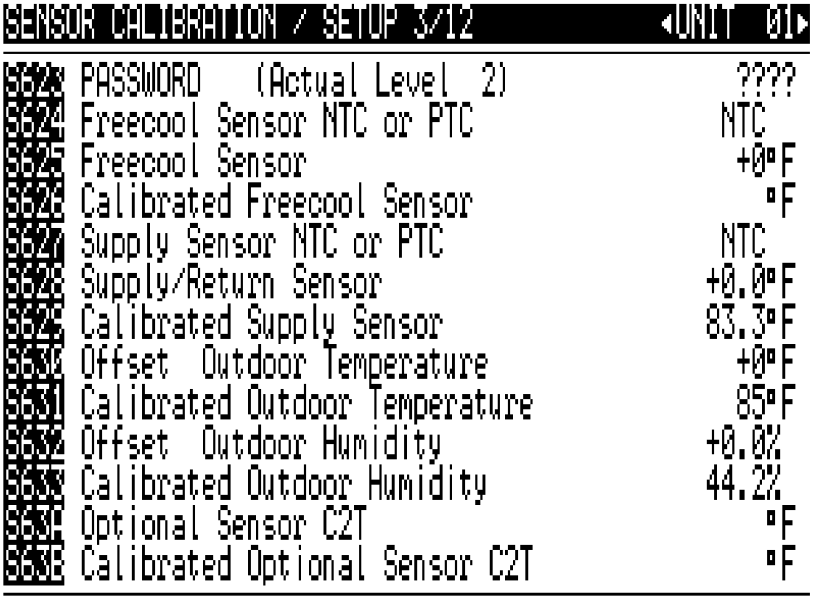


Optional Sensor A and B—Adjusts the reading from the actual sensor to compensate for any error of the sensor or to match other sensors in the room.

Calibrated Optional Sensor A and B—Shows the adjusted value of the sensor. This value is the actual sensor reading (+ or -) the offset.

Optional Sensor B & C Type—Read-only parameter, Liebert iCOM automatically detects the type of sensor connected and displays the sensor type here.

Figure 151 Sensor calibration/setup screen, page 3 of 12



S624 Freecool Sensor PTC or NTC—Currently supports only the NTC selection.

S625 Freecool Sensor—Adjusts the free-cooling temperature reading from the actual sensor to compensate for any sensor error or to match other sensors in the room.

S626 Calibrated Freecool Sensor—Shows the adjusted temperature value of the free-cooling sensor. This value is the actual sensor reading (+ or -) the offset *Freecool Sensor*.

S627 Supply/Return Sensor PTC or NTC—Supports only the NTC selection.

S628 Supply/Return Sensor—Applies to both supply and return sensors; adjusts the supply temperature reading from the actual sensor to compensate for any sensor error or to match other sensors in the room.

S629 Calibrated Supply/Return Sensor—Applies to both supply and return sensors. Liebert iCOM will automatically detect the sensor connected and update the parameter name to reflect the sensor location; shows the adjusted temperature value of the supply sensor. This value is the actual sensor reading (+ or -) the offset Supply/Return Sensor.

S630 Offset Outdoor Temperature/Offset Optional Sensor C1T—Applies to both outdoor sensor and optional Sensor C. Liebert iCOM will automatically detect the sensor connected and update the parameter name to reflect the sensor location. Adjusts the outdoor temperature reading or sensor C from the actual sensor reading to compensate for any sensor error or to match other sensors.

S631 Calibrated Outdoor Temperature/Calibrated Optional Sensor C1T—Applies to both outdoor sensor and optional Sensor C. The Liebert iCOM will automatically detect the sensor connected and update the parameter name to reflect the sensor location; shows the adjusted temperature value of the outdoor temperature or sensor C1T. This value is the actual sensor reading (+ or -) the "Offset Outdoor Temperature".

S632 Offset Outdoor Humidity/ Offset Optional Sensor C2H—Applies to both outdoor sensor and optional Sensor C. The Liebert iCOM will automatically detect the sensor connected and update the parameter name to reflect the sensor location; adjusts the outdoor or sensor C2H humidity reading from the actual sensor reading to compensate for any sensor error or to match other sensors.

S633 Calibrated Outdoor Humidity/ Calibrated Optional Sensor C2H—Applies to both outdoor sensor and optional Sensor C. The Liebert iCOM will automatically detect the sensor connected and update the parameter name to reflect the sensor location; shows the adjusted humidity value of the outdoor or C2H humidity sensor. This value is the actual sensor reading (+ or -) the "Offset Outdoor Humidity" or "Offset Optional Sensor C1T" or "Offset Optional Sensor C2H."

S63A Optional Sensor C2T—Shows the adjusted temperature value of the sensor C. This value is the actual sensor reading (+ or -) the "Calibrated Optional Sensor C2T".

S63B Calibrated Optional Sensor C2T—Adjusts the optional sensor C2T reading from the actual sensor reading to compensate for any sensor error or to match other sensors.

Figure 152 Sensor calibration/setup screen, page 4 of 12

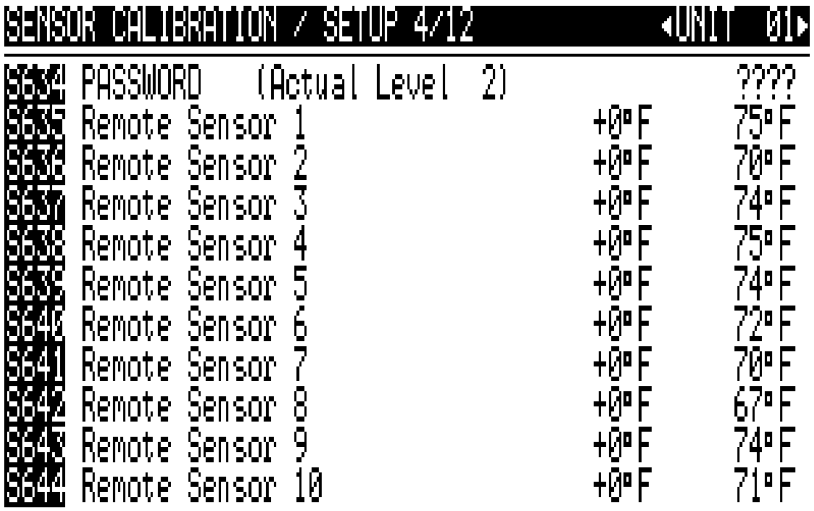
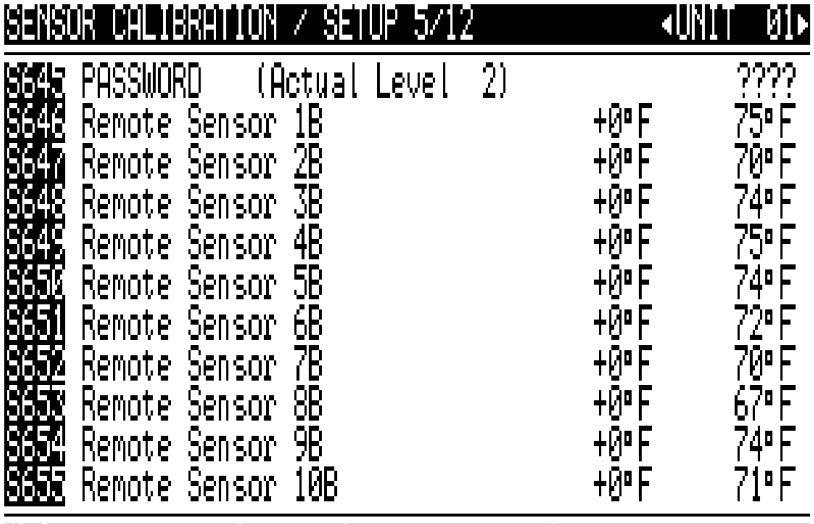


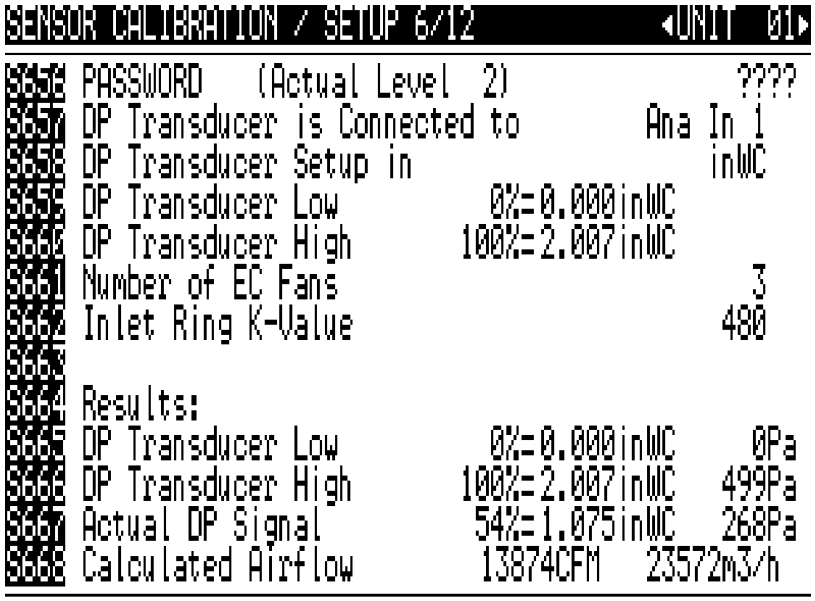
Figure 153 Sensor calibration/setup screen, page 5 of 12



Each unit can be equipped with a total of 20 rack sensor readings or ten 2T temperature sensor modules. These menus permit temperature sensor calibration by entering a negative or positive offset.

The calibrated reading is displayed in the far right column. If a value does not appear in the far right column, then the sensor is either not set up correctly or is not connected.

Figure 154 Sensor calibration/setup screen, page 6 of 12



S657 DP Transducer is Connected to—Sets the analog input that will be used for the differential pressure transducer. This parameter is selectable from None, Ana In 1, Ana In 2, Ana In 3 and Ana In 4. The factory default is none.

S658 DP Transducer is Setup in—Sets the unit of measure that will be used for the differential pressure transducer. This parameter is selectable in inWC or PA. The factory default is PA.

S659 DP Transducer Low—Sets the unit of measure that will be used for the low differential pressure transducer. This parameter is selectable from 0-9.999 inWC. The factory default is 0.000 inWC.

S660 DP Transducer High—Sets the unit of measure that will be used for the high differential pressure transducer. This parameter is selectable from 0-9.999 inWC. The factory default is 2.005 inWC.

S661 Number of EC Fans—Sets the unit of number of EC fans. This parameter is selectable between 1 and 5. The factory default is 3.

S662 Inlet Ring K-Value—Sets the inlet ring K-Value. This parameter is selectable between 1 and 999. The factory default is 480.

S664 Results:—Read-only string that describes S665 through S668.

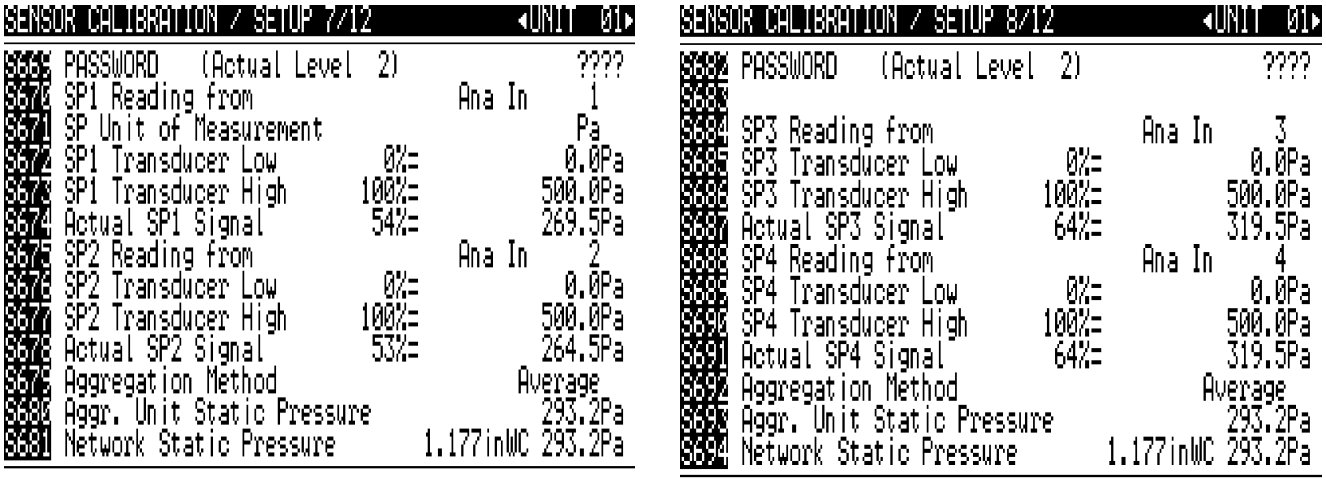
S665 DP Transducer Low—Shows the status of the low differential pressure transducer in both inWC and Pa after it's setup at S659.

S666 DP Transducer High—Shows the status of the high differential pressure transducer in both inWC and Pa after it's setup at S660.

S667 Actual DP Signal—Shows the actual differential pressure transducer percentage.

S668 Calculated Airflow—Shows the calculated airflow based on the low, high, number of EC fans and the Inlet Ring K-Value settings.

Figure 155 Sensor calibration/setup screen, pages 7 and 8 of 12



Up to four static pressure transducers may be programmed on Screens 7 and 8. Four static pressure transducers are shows in **Figure 155** for simplicity. Transducer information will be hidden if a device has not been configured on *SP# Reading from*.

SP# Reading from—Sets the analog input that will be used for the static pressure transducer. This parameter is selectable from None, Ana In 1, Ana In 2, Ana In 3 and Ana In 4. The user may also choose to select Network. This setting allows the unit to operate based on a shared static pressure value across the U2U network. This setting does not required a static pressure transducer connection at the unit. The default is none.

SP# Unit of Measurement—Sets the unit of measure that will be used for the static pressure transducer. This parameter is selectable in inWC or PA. The default is PA.

SP# Transducer Low—Calibrates the static pressure transducer; sets the value displayed at the starting point of the analog input signal. This parameter is selectable from 0-9.999 inWC or 0.0-2491.0 Pa. The default is 0.000 inWC or 0.0 Pa.

SP# Transducer High—Calibrates the static pressure transducer; sets the maximum value displayed, or end point, of the analog input. This parameter is selectable from 0-9.999 inWC or 0.0-2491.0 Pa. The default is 2.005 inWC or 500.0 Pa.

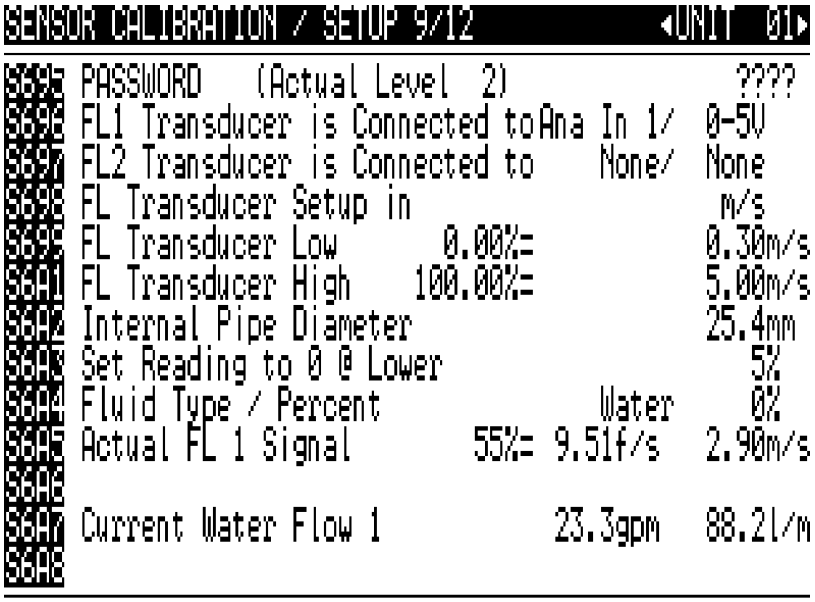
Actual SP# Signal—Shows the current static pressure based on low and high settings.

Aggregation Method—Up to four different analog inputs can be configured for static pressure. The aggregation method defines if the resulting pressure is the Average, Maximum or the Minimum of all connected sensors.

Aggr. Unit Static—Displays the unit static pressure based on the *Aggregation Method* setting.

Network Static Pressure—Displays the maximum or average U2U network static pressure of all devices connected in the group. The maximum or average reading is based on the value programmed in Service Menus>System / Setpoints, *S197 SP Teamwork / Network Mode*.

Figure 156 Sensor calibration/setup screen, page 9 of 12



S696 FL1 Transducer is Connected to—Sets the analog input and the input range that will be used with the flow meter. This parameter is selectable from None, Ana In 1, Ana In 2, Ana In 3 and Ana In 4. The factory default is None. The input range options are 0-5VDC, 0-10VDC, and 4-20mA.

S697 FL2 Transducer is Connected to—Sets the analog input and the input range that will be used with the flow meter. This parameter is selectable from None, Ana In 1, Ana In 2, Ana In 3 and Ana In 4. The factory default is None. The selectable input range options are 0-5VDC, 0-10VDC, and 4-20mA.

S698 FL Transducer Setup in—Sets the unit of measure for the flow readout. Two options are available, m/s (meter per second) and f/s (feet per second). The factory default is m/s.

S699 FL Transducer Low—Used for calibrating the flow meter. Sets the value displayed at the starting point of the analog input signal. This parameter is selectable from 0.00 - 9.99 m/s or 0.00 - 32.48 f/s. The factory default is 0.98 f/s or 0.30 m/s.

S6A1 FL Transducer High—Used to calibrate the flow meter. Sets the maximum value displayed, or end point of the analog input. This parameter is selectable from 0.00 - 9.99 m/s or 0.00 - 32.48 f/s. The factory default is 16.40 f/s or 5.00 m/s.

S6A2 Internal Pipe Diameter—Sets the inside pipe diameter of pipe where the flow meter is installed. Units of measure include inches and millimeters. This parameter is selectable from 0.39-39.36 in or 10.0-999.9 mm. The factory default is 1.00 in or 25.4 mm.

S6A3 Set Reading to 0 @ Lower—Used to prevent false flow readings when the regulating valve is closed or open to a very small percentage. The programmed here is compared to the valve call. If the valve call is less than the value programmed, the Liebert iCOM will register 0.00 m/s or 0.00 f/s. This parameter is selectable from 0-50%. The factory default is 5%.

S6A4 Fluid Type / Percent—Sets the fluid type used in the system as a correction factor for calculating cooling capacity. Three options are available: Water, EGlycol (ethylene glycol), and PGlycol (propylene glycol). When EGlycol or PGlycol are selected, the percent concentration can be set in the field to the far right. The factory default fluid type is Water and percent concentration is 0%.

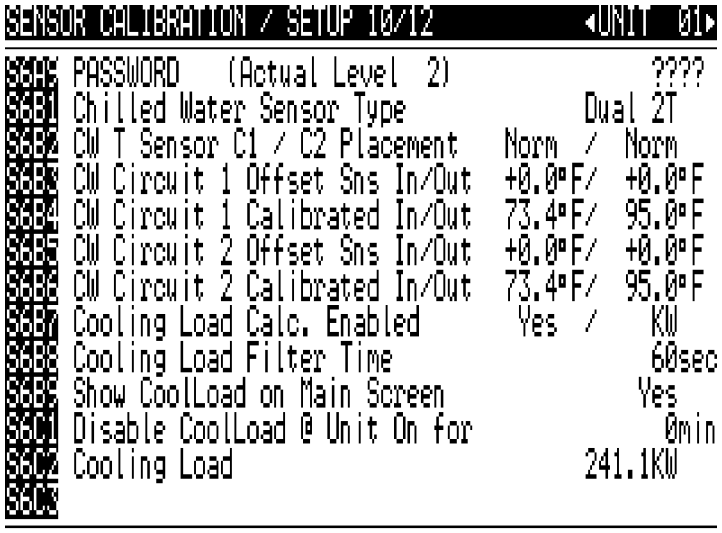
S6A5 Actual FL 1 Signal—Displays the fluid flow rate for flow meter 1 in m/s or ft/s.

S6A6 Actual FL 2 Signal—Displays the fluid flow rate for flow meter 2 in m/s or ft/s.

S6A7 Current Water Flow 1—This parameter displays the fluid flow rate for flow meter 1 in GPM (gallons per minute) or l/m (liters per minute).

S6A8 Current Water Flow 2—This parameter displays the fluid flow rate for flow meter 2 in GPM (gallons per minute) or l/m (liters per minute).

Figure 157 Sensor calibration/setup screen, page 10 of 12



S6B1 Chilled Water Sensor Type—Used for selecting the type and number of fluid sensors installed. Two options are available: 2T and Dual 2T. The 2T option is used on units equipped with one flow meter and Dual 2T is used for units with two flow meters.

S6B2 CW Temp Sensor Placement (CW T Sensor C1 / C2 Placement w/Dual 2T)—Allows swapping the chilled water sensor readout in the display. In the event the 2T sensor probe is installed backward, this allows the user to correct the readout in the software. On dual-sensor applications, a parameter will be available for each sensor. Two options are available: Norm and Rev. The factory default is Norm.

S6B3 CW Circuit 1 Offset Sns In/Out—Adjusts the fluid temperature value of the fluid temperature inlet and outlet probes. This value is the actual sensor reading (+ or -) the offset "CW Circuit 1 Calibrated In/Out."

S6B4 CW Circuit 1 Calibrated In/Out—Shows the adjusted fluid temperature value of the fluid temperature inlet and outlet probes. This value is the actual sensor reading (+ or -) the offset "CW Circuit 1 Calibrated In/Out."

S6B5 CW Circuit 2 Offset Sns In/Out—Adjusts the fluid temperature value of the fluid temperature inlet and outlet probes. This value is the actual sensor reading (+ or -) the offset "CW Circuit 2 Calibrated In/Out."

S6B6 CW Circuit 2 Calibrated In/Out—Shows the adjusted fluid temperature value of the fluid temperature inlet and outlet probes. This value is the actual sensor reading (+ or -) the offset "CW Circuit 2 Calibrated In/Out."

S6B7 Cooling Load Calc. Enabled—Allows enabling or disabling the cooling load calculation. Two options are available: No and Yes. If Yes is selected, a cooling load output field will populate. Cooling load output options include kW and kBtuh. The factory default for the cooling load calculation is No.

S6B8 Cooling Load Filter Time—Cooling load is based on an average calculation of input temperature and flow. This parameter sets duration of the average used for the cooling output reading. This parameter is adjustable from 30 to 300 sec. The factory default is 60 sec.

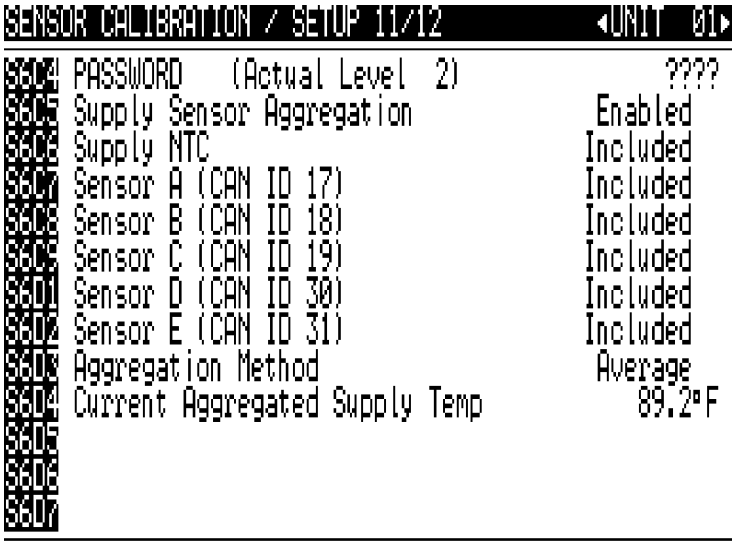
S6B9 Show CoolLoad on Main Screen—Allows selecting whether the cooling load calculation is displayed in the Unit View>Main Screen. The options are: No and Yes. The factory default is No.

S6C1 Disable CoolLoad @ Unit On for—Delays the cooling load calculation start point after a unit has turned On. During delay time programmed, cooling capacity will not be shown through the local display or through monitoring. The range is 0-10 minutes with a factory default of 5 minutes. To show cooling load as soon as the unit powers up, set the parameter to 0.

S6C2 Cooling Load (Cooling Load C1 + C2 w/Dual 2T & flow meters)—Displays the total calculated cooling load in kW or kBtu/h. C1 and C2 are added together and displayed here on applicable models.

S6C3 Cooling Load C2 / C1—Displays the calculated cooling load in kW or kBtu/h by circuit on applicable models.

Figure 158 Sensor calibration/setup screen, page 11 of 12



S6C5 Supply Sensor Aggregation—Five additional supply air sensors (2T sensors) may be connected for control purposes. This parameter enables and disables the additional supply air sensors for control purposes.

S6C6 Supply NTC—Allows including or excluding the sensor reading from the Maximum or Average *Aggregation Method*.

S6C7 Sensor A (CAN ID 17)—Allows the include or exclude the sensor reading from the Maximum or Average *Aggregation Method*.

S6C8 Sensor B (CAN ID 18)—Allows including or excluding the sensor reading from the Maximum or Average *Aggregation Method*.

S6C9 Sensor C (CAN ID 19)—Allows including or excluding the sensor reading from the Maximum or Average *Aggregation Method*.

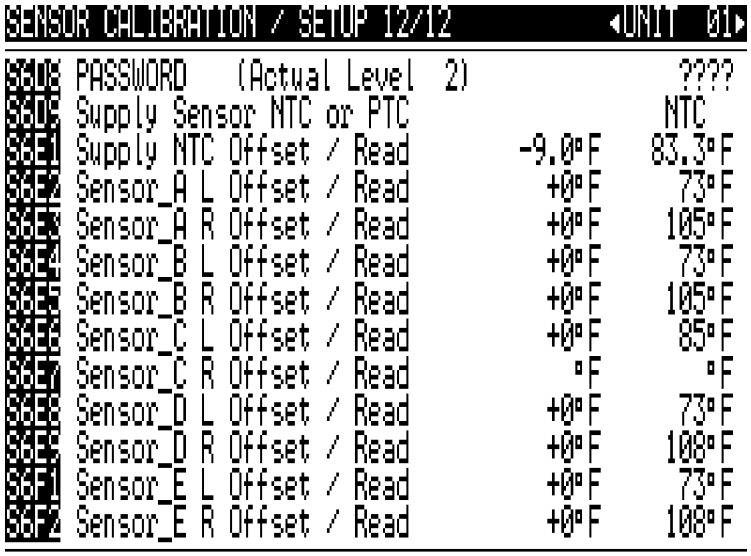
S6D1 Sensor D (CAN ID 30)—Allows including or excluding the sensor reading from the Maximum or Average *Aggregation Method*.

S6D2 Sensor E (CAN ID 31)—Allows including or excluding the sensor reading from the Maximum or Average *Aggregation Method*.

S6D3 Aggregation Method—Allows including or excluding the sensor reading from the Maximum or Average *Aggregation Method*.

S6D4 Current Aggregation Supply Temp—Displays the maximum or average temperature based on *Aggregation Method* programming in degrees Celsius or degrees Fahrenheit.

Figure 159 Sensor calibration/setup screen, page 12 of 12



S6D9 Supply Sensor NTC or PTC—Supports only the NTC selection.

S6E1 Supply NTC Offset / Read—The left hand parameter adjusts the supply temperature reading from the actual sensor to compensate for any sensor error or to match other sensors in the conditioned space. The right hand parameter shows the calibrated value in degrees Celsius or degrees Fahrenheit.

S6E2 Sensor_A L Offset / Read—The left hand parameter adjusts the thermistor temperature leaving the left side of supply Sensor A to compensate for any sensor error or to match other sensors in the conditioned space. The right hand parameter shows the calibrated value in degrees Celsius or degrees Fahrenheit.

S6E3 Sensor_A R Offset / Read—The left hand parameter adjusts the thermistor temperature leaving the right side of supply Sensor A to compensate for any sensor error or to match other sensors in the conditioned space. The right hand parameter shows the calibrated value in degrees Celsius or degrees Fahrenheit.

S6E4 Sensor_B L Offset / Read—The left hand parameter adjusts the thermistor temperature leaving the left side of supply Sensor B to compensate for any sensor error or to match other sensors in the conditioned space. The right hand parameter shows the calibrated value in degrees Celsius or degrees Fahrenheit.

S6E5 Sensor_B R Offset / Read—The left hand parameter adjusts the thermistor temperature leaving the right side of supply Sensor B to compensate for any sensor error or to match other sensors in the conditioned space. The right hand parameter shows the calibrated value in degrees Celsius or degrees Fahrenheit.

S6E6 Sensor_C L Offset / Read—The left hand parameter adjusts the thermistor temperature leaving the left side of supply Sensor C to compensate for any sensor error or to match other sensors in the conditioned space. The right hand parameter shows the calibrated value in degrees Celsius or degrees Fahrenheit.

S6E7 Sensor_C R Offset / Read—The left hand parameter adjusts the thermistor temperature leaving the right side of supply Sensor C to compensate for any sensor error or to match other sensors in the conditioned space. The right hand parameter shows the calibrated value in degrees Celsius or degrees Fahrenheit.

S6E8 Sensor_D L Offset / Read—The left hand parameter adjusts the thermistor temperature leaving the left side of supply Sensor D to compensate for any sensor error or to match other sensors in the conditioned space. The right hand parameter shows the calibrated value in degrees Celsius or degrees Fahrenheit.

S6E9 Sensor_D R Offset / Read—The left hand parameter adjusts the thermistor temperature leaving the right side of supply Sensor D to compensate for any sensor error or to match other sensors in the conditioned space. The right hand parameter shows the calibrated value in degrees Celsius or degrees Fahrenheit.

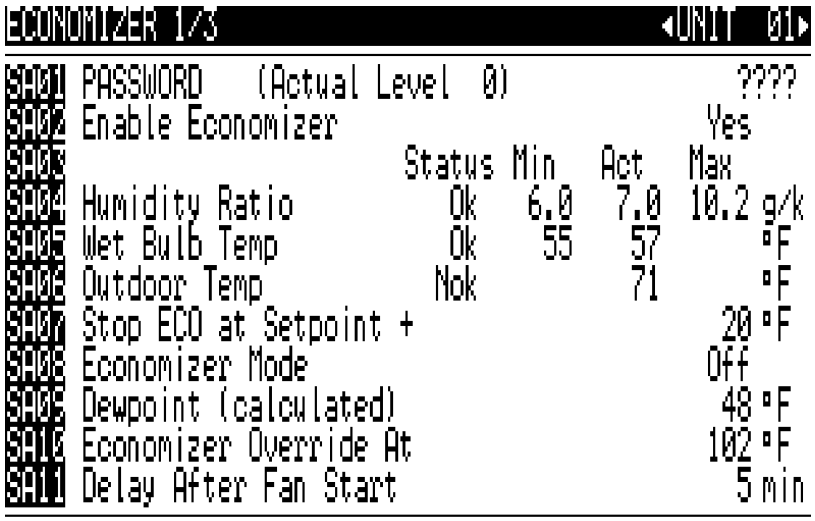
S6F1 Sensor_E L Offset / Read—The left hand parameter adjusts the thermistor temperature leaving the left side of supply Sensor E to compensate for any sensor error or to match other sensors in the conditioned space. The right hand parameter shows the calibrated value in degrees Celsius or degrees Fahrenheit.

S6F2 Sensor_E R Offset / Read—The left hand parameter adjusts the thermistor temperature leaving the right side of supply Sensor E to compensate for any sensor error or to match other sensors in the conditioned space. The right hand parameter shows the calibrated value in degrees Celsius or degrees Fahrenheit.

8.8 Service-Economizer Menu Screens

Economizer provides advanced air side Economizer monitoring and parameter adjustment

Figure 160 Economizer, page 1 of 3



SA02 Enable Economizer—Sets the Liebert Air Economizer™ operation to one of the following modes. These selections only determine if the Liebert Air Economizer is available for use; they do not determine or override damper position. Damper position is always controlled by the sensor set to control temperature (i.e., Return / Supply Sensor)

- **Yes**: This parameter will operate the Liebert Air Economizer based on the outdoor sensor reading and will allow the Liebert iCOM to determine if the conditions are within the acceptable range of operation.
- **NO**: This parameter will disable the Liebert Air Economizer and will not allow Liebert Air Economizer to operate even if the outdoor conditions are acceptable.
- **Remote**: This parameter will enable the Liebert Air Economizer and ignore the outdoor Liebert iCOM sensor even if the conditions are outside the range of operation.

SA04 Humidity Ratio—Sets the minimum and maximum limits of outdoor air based on the amount of moisture content. The humidity ratio is set based on pounds of moisture per pound of dry air. This is equivalent to the dew point temperatures.

SA05 Wet Bulb Temp—Read-only value that displays the outdoor wet bulb temperature. (This reading will be in metric values.)

SA06 Outdoor Temp—Displays the actual outdoor temperature based on the Temperature Humidity sensor (Sensor C). When this parameter shows OK, the outdoor temperature requirements have been met to use economization. When NOK is shown, the outdoor temperature is outside the operating range set in the Liebert iCOM control.

SA07 Stop ECO at Setpoint + —Sets the temperature when the Liebert Air Economizer will be disabled due to an increasing outdoor air temperature. This parameter is added to the return air sensor setpoint and then compared to the outdoor temperature reading. If the outdoor temperature reading exceeds the return air temperature setpoint plus this parameter, the Liebert Air Economizer will be disabled. This is factory-set at 20°F (-6.7°C).

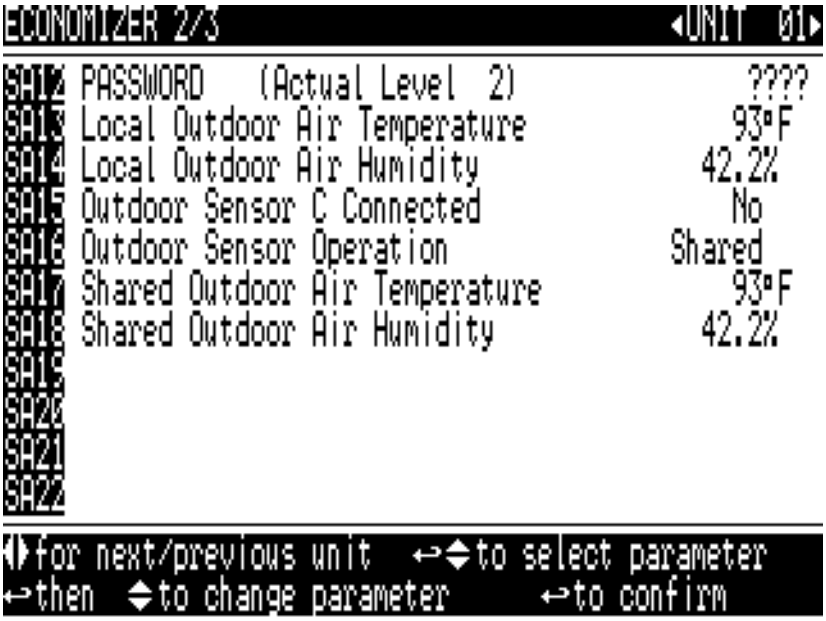
SA08 Economizer Mode—Displayed when the Liebert Air Economizer is available for use.

SA09 Dew Point (calculated)—Displays the actual outdoor dew point based on the outdoor sensor.

SA10 Economizer Override At—Sets the indoor temperature when the Liebert Air Economizer™ will be locked out. Even when all other parameters are satisfied, the Liebert Air Economizer will be locked out when the return air temperature sensor reads this value.

SA11 Delay After Fan Start—Sets the delay from the time the unit has been started until the ECO EMERGENCY OVERRIDE can be triggered. This allows airflow to pass over the sensors to get an accurate reading before any emergency modes are activated.

Figure 161 Economizer, page 2 of 3



SA13 Local Outdoor Air Temperature—Actual outdoor temperature from the sensor connected to the unit.

SA14 Local Outdoor Air Humidity—Actual outdoor humidity from the sensor connected to the unit.

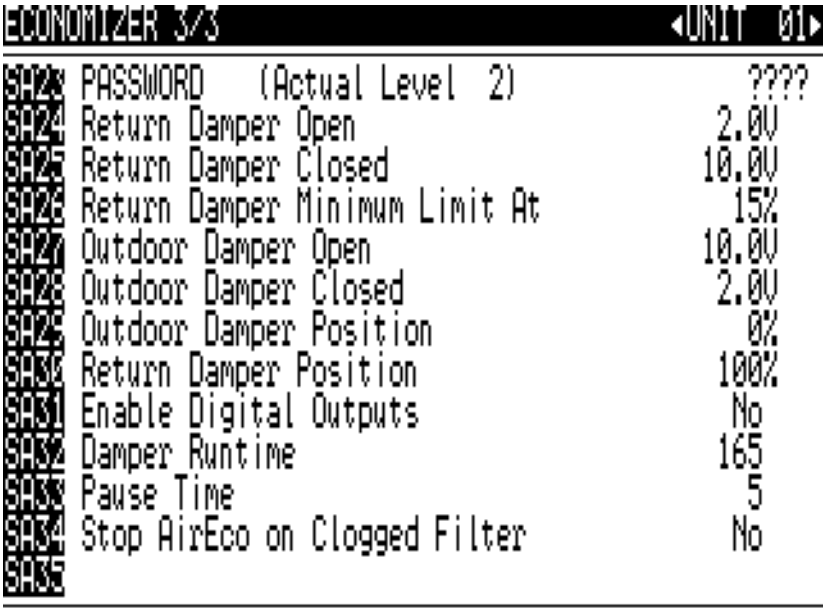
SA15 Outdoor Sensor C Connected—The default selection for units without air economizer is No. The default selection for unit with air economizer is Yes. When set to Yes, the unit uses the locally installed outdoor air temperature and humidity sensor to help determine air economizer eligibility. Setting the parameter to No on air economizer units will prevent the locally installed air economizer sensor from being used in the eligibility calculation when SA16 Outside Air Sensor is set to Shared. SA16 must be set to Shared before changing the parameter to No.

S**A16 Outdoor Sensor Operatio**n—The parameter may be set to Local or Shared. The factory default is Shared. When set to Shared, outdoor temperature and humidity readings are averaged among all connected units. The average is used to determine air economizer eligibility. When set to Local, the sensor installed at the unit determines air economizer eligibility without influence from other units connected in the group.

SA17 Shared Outdoor Air Temperature—Read-only parameter displays the shared outside air temperature when Outdoor Sensor Operation is set to Shared.

SA18 Shared Outdoor Air Humidity—Read-only parameter displays the shared outside air humidity when Outdoor Sensor Operation is set to Shared.

Figure 162 Economizer, page 3 of 3



SA24 - Return Damper Open—Sets the open voltage. This parameter may be set from 0V to 10.0V. The factory default is 2.0V.

SA25 - Return Damper Closed—Sets the closed voltage. This parameter may be set from 0V to 10.0V. The factory default is 10.0V.

SA26 - Return Damper Minimum Limit At—Sets the minimum damper position limit for recirculating return air with the outdoor air. This parameter may be set from 0-100%. The factory default is 15%.

SA27 - Outdoor Damper Open—Sets the open voltage. This parameter may be set from 0.V to 10.0V. The factory default is 2.0V.

SA28 - Outdoor Damper Closed—Sets the closed voltage. This parameter may be set from 0V to 10.0V. The factory default is 10.0V.

SA29 - Outdoor Damper Position—Shows the actual outdoor damper position; read-only.

SA30 - Return Damper Position—Shows the actual return damper position; read-only.

SA31 - Enable Digital Outputs—Enables Liebert Air Economizer digital output signal. This parameter may be set to Yes or No. The factory default is No.

SA32 - Damper Runtime—Sets the runtime for a damper. This parameter may be set from 30 to 500 seconds. The factory default is 165 seconds.

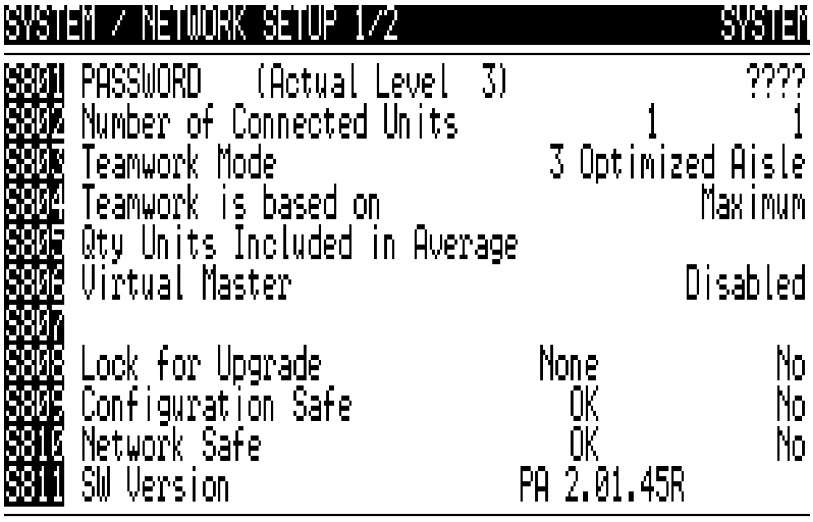
SA33 - Pause Time—Sets the time for a damper to open before the fan starts. This parameter may be set from 1-120 seconds. The factory default is 5 seconds.

SA34 - Stop AirEco On Clogged Filter—Sets the control to stop using the Air Economizer when a clogged filter event is active. This parameter may be set to Yes or No. The factory default is No.

8.9 Service-System/Network Setup Menu Screens

System Network Setup allows setting up a unit-to-unit (U2U) network for multiple cooling units controlled by Liebert iCOM.

Figure 163 System/network setup screen—System, page 1 of 2 (large display only)



S802 Number of Connected Units—Reflects the number of units connected that to the Liebert iCOM large display. If multiple units are connected in a unit-to-unit network, then the number will be greater than one.

S803 Teamwork Mode—Selects which teamwork mode to use within a selected group. Teamwork modes are described in **4.0 - Teamwork**.

S804 Teamwork is based on—Choices are Average or Maximum

Average: The temperature/humidity is controlled to an average reading of the controlling sensors.

Maximum: The temperature/humidity is controlled to the highest controlling sensor reading.

S805 Qty Units Included in Average—Defines the number of units to include in the average calculation. If the Qty setting is higher than the number of units, use all teamworked units in the group for the calculation. Available only if Teamwork Mode Based On is set to Average.

S806 Virtual Master—Enables or disables the virtual master feature. Enabling virtual master allows the control to automatically switch the U2U network duties from the current master to another unit in the group if the master gets disconnected from the network. If the setting is *Disabled*, all units operate independently based off their own sensor inputs and setpoints.

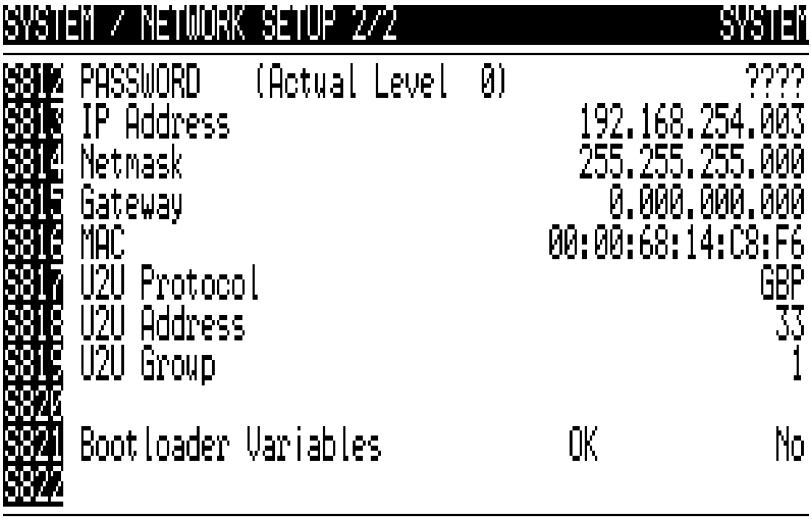
S808 Lock for Upgrade—Used to save and update files for Liebert iCOM service tool updates. Service tool updates are performed by specially trained and certified HVAC technicians.

S809 Configuration Safe—Saves or loads configuration settings for the display that have been modified from the factory defaults to an internal file that can be downloaded / uploaded using the Liebert iCOM Service Tool. Selecting “Save” will write the settings to the internal storage file and selecting “Load” will write the settings from the internal storage file to the application software. The internal file is updated every 12 hours automatically.

S810 Network Safe—Saves or loads network settings for the display that have been modified from the factory defaults to an internal file that can be downloaded/uploaded using the Liebert iCOM Service Tool. Selecting “Save” will write the settings to the internal storage file. Selecting “Load” will write the settings from the internal storage file to the application software.

S811 SW Version—Contains the application software version loaded onto the Liebert iCOM display.

Figure 164 System/network setup screen—System, page 2 of 2 (large display only)



S813 IP Address—Contains the network address of the display. This address must be unique on the network.

S814 Netmask— Netmask is used to divide IP addresses in subnet and specify the network available to hosts.

S815 Gateway—Routes data and act as a proxy server or a fire wall when setting up networks.

S816 MAC—Unique hardware identifier of the Ethernet device. READ ONLY

S817 U2U Protocol—Always set to GBP.

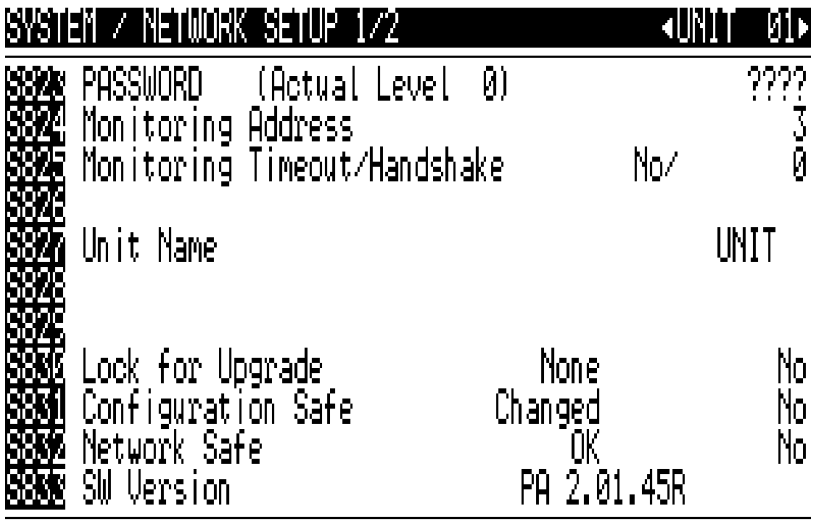
S818 U2U Address—Unique identifier for each unit on the network. Display addresses range from 33 to 64. Each display on the U2U network must have a different U2U address.

S819 U2U Group—Used to create zones or groups within a U2U network. Once a group number is selected the display will see only devices with the same group number. The group number can be changed to view other devices in different groups.

S821 Bootloader Variables—Indicates if there has been a change to the bootloader since it was last loaded, such as monitoring protocol, IP subnet setting, group or U2U number. This parameter should only be activated by an authorized service person.

8.10 Service-System/Network Unit-Level Setup Menu Screens

Figure 165 System/network setup screen—Unit, page 1 of 2



S824 Monitoring Address—Sets the address used by the Liebert IntelliSlot® cards. This is set to 3 at the factory and should not be changed.

S825 Monitoring Timeout/Handshake—Can be used with a building management system to verify communication has not been lost between the Liebert iCOM control and the BMS. If the time specified in this parameter elapses before the BMS writes a new value, then an alarm will occur "BMS TIMEOUT" and the temperature setpoint will revert to the backup setpoint and the fan speed "if equipped" will change to 100%. To disable this feature, write a zero to this parameter when it is active.

S827 Unit Name—A six-digit label to identify the unit from the local or remote display. This label will show at the top right of every screen that has monitoring or configuration of that unit.

S830 Lock for Upgrade—Locks the Liebert iCOM functions to permit upgrading firmware.

S831 Configuration Safe—Saves or loads configuration settings for the control board that have been modified from the factory default to an internal file that can be downloaded / uploaded using the Liebert iCOM Service Tool. Selecting Save will write the settings to the internal storage file and selecting Load will write the settings from the internal storage file to the application software. The internal file is updated automatically every 12 hours.

S832 Network Safe—Saves or loads network settings for the control board that have been modified from the factory defaults to an internal file that can be downloaded / uploaded using the Liebert iCOM Service Tool. Selecting Save will write the settings to the internal storage file and selecting Load will write the settings from the internal storage file to the application software.

S833 SW Version—Contains the application software version loaded onto the Liebert iCOM control board.

Figure 166 System/network setup screen—Unit, page 2 of 2

S835 Monitoring Protocol—Selects the monitoring protocol. Velocity V4 is the factory default that will provide communication to the Liebert IntelliSlot® housing. IGMNet will activate the legacy Liebert SiteLink™ protocol for communication to the Liebert SiteLink™(-E). Liebert Hironet™ is used only on Liebert HPM™ units.

S836 IP Address—Contains the network address of the display. This address must be unique on the network.

S837 Netmask—Netmask is used to divide IP addresses in subnet and specify the network available to hosts.

S838 Gateway—Routes data and act as a proxy server or a firewall when setting up networks.

S839 MAC—Unique hardware identifier of the Ethernet device; read-only.

S840 U2U Protocol—This parameter is always set to GBP.

S841 U2U Address—Unique identifier for each unit on the network. Display addresses range from 33 to 64. Each display on the U2U network must have a different U2U address.

S842 U2U Group—Creates zones or groups within a U2U network. Once a group number is selected, the display will see only devices with the same group number. The group number can be changed to view other devices in different groups.

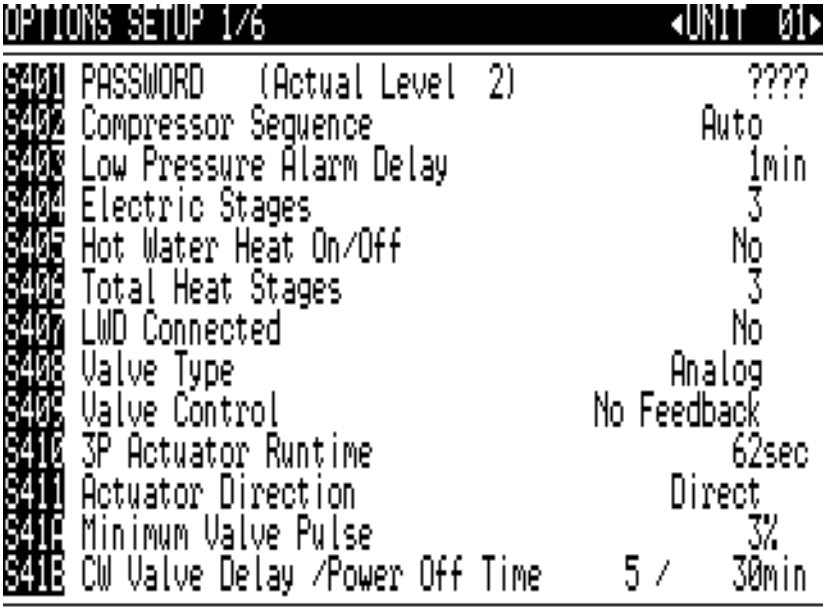
S843 Bootloader Variables—Indicates if there has been a change to the boot loader since it was last loaded. This parameter should only be activated by an authorized service person.

S844 Static RAM—Static RAM shows the status of changes made and whether they have been saved to the Static Memory on the board. The ranges of this parameter are, 0=Not Available, 1=Invalid, 2=OK, 3=Changed, 4=Updating and 5=Locked. The right hand parameter will allow the user to do two options, 0=nothing or 1=Clear+Reboot. This clears all the settings in the Static RAM.

8.11 Service-Options Setup Menu Screens

Options Setup contains component configuration, such as enable/disable humidifier, reheat, etc.

Figure 167 Options setup, page 1 of 6



S402 Compressor Sequence—Changes the lead compressor when cooling is activated. This parameter can also be set to "AUTO" mode, which will activate the compressor with the lowest run hours first.

S403 Low-Pressure Alarm Delay—Sets how long the unit will ignore a low-pressure condition during compressor startup. This parameter has previously been referred to as a Winter Start Time. This parameter can be set between 0 to 5 minutes.

S404 Electric Stages—Shows the number of electric stages that can be activated during a call for reheat. This parameter is set at the factory based on the unit's model number.

S405 Hot Water Heat On/Off—Selectable between "Yes and No". If *YES* is selected, the unit is equipped with a hot water heater.

S406 Total Heat Stages—Shows the number of heat stages that can be activated during a call for reheat. This parameter is set at the factory based on the unit's model number.

S407 LWD Connected—This parameter is set to *YES* if a liquid detection device is connected to the Liebert iCOM.

S408 Valve Type—Displays the type of valve actuator installed, either chilled water or free-cooling. This parameter is factory-set and read-only.

S409 Valve Control—Selects between two different methods to keep track of valve position when a stem/3P valve is installed in the unit. This setting does not affect motorized ball valves. If "Time" is selected, then the valve position is tracked by an internal timer in the control to determine the position or opening of the valve. If "Feedback" is selected, then analog input #1 interprets the signal from the valve to determine its position. Using the "Feedback" setting requires the setup procedure in **3.3.3 - Chilled Water Control**.

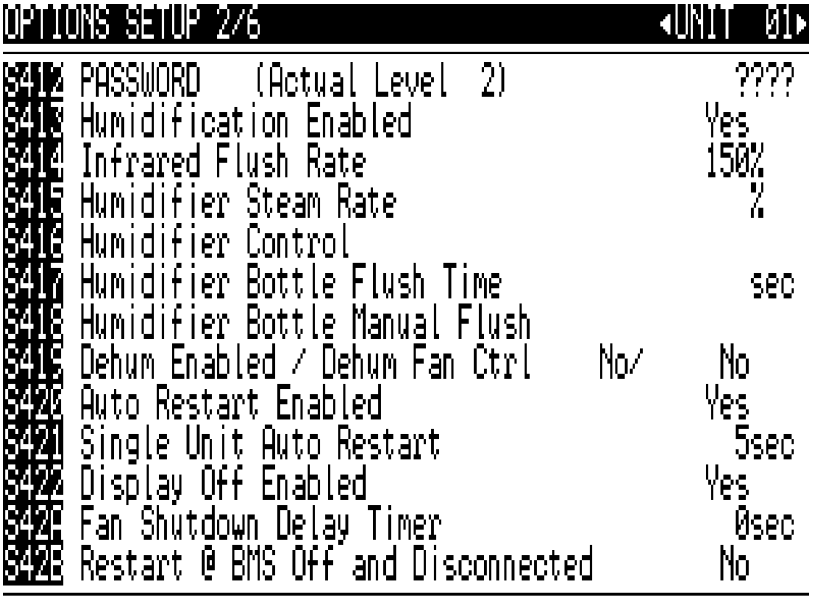
S41 3P Actuator Runtime—Sets the runtime at which the actuator will run.This parameter is adjustable from 30 - 500 seconds. Factory-set by unit code and should not be changed without contacting factory.

S411 3P Actuator Direction—Selects if the valve is a "Direct" or "Reverse" acting valve. Factory-set by unit code and should not be changed without contacting factory

S41A Minimum Valve Pulse—Sets the minimum valve pulse % when a movement is requested. This parameter is adjustable from 0 - 10%. The factory default is 5%.

S41B CW Valve Delay / Power Off Time—Sets the delay time of the CW valve movement when power is lost. If power is lost, the valve will not move for the time entered into this parameter so the unit has time to come back online from a power loss. This parameter is adjustable from 0 - 60 minutes. The factory default is 5 minutes. Sets the Power Off time; if power has been lost for the time entered into this parameter, the CW delay will be ignored. This parameter is adjustable from 0 - 300 minutes. The factory default is 30 minutes.

Figure 168 Options setup, page 2 of 6



S413 Humidification Enabled—Enables or disables humidification.

S414 Infrared Flush Rate—Shows the amount of makeup water supplied to an infrared humidifier as a percentage of the humidifier capacity. This value can be set from 110-500% (default is 150%). Higher flush rates reduce mineral deposit buildup in the humidifier pan.

S415 through S418—Not applicable to Liebert North America units.

S419 Dehum Enabled/Dehum Fan Ctrl—Selects whether the compressor and / or valve will be used to dehumidify when the humidity is above setpoint.

S420 Auto Restart Enabled—Restarts the unit after a power cycle when set to *Yes*. When this parameter is set to "No," the unit will not restart (Turn On) after a power cycle.

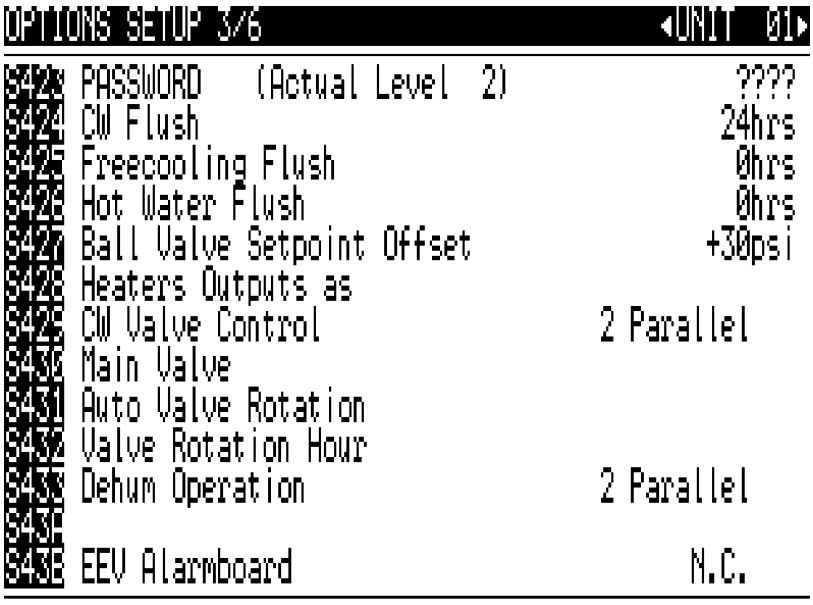
S421 Single Unit Auto Restart—Sets a time delay for the unit to restart when the Auto Restart Enabled is set to *YES*. The delay begins once the boot process has completed. This parameter allows units to be staggered On to reduce the amount of simultaneous power consumption after a loss of power.

S422 On-Off Enabled—Sets the Liebert iCOM control to ignore the On/Off command from the display On/Off button when set to NO. This parameter is a local setting in the control board.

S42A Fan Shutdown Delay Timer—Sets the fan shutdown delay timer to allow the fan to continue to operate after the unit has been shut down. This parameter is adjustable from 0 - 999 seconds. The factory default is 0 seconds.

S42B Restart @ BMS Off and Disconnected—*Yes* allows the unit turn On if in a monitoring off state when a BMS Disconnect alarm occurs. *Remote Off, Display Off, System Off, Alarm Off* and *U2U Standby* will take priority over this feature when a disconnect occurs. *No* allows the unit to remain in a monitoring off state if a BMS disconnect occurs.

Figure 169 Options setup, page 3 of 6



S424 CW Flush—Selects the number of hours between each chill water coil flush cycle. The default is every 24 hours. Reducing this number will increase the number of coil flushes.

S425 Freecooling Flush—Selects how many hours between each free-cooling coil flush cycle. The default is every 24 hours. Reducing this number will increase the number of coil flushes.

S426 Hot Water Flush—Selects how many hours between each hot water coil flush cycle. The default is every 24 hours. Reducing this number will increase the number of coil flushes.

S427 Ball Valve Setpoint Offset—Adjusts the operating compressor discharge pressure by changing the targeted range of control for units with motorized ball valves. The psi added here increases valve sensitivity. The higher the number, the more the ball valve will open at a given pressure.

S428—Not applicable to Liebert North America units.

S429 CW Valve Control—Allows the valves to be set to operate in parallel, alternate or cascade for units equipped with dual motorized ball valves controlling flow to the chilled water coil. Parallel is the default selection and operates the valves at the same opening based on the call for cooling.

S430 Main Valve—Selects which valve is the lead valve if CW Valve Control is set for "Alternate or Cascade."

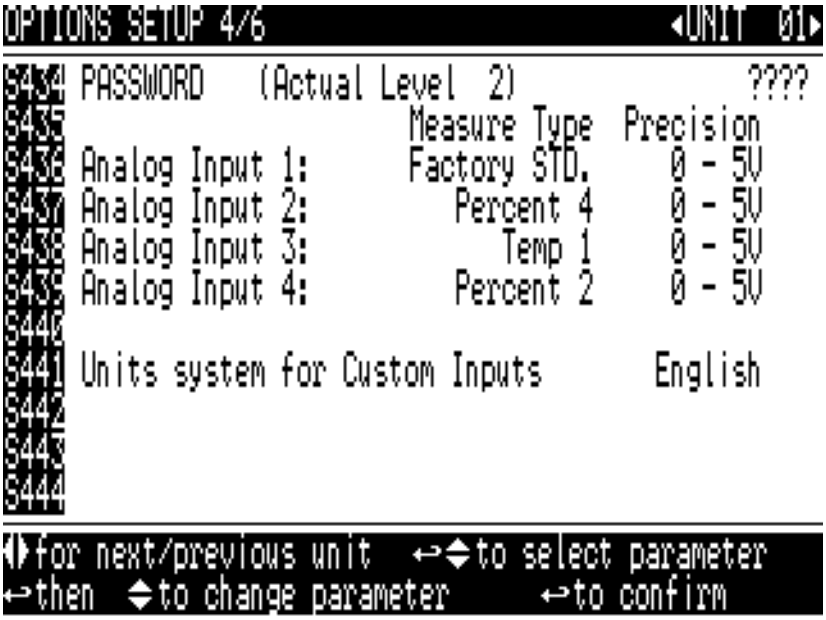
S431 Auto Valve Rotation—Allows the valves to be rotated based on the Valve Rotation Hour if CW Valve Control is set for "Alternate or Cascade."

S432 Valve Rotation Hour—Determines the time between the valve rotations if Auto Valve Rotation is enabled.

S433 Dehum Operation—Selects the dehumidification operation of the valves for units equipped with dual motorized ball valves controlling flow to the chilled water coil.

S43B EEV Alarmboard (Liebert DSE only)—Sets the EEV Alarmboard events sent to the board as a normally open or normally closed set of contacts. The choices are NO and NC; the default is NC.

Figure 170 Options setup, page 4 of 6



S435 Measure Type—Determines the measurement units and range for each analog input.

Factory Std measurement type means the input is being used by the factory-configured device for unit control and cannot be set to any other measurement type.

Not Config measurement type means the input is available for custom sensor use, but has not been configured. After unit code execution, all analog inputs that are available will be set to "Not Config," and can then be set to any of the following choices by the user:

- Air Pres 1, 2, 3 or 4
- Pressure 1, 2, 3 or 4
- Temp 1, 2, 3 or 4
- Percent 1, 2, 3 or 4

It is not necessary to match a measurement type number to the analog input number (i.e., "Air Pres 2" does not have to be connected to Analog Input 2). The numeric designation on each measurement type is just to allow the user to differentiate between readouts if multiple measurements of the same type are required.

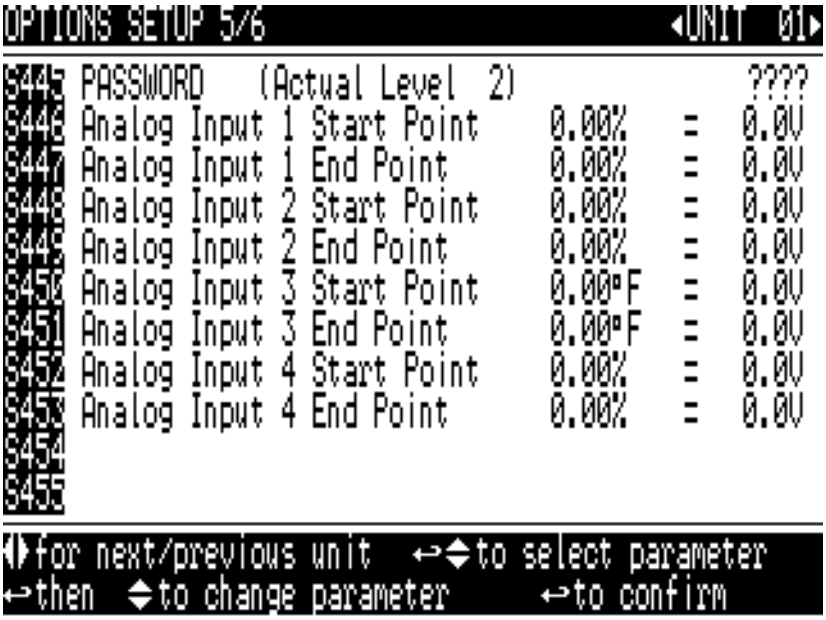
Precision—Parameters in the Precision column must match the DIP switch settings for each analog input being used. There are two choices for these parameters: 0-5V and 0-10V. This setting will also regulate the range of an analog input's linear characteristic on Page 5 of the Options Setup screen of the Service Menu (see **Figure 171**).

S441 Units system for Custom Inputs—Determines the unit type (English or SI) that will be used for the setup and readout of custom sensors. This parameter affects only analog inputs. All lines in other menus involving pressures or temperatures will have their readout type determined by line U404 of the User - Selection menu. The table below shows the English and SI units for each measurement type.

Measurement Type	Units	
	English	SI
Air Pres	inWC	Pa
Pressure	PSI	Bar
Temp	°F	°C
Percent	%	%

When the unit type is changed on line S441, the linear characteristics for all of the inputs on Page 5 of the Options Setup screen of the Service Menu will be converted to match the new units system, and the readout in the Sensor Data in the User Menu will also change to reflect the new units.

Figure 171 Options setup, page 5 of 6



Only characteristics for analog inputs used for custom sensors are visible in this menu.

Start Points (S446, S448, S450 and S452)—Represent the starting point of each analog input's linear characteristic. The column on the left indicates the desired readout at the lowest allowable sensor voltage, and the column on the right indicates the lowest sensor voltage.

End Points (S447, S449, S451 and S453)—Represent the finish point of each analog input's linear characteristic. The column on the left indicates the desired readout at the highest allowable sensor voltage, and the column on the right indicates the highest sensor voltage.

The range of allowable voltages is dictated by the Precision selection for that analog output on Page 4 of the Options Setup screen of the Service Menu (see **Figure 170**). If the precision of Analog Input 1 is set to 0-5V on line S436, the voltage selection on line S447 will not be allowed to go above 5.0V.

The range of the readout start/finish points is dictated by the units system selection on line S441. The range for each is shown in the table below.

Measurement Type	Units	
	English	SI
Air Pres	-1.25 to 1.25 inWC	-320.00 to 320.00 Pa
Pressure	-320.00 to 320.00 PSI	-22.00 to 22.00 Bar
Temp	-320.00 to 320.00 °F	-160.00 to 160.00 °C
Percent	-320.00 to 320.00%	-320.00 to 320.00%

Figure 172 Options setup, page 6 of 6

S457 Q15 Output Function—Sets the output function for Q15. This parameter is selectable for 0 = None, 1 = Dehum On, 2 = Cooling On, 3 = Reheat On, 4 = Comp On, 5 = Comp 1 On, 6 = Comp 2 On, 7 = Humi On, 8 = Fan On, 9 = FreeCool On, 10 = Damper, 11 = High Temp, 12 = Low Temp, 13 = Loss Power and 14 = Power Source The factory default is none. NOTE: Unit Code 16 can set the output for this parameter. The Q15 output is rated up to 27VAC and 2A. An additional contactor or control relay with power supply will be required if the application exceeds this limit.

S458 Q15 output direction—Sets the Q15 output direction. This parameter is adjustable from direct or reverse. The factory default is direct.

S459 Fan delay for damper—Sets the delay for the damper to open before the fan starts. This parameter is adjustable from 0 to 120 seconds.

S460 Damper switch feedback damper—Sets the timer for the damper when using Q15. This parameter is adjustable from 0 to 120 seconds. The factory default is 30 seconds.

S461 Q15 Temp output sensor—This parameter is adjustable from 0 = Return, 1 = Supply, 2 = Rem Max, 3 = Rem Low and 4 = Rem Avg. The factory default is Return.

S462 Q15 Temp output threshold—Sets the output threshold for the temperature using Q15. This parameter is adjustable from 32°F to 150°F. The factory default is 80°F.

S463 Q15 temp actual—Shows the status of the temperature in Celsius or Fahrenheit for Q15.

S465 Medium board: Q15 map to K11—Shows the status of Q15 being mapped to K11 on the medium board. This parameter will be shown as *No* or *Yes*. On the medium board, Q15 is mapped to K11 and is selectable. If this has been selected, this parameter will show the status of K11.

S466 Q15 output state—Shows the status of the Q15 output state. This parameter will be shown as *Off* or *On*.

8.12 Service-Service Contact Info Menu Screens

Service Contact Info contains the service contact phone number, e-mail address, pager number and Web site to be entered in this screen.

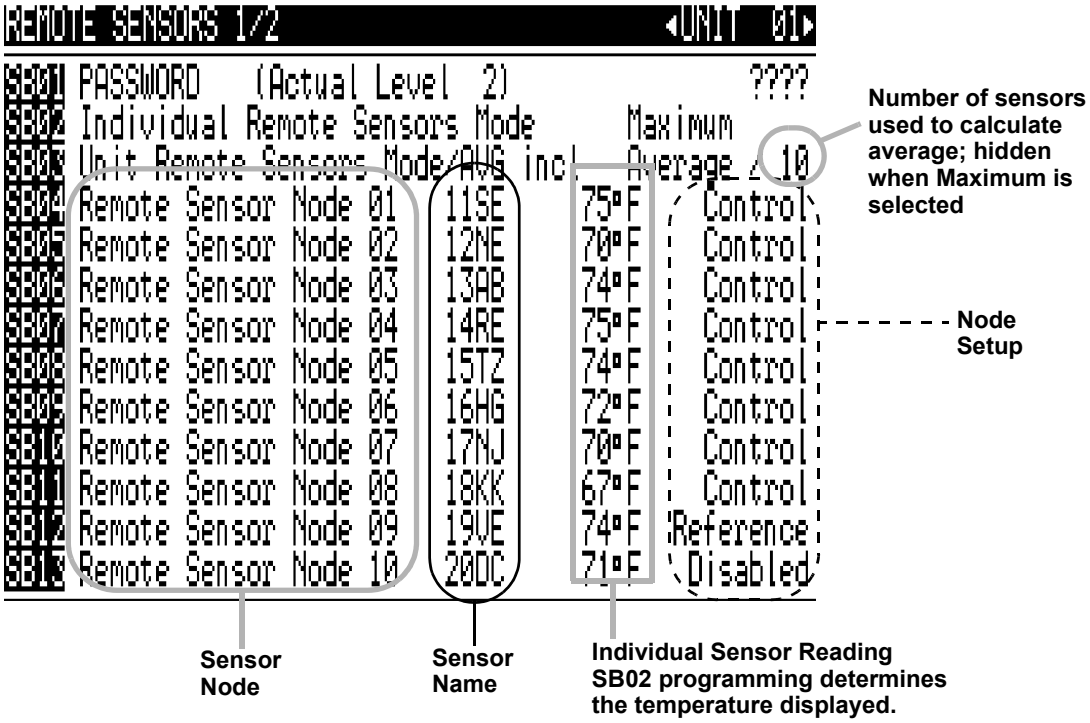
Table 20 Service contact information parameters

Function		Range Imperial (metric)
Large Display	Small Display	
Page 1 of 1		
Password	PASSWORD	-
Country	Country	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
Address line 1	Address line 1	text-string
Address line 2	Address line 2	text-string
Address line 3	Address line 3	text-string
Address line 4	Address line 4	text-string

8.13 Service-Remote Sensors Menu Screens

Remote Sensors provides remote sensor setup and readings.

Figure 173 Remote sensors, page 1 of 2



SB02 Individual Sensors Mode—Each sensor node has two temperature sensors connected. This line determines how each node or set of sensor readings will be displayed and used for control. Two selections are available: Maximum or Average. When set to *Maximum*, all connected sensor nodes will display the maximum reading of the of the two thermistors. When set to *Average*, all connected sensor nodes will display the average reading of the two thermistors.

SB03 Unit Remote Sensors Mode/AVG—Compares the average or maximum reading from all connected sensors depending on whether line SB02 is set to Maximum or Average. When *Average* is selected, the user may select a smaller number of sensors to be calculated in the sensor average. If the number selected is smaller than the number of sensor set for *Control*, only the highest sensor readings will be used for the average calculation.

SB04 - SB13Remote Sensor Node #—Defines the remote sensor programming and setup. Each line consists of four parts: sensor node, name, sensor reading and sensor setup.

Sensor Node—Up to 10 wired 2T sensors can be connected to each unit.

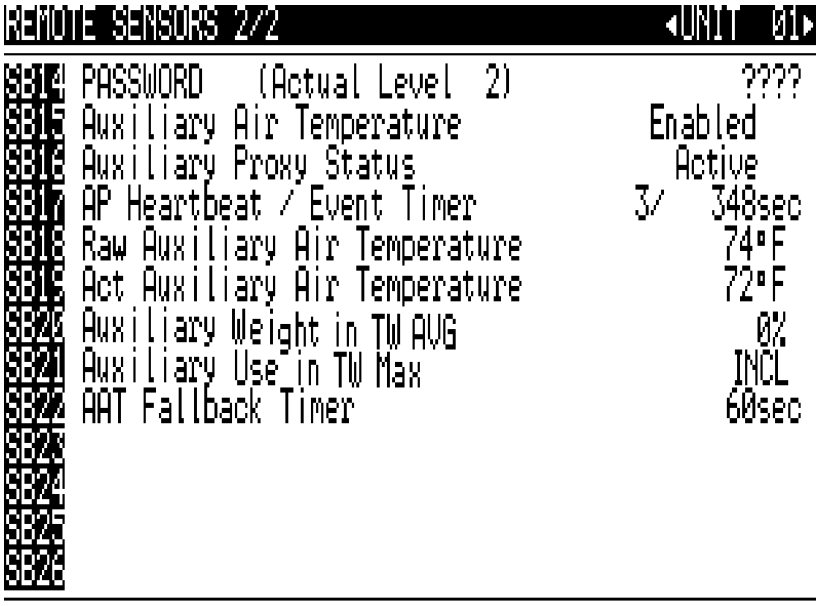
Name—Each node or sensor can be identified with a name (chosen and entered by user) to help identify sensors mounted in the facility. Sensor names can be up to four alphanumeric characters long, uppercase or lowercase, and special characters are permissible: & * / . + - : @ \

The factory default is blank.

Sensor Reading: Two temperature thermistors are attached to each 2T sensor. This portion of the line displays the maximum or average sensor value of the two readings measured. SB02 programming determines whether the reading shows the maximum or average calculation. If a sensor is connected but no reading is available, verify that the CANbus cables are properly inserted and that the DIP switches and sensor termination are correct.

Sensor Setup: Defines what the sensor is used for. Three options are available: **Disabled, Reference** and **Control**. *Disabled*, the factory default, is used when a sensor is not connected. *Reference* is for remote sensors used for remote monitoring. *Control* is for sensors used for controlling fan or cooling output.

Figure 174 Remote sensors, page 2 of 2



SB15 Auxiliary Air Temperature- enables or disables the wireless sensor connection.

SB16 Auxiliary Proxy Status—displays the proxy server communication status. Status's include *'initializing', 'active', 'inactive* or *lost.*

- Initializing: Displayed immediately after the start of the Liebert iCOM process responsible for tracking the communication state, or immediately after the *Auxiliary Air Temperature* value is enabled.
- Active: Displayed during normal operation.
- Inactive: Displayed when iCOM becomes disconnected from the proxy.
- Lost: Displayed when the Liebert iCOM is disconnected from the proxy and the Heartbeat Event Timer has elapsed.

SB17 AP Heartbeat / Event Timer—the left parameter is a timer that resets every time iCOM receives an information packet is from the proxy. If iCOM does not receive a packet within the time specified, the *Auxiliary Proxy Status* will show lost and the Event timer (right hand value) will start counting down. If iCOM does not receive a packet before the event timer has reached zero, an *AUX SENSOR DISCONNECT* event will become active.

SB18 Raw Auxiliary Air Temperature—The air temperature reading reported by the wireless proxy in degrees Fahrenheit or degrees Celsius.

SB19 Act Auxiliary Air Temperature—The remote temperature reading after wireless sensors is weighted with hard-wired sensors. The parameter reports in either degrees Fahrenheit or degrees Celsius.

SB20 Auxiliary Weighting in TW AVG—Represents the weight applied to the *Actual Auxiliary Air Temperature*, relative to the wired sensor value from each unit reported to the master. The range is 0 to 100% with a default of 0. The parameter will be hidden unless *Teamwork is based on* is set to *Average*.

Example:

X = *Auxiliary Weighting in TW AVG*

T0= *The temperature reported by the master*

n= *number of units in the group*

T1 through Tn = the wired sensors connected to each unit in the U2U group. The temperature reported by each unit is based on the Individual Remote Sensor Mode and Unit Remote Sensor Mode/AVG incl.

The aggregate average value will be:

(X/100)(Actual Auxiliary Air Temperature) + [(100-X)/100/(n+1)](T0 + T1 + … Tn)

SB21 Auxiliary Use in TW Max—Determines how the *Raw Auxiliary Air Temperature* is used in teamwork. This menu item has three possible values:

Exclude (default)—the *Actual Auxiliary Air Temperature* value will not be included in the maximum calculation.

Include— the *Actual Auxiliary Air Temperature* value will be included with values from the master and all other units in the teamwork group in order to calculate the maximum value.

Only—the *Actual Auxiliary Air Temperature* maximum value will be the AAT value, i.e. values from the master and all other units in the teamwork group will be ignored.

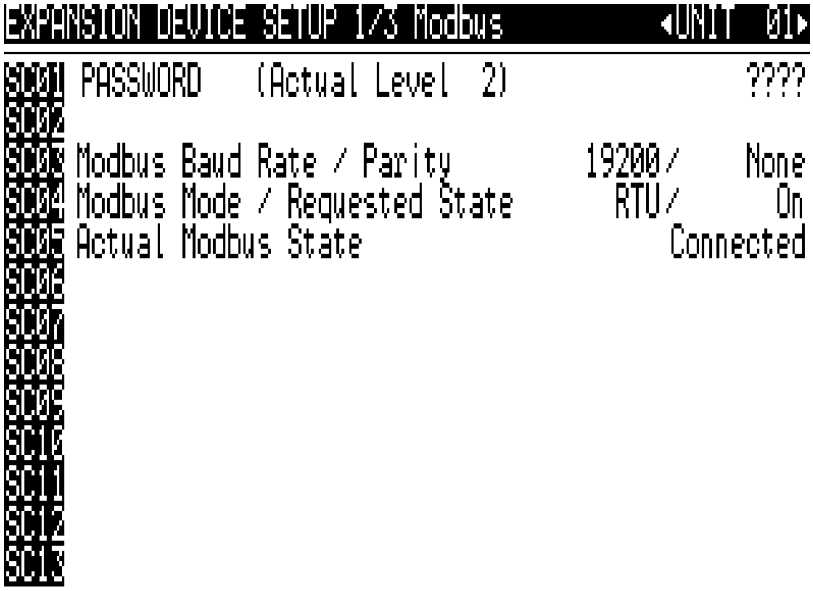
The parameter will be hidden unless *Teamwork is based on* is set to Maximum.

SB22 AAT Fallback Timer—Serves as a fail-safe mode if the wireless proxy fails to communicate with the Liebert iCOM. The user-adjustable timer begins when communication is lost. Once it reaches zero, the control will revert to wired sensor control. The default setting is 60 seconds with an adjustable range of 0-999 seconds.

8.14 Service-Expansion Device Setup Menu Screens

The Expansion Device Setup menu is used to set up auxiliary modbus devices, such as power meters. This menu is not used for establishing communication with the BMS.

Figure 175 Expansion device, page 1 of 3

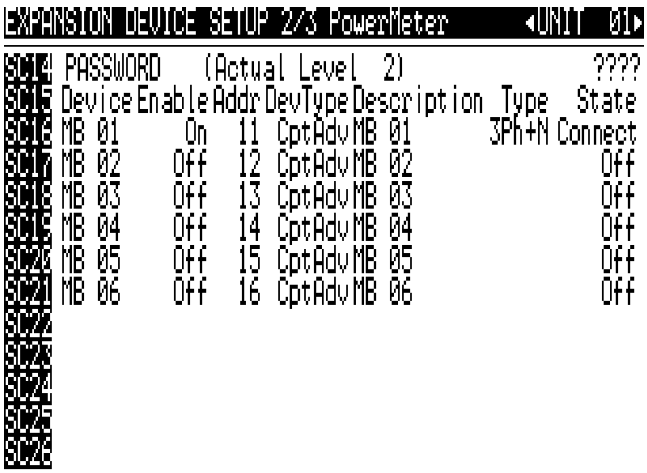


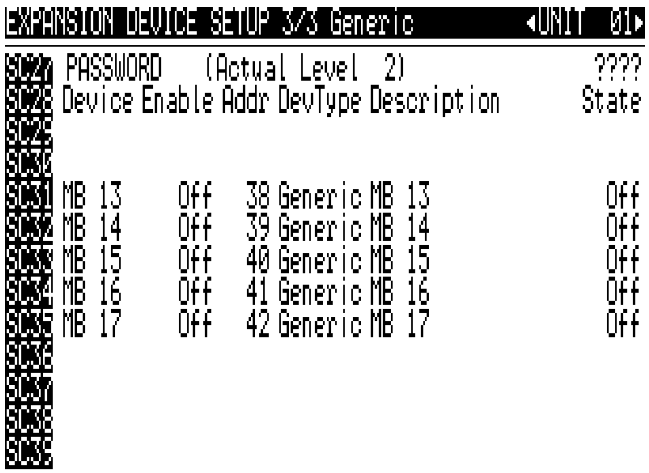
S**C03 Modbus Baud Rate / Parity**—Configures the baud rate and the parity for communication with connected devices. The baud rate may be set to 1200, 2400, 4800, 9600 or 19200. The parity may be *None, Even* or *Odd*.

SC04 Modbus Mode / Requested State—The left hand parameter configures the Modbus Mode. The right hand parameter is a user-adjustable value to enable or disable communication. The mode may be *ASCII* or *RTU*.

SC05 Actual Modbus State—Read-only value displays the device connection state.

Figure 176 Expansion device, pages 2 and 3





SC16-SC21, SC31-SC35—Displays device names (read only), permits enabling or disabling each device, and displays the Modbus address, device type (read only), user description and device status (read only).

Technical Support / Service

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