Vertiv™ Liebert® iCOM™

Installer/User Guide

Intelligent Communication and Monitoring for Vertiv™ CoolPhase Perimeter, Vertiv™ CoolLoop Perimeter, and Vertiv™ CoolLoop Thermal Wall

NOTE: Vertiv™ CoolPhase Perimeter includes the following products: DS/VS, DSE, and PDX.

NOTE: Vertiv™ CoolLoop Perimeter includes the following products: CW and PCW.

NOTE: Vertiv™ CoolLoop Thermal Wall includes the following products: CWA

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Refer to local regulations and building codes relating to the application, installation, and operation of this product. The consulting engineer, installer, and/or end user is responsible for compliance with all applicable laws and regulations relation to the application, installation, and operation of this product.

The products covered by this instruction manual are manufactured and/or sold

Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit https://www.vertiv.com/en-us/support/ for additional assistance.

TABLE OF CONTENTS

1 Getting Started with Vertiv™ Liebert® iCOM™ Installer/User Guide 1
1.1 Touchscreen Display and User Interface 1
1.2 Touchscreen Status Dial 3
1.2.1 Dial Background Color Status Indication 5
1.3 Control Header 6
1.3.1 Powering On the Vertiv™ Liebert® iCOM™ and Logging In/Unlocking Controls 6
1.3.2 Powering On the Thermal Management Unit 7
1.3.3 Powering Off the Thermal Management Unit 8
1.3.4 Logging Out 8
1.3.5 Setting the Date and Time 9
1.3.6 Searching 9
1.4 Using Context Sensitive Help 9
1.5 About Vertiv™ Liebert® iCOM™ Version 10
1.6 Accessing the User, Service, and Advanced Menus 10
1.7 User Menu 10
1.8 Service Menu 11
1.8.1 Service Menu Options 11
1.9 Advanced Menu 12
1.9.1 Advanced Menu Options 12
2 User Operation 15
2.1 Viewing and Editing Setpoints for the Cooling Unit 15
2.1.1 Editing Humidity Setpoints 15
2.1.2 Editing Temperature Setpoints 16
2.2 Viewing Unit Alarms 17
2.2.1 To View Alarms 17
2.2.2 Alarm Detail Fields 19
2.2.3 Silencing an Audible Alarm 19
2.2.4 Acknowledging Alarms 20
2.3 Viewing the Event Log 21
2.4 Viewing Sensor Data 21
2.5 Managing Run Hours for a Component 21
2.5.1 Setting Run Hours to Zero 22
2.6 Viewing Vertiv™ EconoPhase Operation 22
2.7 Viewing Teamwork, Standby, and Cascade Status 23
2.7.1 To View the Teamwork Details 23
3 Service Operation 25

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3.1 Editing Setpoints for the Cooling Unit 25
3.1.1 Setpoints Options 25
3.1.2 Configuring Temperature Setpoints 26
3.1.3 Temperature Control—Temperature Setpoints and Cooling Operation 29
3.1.4 Compressor Control by Cooling Requirement 31
3.1.5 Setting Temperature Compensation 39
3.1.6 Fan Temperature Compensation 39
3.1.7 Configuring High/Low Limit Setpoints 41
3.1.8 Configuring Humidity Setpoints 42
3.1.9 Humidity Control 44
3.1.10 Configuring Fan Setpoints 45
3.1.11 Manual Fan Speed Control 47
3.1.12 Automatic Fan Speed Control 49
3.1.13 Configuring Static Pressure Setpoints 49
3.1.14 Control Sensor Aggregation 51
3.2 Scheduling Condenser and Cooling Unit Tasks 54
3.2.1 Scheduling Condenser Low Noise Operation 54
3.2.2 Scheduling Condenser Fan Reversal 55
3.2.3 Scheduling Sleep Times for Thermal Management Units 55
3.3 Setting General Thermal Management Unit Options 56
3.3.1 Setting Miscellaneous Options 56
3.3.2 Configuring Quick Start 58
3.3.3 Automatic Restart after Power Failure 60
3.3.4 Setting Fan Options 60
3.3.5 Setting Compressor Options 63
3.3.6 Setting Reheat Options 65
3.3.7 Reheat Control 66
3.3.8 Setting Humidifier Options 72
3.3.9 Setting Dehumidification Options 73
3.3.10 Setting Water Leak Detector Options 74
3.3.11 Setting Q15 Options 74
3.3.12 Temperature Control: Setting Loss of Cooling Operation 76
3.3.13 Max Cool (Customer Alarm Input) 77
3.4 Vertiv™ Liebert® Fluid Economizer 77
3.4.1 Differential Temperatures/Controls (Comparator Circuit) 77
3.4.2 Vertiv™ Liebert® Air Economizer 80
3.5 Vertiv™ Liebert® Air Economizer Operation 82
3.5.1 Vertiv™ Liebert® Air Economizer System Overview 84
3.5.2 Disable the Vertiv™ Liebert® Air Economizer 86

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3.5.3 Adjust the Restricted Airflow Switch on the Vertiv™ Liebert® Air Economizer 87
4 Managing Events: Alarms, Warnings and Messages 89
4.1 Event Properties 89
4.1.1 Alarms and Events Panel Fields 89
4.2 Enabling Events and Editing Event Settings 90
4.3 Selecting Event Type and Setting Alarm/Warning Notification 91
4.3.1 Notification Properties 91
4.4 Enabling the Audible Alarm Notification 100
4.5 Remote Alarm Device and Customer Input Events 100
4.5.1 Setting Up Customer Input Events 101
5 U2U Networking 105
5.1 Preparing for U2U Group Set Up 105
5.2 Configuring U2U Network Settings 107
5.2.1 U2U Control Board Settings 107
5.2.2 Troubleshooting Network Settings Issues 108
5.2.3 Modifying U2U Network Settings 109
6 Teamwork, Standby and Rotation for Cooling Units 111
6.1 Continuous Control with Virtual Master 111
6.2 Teamwork Modes 111
6.2.1 To Set Up Teamwork 111
6.2.2 No Teamwork—Multiple Zones in One Room 114
6.2.3 Teamwork Mode 1—Parallel Operation 115
6.2.4 Teamwork Mode 2—Independent Operation 115
6.2.5 Teamwork Mode 3—Optimized Aisle Operation 115
6.3 Assigning Cooling Units to Standby (Lead/Lag) 117
6.3.1 To Set Up Lead/Lag Operation 117
6.4 Setting a Rotation Schedule 118
6.4.1 Unit Rotation Options 118
6.4.2 Manually Rotating the Operating and Standby Units 119
7 Configuring Economizer Operation 121
7.1 Fluid Economizers 121
7.1.1 Fluid Economizer Control Options 121
7.1.2 Overriding the Fluid Economizer Operation 122
7.1.3 Setting Up Fluid Economizer Operation 122
7.1.4 Temperature Control with a Fluid Economizer 124
7.1.5 Viewing Fluid Economizer Statuses 127
8 External Monitoring and Building Management Systems 129
8.1 BMS and Vertiv™ Liebert® IntelliSlot™ Settings 129

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8.1.1 Configuring BMS Communication with Embedded Unity 129
8.1.2 Setting BMS Control Settings 130
8.1.3 Setting BMS Backup Setpoints 131
8.2 Communication Setup with Embedded Unity 132
8.2.1 Connecting to the BMS 133
8.2.2 Embedded Unity User and Password 137
8.2.3 Unity Restart and Restore Defaults 137
8.2.4 System Configuration 137
8.2.5 Local Users Configuration 139
8.2.6 Network Configuration 140
8.2.7 Web Server Configuration 143
8.2.8 Remote Services Configuration 145
8.2.9 Velocity Protocol Configuration 148
8.2.10 Messaging Configuration 149
8.2.11 BACnet Protocol Setup 155
8.2.12 Modbus Protocol Setup 158
8.2.13 SNMP Protocol Setup 160
8.3 Unity Status Readings 165
8.4 Unity Support Information 166
8.4.1 Configuring Active Networking Settings 167
9 Configuring Auxiliary Devices 169
9.1 Power Monitoring 169
9.1.1 Power Monitoring Device Options 169
9.2 Fluid Temperature Monitoring 170
9.2.1 Fluid Sensor Options 171
9.3 Configuring Analog Input Devices 171
9.4 Wired Remote Sensors 172
9.4.1 Wired Remote Sensor Setup Options 172
9.4.2 Wired Remote Sensor Sensor Property Options 174
9.5 Supply Sensors 175
9.6 Return Air Temperature/Humidity Sensor 175
9.7 Modbus Devices 175
9.7.1 Power Meters 175
9.7.2 Flow Meters 175
9.7.3 Modbus Fans 176
9.7.4 Automatic Transfer Switch (ATS) 176
9.7.5 Modbus Chilled Water Valve 176
9.7.6 Diagnosing Refrigerant Leak Detection Issues 177
9.7.7 Refrigerant Leak Detection (RLD) Sensor 177

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10 Administering Firmware, Settings and Security 179
10.1 Vertiv™ Liebert® iCOM™ Firmware Upgrades 179
10.1.1 Compatibility with Earlier Versions of Vertiv™ Liebert® iCOM™ 179
10.1.2 Updating Vertiv™ Liebert® iCOM™ Control Board Firmware 179
10.1.3 Reverting to Firmware in Dormant Partition 181
10.2 Backing Up and Restoring Control Board Settings 181
10.2.1 Control Board Back Up and Restore Options 182
10.3 Managing Access Permission and Passwords 182
11 Performing Diagnostics 185
11.1 Cooling Unit Status LED 185
11.2 Enabling Manual Mode for Diagnostics 185
11.2.1 Disabling Diagnostics Manual Mode 186
11.3 Diagnosing Evaporator Fan Issues 186
11.3.1 Diagnostics—Evaporator Fan Options 186
11.4 Diagnosing Compressor Circuit Issues 187
11.4.1 Diagnostics—Compressor Circuit Options 187
11.4.2 Resetting High Pressure Alarm Code 188
11.4.3 Resetting Low Pressure Alarm Code 189
11.4.4 Resetting High Temperature Alarm Counter 189
11.5 Diagnosing Electronic Expansion Valve Issues 189
11.5.1 Diagnostics—Electronic Expansion Valve Options 189
11.5.2 Resetting EEV Battery Failure Counter 190
11.6 Diagnosing Vertiv™ EconoPhase Issues 190
11.6.1 Diagnostics—Vertiv™ EconoPhase Options 191
11.7 Diagnosing Reheat Issues 191
11.7.1 Diagnostics—Reheat Options 192
11.8 Diagnosing Humidifier Issues 192
11.8.1 Diagnostics—Humidifier Options 192
11.9 Diagnosing Digital Output Issues 193
11.9.1 Diagnostics—Digital Output Options 194
11.10 Diagnosing Analog Output Issues 194
11.10.1 Diagnostics—Analog Output Options 194
11.11 Diagnosing Customer Input Issues 194
11.11.1 Diagnostics—Customer Input Options 194
11.12 Diagnosing Water Leak Detection Issues 195
11.12.1 Diagnostics—Water Leak Detection Options 195
11.13 Diagnosing Refrigerant Leak Detection Issues 195
11.13.1 Diagnostics - Refrigerant Leak Detection Options 195
11.13.2 Refrigerant Leak Sensor: Test Mode 196

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12 Customizing the Vertiv™ Liebert® iCOM™ Display 197
12.1 Setting General Display Properties 197
12.1.1 Unit Display Options 197
12.2 Customizing Main Display Views 198
12.2.1 Moving Content 198
12.2.2 Resizing Content 198
12.2.3 Adding and Adjusting Content 199
12.2.4 Removing Content 200
12.3 Customizing Parameter and Field Labels 200
12.3.1 Exporting, Importing and Customizing Labels Using a Text Editor 202
13 Vertiv™ Liebert® iCOM™ Hardware Installation 205
13.1 P67: Return Air Temperature—Humidity Board 205
13.2 Jumper P3 CANbus Termination 207
13.3 Installing Wired Remote Sensors 207
13.3.1 Setting DIP Switches and Labeling Remote Sensors 208
13.3.2 Terminating the Last Sensor on the CANbus link 211
13.3.3 Installing Remote Sensors in the Remote Space to Monitor 213
13.3.4 Connect the CANbus Cable and Ground 215
13.4 Installing a Fluid Temperature Sensor 217
13.5 Installing Supply Air Temperature Sensors 219
13.5.1 Deploying the Supply Air Temperature Sensor 219
13.5.2 Installing Additional Aggregated Supply Air Temperature Sensors 221
13.6 Installing Analog Input Devices 221
13.7 Installing the U2U Network 222
13.7.1 Required Network Equipment 222
13.7.2 Plan Wiring Runs 222
13.7.3 U2U Wiring Connections 222
13.7.4 Wiring Cooling Units without Wall Mount Displays 223
13.7.5 Wiring Cooling Units with Wall Mount Displays 226
Appendices 227
Appendix A: Technical Support and Contacts 227
Appendix B: Setpoints and Alarm Settings by Line ID 229
Appendix C: Communication Protocol 255

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1 Getting Started with Vertiv™ Liebert® iCOM™ Installer/User Guide

The Vertiv Liebert iCOM offers the highest capability for unit control, communication, and monitoring of Vertiv thermal management units. It is available factory installed on new units and assemblies or may be retrofitted in existing units.

1.1 Touchscreen Display and User Interface

The Vertiv Liebert iCOM touchscreen and user interface speeds set up and installation and simplifies control of Vertiv™ thermal management units, literally putting cooling system monitoring and management at your fingertips.

- The resistive touchscreen is used with a firm touch, or consider using a stylus when interacting with the touchscreen.
- User and service menus are password protected to prevent unauthorized changes to cooling unit operation.
- The touchscreen is back lit and auto-dims after a period on non-use, then turns off. Touch the screen to illuminate the main screen.
- Vertiv Liebert iCOM ships with default settings for efficient and effective operation of most cooling-units and is easily configured to meet any need.
- Vertiv Liebert iCOM menus and displays are based on the options installed on the cooling units that it monitors and manages.

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Figure 1.1 Vertiv™ Liebert® iCOM™ Main Display

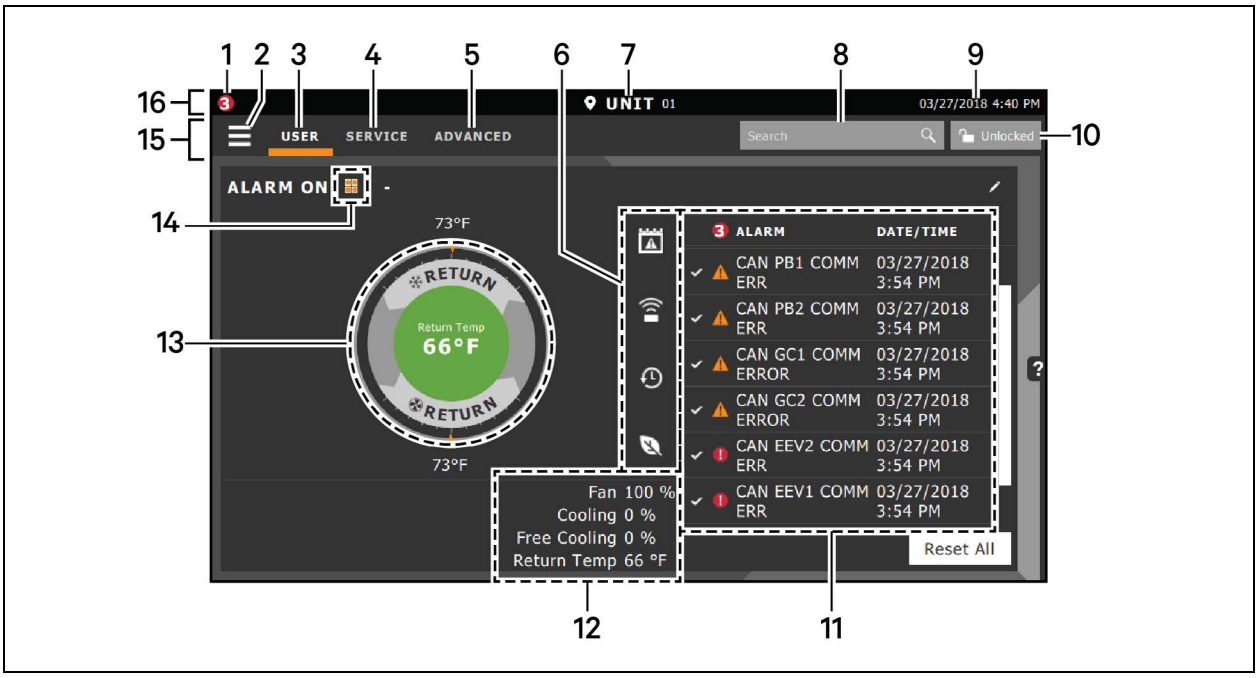

Table 1.1 Main Display Controls and Options

Item	Description
1	Alarms present. Displays the number of active alarms.
2	Menu icon. When unlocked, displays a menu for user or service options depending on which icon is selected.
3	User icon. When selected, the user options are available on the main display and menu. **NOTE: You must unlock the display with the User PIN to access the menu and options.** **See Powering On the Vertiv™ Liebert® iCOM™ and Logging In/Unlocking Controls on page 6 .**
4	Service icon. When selected, the service options are available on the main display and menu. **NOTE: You must unlock the display with the Service PIN to access the menu and options.** **See Powering On the Vertiv™ Liebert® iCOM™ and Logging In/Unlocking Controls on page 6 .**
5	Advanced icon. When selected, the advanced options are available on the main display and menu. **NOTE: You must unlock the display with the Service PIN to access the menu and read-only options.** **See Powering On the Vertiv™ Liebert® iCOM™ and Logging In/Unlocking Controls on page 6 .**
6	Cooling-unit parameters. Status display of selected system parameter settings. See Adding and Adjusting Content on page 199
7	Unit Identification. You may customize the unit name up to six characters/numbers.
8	Search icon. Open the keyboard to search for controls and setting locations. See Searching on page 9 .
9	Date/Time.

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Table 1.1 Main Display Controls and Options (continued)

Item	Description
10	Lock/Unlock icon. Indicates whether or not the user and service options are accessible. • Locked icon: display is read-only • Unlocked icon: user or service is logged-in and options are accessible. See Powering On the Vertiv™ Liebert® iCOM™ and Logging In/Unlocking Controls on page 6 .
11	Secondary content panel. When accessing settings/configuration via the menus, the settings display in the right, secondary panel.
12	Summary of current unit function. You can customize to show fan speed, cooling, percentages from any installed device, and any physical (sensor) values.
13	Status Dial. Circular display of setpoints and environmental conditions of the unit. See Touchscreen Status Dial below .
14	Teamwork mode icon. In a panel with Status content, the Teamwork Mode icon indicates the mode selected. For details and descriptions of the teamwork controls, see Teamwork Modes on page 111 .
15	Control header. Controls to access the user and service menus. See Control Header on page 6 .
16	Status Header. Displays the alarm status, unit identification, and the current date and time.

1.2 Touchscreen Status Dial

The dial in the primary control panel displays read-only control sensors, setpoints, and environmental conditions for unit status at a glance. See Figure 1.2 on the next page .

The center of the dial displays sensor readings and changes color according to alarm thresholds as the readings rise and fall, see Dial Background Color Status Indication on page 5 .

Touching the center of the dial cycles through a set of sensor settings, and you can select the readings displayed, see Adding and Adjusting Content on page 199 .

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Figure 1.2 Dial Sections

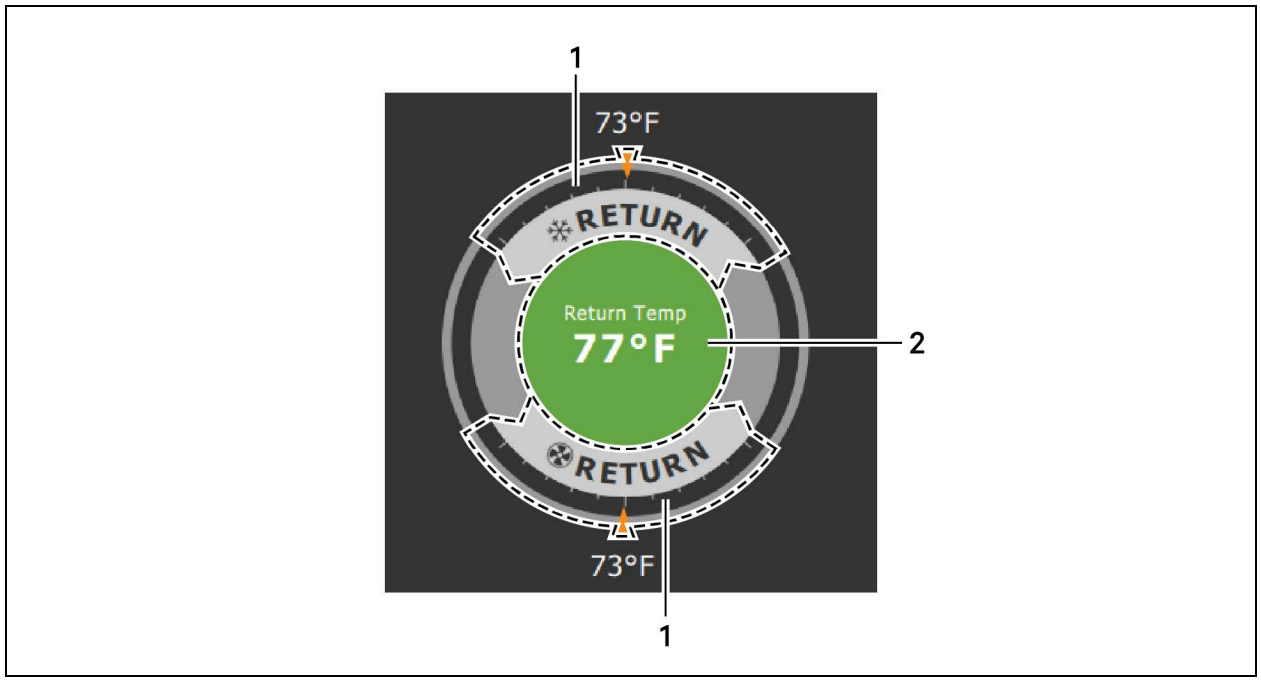

Table 1.2 Dial Sections

Item	Description
1	Control sensor and its setpoint. The sensors and setpoints displayed depend on the configuration of your unit. You may see only temperature-control, or if the unit includes humidity control, that displays on the dial as well. If the sensor selected for fan control is the same as that selected for temperature control, the dial displays the fan control sensor and setpoint, as shown in **Figure 1.2** above .
2	Single or multiple sensor readings. Cycle through readings by touching the displayed reading.

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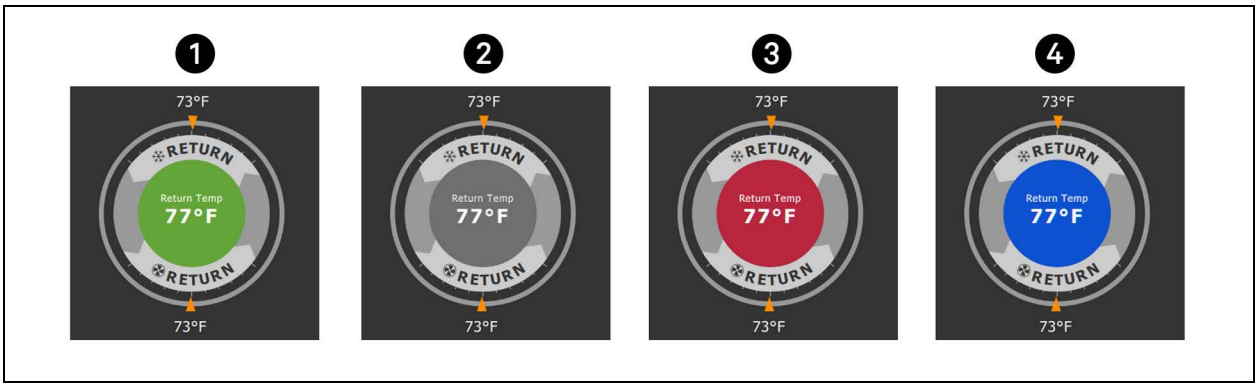
1.2.1 Dial Background Color Status Indication

The background color of the dial indicates whether or not the unit is powered on, and it also responds to threshold settings of the control sensor reading. See Figure 1.3 below . Table 1.3 below describes the background color displayed if the selected sensor reading has threshold limits set.

Figure 1.3 Dial Background Colors



Item	Description
1	Sensor reading is within threshold limits.
2	Unit is powered off.
3	Sensor reading is above threshold limit or the unit is in an alarm condition.
4	Sensor reading is below threshold limit.

Table 1.3 Background Color Displayed by Selected Value and Threshold Limit

Sensor/Value Selected	Threshold Limit	Background Color
Return Temp	None	Blue
	High return temperature	Red
Return Humidity	Low return humidity	Blue
	High return humidity	Red
Dew Point	Low dew point	Blue
	High dew point	Red
Supply Temp	Low supply temperature	Blue
	High supply temperature	Red
Average Rack Temp	Low remote temperature	Blue
	High remote temperature	Red

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Table 1.3 Background Color Displayed by Selected Value and Threshold Limit (continued)

Sensor/Value Selected	Threshold Limit	Background Color
Max Rack Temp	Low remote temperature	Blue
	High remote temperature	Red
Min Rack Temp	Low remote temperature	Blue
	High remote temperature	Red
Static Pressure	Low static pressure	Blue
	High static pressure	Red
Outdoor Temp	None	Green
Outdoor Humidity	None	Green

1.3 Control Header

The control header contains the controls to access the user and service settings. The display is locked when started initially and when restarted after a period of inactivity.

1.3.1 Powering On the Vertiv™ Liebert® iCOM™ and Logging In/Unlocking Controls

The Vertiv Liebert iCOM is powered on when power is switched on at the cooling unit's disconnect switch and you activate the display by touching it.

Vertiv Liebert iCOM is locked when started and also locks after a period of inactivity to prevent unauthorized changes. A four digit password is required to access the user and service menus and options, and the advance menu displays as read-only when logged in at the service level.

NOTE: The factory default inactivity period is one minute. To change the inactivity period, see Customizing Main Display Views on page 198 .

NOTE: The factory default password for user and service log in are provided. We recommend you change passwords as necessary to prevent unauthorized changes. See Managing Access Permission and Passwords on page 182 .

- Default user password: 1490
- Default service password: 5010

To unlock the controls:

1. On the header, touch 

.The keypad opens.
2. Touch the numbers/characters for your password, then touch . Depending on the password entered and your level of access, the User and/or Service options, and view only access to the Advanced menu are accessible. See Accessing the User, Service, and Advanced Menus on page 10 .

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1.3.2 Powering On the Thermal Management Unit

NOTE: Depending on the operating state, there are start and stop priority switches that may prevent the cooling unit from operating even though power to the unit is switched on and you have turned it on via Vertiv Liebert iCOM.

The cooling unit operates only when all switches are closed. For example, even though you have turned on the unit through Vertiv Liebert iCOM, if the BMS remote monitoring system is sending a command to turn off the unit, the cooling unit remains off.

NOTE: You must be logged in to access the menu options. See Powering On the Vertiv™ Liebert® iCOM™ and Logging In/Unlocking Controls on the previous page .

To power-on the unit:

1. Touch USER, then ☰ > *Turn Unit On*. The TURN UNIT ON dialog opens.
2. Touch *Turn Unit On*. The cooling unit starts and the operating status is displayed as shown in Figure 1.4 below .

Figure 1.4 Unit Status on Vertiv™ Liebert® iCOM™ Display



Item	Description
1	Current status of the unit. See Table 1.4 below .
2	Teamwork icon. See Viewing Teamwork, Standby, and Cascade Status on page 23 .

Table 1.4 Cooling Unit Statuses Displayed

Unit Status Text	Description
ALARM OFF	An alarm forced the unit to turn off. See Viewing Unit Alarms on page 17 .
MANUAL	Controlled by a service technician. See Enabling Manual Mode for Diagnostics on page 185 .
DISPLAY OFF	Unit is turned Off at the Vertiv Liebert iCOM display. See Powering On the Thermal Management Unit above .

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Table 1.4 Cooling Unit Statuses Displayed (continued)

Unit Status Text	Description
ALARM STANDBY	In standby because of an active alarm on the unit. See Viewing Unit Alarms on page 17 .
STANDBY	In standby because of service-menu setting. See Assigning Cooling Units to Standby (Lead/Lag) on page 117 .
TIMER OFF	Scheduled on a timer and is in sleep mode waiting for the next start interval. See Scheduling Condenser and Cooling Unit Tasks on page 54 .
UNIT ON	Operating normally without alarms or warnings.
WARNING ON	Active warning, but still operating. See Viewing Unit Alarms on page 17 .
ALARM ON	Active alarm, but still operating. See Viewing Unit Alarms on page 17 .
TIMER	Scheduled on a timer to operate, and is in operating mode. See Scheduling Condenser and Cooling Unit Tasks on page 54 .
REMOTE OFF	Turned-off by remote shutdown terminal. Occurs when a normally-closed set of 24V contacts opens. The Remote On/Off and Display On/Off switches are in series, and the cooling unit will only turn-on if both switches are on/closed. If one is off/open, the unit turns off.
MONITORING OFF	Turned-off by remote monitoring system. Check the remote monitoring device or call Vertiv technical support for assistance.
BACK-DRAFT	Unit is non-operational, but EC fan is operating as a back-draft damper.
RESTART DELAY	Not yet operational after a power cycle because the restart delay timer is active.

1.3.3 Powering Off the Thermal Management Unit

NOTE: You must be logged in to access the menu options. See Powering On the Vertiv™ Liebert® iCOM™ and Logging In/Unlocking Controls on page 6 .

1. Touch 

, then  >*Turn Unit Off*. The TURN UNIT OFF panel opens.
2. Touch *Turn Unit Off*. The unit begins a power off countdown then powers off.

1.3.4 Logging Out

Log out occurs automatically when the display back light turns off for inactivity.

NOTE: The factory default inactivity period is one minute. To change the inactivity period, see Setting General Display Properties on page 197 .

- To log out manually, touch the lock icon. The icon indicates locked.

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1.3.5 Setting the Date and Time

The correct date and time is critical for warnings, alarms, and scheduling.

1. Touch 

, then  > *Display Options* > *Display Properties* > *Date & Time*.
2. Touch the date field, use the arrows to select the date, and touch *OK*.
   – or –
   Touch the time field, use the arrows to set the time, and touch *OK*.
3. Select the date and time format if necessary.
4. Touch Save.

1.3.6 Searching

When logged in, you can use the display search to find the location of settings options based on a term, service code, or parameter. You can also search by the line ID used in the Vertiv Liebert iCOM before the touchscreen model. For a listing of the line IDs, see Setpoints and Alarm Settings by Line ID on page 229 .

NOTE: You must be logged in to access the display search. See Powering On the Vertiv™ Liebert® iCOM™ and Logging In/Unlocking Controls on page 6 .

1. In the control header, touch the search field. The keyboard opens.
2. Type the term and touch . A list of locations that contain the searched term opens.
3. To go to a listed location, touch an item, then touch *Go*. The panel for the selected location opens.

   – or –

   To view the service codes and parameter entries related to the searched term, touch View Parameter Directory Entries (the number of related entries is included in the option). The Parameter Directory opens. You may further refine the search in the directory.

1.4 Using Context Sensitive Help

Touching the Help icon, , on the right-hand side of the display opens the Help drawer with information about the panel or dialog currently on the display.

You can use search and the topic index to find further information.

To close the Help drawer, touch the close arrow, .

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1.5 About Vertiv™ Liebert® iCOM™ Version

The version, build, and other firmware information for the Vertiv Liebert iCOM display board may be helpful when servicing or troubleshooting. To locate the firmware version of the Vertiv Liebert iCOM control board, see Updating Vertiv™ Liebert® iCOM™ Control Board Firmware on page 179 .

- Touch 

, then  > *About*. The ABOUT panel opens.

1.6 Accessing the User, Service, and Advanced Menus

Vertiv Liebert iCOM operating functions that monitor and control a cooling unit are accessed via the User and Service menus.

NOTE: You must be logged in to access the menu options. See Powering On the Vertiv™ Liebert® iCOM™ and Logging In/Unlocking Controls on page 6 .

1. To access a menu, touch the icon for the menu you want, 

, 

or 

, in the control header, see Control Header on page 6 . The orange bar appears below the menu name when selected indicating that this is the menu content that will be displayed.
2. Touch the menu icon,  . The menu opens.

1.7 User Menu

The user menu lets you view system and unit statuses and edit some setpoints.

User Menu Options

Setpoints

Opens the SETPOINTS panel. See Viewing and Editing Setpoints for the Cooling Unit on page 15 .

Active Alarms

Opens the ALARMS panel. See Viewing Unit Alarms on page 17 .

Event Log

Opens the EVENT LOG panel. See Viewing the Event Log on page 21 .

Sensor Data

Opens the SENSOR DATA panel. See Viewing Sensor Data on page 21 .

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Display Options

Opens the Display Options menu:

- Customize Layout: See Customizing Main Display Views on page 198 .
- Custom Labels: See Customizing Parameter and Field Labels on page 200 .
- Date & Time: See Setting the Date and Time on page 9 .

Total Run Hours

Opens the RUN HOURS panel. See Managing Run Hours for a Component on page 21 .

About

Opens the ABOUT panel. See About Vertiv™ Liebert® iCOM™ Version on the previous page .

Turn Unit On/Off

Depending on unit's status, open the TURN UNIT ON or TURN UNIT OFF dialog. See Powering Off the Thermal Management Unit on page 8 , or Powering Off the Thermal Management Unit on page 8 .

1.8 Service Menu

The service menu lets you view and edit setpoints and perform many other functions.

1.8.1 Service Menu Options

Setpoints

Opens the SETPOINTS panel. See Editing Setpoints for the Cooling Unit on page 25 .

Diagnostic/Service

Opens the Diagnostic/Service menu:

- Diagnostics: See Performing Diagnostics on page 185 .
- Technical Support: Contact information for the cooling unit and Vertiv Liebert iCOM display.

Alarm/Event Setup

Opens the ALARMS & EVENTS panel. See Managing Events: Alarms, Warnings and Messages on page 89 .

BMS & Teamwork

Opens the BMS & Teamwork menu:

- U2U Setup: See Configuring U2U Network Settings on page 107 .
- Teamwork/Standby: See Teamwork, Standby and Rotation for Cooling Units on page 111 .
- BMS Setup: See BMS and Vertiv™ Liebert® IntelliSlot™ Settings on page 129 .

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Scheduler

Opens the SCHEDULER panel. See Scheduling Condenser and Cooling Unit Tasks on page 54 .

Options Setup

Opens the OPTIONS SETUP panel. See Setting General Thermal Management Unit Options on page 56 .

Auxiliary Device Setup

Opens the Auxiliary Device Setup menu:

- Sensors: See Wired Remote Sensors on page 172 .

Backup & Security

Opens the Backup & Security menu:

- Display Backup and Restore: See Backing Up and Restoring Control Board Settings on page 181 .
- Control Backup and Restore: See Backing Up and Restoring Control Board Settings on page 181
- Display Upgrade: See Updating Vertiv™ Liebert® iCOM™ Control Board Firmware on page 179 .
- Control Upgrade: See Updating Vertiv™ Liebert® iCOM™ Control Board Firmware on page 179 .
- Manage Permissions: See Managing Access Permission and Passwords on page 182 .

Turn Unit On/Off

Depending on unit's status, open the TURN UNIT ON or TURN UNIT OFF dialog. See Powering On the Thermal Management Unit on page 7 , or Powering Off the Thermal Management Unit on page 8 .

1.9 Advanced Menu

The advanced menu provides a read-only view of the advanced set up and factory level settings.

1.9.1 Advanced Menu Options

Factory Settings

Unit code and configuration settings.

Diagnostics

Details about control and cooling operation.

Expert Settings

Parameters and settings for use by trained professionals only.

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Compressor Info

Details about compressor state and operating mode.

Tandem Info

Details about tandem compressor states and operating modes.

MBV Settings

Motorized ball valve settings (water cooled heat rejection).

Runtime Monitoring

Details about component run times.

Modbus Devices

Configuration information about connected Modbus devices such as power meters, flow meters, Modbus fans, Automatic Transfer Switch, Chilled Water Valves, and other generic devices.

Control Override

Allows simulating events and override of analog outputs beyond normal limits.

EEV Settings

Electronic expansion valve settings.

EconoPhase

Details about Vertiv™ EconoPhase pumping unit.

CoolPhase Condenser

Details about Vertiv™ CoolPhase Condenser (air cooled heat rejection).

Parameter Directory

A searchable list of all parameters in the user interface. See Setpoints and Alarm Settings by Line ID on page 229 .

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2 User Operation

2.1 Viewing and Editing Setpoints for the Cooling Unit

NOTE: User level access allows viewing and editing only a limited number of setpoints. To view or adjust all setpoints, you must have service level access. See Editing Setpoints for the Cooling Unit on page 25 .

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

2.1.1 Editing Humidity Setpoints

1. Touch 

, then  >*Setpoints*. > *Humidity Control*. The HUMIDITY CONTROL secondary panel opens.
2. Refer to User Humidity Setpoint Options below and Humidity Control on page 44 to adjust the setpoint options, then touch *Save*. The setpoint is updated.
   - Touch *Cancel* to discard the changes.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

User Humidity Setpoint Options

Dew Point Setpoint

Desired dew point (based on actual return air temperature and humidity) by adding moisture to or removing moisture from the air.

Humidity Control Sensor

Selects sensor used when calculating relative humidity.

Humidity Control Type

Control when staging humidification operations. Valid values:

- Relative: Percent of humidification/dehumidification is determined by the difference between the humidity-sensor reading and the humidity setpoint.
- Compensated: Percent of humidification/dehumidification is determined by considering the actual deviation from the temperature setpoint and adjusts the humidity setpoint accordingly. The recalculated humidity setpoint displays on the screen.
- Predictive: Percent of humidification/dehumidification is determined by considering the actual deviation from the temperature setpoint and adjusts the humidity sensor reading accordingly. The adjusted humidity sensor reading displays on the screen.
- Dew point: Percent of humidification/dehumidification is determined by the difference between the dew point calculated from the humidity sensor reading and the dew point setpoint.

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Humidity Setpoint

Desired humidity level by adding moisture to or removing moisture from the air.

Humidity Setpoint 2

Alternate setpoint activated by customer input (remote alarm device). When customer input connection is 2nd Setpoint, this value becomes the active humidity setpoint.

2.1.2 Editing Temperature Setpoints

1. Touch 

, then  > *Setpoints* > *Temperature Control*. The TEMPERATURE CONTROL secondary panel opens.
2. Refer to User Temperature Setpoint Options below , Temperature Control—Temperature Setpoints and Cooling Operation on page 29 , and Compressor Control by Cooling Requirement on page 31 to adjust the setpoint options, then touch *Save*.
   The setpoint is updated.
   - Touch *Cancel* to discard the changes.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

User Temperature Setpoint Options

2nd Temperature Setpoint

Alternate setpoint activated by customer input (remote alarm device). When customer input connection is 2nd Setpoint, this value becomes the active temperature setpoint.

BMS Backup Temp Setpoint

Selects a temperature setpoint that activates in the event of a BMS timeout. The BMS timer must be configured for this setpoint to activate. See Setting BMS Backup Setpoints on page 131 .

Optimized Aisle Enabled

Read-only. Indicates that Vertiv Liebert iCOM is configured for optimized-aisle operation. See Teamwork Mode 3—Optimized Aisle Operation on page 115 .

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Temperature Control Sensor

Selects sensor that controls cooling. Values are:

- Supply Sensor: Temperature control is based on maintaining the temperature of the discharge air from the cooling unit. See Supply Sensors on page 175 .
- Remote Sensor: Temperature control is based on the temperature reading(s) from wired remote sensor(s). See Wired Remote Sensors on page 172 .
- Return Sensor: Temperature control is based on maintaining the temperature of the air returning to the cooling unit.

Temperature Setpoint Act

Read-only display of adjusted temperature setpoint when one of the following is active:

- Temperature compensation
- BMS backup temperature setpoint
- Customer input setpoint (remote alarm device)

Temperature Setpoint

Temperature that the unit maintains via cooling/reheat.

2.2 Viewing Unit Alarms

The ALARMS panel lists active alarm and warning events. Table 2.1 below describes the type and state of the alarm shown by indicator dots.

Table 2.1 Alarm Status and Type Indicators

Indicator	Description
Yellow dot	Warning event.
Red dot	Alarm event.
Circle	Event condition has cleared, but still must be acknowledged. See Acknowledging Alarms on page 20 .

2.2.1 To View Alarms

1. Touch 

, then  > *Alarms*. The ALARMS panel opens.
2. Touch an alarm to display the ALARM DETAILS panel.

Alarm Fields

Alarm

Name of the event.

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Date

Date event was logged.

Time

Time event was logged

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2.2.2 Alarm Detail Fields

Alarm

Name of the event.

Alarm Type

Number representing the event type.

- 1 : Warning
- 2: Alarm

Date/Time

Date and time the event was logged.

Duration

Time elapsed since event was logged.

Threshold

Sensor reading at which an event is triggered.

Unit

Cooling unit to which the alarm applies.

Value

The current value to which the threshold is compared.

2.2.3 Silencing an Audible Alarm

Touch the screen to silence an audible alarm. If the alarm is non-latching, the alarm silences when the condition clears.

NOTE: The audible alarm must be enabled in display options to sound. See Enabling the Audible Alarm Notification on page 100 .

2.2.4 Acknowledging Alarms

Depending on the notification settings, alarms and warnings must be acknowledged or reset. An event is active as long as it is unacknowledged, with the exception of the network failure events described in Table 2.2 below . Once acknowledged, an event remains active until the situation that triggered the event is resolved, see Table 2.1 on page 17 , for event status indicators. When an event acknowledged and cleared, it is removed from the Alarms panel and the LED stops flashing red.

NOTE: Acknowledging alarm events does not clear them. To clear an issue, it must be corrected, reset automatically by the controller, or reset manually.

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To Acknowledge Alarms

1. On the ALARMS panel, touch *Acknowledge All*. A check mark overlays the status indicator of the active alarms and warnings, and these automatically clear when the condition is no longer present.
   - If a critical event must be manually reset, the acknowledged items are listed with a Reset All button on the ALARMS panel.
2. Touch *Reset All* to manually reset the condition.

Table 2.2 Events That Clear without Acknowledgment

Network Failure	Description
UNIT XX DISCONNECTED	The Vertiv Liebert iCOM I/O board assigned as U2U address number XX (two up to thirty-two) has lost communication with the group. Make sure all units are powered on at the disconnect. Check cable connections and network settings where applicable.
NO CONNECTION W/UNIT 1	The Vertiv Liebert iCOM I/O board assigned as U2U address number 1 has lost communication with the group. Make sure all units are powered on at the disconnect. Check cable connections and network settings where applicable.
BMS DISCONNECT	The BMS/BAS has not completed a handshake within the time defined by the BMS/BAS. Verify monitoring connections and communication to the BMS/BAS panel.
UNIT CODE MISSING	The factory unit code must be confirmed, saved and executed.
UNIT CODE MISMATCH	The factory unit code must be confirmed, saved and executed.
AMBIENT SENSOR FAILURE	The outdoor temperature / humidity sensor used on the air economizer unit has become disconnected or is no longer working properly.
CAN GC 1 or 2 COMM ERR	See **Table 4.3** on page 95 .
CAN PB COMM ERR	See **Table 4.4** on page 96 .
CAN EEV 1 or 2 COMM ERR	See **Table 4.6** on page 99
COMP 1 or 2 OVERLOAD	See **Table 4.5** on page 98 .
LOW PRESS CIRCUIT 1 or 2	See **Table 4.5** on page 98 .

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2.3 Viewing the Event Log

The event log is a list by date/time of the last 400 events generated by Vertiv Liebert iCOM for the thermal management unit.

- On the User menu, touch *Event Log*. The EVENT LOG for the cooling unit opens. Table 2.3 below describes the color coded status for each event.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

Table 2.3 Event Status/Type Indicators

Indicator	Description
Green dot	Message.
Yellow dot	Unacknowledged warning event. See Acknowledging Alarms on the previous page .
Red dot	Unacknowledged alarm event. See Acknowledging Alarms on the previous page .
White dot with check-mark overlay	Acknowledged event, the cause still exists.
White circle	Acknowledged event, the cause is cleared.

2.4 Viewing Sensor Data

The Sensor Data panel lists the standard and optional sensors monitored by Vertiv Liebert iCOM and the current reading of each sensor.

- Touch 

, then 
> *Sensor Data*. The SENSOR DATA panel opens.

  A secondary panel displays the DAILY SENSOR READING SUMMARY, which shows temperature, humidity and dew-point readings for the cooling unit.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, the options on your Vertiv Liebert iCOM display may differ.

2.5 Managing Run Hours for a Component

You can view the run hours for components on a cooling unit, set the total run time limit and reset total run hours to zero.

1. Touch 

, then 
> *Total Run Hours*. The RUN HOURS panel opens and the current hours for each component are listed in the Total Run Hours column.
   To reset the total run hours to zero, see Setting Run Hours to Zero on the next page .
2. Use the slider to set the total run time limit for each component, then touch *Save*. The limits are set.

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2.5.1 Setting Run Hours to Zero

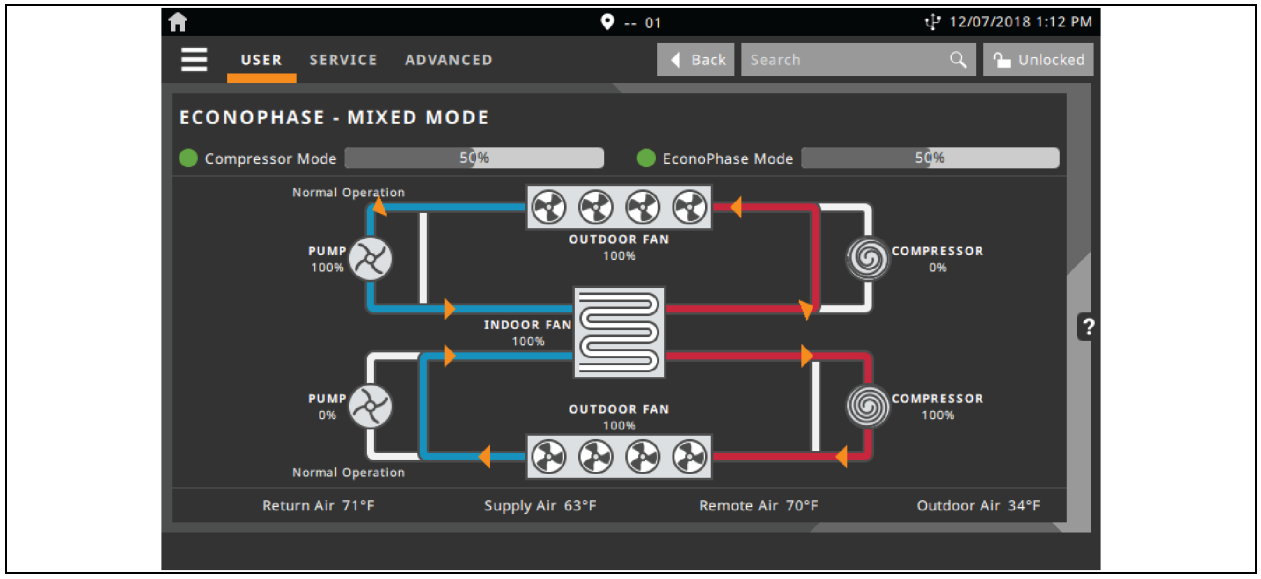
1. On the RUN HOURS panel, touch to check each box in the *Total Run Hours* column next to the component(s) to reset. The Set to Zero button becomes available.
2. Touch *Set to Zero*. The total run hours for the selected component(s) is set to zero.

2.6 Viewing Vertiv™ EconoPhase Operation

When your Thermal Management System is a Vertiv™ CoolPhase Perimeter system with a Vertiv EconoPhase pumped refrigerant economizer (PRE) and a Vertiv CoolPhase Condenser, the Vertiv EconoPhase screen, Figure 2.1 below , shows the operating mode of the system. The Vertiv CoolPhase Perimeter System Optimization feature is automatically employed and reduces power consumption significantly because a PRE package consumes about one-tenth the power of the compressors.

Vertiv EconoPhase operation saves energy by eliminating compressor operation when outdoor ambient temperatures are cool enough, or when the difference between the indoor and outdoor ambient temperature is satisfied. Vertiv CoolPhase Perimeter System Optimization further improves efficiency by optimizing liquid refrigerant temperature and pressure setpoints in mid- and high-ambient temperature conditions, thus reducing the operation of condenser fans while maintaining the appropriate heat rejection capacity.

Figure 2.1 Vertiv™ EconoPhase Pump Mode Screen



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2.7 Viewing Teamwork, Standby, and Cascade Status

In the main User panel, the Teamwork Mode icon indicates the mode selected, Figure 2.2 below .

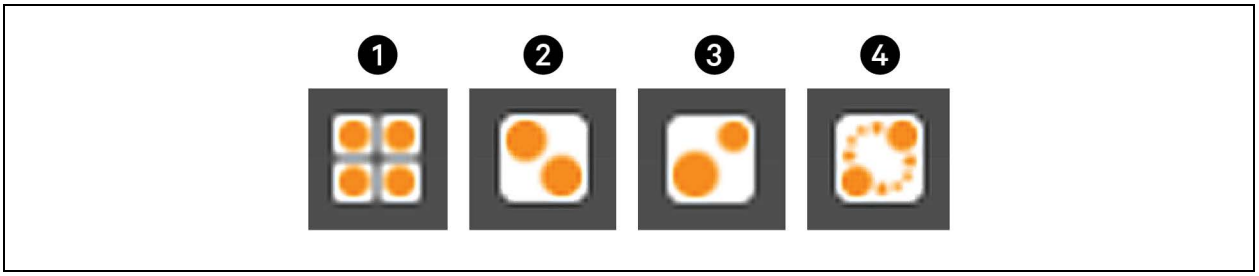
2.7.1 To View the Teamwork Details

Touch the Teamwork mode icon.

The teamwork dialog opens displaying the teamwork mode, number of units in standby, and number of operating units.

NOTE: You must be logged in with the Service PIN to edit teamwork mode. See Powering On the Vertiv™ Liebert® iCOM™ and Logging In/Unlocking Controls on page 6 .

Figure 2.2 Teamwork Icons



Item	Description
1	No teamwork
2	Mode 1 - Parallel teamwork
3	Mode 2 - Independent teamwork
4	Mode 3 - Optimized aisle teamwork

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3 Service Operation

3.1 Editing Setpoints for the Cooling Unit

Setpoints are the means by which cooling unit operation is controlled.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

3.1.1 Setpoints Options

Fan Control

See Configuring Fan Setpoints on page 45 .

High/Low Limit Control

See Configuring High/Low Limit Setpoints on page 41 .

Humidity Control

See Configuring Humidity Setpoints on page 42 .

Static Pressure Settings

See Configuring Static Pressure Setpoints on page 49 .

Temperature Control

See Configuring Temperature Setpoints on the next page .

Temperature Compensation

See Setting Temperature Compensation on page 39 .

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3.1.2 Configuring Temperature Setpoints

1. Touch 

, then  > *Setpoints* > *Temperature Control*. The TEMPERATURE CONTROL secondary panel opens.
2. Refer to Temperature Control Options below , Temperature Control—Temperature Setpoints and Cooling Operation on page 29 , and Compressor Control by Cooling Requirement on page 31 to adjust the setpoint options, then touch *Save*.
   The setpoint is updated.

NOTE: Proportional band setting is dependent on the heat load and the components specific to your cooling unit. Additional tuning may be required after start up when using PI temperature control. See Considerations when Using PI Temperature Control on page 31 .

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

Temperature Control Options

AutoSet Enabled

When enabled, the proportional band for temperature and humidity and both integration time factors are set automatically based on the type of cooling unit (single compressor, dual compressor or chilled water).

NOTE: General settings cannot be adjusted or changed when AutoSet is enabled. If you make a change when AutoSet is enabled, the parameter defaults back to its original setting.

BMS Backup Temp Setpoint

Temperature that the cooling unit maintains during BMS backup operation.

Dehumidification Reheat Proportional Band

Sets reheat operation independently from the temperature proportional band. Adjusts the activation point of dehumidification components based on deviation of the selected dehumidification reheat temp control sensor and the dehumidification reheat setpoint by placing half of the selected value on each side of the setpoint. A smaller number causes faster reaction to temperature changes.

Dehumidification Reheat Setpoint

Temperature that the unit maintains via dehumidification reheat.

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Dehumidification Reheat Temp Control Sensor

Selects the sensor that controls dehumidification reheat. Values are:

- SUP: Temperature control is based on maintaining the temperature of the discharge air from the cooling unit. See Supply Sensors on page 175 .
- REM: Temperature control is based on the temperature reading(s) from wired remote/rack sensor(s). See Wired Remote Sensors on page 172 .
- RET: Temperature control is based on maintaining the temperature of the room air.

Heater Deadband

Widens the setpoint to prevent small temperature changes from cycling re-heat components.

Temperature Control Sensor

Selects sensor that controls cooling. Values are:

- Supply Sensor: Temperature control is based on maintaining the temperature of the discharge air from the cooling unit. See Supply Sensors on page 175 .
- Remote Sensor: Temperature control is based on the temperature reading(s) from wired remote/rack sensor(s). See Wired Remote Sensors on page 172 .
- Return Sensor: Temperature control is based on maintaining the temperature of the room air.
- Customer input setpoint (remote alarm device)

With regards to Temperature Control and Fanspeed Control, Vertiv Liebert iCOM controller shall support the following sensor configurations:

- Mode A: Cooling = Supply Sensor, Fanspeed = Supply Sensor
- Mode B: Cooling = Remote Sensor, Fanspeed = Remote Sensor
- Mode C: Cooling = Return Sensor, Fanspeed = Return Sensor
- Mode D: Cooling = Supply Sensor, Fanspeed = Remote Sensor
- Mode E: Cooling = Supply Sensor, Fanspeed = Return Sensor

NOTE: Sensor configurations A-E are supported in Teamwork Mode 2 - Independent and Teamwork Mode 3 - Optimized Aisle.

NOTE: Sensor configurations B & C are supported in Teamwork Mode 1 - Parallel.

NOTE: Prior to enabling any version of Teamwork Mode, the controlling sensors for Temperature Control (cooling capacity) and Fanspeed Control must first be defined within Vertiv Liebert iCOM.

Setpoint Calibration

The setpoint calibration parameter may be utilized when Teamwork Mode is configured. In the event a shared temperature setpoint across a network group is not desired, then the Setpoint Calibration parameter may be configured in order to identify a unique temperature setpoint. This parameter must be configured on an individual unit basis if it is the desire to have different temperature setpoints at different units.

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Temperature Control Type

Control when staging cooling and heating operations. Values are:

- Proportional: Percent of cooling/heating determined by the difference between the air temperature sensor reading and the temperature setpoint.
- P: Percent of cooling/heating calculated using the temperature proportional band and temperature-integration time settings. See Considerations when Using PI Temperature Control on page 31 .
- Adaptive PID: Auto-tuning PID control loop, can be set for cooling. Only available on Liebert® chilled water systems.
- Intelligent: Percent of cooling/heating determined by programmed logic that simulates manual human control.

Temperature Deadband

Widens the setpoint to prevent small temperature changes from cycling compressors and valves maximizing component life. When temperature is within the deadband, no change of the control output (heating/cooling) occurs.

Temperature Integration Time

Adjusts amount of cooling/heating based on the length of time the temperature has deviated from the setpoint. The time selected is the amount of time it will take cooling capacity to reach 100%. For example, if three minutes is selected, cooling capacity will increase to 100% in three minutes.

NOTE: Three to five minutes of integration time is adequate for most applications. See Considerations when Using PI Temperature Control on page 31 .

NOTE: Only used when Temperature Control Type is PI.

Temperature Proportional Band

Adjusts the activation point of cooling/heating components based on deviation from setpoint by placing half of the selected value on each side of the temperature control setpoint. A smaller number causes faster reaction to temperature changes.

NOTE: Setting this too low causes short cycling of compressors.

Temperature Setpoint

Temperature that the unit maintains via cooling/reheat.

Temperature Setpoint Act

Read-only display of adjusted temperature setpoint when one of the following is active:

- Temperature compensation.
- BMS backup temperature setpoint.

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3.1.3 Temperature Control—Temperature Setpoints and Cooling Operation

Temperature control refers to the cooling unit's response to programmed setpoints and sensed room/load conditions. Temperature control is closely-tied to the primary cooling source. Vertiv Thermal management units employ several types of primary cooling sources:

Compressor Operation

Vertiv Liebert iCOM controls the cooling units based on a calculated need for cooling (and heating, if included on your system). The requirement is expressed as a percentage and is calculated using the selected temperature control type.

Temperature Proportional Band

Use the proportional and deadband parameters to control how your cooling unit(s) respond based on the calculated need for cooling (or heating). Figure 3.1 on the next page , illustrates temperature control using:

- 70° setpoint
- 10° proportional band
- No deadband

The proportional band is divided evenly on each side of the setpoint:

- 0% cooling capacity is required at 70°.
- As the air temperature increases, cooling also increases along the proportional band.
- If the air temperature reaches 75°, the system operates at 100% cooling capacity.
- If air temperature rises to the end of the proportional band or further, the system operates at 100% capacity to bring the temperature down to the setpoint.
- If your unit includes reheat, the heating capacity operates in the same way as the air temperature falls below the setpoint. See Reheat Control on page 66 .

Details for enablement:

The position of the chilled water valves (single or dual valves) can be driven from the BMS via one (single) or two (dual) Velocity points.

- CWV.001, 'BMS CWV Local Override', if set to 'Enabled' activates the following functions:
  - S825.3, 'BMS Handshake Enabled' will be set to 'Yes' to activate the handshake timer (can be disabled afterwards)
  - S825.1, 'BMS Handshake Timer' will be set to 10 minutes (can be user-adjusted afterwards)

The chilled water valve signal will be deviated away from variables 'Valve1_PI' and 'Valve2_PI' to 'BMS_CWV_1' and 'BMS_CWV_2' which can be written from the BMS.

- With that setup the chilled water valves follow strictly only the BMS position command(s), and ignore any position change request from the Vertiv Liebert iCOM control, where special activities like CF Flush or Min. Opening still remain functional.
- The current position request of the valves (driven in either way, local or BMS) can be viewed in _CWV.007, 'Valve 1 Final Request' (Valve3P) and _CWV.008, 'Valve 2 Final Request' (Valve3P_2).

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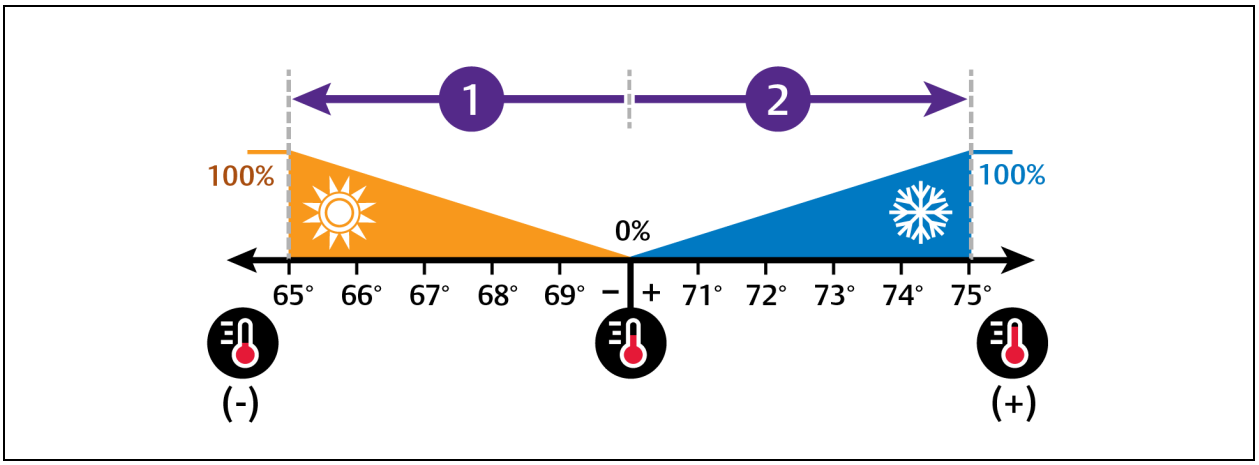
Figure 3.1 Temperature Control without a Deadband



No.	Description
1	½ of proportional band
2	½ of proportional band

Temperature Deadband

A deadband widens the setpoint to prevent small temperature changes from activating compressors and valves and cause excessive component cycling. Figure 3.2 on the facing page , illustrates temperature control using:

- 70° setpoint
- 10° proportional band
- 2° deadband

Like the proportional band, the deadband is also divided evenly on each side of the setpoint:

- 0% cooling capacity is required from 69° to 71°.
- At 71°, the system operates according to the temperature proportional band.

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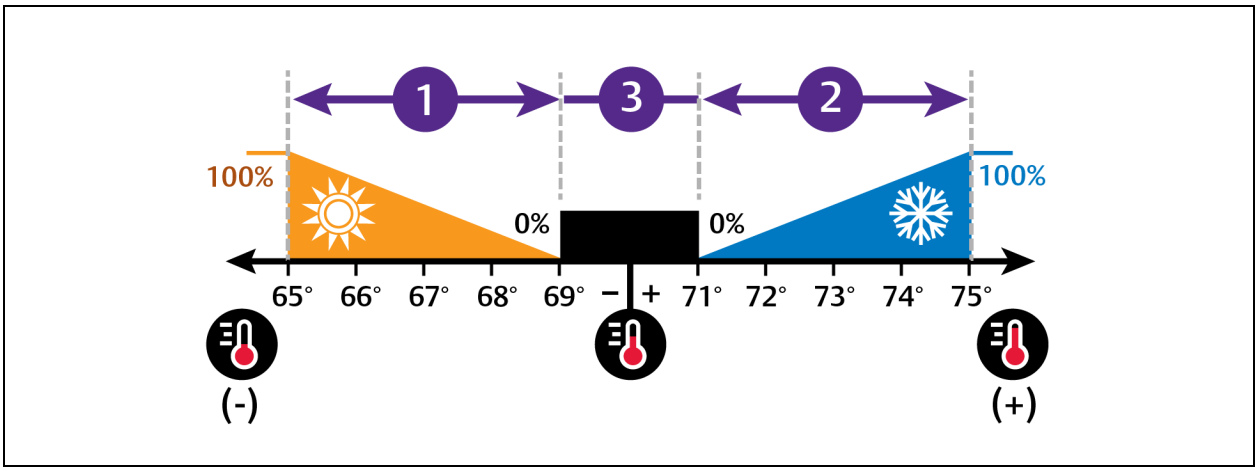
Figure 3.2 Temperature Control with a Deadband



No.	Description
1	½ of proportional band
2	½ of proportional band
3	Deadband

Considerations when Using PI Temperature Control

Several factors, such as room heat load, external heat gains, and component-specific performance can affect the PI control loop. Adjusting the temperature proportional band and integration time can improve cooling unit performance and avoid problems detailed in Table 3.1 below .

Table 3.1 PI Temperature Control Troubleshooting

Problem	Solution
Cooling is slow to activate	Decrease the proportional band slightly and monitor operation. Repeat until cooling reaction time is acceptable.
Compressor short cycle alarm	Increase the proportional band slightly by increasing the integration time between 3 and 5 minutes, and monitor compressor run time. Set the temperature deadband to 2. Run time must be more than three minutes to prevent a short cycle of the compressor.
Excessive valve oscillation or hunting	Increase the proportional band and/or increase integration time.

3.1.4 Compressor Control by Cooling Requirement

Compressor control is directly linked to temperature control in that the cooling requirement determined by the temperature proportional band determines compressor operation. Depending on the type of cooling unit, the number and type of compressors varies. The following describes compressor operation along the proportional band for the varying compressor options.

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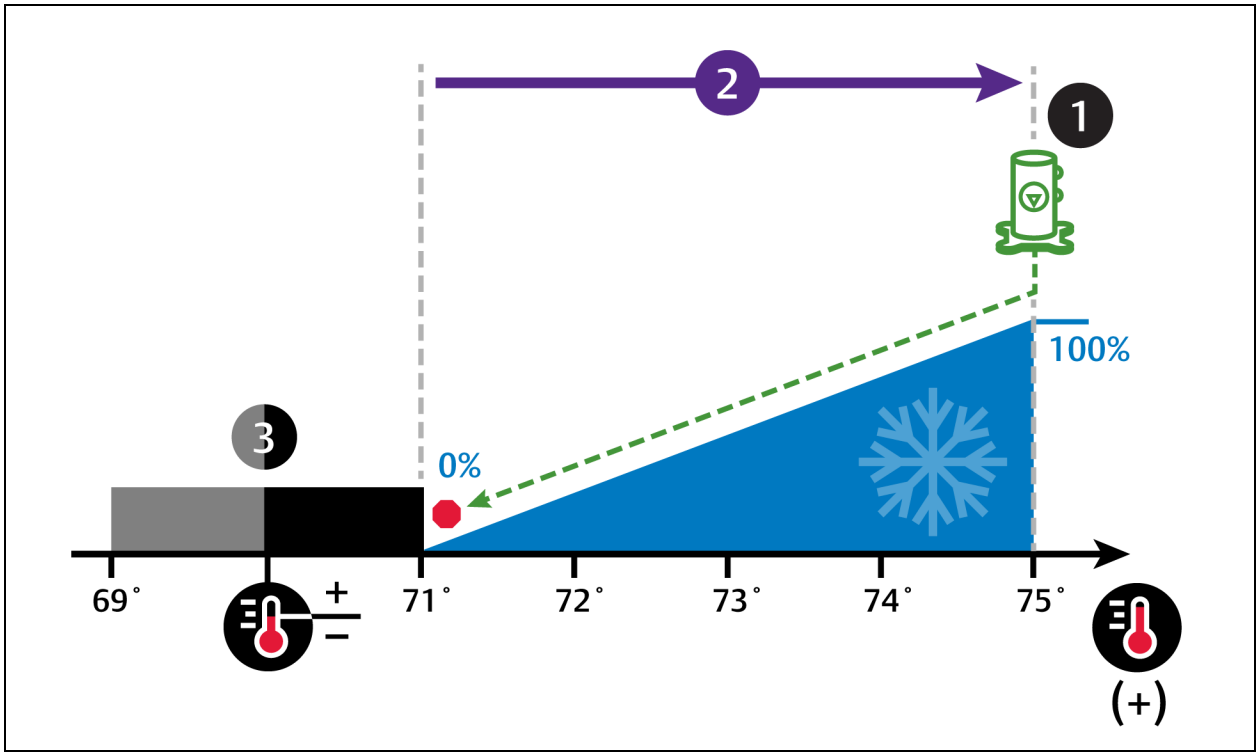
One Scroll Compressor without Unloaders

- 70° setpoint
- 8° proportional band
- 2° deadband

In Figure 3.3 below :

The compressor starts at 75° when the cooling requirement is 100% and continues to operate until 71° is reached when cooling requirement is 0%.

Figure 3.3 Compressor Control—One Step Capacity



No.	Description
1	Single scroll compressor
2	½ of proportional band
3	Deadband

Two Scroll Compressors without Unloaders

- 70° setpoint
- 8° proportional band
- 2° deadband

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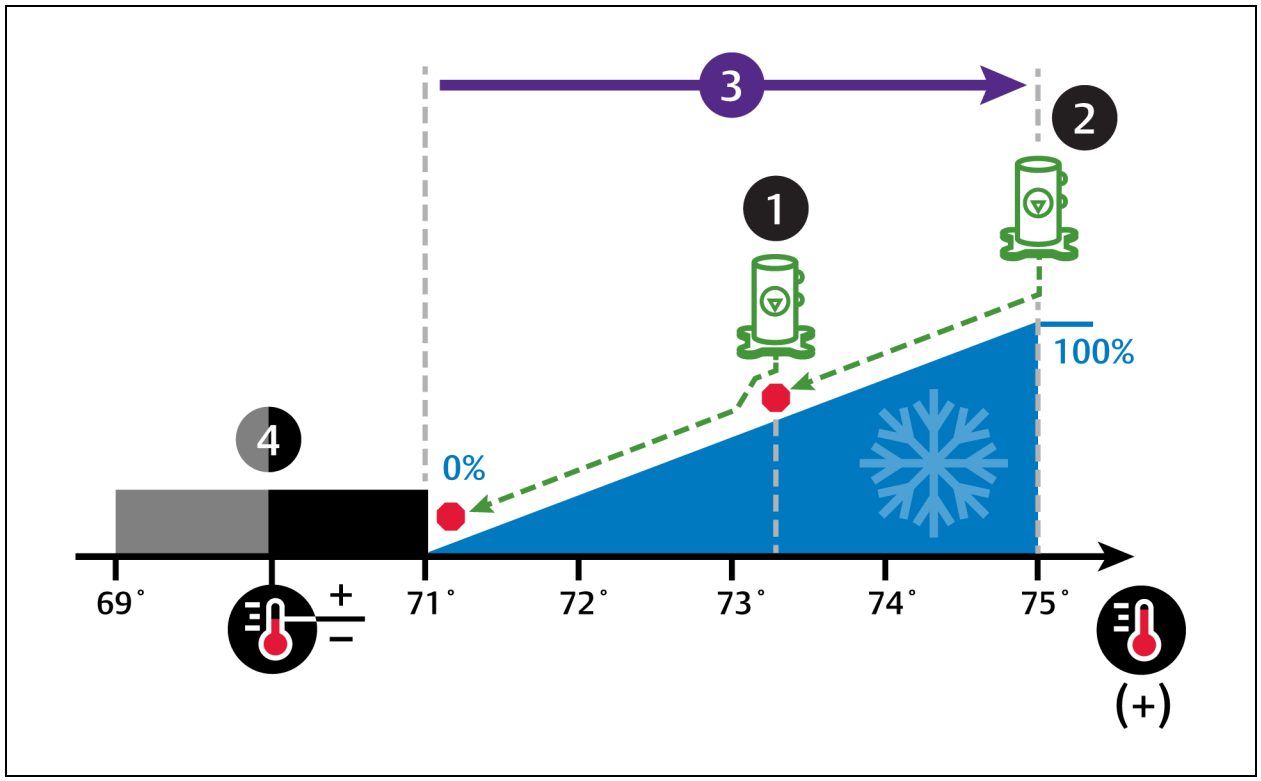
In **Figure 3.4** below :

Compressor 1 starts at 73° when the cooling requirement is 50% and continues to operate until 71° is reached when cooling requirement is 0%.

Compressor 2 starts at 75° when the cooling requirement is 100% and continues to operate until 73° is reached when cooling requirement is 50%.

Figure 3.4 Compressor Control—Two Step Capacity Using Two Scroll Compressors without Unloaders



Number	Description
1	Scroll compressor 1
2	Scroll compressor 2
3	½ of proportional band
4	Deadband

One Scroll Compressor with Unloader

- 70° setpoint
- 8° proportional band
- 2° deadband

In **Figure 3.5** on the next page :

The compressor starts unloaded at 73° when the cooling requirement is 50%.

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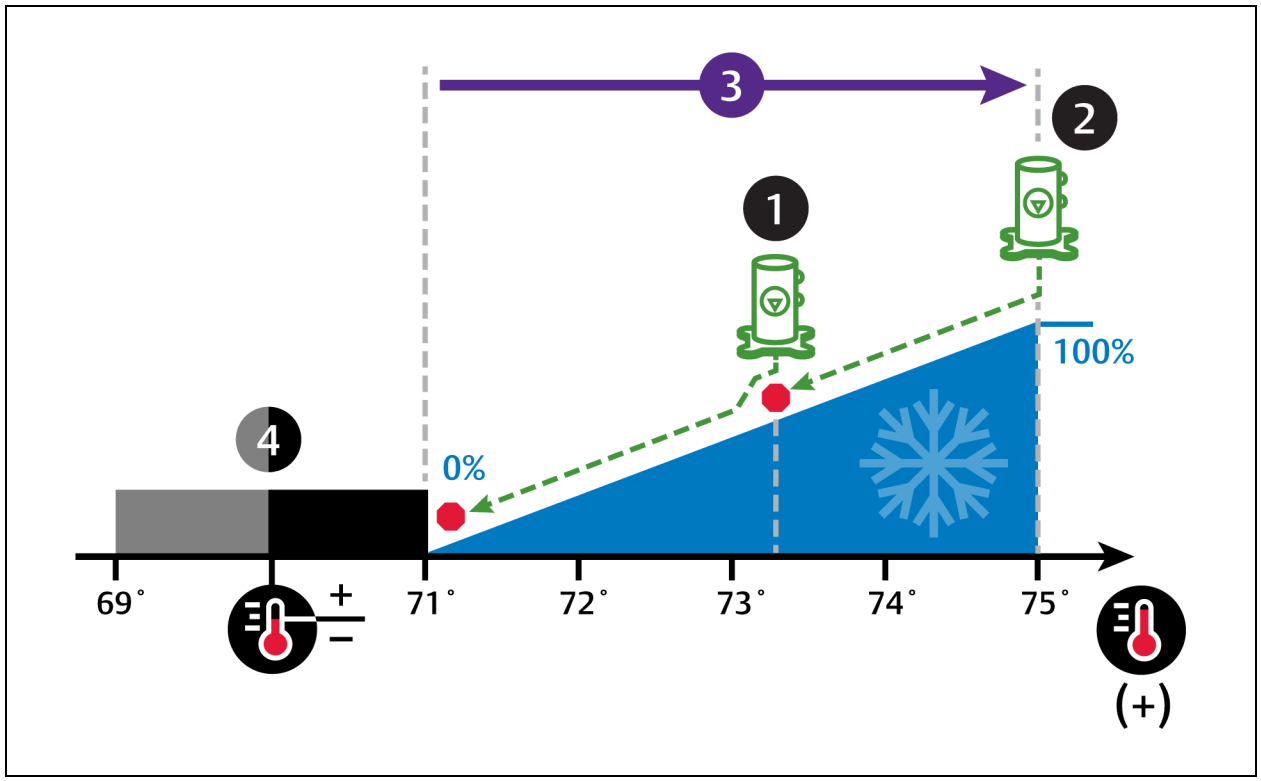
At 75° when the cooling requirement is 100%, the compressor operates loaded until 73° is reached when cooling requirement is 50% and it returns to unloaded operation.

Figure 3.5 Compressor Control—Two Step Capacity Using One Scroll Compressor with Unloaders



Number	Description
1	Scroll compressor unloaded
2	Scroll compressor loaded
3	½ of proportional band
4	Deadband

Two Scroll Compressors with Unloaders

- 70° setpoint
- 8° proportional band
- 2° deadband

In Figure 3.6 on the facing page :

Compressor 1 starts unloaded when the cooling requirement is 33% and continues to operate until the cooling requirement is 17% or, if the cooling requirement reaches 80%, Compressor 1 operates loaded until the requirement is 70%.

Compressor 2 starts unloaded when the cooling requirement is 63% and continues to operate until the cooling requirement is 47% or, if the cooling requirement reaches 100%, Compressor 2 operates loaded until the requirement is 90%.

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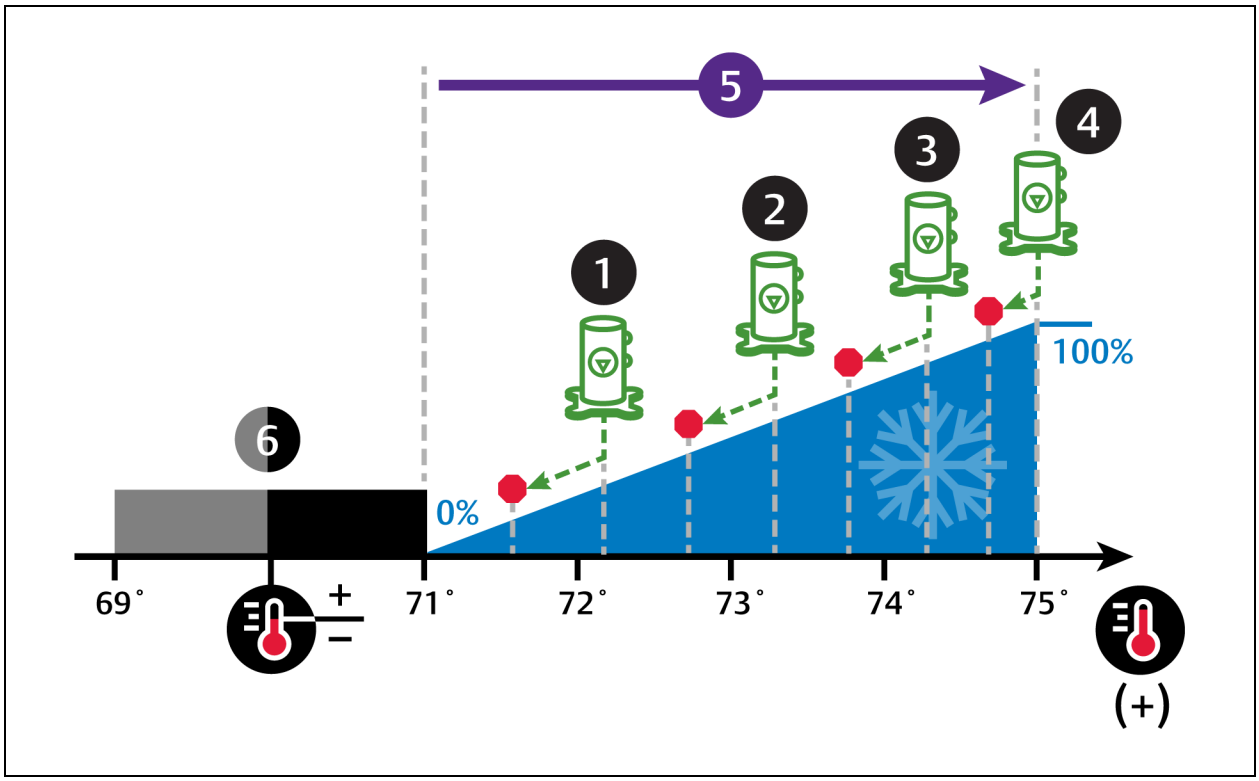
Figure 3.6 Compressor Control—Four Step Capacity



No.	Description	No.	Description
1	Step 1: Compressor 1 starts unloaded.	4	Step 4: Compressors 1 and 2 operate loaded.
2	Step 2: Compressor 2 starts unloaded.	5	½ of proportional band
3	Step 3: Compressor 1 operates loaded and compressor 2 operates unloaded.	6	Deadband

Digital Scroll Compressors

Digital scroll compressors use time loaded/unloaded to modulate cooling capacity between 10% and 100% to control cooling more precisely than non-digital compressors. Capacity modulation is achieved by opening and closing a digital solenoid valve in 15 second intervals while the compressor runs continuously when the cooling requirement is 10% to 100%.

- When the valve is opened (energized, the compressor is unloaded and capacity is 0% (because the scroll plates are separated so that there is no refrigerant flowing through the compressor).
- When the valve is closed (de-energized), the compressor is loaded and capacity is 100%.
- Capacity is determined by the amount of time that the valve is closed in the 15 second interval. Figure 3.7 on the next page illustrates solenoid-valve operation when cooling requirement is 66%.
  - The valve is closed for 10 seconds (100% cooling).
  - The valve is then open for 5 seconds (0% cooling).
  - This results in 66% cooling. Essentially, the compressor is partially loaded.

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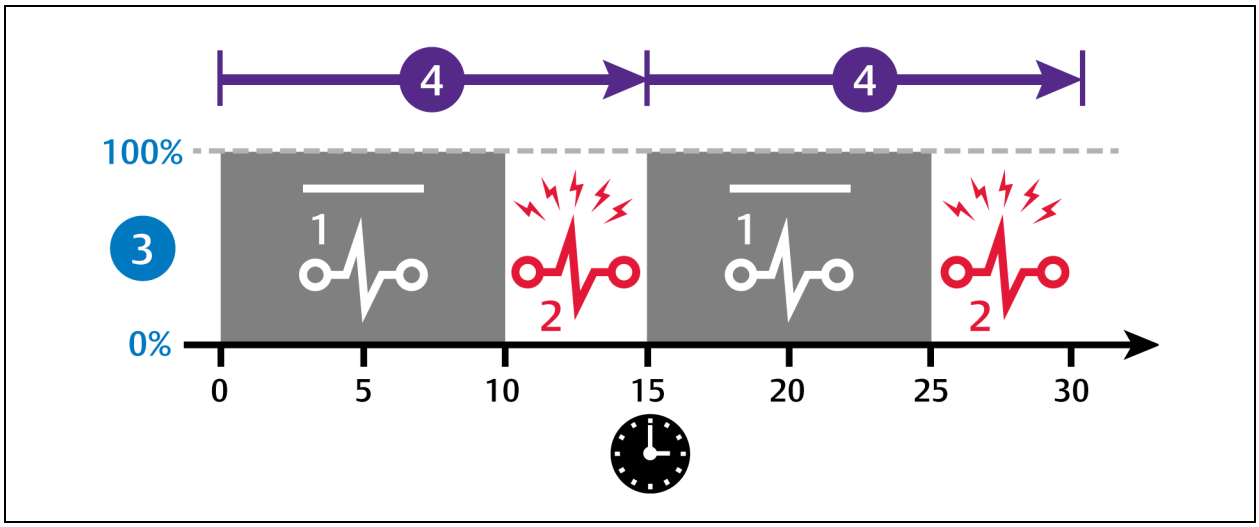
Figure 3.7 Digital Scroll Compressor Operation to Provide 66% Cooling Capacity



No.	Description
1	Solenoid de-energized
2	Solenoid energized
3	Percent loaded
4	15 second capacity modulation cycle

One Digital Scroll Compressor

In a single digital scroll system:

- The compressor starts when the cooling demand is at least 25% (calculated from temperature proportional band) and operates at 50% capacity (valve open 7.5 seconds/closed 7.5 seconds) for an initial period set in Winter Start Delay (see Setting Low Pressure Time Delay on page 64), after which it operates per cooling demand.
- As cooling demand increases, the length of time the valve is closed increases/capacity increases.
- At 100% cooling requirement, the valve remains closed for the entire 15 second interval and the compressor is operating loaded at 100% capacity.
- The compressor stops when cooling demand decreases to 10%.

Figure 3.8 on the facing page illustrates digital scroll compressor operation with the following setpoint parameters:

- 70° setpoint
- 8° proportional band
- 2° deadband

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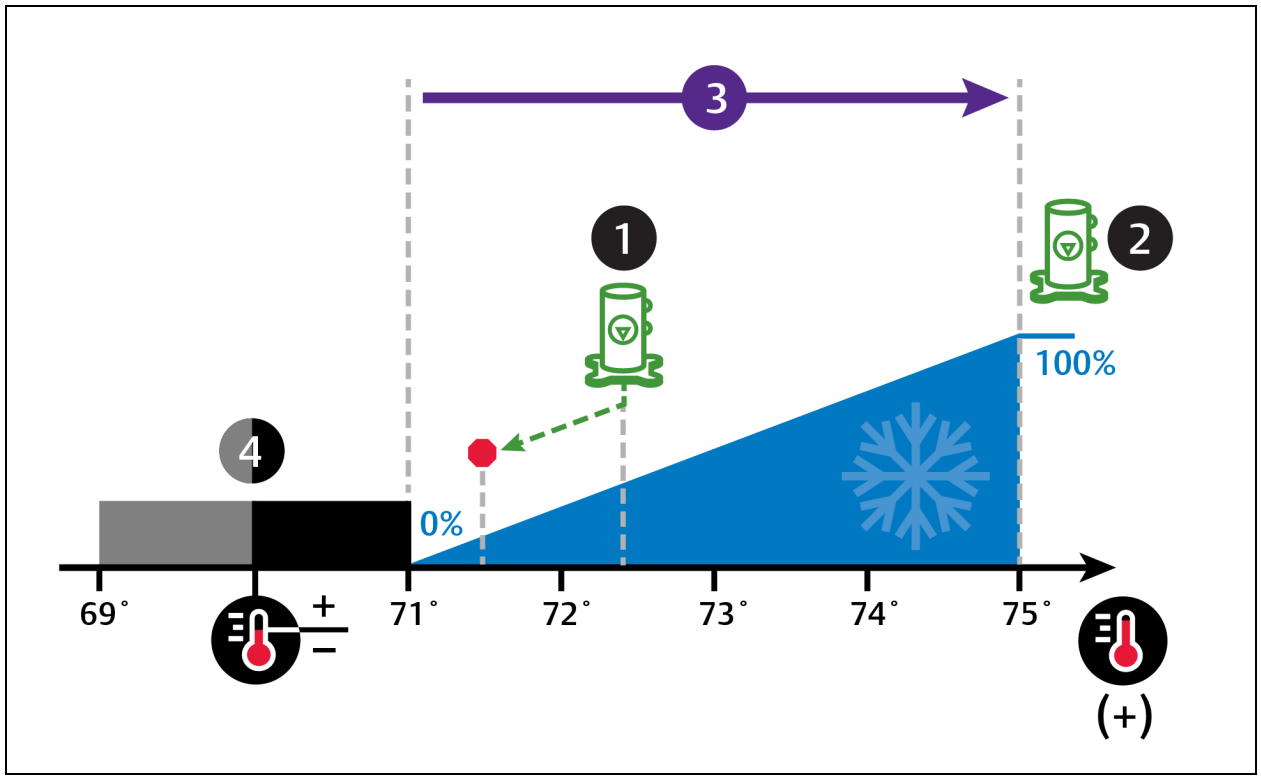
Figure 3.8 Compressor Control—Single Digital Scroll Compressor



No.	Description
1	Digital scroll begins operation
2	Digital scroll operation at 100%
3	½ of proportional band
4	Deadband

Dual Digital Scroll Compressors

In a two digital scroll system, the compressors operate in a lead-lag configuration:

- The lead compressor starts when the cooling demand is at least 25% (calculated from temperature proportional band) and operates at 50% capacity (valve open 7.5 seconds/closed 7.5 seconds) for an initial period set in Winter Start Delay (see Setting Low Pressure Time Delay on page 64), after which it operates per cooling demand.
- The lag compressor starts when cooling demand is 35% and operates at 70% capacity, increasing capacity as cooling demand increases.
- On both compressors at 100% cooling requirement, the valve remains closed for the entire 15 second interval and the compressors operate loaded at 100% capacity.
- The lag compressor stops when the cooling demand decreases to 20%.
- The lead compressor stops when cooling demand decreases to 10%.

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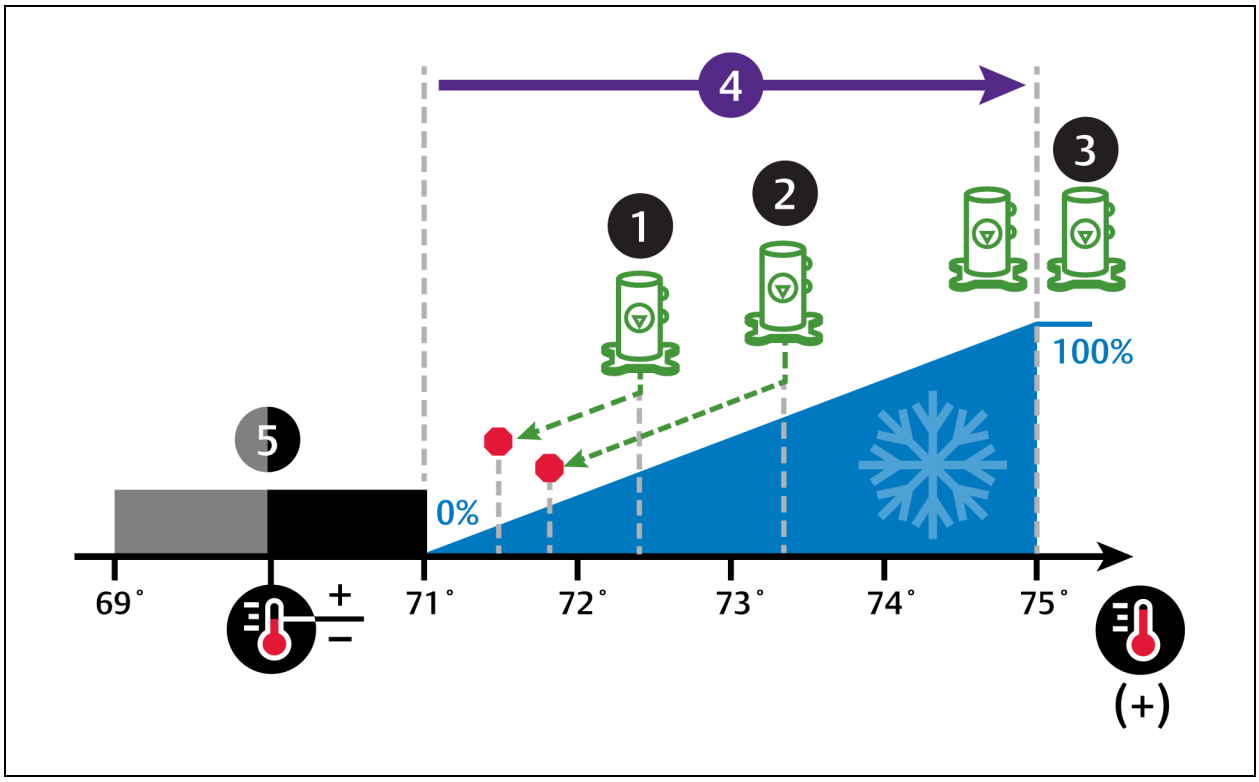
Figure 3.9 below illustrates digital scroll compressor operation with the following setpoint parameters:

- 70° setpoint
- 8° proportional band
- 2° deadband

Figure 3.9 Compressor Control—Dual Digital Scroll Compressor



No.	Description
1	Lead compressor
2	Lag compressor
3	Lead and lag compressors
4	½ of proportional band
5	Deadband

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3.1.5 Setting Temperature Compensation

Temperature compensation provides protection from changes that affect capacity and heat load by monitoring temperature conditions and fan speed settings, then automatically adjusting the temperature setpoint. Changes that may cause temperature compensation are floor tile removal in non-cold aisle areas, incorrect supply temperature setpoint, unit failure in a neighboring zone, or unexpected heat load fluctuations at rack equipment.

Temperature compensation is also tied in to cascade/standby operation in Teamwork Mode 3. See Teamwork Mode 3—Optimized Aisle Operation on page 115 .

1. Touch 

, then  > *Setpoints* >*Temperature Compensation*. The TEMPERATURE COMPENSATION secondary panel opens.
2. Select the Compensation Type, then touch *Save*. The setpoint is updated.
   - Return temperature compensation cannot be used when both fan and cooling control is set to Return.
   - Supply temperature compensation requires the following settings:

     Temperature Control Sensor: Supply Sensor

     Fan Control Sensor: Remote Sensor

NOTE: When temperature compensation is enabled and active, the Temperature Setpoint Act field on the Temperature Control setpoints panel displays the adjusted setpoint value.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

Temperature Compensation Options

Compensation Type

Selects the compensation routine:

- No: Temperature compensation routine disabled.
- Return: Increases the temperature setpoint when the return air temperature is too cold.
- Supply: Decreases the temperature setpoint when the air flow capacity approaches 100% and the cold aisle temperature remains above the setpoint.
- Supply+Return: Allows both supply and return compensation.

3.1.6 Fan Temperature Compensation

For applications where unit fan speed is being controlled off the return sensor, Vertiv Liebert iCOM shall also support the capability of simultaneously utilizing remote 2T sensor values to override the return air temperature setpoint associated with fan speed control. Once enabled, when a high remote temperature is detected, the Fan Temperature Compensation routine shall temporarily increase fan speed output to compensate for the high remote temperature by decreasing the return temperature setpoint by a value specified by the end-user.

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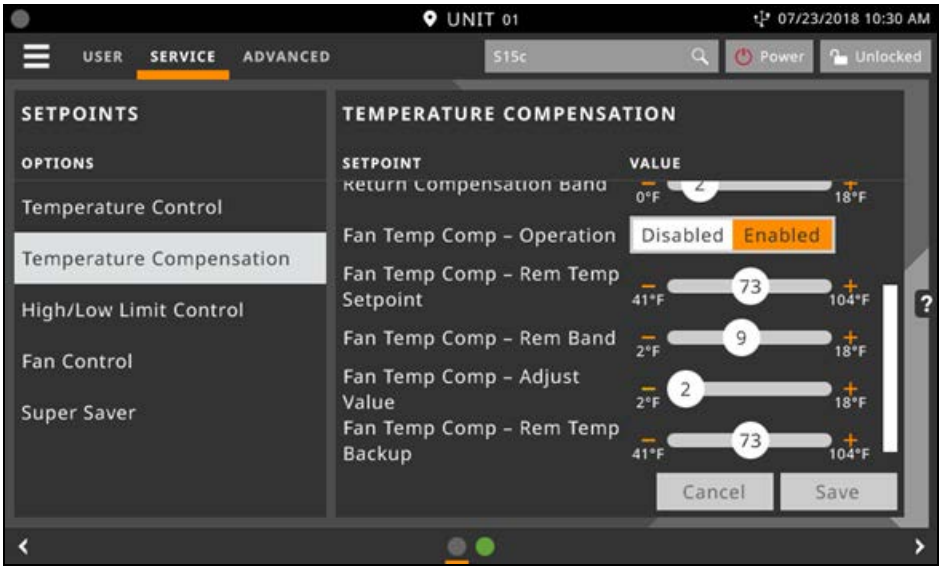
The remote 2T sensors required for this feature shall monitor cold aisle temperatures while fan speed is driven by the return air sensor and corresponding setpoint. As the remote temperature increases above the Fan Temp Comp – Remote Setpoint, fan speed control setpoint (return air setpoint) shall begin to decrease starting with 0°F/0.0K adjustment when at the remote setpoint and ending with the maximum adjustment as defined by Fan Temp Comp – Adjust Band (i.e. Fan Temp Comp – Rem Temp Setpoint + Fan Temp Comp – Rem Band). In the event the remote temperature sensor reading is considered invalid, Vertiv Liebert iCOM shall fall back and use Fan Temp Comp – Rem Temp Backup value for control. When the remote temperature is continuously above the sum of Fan Temp Comp – Remote Setpoint + Fan Temp Comp – Rem Band, the Fan Temp Comp Limit alarm event shall annunciate after the defined delay time has surpassed.

- Fan Temp Comp – Operation – enables/disables Fan Temperature Compensation routine
- Fan Temp Comp – Rem Temp Setpoint – remote temperature threshold at which routine activates
- Fan Temp Comp – Rem Band – adjustment band
- Fan Temp Comp – Adjust Value – value subtracted from return temperature setpoint as remote temperatures rise above
- Fan Temp Comp – Rem Temp Backup – remote temperature backup value which shall be used in the event remote sensor values are considered invalid.

Figure 3.10 Fan Temperature Compensation



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3.1.7 Configuring High/Low Limit Setpoints

Setting dehumidification low limits avoids over cooling a room during dehumidification. When a low limit is reached, the cooling source used for dehumidification is disabled. Dehumidification resumes when air temperature rises above the low limit reset value.

NOTE: Dehumidification lock out can occur with improper low limit settings. To avoid lockout, increase heat load for efficient operation, decrease low limit settings slightly, and where applicable, decrease the reheat proportional band to allow reheat sooner.

To Set High and Low Limits

1. Touch 

, then  > *Setpoints* > *High/Low Limit Control*. The HIGH/LOW LIMIT CONTROL secondary panel opens.
2. Adjust the setpoint options, then touch *Save*. The setpoint is updated.
   - Touch *Cancel* to discard the changes.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

High/Low Limit Control Options

Dehum Low Limit X

Temperature at which dehumidification is interrupted, where X is limit 1 or 2.

Dehumidification Low Limit Sensor

Selects the sensor that is used for the low limit determination.

Dehumidification Low Limit Setpoint

Temperature below which dehumidification is disabled.

High Return Limit

Enables/disables use of additional fan speed based on return air temperature.

Return Limit P-band

Calculates fan speed based on proportional deviation from the return air temperature.

Supply Limit Enabled

Enables/disables use of additional fan speed based on supply air temperature.

Supply Temp Limit Setpoint

Supply air temperature at which use of additional fan speed is enabled.

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3.1.8 Configuring Humidity Setpoints

1. Touch 

, then  > *Setpoints* > *Humidity Control*. The HUMIDITY CONTROL secondary panel opens.
2. Refer to Humidity Control Options below and Humidity Control on page 44 to adjust the setpoint options, then touch *Save*. The setpoint is updated.
   - Touch *Cancel* to discard the changes.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

Humidity Control Options

Control Dew Point

Dew point setpoint.

Dew Point Deadband

Widens the setpoint to prevent small changes from cycling compressors and valves maximizing component life. When temperature is within the deadband, no change of the control output (humidification) occurs.

Dew Point P-Band

Adjusts the activation point of humidifier/dehumidification components based on deviation from setpoint by placing half of the selected value on each side of the dew point setpoint. A smaller number causes faster reaction to humidity changes.

Dew Point Setpoint

Humidity level (based on actual return air temperature and humidity) by adding moisture to or removing moisture from the air.

Humidity Control Sensor

Selects sensor used when calculating relative humidity.

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Humidity Control Type

Controls humidification/dehumidification operation. Valid values are:

- Proportional: Percent of humidification/dehumidification determined by the difference between the humidity sensor reading and the humidity setpoint.
- Dew Point: Percent of humidification/dehumidification determined using the measured return temperature and humidity to calculate the dew point and comparing it to the setpoints.

NOTE: When dew point is selected, the humidity setpoint and proportional band units are degrees dew point.

- Relative: Percent of humidification/dehumidification determined using the measured humidity content of the air to calculate the percent relative humidity (RH) and comparing it to the setpoints.

NOTE: Relative humidity control can cause unnecessary humidification/dehumidification from over cooling based on a higher than normal RH reading that causes extended dehumidification, which in turn causes a low RH reading that activates the humidifier.

- Compensated: Percent of humidification/dehumidification determined using the measured humidity content of the air and automatically adjusting the humidity setpoint.

NOTE: Compensated humidity control prevents unnecessary humidification/dehumidification noted with relative humidity control.

- Predictive: Percent of humidification/dehumidification determined using the measured humidity content of the air and automatically adjusting the humidity sensor reading.

Humidity Deadband

Widens the setpoint to prevent small changes in humidity from cycling components and also maximizes component life. When humidity is within the deadband, no humidification/dehumidification occurs.

Humidity Integration Time

Adjusts unit capacity based on the length of time the humidity has deviated from the setpoint. Works in conjunction with the proportional band to maintain tight setpoint control.

Humidity Proportional Band

Adjusts the activation point of humidifier/dehumidification components based on deviation from setpoint by placing half of the selected value on each side of the humidity control setpoint. A smaller number causes faster reaction to humidity changes.

Humidity Setpoint

Humidity level by adding moisture to or removing moisture from the air.

Humidity Setpoint 2

Alternate setpoint activated by customer input (remote alarm device). When customer input connection is 2nd Setpoint, this value becomes the active humidity setpoint.

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3.1.9 Humidity Control

Humidity control refers to the cooling unit's response to programmed setpoints and sensed humidity conditions.

Vertiv Liebert iCOM controls humidity based on temperature and humidity sensor readings. The requirement is expressed as a percentage and is calculated using the selected humidity control type.

Humidity Proportional Band

Use the proportional and dead-band parameters to control how your cooling unit(s) respond based on the calculated need for humidification/dehumidification. As the return air humidity deviates from the humidity setpoint, Vertiv Liebert iCOM responds with a humidification or dehumidification capacity of 0% to 100% in 1% increments.

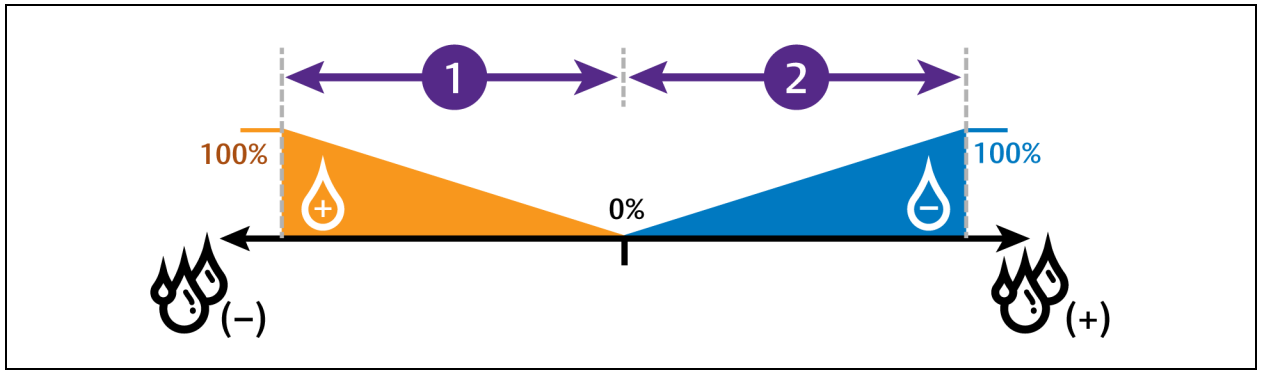
Figure 3.11 below , illustrates humidity control using:

- 50% setpoint
- 8% proportional band
- No deadband

The proportional band is divided evenly on each side of the setpoint.

- 0% humidifying capacity is required at the humidity setpoint.
- The humidifier starts operating when the humidification requirement reaches 100% and continues to operate until the humidification requirement drops to 0%. During this period, the display shows 100% humidification
- The dehumidifying capacity responds in the same way as the return-air humidity rises above the setpoint. Dehumidification is accomplished by a request for cooling that activates as soon as the required dehumidifying capacity reaches 100% and continues operating until the required dehumidifying capacity drops to 0%. During this period, the digital compressor loading scales between a minimum percentage (advanced setting is A557) and 100% depending upon required dehumidifying capacity. The display always shows 100% dehumidification.

Figure 3.11 Humidity Control without a Deadband



No.	Description
1	½ of proportional band
2	½ of proportional band

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Humidity Deadband

A deadband widens the setpoint to prevent small changes in humidity from activating humidifiers, compressors and valves and cause excessive component cycling.

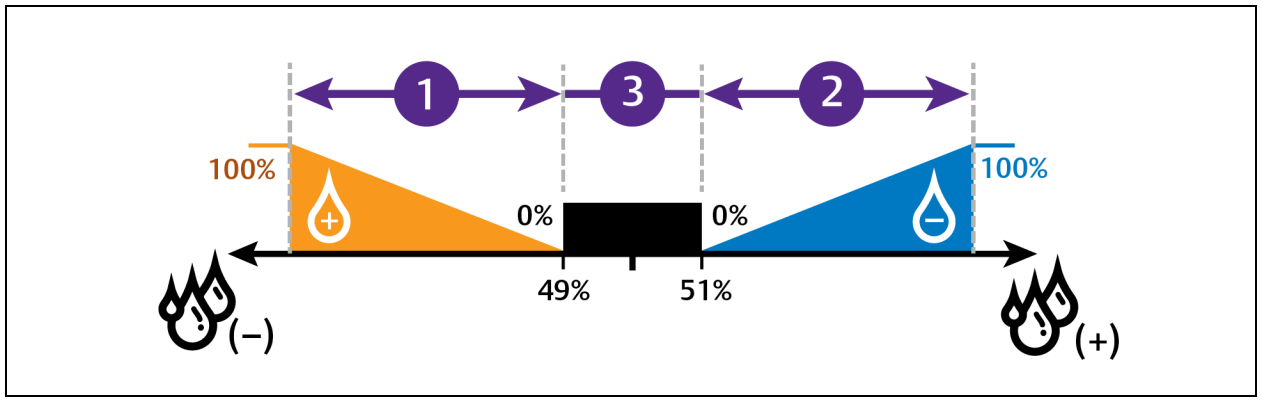
Figure 3.12 below , illustrates humidity control using:

- 50% setpoint
- 8% proportional band
- 2% deadband

Like the proportional band, the deadband is also divided evenly on each side of the setpoint.

- 0% cooling capacity is required from 49% to 51%.
- Below 49%, humidification operates according to the humidity proportional band.
- Above 51%, dehumidification operates according to the humidity proportional band.

Figure 3.12 Humidity Control with a Deadband



No.	Description
1	½ of proportional band
2	½ of proportional band
3	Deadband

3.1.10 Configuring Fan Setpoints

Configures fan-speed control to operate independent of compressor loading (decoupled mode).

1. Touch SERVICE, then ☰ > *Setpoints* > *Fan Control*. The FAN CONTROL secondary panel opens.
2. Adjust the setpoint options, then touch *Save*. The setpoint is updated.
   - Touch *Cancel* to discard the changes.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

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Fan Control Options

Airflow Calibration

Maximum allowed fan output voltage.

Fan Control Sensor

Selects the sensor that controls automatic fan speed, see Automatic Fan Speed Control on page 49 ,
– or –
Selects manual control, see Manual Fan Speed Control on the facing page . Options are:

- Supply: Air flow/fan speed is adjusted based on reading from the supply air temperature sensor.
- Remote: Air flow/fan speed is adjusted based on reading from a wired, remote temperature sensor.
- Return: Air flow/fan speed is adjusted based on reading from the wired, return air temperature sensor.
- Manual: Air flow/fan speed is adjusted using a building-management system.

Fan Control Type

Selects the method of control for the fan motor.

- Auto: Air flow/fan speed is adjusted using locally installed temperature sensors.
- Proportional: Regulation based on the difference between the fan control sensor reading and the fan setpoint.
- PI: Regulation is based on proportional and integral terms. Provides best temperature control and helps avoid fan speed oscillation.
- Adaptive PID: Auto-tuning PID control loop, can be set for cooling or fan speed.

Fan Delta

Fan temperature setpoint, it is the temperature difference compared to the cooling setpoint.

Fan Speed Proportional Band

Adjusts the fan speed based on the deviation from the setpoint. A smaller number causes faster reaction to temperature changes.

Fan Speed Integration

Adjusts fan speed based on time away from the setpoint to maintain accurate temperature control.

Maximum Fan Speed

Maximum percentage at which the fans will operate.

Minimum Fan Speed

Minimum percentage at which the fans will operate.

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Static Pressure Deadband

Widens the setpoint to prevent small changes in static pressure from cycling the fan speed. When static pressure reading is within the deadband, no change in fan speed occurs

Static Pressure Fan Control

Fan speed is controlled based on the static pressure setpoint and the static pressure reading from the sensor.

Static Pressure Fan Speed P-band

Proportional band adjusts fan speed activation point based on a deviation from setpoint by placing half of the selected value on either side of the fan speed control setpoint. A smaller number causes a faster reaction in fan speed.

Static Pressure Lower Range

Minimum threshold for static pressure. Defines the low end of the static pressure range.

Static Pressure Setpoint

Static pressure that the unit maintains via fan speed. Expressed in inWC or Pa, depending on the unit of measurement selected.

Static Pressure Upper Range

Maximum threshold for static pressure. Defines the high end of the static pressure range.

3.1.11 Manual Fan Speed Control

In Manual fan control mode, the speed of the motor can be set in one of the following ways:

- The manual (fixed) fan speed may be set via Vertiv Liebert iCOM.
- Hard wired analog input (input signal types including 4 to 20 mA, 0 to 10 VDC, and 0 to 5 VDC) and a factory-suppled isolator to ensure reliable communication.
- Remotely using a Vertiv™ Liebert® IntelliSlot™ card.

Setting Manual Fan Speed Control via Analog Input

1. Touch 

, then  > *Setpoints* > *Fan Control*, set *Fan Control Sensor* to *Manual*, then touch *Save*.
2. Touch 

, then  > *Auxiliary Device Setup* > *Analog Input*.
3. On ANALOG INPUTS, touch *Customer Analog Inputs* to expand it, then touch the analog input device corresponding to fan-speed control.
4. On the ANALOG INPUT PROPERTIES panel, adjust the properties, then touch *Save*.
    - Touch *Cancel* to discard the changes without saving.

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Setting Manual Fan Speed Control via BMS

1. Touch 

, then 
 > *Setpoints* > *Fan Control*, set *Fan Control Type* to Manual, then touch *Save*.
2. Touch 

, then 
 > *BMS & Teamwork Setup* > *BMS Setup*.
3. On BMS SETUP, touch *Control Settings*. The CONTROL SETTINGS secondary panel displays:
   - In *Fan Control Sensor*, select *Manual*.
   - In *BMS Fan Speed Local Override*, select *No*.
   - Touch *Save*. BMS control of fan speed is set, and the BMS set fan speed is displayed on the Fan Speed slider.

BMS Backup Fan Speed

Sets a fan speed % the unit shall ramp fanspeed at in the event of a BMS timeout. The end-user may select one of the following options for operation:

- Disabled - There is no reaction when BMS is disconnected. Unit shall remain as is.
- BMS Backup Spd - Fanspeed shall change to setting defined by parameter S162 BMS Backup Fanspeed when the BMS is disconnected.
- Coupled - Links the call for fanspeed percentage (%) to the call for cooling percentage (%). The fan shall still ramp between the minimum percentage and the STD speed percentage (MAX), still respecting the airflow calibration.
- BMS Backup Set - When configured, the current fan setpoint used for control (S147 Fan Setpoint) shall be replaced by value configured by Vertiv Liebert iCOM parameter S162 BMS Backup Fan Setpoint.
- SP Control - S146 Fan Control Sensor shall change back from Manual to Return and the static pressure related to the fan speed starts at the most recent BMS manual speed, eventually controlling to that speed.

  The BMS timer must be configured for this setting to activate.

NOTE: Set the fan speed via BMS by writing to the *"Fan Speed Maximum Setpoint"* monitoring point. For details, see SL-28170 IntelliSlot™ Reference Guide found at *https://www.vertiv.com/en-us/support/*.

NOTE: Local adjustments to fan speed are overridden when remote/BMS fan speed control is set.

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3.1.12 Automatic Fan Speed Control

Temperature sensors can control fan speed using one of three modes based on the type of sensor selected as the fan-control sensor: supply, return, or remote, see Table 3.2 below . Control is based on the selected sensor for both fan control and temperature control and their setpoints as follows:

- Coupled: The fan control and temperature control sensor selection is the same. When coupled, fan speed and cooling capacity share the same temperature setpoint.
- Decoupled: The fan control and temperature control sensor selection is different. When decoupled, fan speed control and temperature control have separate setpoints and tunable PI loops.

Table 3.2 Fan Speed Controlling Sensor Options

		Temperature Control Sensor Selected		
		Supply Sensor	Remote Sensor	Return Sensor
Fan Control Sensor Selected	Supply Sensor	Coupled	Decoupled	Decoupled
	Remote Sensor	Decoupled (Recommended)	Coupled	N/A
	Return Sensor	Decoupled	N/A	Coupled

To set parameters for automatic fan speed control:

1. Touch SERVICE, then ☰ > *Setpoints* > *Fan Control*,
   - Set *Fan Control Type* to Return.
   - Select a *Fan Control Sensor*.
   - Adjust the setpoint options, then touch *Save*.

   Sensor based fan speed control is set.
2. Touch *Temperature Control*.
3. On the TEMPERATURE CONTROL secondary panel:
   - Select a *Temperature Control Sensor*.
   - Adjust the setpoint options, then touch *Save*.

3.1.13 Configuring Static Pressure Setpoints

1. Touch SERVICE, then ☰ > *Setpoints* > *Static Pressure Settings*. The STATIC PRESSURE SETTINGS secondary panel opens.
2. Adjust the setpoint options described in the Static Pressure Settings Options on the next page , then touch *Save*. The setpoint is updated.
   - Touch *Cancel* to discard the changes.

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NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

Static Pressure Settings Options

Current Override Temperature

Current temperature reading of the sensor selected for static pressure control override.

Current Override Value

Percentage of override from 0% (no override/static pressure control only) to 100% (temperature-sensor reading overrides completely).

Full Speed at

Temperature at which override reaches 100% and fan operates at full speed.

Operation at Static Pressure Sensor Failure

Selects operation in the event that the static pressure sensor fails. Values are:

- Freeze Speed: Current fan speed is kept.
- SP Off: Static pressure control is disabled and fan speed is dictated by selected fan speed sensor.

Override Integration Time

Adjusts amount of override based on the length of time the temperature has deviated from the setpoint.

Override Slew Rate Filter

Rate of change filter to slow down fan speed changes.

Static Pressure Control Override

Selects sensor that may override static pressure control if the temperature gets too far from the temperature setpoint to provide additional air flow because static pressure is not able to maintain the temperature. Values are:

- None: Override is disabled.
- Remote Sensor: The remote sensor overrides static pressure control.
- Return Sensor: The return sensor overrides static pressure control.

Static Pressure Min Pause

Minimum initial length of time that fan speed stops increasing after the pressure reading crosses into the deadband. After the pause, the fan speed pulses (increases if below the setpoint and decreases if above the setpoint) for the period selected in the Static Pressure Pulse inside deadband field. After each pulse, a pause takes place, the length of which is calculated as a ratio between the deadband border (minimum) and the setpoint (maximum).

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Static Pressure Max Pause

Maximum initial length of time that fan speed stops increasing after the pressure reading crosses into the deadband. After the pause, the fan speed pulses (increases if below the setpoint and decreases if above the setpoint) for the period selected in the Static Pressure Pulse inside deadband field. After each pulse, a pause takes place, the length of which is calculated as a ratio between the deadband border (minimum) and the setpoint (maximum).

Static Pressure Pulse Inside Deadband

Period of time the fan speed increases or decreases (pulses) when pressure is inside the deadband.

Static Pressure Requested Speed Up To

Temperature at which static pressure control override begins.

3.1.14 Control Sensor Aggregation

When more than one supply or return air sensor is required to be used for monitoring purposes or influence a form of unit-level control, the Control Sensor Aggregation feature may be enabled. Control Sensor Aggregation feature allows the use of multiple wired sensors to create a single, aggregated temperature value based on the average or maximum of all wired sensors included. The end-user may define whether the given wired sensor connected is defined as a "supply" air temperature used for supply sensor aggregation or "return" air temperature sensor used for return sensor aggregation via the Vertiv Liebert iCOM user interface. When multiple sensors are configured as a certain 'style' of sensor as determined by the Vertiv Liebert iCOM data label (ex: Supply or Return in this case), the readings from the corresponding wired sensors may be averaged or based on maximum, worst-case reading as defined by the end-user. These aggregated calculations may ultimately be used to influence cooling capacity control, fan speed control, or simply used for monitoring only.

Vertiv Liebert iCOM shall support the connection of up to five additionally wired sensors that may be used to influence Control Sensor Aggregation routines. Control Sensor Aggregation routine supports both supply & return sensor aggregation calculations as described below:

- Total of six wired sensors may be used to influence supply sensor aggregation calculation (when including wired supply NTC sensor).
- Total of six wired sensors may be used to influence return sensor aggregation calculation
- Wired sensor style utilized by the end-user may be either 2T or T/H-based

Invalid sensor readings will not affect the unit calculation (they will be excluded).

NOTE: Either a wired T/H or 2T sensor may be connected and used with Control Sensor Aggregation.

NOTE: 2T sensors provide two total air temperature values, which are then averaged together and presented as a single air temperature reading per 2T sensor. From there, 2T sensors may be averaged or operated off maximum (worst case) temperature value if desired.

Configuring Control Sensor Aggregation

Via the Vertiv Liebert iCOM display, navigate to Service Menu > Auxiliary Device Setup > Sensors > Control Sensor Aggregation Setup.

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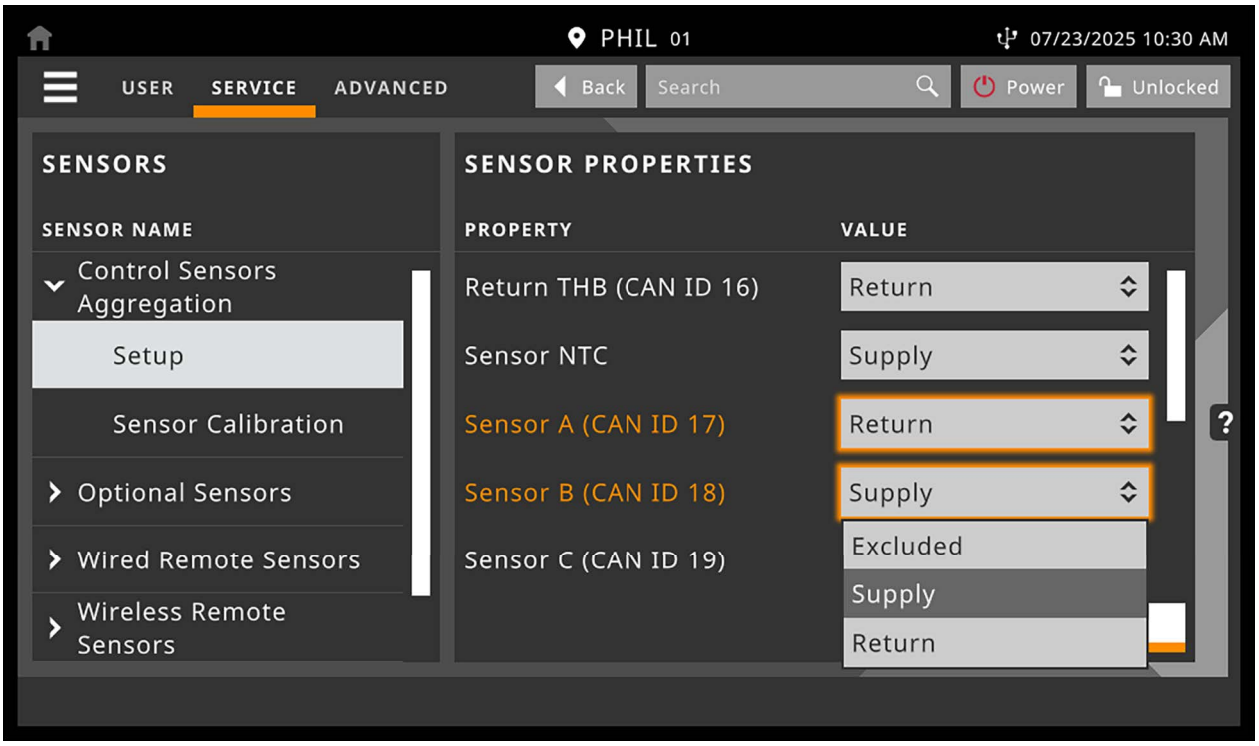
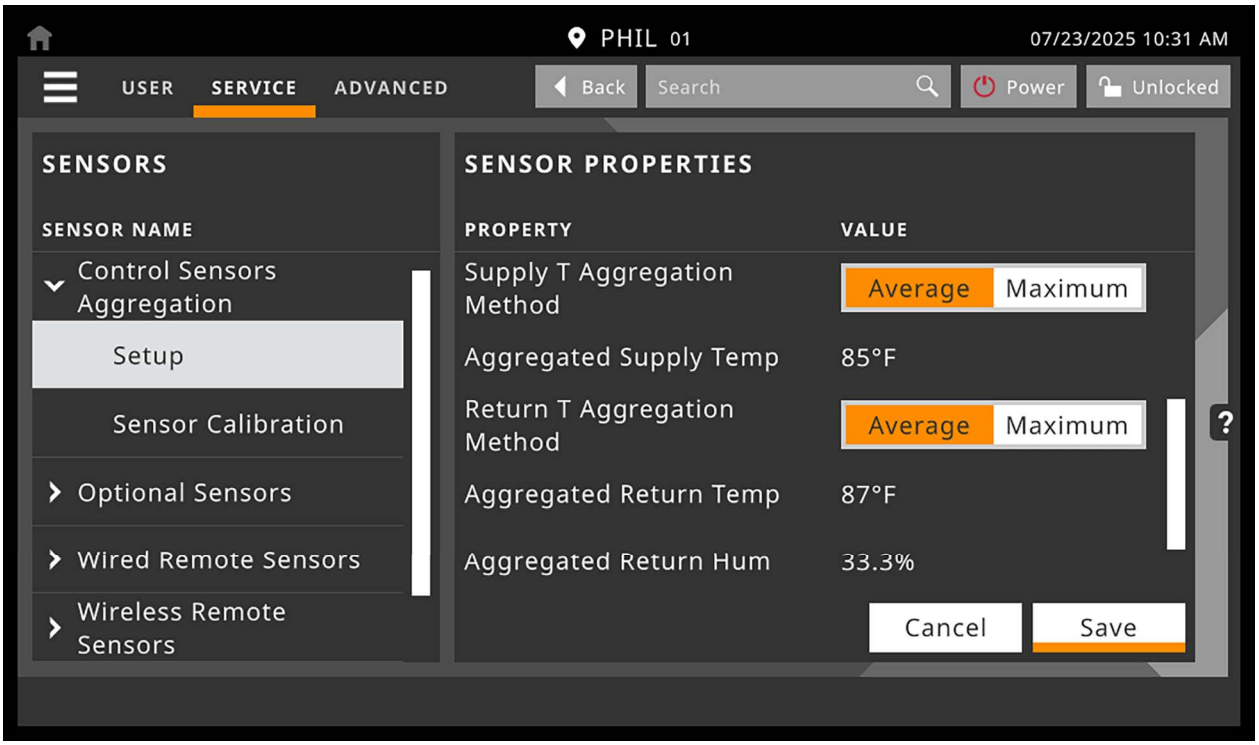
Figure 3.13 Enabling Control Sensor Aggregation





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The additional wired 2T or T/H sensors must be properly addressed in order to be used in the Control Sensor Aggregation calculations. The standard addressing of these sensors differs from that of the Control Sensor Aggregation calculations Vertiv Liebert iCOM also supports. The end-user shall have the ability to determine which of the connected sensors may be included/excluded in the Supply or Return Sensor Aggregation calculations that are supported by the Control Sensor Aggregation feature via the toggle shown in the image above. End-users will also the capability of calibrating each sensor.

The information below represents the CANbus addressing of the additional wired sensors which shall be used for Control Sensor Aggregation calculation:

Table 3.3 Control Sensor Aggregation Calculation

Sensor	CANbus Node	Dip Switch Position SW1-1	Dip Switch Position SW1-2	Dip Switch Position SW1-3	Dip Switch Position SW1-4	Dip Switch Position SW1-5	Dip Switch Position SW1-6
Sensor A	17	ON	OFF	OFF	OFF	ON	OFF
Sensor B	18	OFF	ON	OFF	OFF	ON	OFF
Sensor C	19	ON	ON	OFF	OFF	ON	OFF
Sensor D	30	OFF	ON	ON	ON	ON	OFF
Sensor E	31	ON	ON	ON	ON	ON	OFF

NOTE: Sensors A - E may be wired T/H or 2T based sensors. Vertiv Liebert iCOM shall populate the applicable sensor readings within the controller UI based on sensor style utilized.

NOTE: Should a given dip switch not possess a position within the chart above, then the default position for this dip switch should be left in 'OFF' position.

Control Sensor Aggregation Selectable Options

Return THB: Excluded, Supply, Return

Supply NTC: Excluded, Supply, Return

Sensor A (CAN ID 17): Excluded, Supply, Return

Sensor B (CAN ID 18): Excluded, Supply, Return

Sensor C (CAN ID 19): Excluded, Supply, Return

Sensor D (CAN ID 30): Excluded, Supply, Return

Sensor E (CAN ID 31): Excluded, Supply, Return

Supply T Aggregation Method: Average, Maximum

Return T Aggregation Method: Average, Maximum

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3.2 Scheduling Condenser and Cooling Unit Tasks

The Scheduler configures operating conditions and modes for specific intervals. Tasks to schedule include:

- Condenser set back: See Scheduling Condenser Low Noise Operation below .
- Condenser fan reversal: See Scheduling Condenser Fan Reversal on the facing page .
- Unit sleep schedule: Turns off units during times of low demand and controlled only by temperature. Sleep is interrupted if the return temperature rises above the alarm threshold.

3.2.1 Scheduling Condenser Low Noise Operation

Condenser setback schedules low noise fan operation on units equipped with Vertiv CoolPhase Condenser premium efficiency control. Fans spin more slowly during specified times to reduce noise, and faster when low noise is unnecessary.

NOTE: Low noise operation is overridden to prevent a high pressure condition.

1. Touch 

, then  > *Scheduler* > *Condenser Setback Schedule*. The TASK PROPERTIES panel opens.
2. Adjust the schedule settings, and touch *Save*. The schedule is set up.
   - Touch *Cancel* to discard the changes.

Condenser Setback Task Properties Options

Disabled Day

Selects specific days on which noise-reduction operation is disabled when the schedule is enabled.

Interval 1

Start and finish time of day that noise-reduction operates.

Interval Day

Selects days on which noise reduction operation for the interval specified in Interval 1.

Max Speed in Low Noise Mode

Sets the maximum speed for the condenser fan during low noise operation.

Max Speed in Normal Mode

Sets the maximum speed for the condenser fan during normal or high efficiency operation.

Noise Reduction

Enable/disable noise reduction. When checked, the schedule is run. When unchecked, the scheduling parameters are ignored.

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Status

Indicates if low noise operation is active or inactive.

Whole Day

Selects whole days for which noise reduction operation is available for the condenser fan.

3.2.2 Scheduling Condenser Fan Reversal

Condenser fan reversal schedules a reversal of the condenser fans, reversing air flow to help remove dust, paper, leaves and such from the suction side of the condenser coil.

1. Touch 

, then  > *Scheduler* > *Condenser Fan Reversal Schedule*. The TASK PROPERTIES panel opens.
2. Adjust the schedule settings, and touch *Save*. The schedule is set up.
   - Touch *Cancel* to discard the changes.

Condenser Fan Reversal Task Properties Options

Reverse Fans At Duration

Length of time, in seconds, the fans are reversed.

Reverse Fans Every

Selects number of days between fan reversal.

Reverse Fans Now

Enables/disables immediate fan reversal.

3.2.3 Scheduling Sleep Times for Thermal Management Units

Unit sleep schedules turn off units during low demand as long as return temperature remains below the alarm threshold.

1. Touch 

, then  > *Scheduler* > *Unit Sleep Schedule*. The TASK PROPERTIES panel opens.
2. Adjust the schedule settings, and touch *Save*. The schedule is set up.
   - Touch *Cancel* to discard the changes.

Unit Sleep Schedule Task Properties Options

Interval 1/2

Start and finish time of day that sleep mode operates.

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Interval Day

Selects days on which sleep mode operates for the intervals specified in Interval 1 and Interval 2.

Sleep Mode

Enable/disable sleep schedule. When checked, the schedule is run. When un-checked, the scheduling parameters are ignored.

Timer Mode Type

Selects unit operation when in sleep mode. Values are:

- Unit Off: The unit stops (fans are off).
- Deadband: The unit operates in a limited capacity (fans are on) based on an additional deadband added to the temperature deadband.

Timer Reset

Selects whether or not the sleep mode timer resets.

Whole Day

Selects specific days on which sleep mode is active for the entire day when the schedule is enabled.

3.3 Setting General Thermal Management Unit Options

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

3.3.1 Setting Miscellaneous Options

1. Touch 

, then  > *Options Setup* > *Misc Settings*. The MISC SETTINGS panel displays.
2. Make adjustments as needed and click *Save*. The option settings are updated.
   - Touch *Cancel* to discard the changes without saving.

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NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

Miscellaneous Cooling Unit Settings Options

Auto Restart Enable

When enabled, the cooling unit returns to the status at which it was operating when input power returns after a power failure. (ON if it was powered on and OFF if it was powered off before the failure.) See Automatic Restart after Power Failure on page 60 .

Cascade after Remote On

Upon a remote request for all units to start, selects whether or not the units start one after another by the Cascade Units Delay set in Teamwork Modes on page 111 , see the Teamwork Control Options on page 113 .

Freecool Capacity Transition Filter

Selects how quickly capacity changes between modes of operation to avoid overshooting during the transition.

- Only a factory-trained service technician should adjust this setting.

K11 Active on

Selects the action of the activated K11 (warning) relay. Options are:

- Dehum: Dehumidification is on.
- Warning: A warning is active.
- Emergency Pwr: Emergency power is on.
- Freecooling: Freecooling is on.
- FC Start: Freecooling is in the start phase or is on.

Loss of Power Autoreset Delay

Selects the length of time that a Loss of Power event (that triggers after a power cycle that occurs when the cooling unit is operating) is active when power is restored. When the delay time elapses, the event resets and is cleared automatically.

Operation at Temp Control Sensor Failure

Selects cooling unit operation in the event that the control temperature sensor fails.

- Shut Down: The unit shuts down on sensor failure.
- Cooling: The unit continues operation based on the select Temp Control Sensor Failure Cooling Mode.

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Single Unit Auto Restart

Selects time elapsed (in seconds) before unit restarts when Auto Restart Enable is enabled.

Temp Control Sensor Failure Cooling Mode

Unit operation when Cooling is selected at control temperature sensor failure.

- Hold: Holds the last call for cooling. That is, continue operating at same capacity.
- Full: Activates full cooling, 100% capacity.

Warning Activates Alarm Relay

When enabled, a warning event activates the common alarm relay.

3.3.2 Configuring Quick Start

In the event of a power interruption to the Vertiv Liebert iCOM controller, the unit components and controls shut down. Normally, after power is restored, the Vertiv Liebert iCOM controller must fully boot, and no cooling or air flow occurs until the controls have fully booted. Quick Start lets you determine the fan and cooling output that the unit will provide before the controller fully boots. When configured, the unit can provide airflow and cooling within 10 seconds after power is restored to the controller. Quick Start can be applied to fan, chilled-water, DX, and PRE-pump functions. Quick Start operates only during Vertiv Liebert iCOM application boot, then normal controller operation resumes.

To Configure Quick Start

1. Touch 

, then  > *Options Setup* > *Quick Start Settings*. The QUICK START SETTINGS panel displays.
2. Refer to Quick Start Options below , and select the configuration options for your system.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

Quick Start Options

CW Quick Start

Enables/disables chilled water quick start.

CW Quick Start Delay

Delay before chilled water function activates after power is restored (0 to 180 seconds).

CW Valve 1 Analog Output

Position percentage open of chilled water valve 1 during quick start operation (0 – 100%).

CW Valve 1 Digital Output

Enables/disables output from chilled water valve 1 during quick start.

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CW Valve 2 Analog Output

Position percentage open of chilled water valve 2 during quick start operation (0 – 100%).

CW Valve 2 Digital Output

Enables/disables output from chilled water valve 2 during quick start.

DX Quick Start

Enables/disables DX quick start.

DX Quick Start Initial Call for Cooling

Compressor output percentage (call for cooling) during quick start operation (0 – 100%).

DX Quick Start with Econophase

Enables/disable Vertiv EconoPhase operation during quick start. When enabled on Vertiv CoolPhase Perimeter thermal management units, note the following:

- If unit was operating in pump mode at the time of power loss, unit restarts in pump mode.
- If unit was operating in mixed mode at the time of power loss, unit restarts in mixed mode.
- If unit was operating in compressor mode at the time of power loss, unit restarts in compressor mode.

Fan Quick Start

Enables/disables fan quick start.

Pump Start Call For Cooling

Output percentage of PRE pump quick start operation (50 – 100%).

Quick Start Delay

Delay before quick start activates after power is restored (0 to 180 sec).

NOTE: When using DX quick start, you must configure a minimum of 40 seconds to allow time for global condenser communication to establish before the compressors are powered on.

Quick Start Fan Analog Output

Fan speed percentage during quick start operation.

Quick Start Overlap Time

Length of time quick start fan speed overlaps normal fan speeds settings. After fully booted, normal fan speed control resumes when this time expires.

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3.3.3 Automatic Restart after Power Failure

Set the cooling unit to return to the status at which it was operating when input power returns after a power failure. (ON if it was powered on and OFF if it was powered off before the failure.)

1. Touch 

, then  > *Options Setup* > *Misc Settings*. The MISC SETTINGS panel displays.
2. Set *Auto Restart Enable* to *Yes*, and use the slider to set the number of seconds to delay before restart, then touch*Save*. Automatic restart is enabled.
    - Touch *Cancel* to discard the changes without saving.

3.3.4 Setting Fan Options

Air flow is adjustable via Vertiv Liebert iCOM manually using a building management system (BMS) or automatically using locally installed temperature sensors.

NOTE: Thermal management units ship with the factory setting Return Sensor for the temperature control sensor and the fan speed control sensor.

1. Touch 

, then  > *Options Setup* > *Fan Settings*. The FAN SETTINGS panel displays.
2. Make adjustments as needed and click *Save*. The option settings are updated.
    - Touch *Cancel* to discard the changes without saving.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

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Fan Settings Options

Airflow Calibration

Maximum allowed fan output voltage.

Allow Fan Modulation with Comp

Enables/disables fan modulation with compressor operation. Values are:

- No: Fan speed ramps to STD when a compressor starts operating.
- Yes: Fan speed modulates based on CFF while compressor operates.

Dehumidification Fanspeed

Maximum fan speed when dehumidification is in progress, assisting with the dehumidification process.

Fan Back Draft Mode

Enables/disables fan operation in back draft mode.

Fan Back Draft Operation

Defines the variation of back draft operation that shall be utilized. Selectable options include:

- Disabled - Fan Back Draft feature is disabled.
- Normal - Standard back draft operation based on configured DC voltage the variable speed fans shall ramp to.

Outdoor Temp

Back draft operation shall duty factor module the fan to operate at 0% (or setting defined by S169 VSD Backdraft Setpoint) where the duty factor operation supports the following:

- Modulation period is one hour.
- Duty factor period is internally computed with results limited to 0% or 10 - 100%.

Once the duty factor period is started, back draft operation continues until the outside temperature becomes invalid or the duty factor one-hour period completes or standby operation is terminated according to network group .

Return Temp

Used to prevent overheating: sets fan speed to ramp based on actual return air temperature which overrides setting configured via S169.1 'Backdraft Setpoint':

- Set to 0% when return air temperature is below S178.1 'Fan Duty Min at Ret Temp'.
- Set to S178.3 'Fan Ret Min' when return air temperature is at S178.1 'Fan Duty Min at Ret Temp'.
- Set 178.4 'Fan Ret Max' when return air temperature is greater than or equal to S178.2 'Fan Duty Max at Ret Temp'.
- Set to linearly interpolated value for return air temperature between S178.1 'Fan Duty Min at Ret Temp' and S178.2 'Fan Duty Max at Ret Temp'.

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Outdoor + Return Temp

Used to aid in anti-condensation and anti-overheating routines at the same time, where the higher demand shall determine the fan speed.

Fan Shutdown Delay Timer

Length of time that the fan continues to operate after the cooling unit is turned off via the display, local control or the BMS.

The delay timer does not apply when the unit is turned off remotely.

Fanspeed at Unit Start

Speed at which the fans run on unit start up.

Fanspeed at Unit Start Timer

Length of time fans run at the speed selected in fan speed at unit start.

Fanspeed Filter at 0%

Decreases the rate at which the fan speed changes when close to or at the temperature setpoint to avoid undershooting the setpoint.

Fanspeed Filter at 100%

Increases the rate at which the fan speed changes for a quicker reaction of fan speed at high temperatures.

Fanspeed Reposition Delay

Length of time before fan speed can decrease, allowing temperature to stabilize before the change occurs.

Fanspeed Reposition Mode

Sets a one time delay that allows the fan to maintain current speed when a call to increase or decrease is made to allow the temperature to stabilize.

Fanspeed Transition Filter

Sets how quickly the fan speed changes between operating modes. Prevents an instant reaction when fans turn on or off and prevents unstable operation.

Max Deceleration Rate

Selects the rate and which the fan speed changes during deceleration.

Maximum Fan Speed

Maximum speed at which the fan will operate.

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MIN at CFC for EC Fan

Cooling deviation at which the fan will operate at minimum speed.

Minimum Fanspeed

Minimum speed at which the fan will operate.

No Power Fanspeed

Speed at which the fans operate when using emergency power.

STD at CFC for EC Fan

Cooling deviation at which the fan will operate at maximum speed.

3.3.5 Setting Compressor Options

1. Touch 

, then  > *Options Setup* > *Compressor Settings*. The COMPRESSOR SETTINGS panel displays.
2. Make adjustments as needed and click *Save*. The option settings are updated.
   - Touch *Cancel* to discard the changes without saving.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

Compressor Settings Options

Ball Valve Setpoint Offset

Adjusts sensitivity to compressor discharge pressure or liquid pressure by increasing sensitivity. The higher the added pressure, the more the valve opens.

Capacity Change at 0%

Decreases the rate at which cooling capacity changes when close to or at the temperature setpoint to avoid undershooting the setpoint.

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Capacity Change at 100%

Increases the rate at which the cooling capacity changes for a quicker reaction of cooling at high temperatures.

Compressor Sequence

Selects the lead compressor when cooling activates. Values are:

- Auto: Compressor with the lowest run hours leads.
- 1: Compressor 1 leads.
- 2: Compressor 2 leads.

Winter Start Delay

Length of time, in minutes, that a low pressure condition is ignored during compressor start-up. See Setting Low Pressure Time Delay below .

Setting Low Pressure Time Delay

At compressor start up, a low pressure condition is ignored for a set period to avoid false trips due to bubbles in the refrigerant or other misreading of the low pressure device.

NOTE: The factory-default setting is a three minute delay for air cooled units and a zero to one minute delay for water cooled units.

1. Touch 

, then  > *Options Setup* > *Compressor Settings*.
2. Use the *Winter Start Delay* slider to select the number of minutes for the delay, and touch *Save*.

Adjusting Ball Valve Pressure Offset

NOTE: Only a properly trained and qualified technician should modify the motorized ball valve setting.

The number of times the valve opens and closes is adjusted based on added pressure offset.

1. Touch 

, then  > *Options Setup* > *Compressor Settings*.
2. Use the *Ball Valve Setpoint Offset* slider to select amount of pressure added to open the valve wider, and touch *Save*.

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Compressor Sequencing for Balancing Run Times

Compressor sequencing, available in two compressor cooling units, allows assigning a lead compressor or allowing automatically leading with the compressor with the lower run hours logged.

When Auto is selected, the following applies as Vertiv Liebert iCOM attempts to maintain equal run time of the compressors:

- If only one compressor is available because of safety delays, it is given first priority to start/stop.
- If both compressors are off, the compressor with fewer run-hours in the next to start.
- If both compressors are operating, the compressor operating for the longest time since the last start is the first to shut off.

NOTE: Automatic compressor sequencing will not power off a compressor if it is required to properly condition the space.

To set-up compressor sequencing:

1. Touch 

, then  > *Options Setup* > *Compressor Settings*.
2. Select the *Compressor Sequence* option to use, and touch *Save*.

3.3.6 Setting Reheat Options

If the room air temperature becomes too cold, heating is activated based on the temperature proportional band setting. Depending on the type of cooling unit, there are different types of reheat (configured at purchase/set at factory). There may also be one to three stages of reheat, which are also factory set. The only service operation available is setting the number of heat stages.

1. Touch 

, then  > *Options Setup* > *Reheat Settings*.
The REHEAT SETTINGS panel displays.
2. Refer to Reheat Settings Options below , and Reheat Control on the next page to adjust the setpoint options, then touch*Save*.
The option settings are updated.
    - Touch *Cancel* to discard the changes without saving.

Reheat Settings Options

Electric Heat Outputs

Shifts the output steps of the electric heaters.

Electric Heat Staging

Selects the number of stages available during reheat operation.

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Enable Hot Gas Heat

Enables/Disables hot gas reheat. (May not be included on your cooling unit.) See Reheat Control below . Values are:

- No: Hot gas reheat disabled.
- Comp. 1: Use compressor 1.
- Comp. 2: Use compressor 2

Enable Hot Water Flush

Selects the number of hours between hot water coil flush cycle.

Enable Hot Water Heat

Enables/disables hot water reheat. (May not be included on your cooling unit.)

Enable Rotation

Enables/disables rotation of multiple heaters.

Reheat Operation

Selects when heating is allowed.

- Dehum: Heating only allowed during dehumidification.
- Normal: Heating allowed during all operating modes.

SCR Control Type

Enables/disables SCR reheat. (May not be included on your cooling unit.) See Reheat Control below . Values are:

- None: SCR reheat disabled.
- Tight: Use tight control reheat mode.
- Standard: Use standard reheat mode.

Electric Heat Stages

Number of electric stages that may be activated during reheat.

- Depending on your cooling unit, the maximum setting may be 1, 2, or 3.

3.3.7 Reheat Control

If your cooling units are equipped with a heating option, reheat control is directly linked to temperature control in that the heating requirement determined by the temperature proportional band determines reheat operation. See Temperature Control—Temperature Setpoints and Cooling Operation on page 29 .

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Electric, Hot Gas, and Hot Water Reheat

Depending on the type of cooling unit, there may be one to three stages of electric and hot gas/hot water reheat. Table 3.4 below , shows the nine electric reheat options.

Table 3.4 Electric, Hot Gas and Hot Water Reheat Configurations

Type	Stage 1	Stage 2	Stage 3
A	Electric 1	—	—
B	Electric 1	Electric 2	—
C	Electric 1	Electric 2	Electric 3
D	Hot gas	—	—
E	Hot gas	Electric 1	—
F	Hot gas	Electric 1	Electric 2
G	Hot water	—	—
H	Hot water	Electric 1	—
I	Hot water	Electric 1	Electric 2

NOTE: During dehumidification, hot gas/hot water are not influenced by the electric reheat setting. Hot gas is set only when the selected compressor is operating. (See Enable Hot Gas Heat on the previous page .)

Reheat is controlled by dividing the “heating” half of the temperature proportional band (below the setpoint) by the number of stages. Figure 3.14 on the next page , illustrates electric reheat operation with three stages as follows:

- 70° setpoint
- 8° proportional band
- 2° deadband
- Three stage reheat

The proportional band is divided evenly on each side of the setpoint. The deadband is divided evenly on each side of the setpoint. The temperature proportional band below the setpoint is divided into thirds, one for each stage.

- From 70° to 69°, 0% heating is required.
- At 68.7° air temperature (heating demand 33%), stage 1 activates and continues operating until temperature reaches 69°.
- When temperature decreases to 67.4° (heating demand 66%), stage 2 activates, and continues until temperature reaches 68.7° (heating demand 33%).
- When temperature decreases to 67.4° (heating demand 100%), stage 2 activates, and continues until temperature reaches 68.7° (heating demand 66%).
- When temperature decreases to 63° (heating demand 100%), stage 3 activates, and continues until temperature reaches 67.4° (heating demand 33%).

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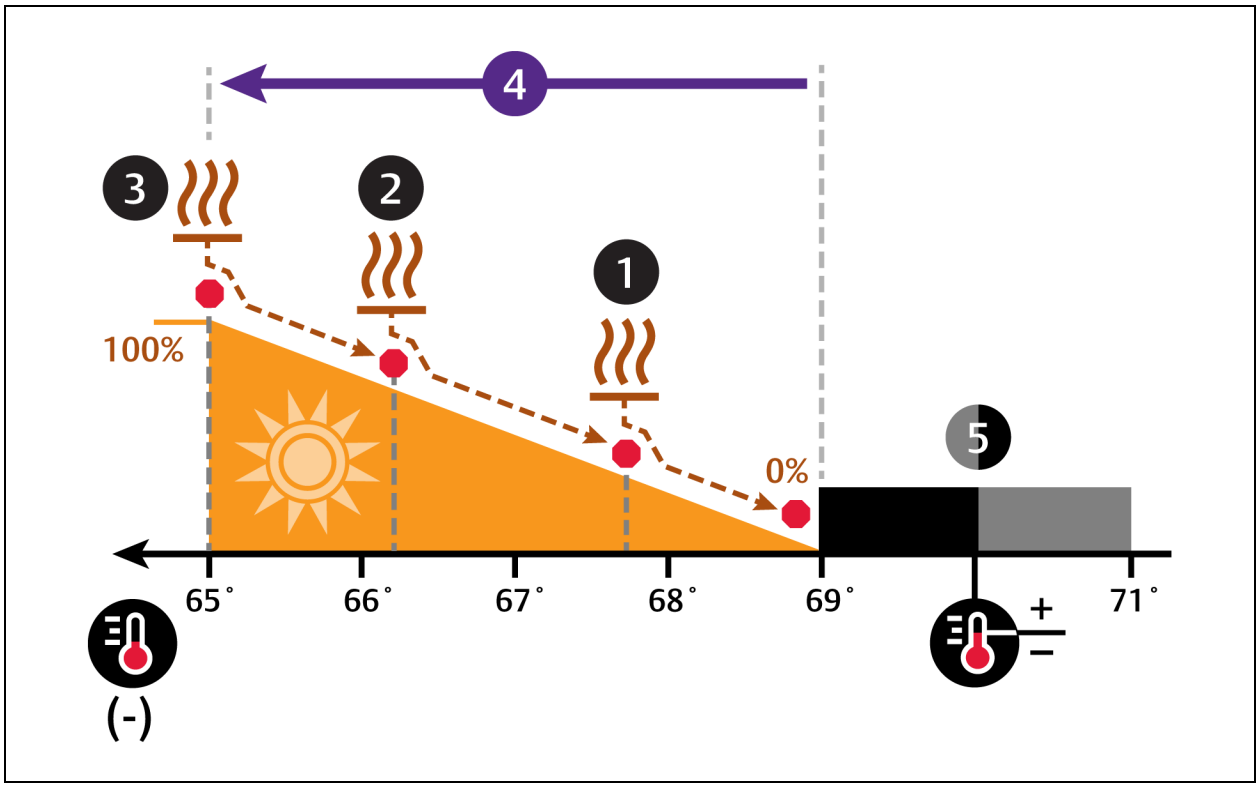
Figure 3.14 Temperature Control for Reheat—Three Stage Electric Reheat



No.	Description	No.	Description
1	Stage 1 reheat	4	½ of proportional band
2	Stage 2 reheat	5	Deadband
3	Stage 3 reheat		

SCR Reheat

SCR reheat uses pulsed on/off operation to modulate heating capacity to control temperature more precisely than staged, electric reheat. 100% heating capacity is constant operation of SCR reheat. As the temperature proportional band requires more heat, the SCR output adjusts proportionally.

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SCR Reheat—Standard Mode

NOTE: Standard SCR Reheat when used in conjunction with variable cooling capacity (such as chilled water, variable speed fans or digital scroll compressors) provides ultimate capacity control and energy efficiency gains.

In standard mode, SCR reheat responds to a 0% to 100% heating requirement based on the temperature proportional band. Figure 3.15 on the next page , illustrates SCR reheat in standard mode as follows:

- 70° setpoint
- 8° proportional band
- No deadband

The proportional band is divided evenly on each side of the setpoint. The deadband is divided evenly on each side of the setpoint.

- At 70° air temperature (heating demand 0%), no heating occurs.
- When temperature decreases below the setpoint, SCR reheat activates, and increases output as the heating demand increases from 0% to 100%.
- As air temperature rises and heating demand decreases, the SCR reduces output and stops operating when 70° (0% heading demand) is reached.

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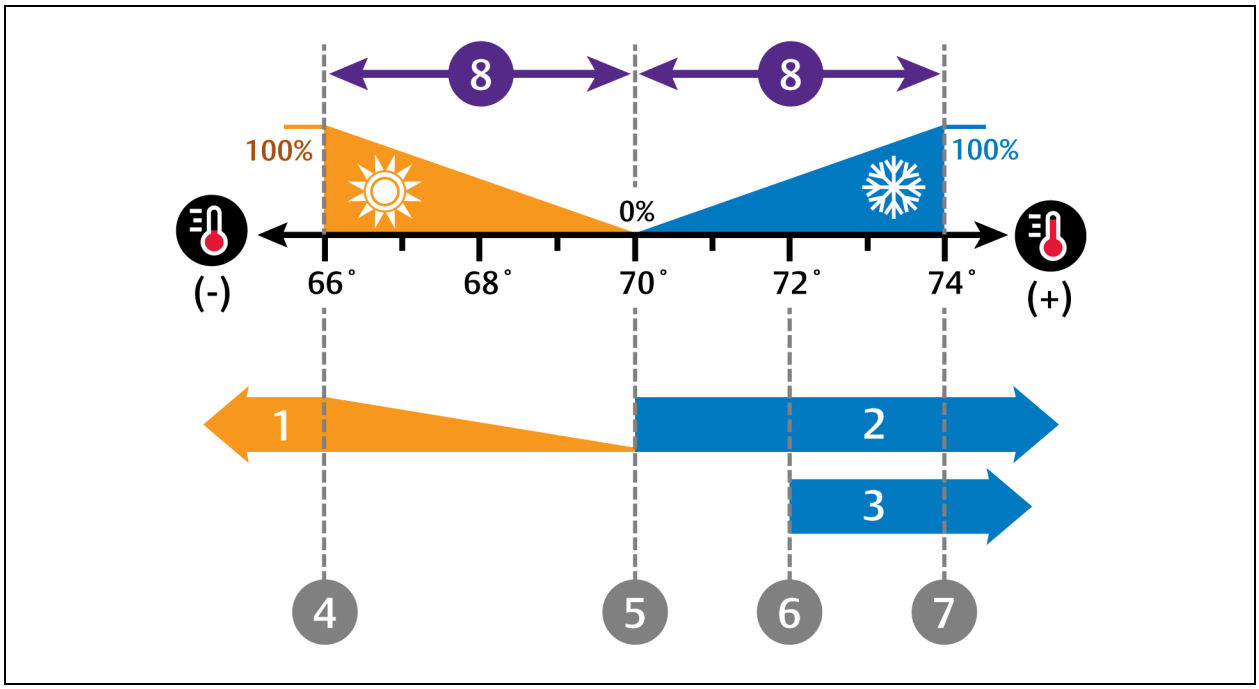
Figure 3.15 Temperature Control for Reheat—SCR in Standard Mode



No.	Description	No.	Description
1	SCR reheat operation	5	SCR reheat stops/begins operating at the setpoint. Compressor 1 begins/stops operation at the setpoint.
2	Compressor 1 operation	6	Compressor 2 stops operating.
3	Compressor 2 operation	7	Compressor 2 begins operating.
4	SCR reheat output is 100%.	8	½ of proportional band

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SCR Reheat—Tight Mode

In tight mode, cooling (compressors) and heating (SCR reheat) components operate simultaneously to provide maximum temperature control.

NOTE: Tight mode is the factory default setting when available. Tight mode is not available on chilled water units, units with variable speed fans or units with digital scroll compressors.

The compressor(s) respond to a 0% to 100% cooling requirement and the SCR responds to a 0% to 200% heating requirement based on the temperature proportional band. Figure 3.16 on the next page , illustrates SCR reheat on a system with two single-step compressors operating in tight mode as follows:

- 70° setpoint
- 8° proportional band
- No deadband

The proportional band is divided evenly on each side of the setpoint, and an additional half of the proportional band is added to the heating side for 200% heating.

- At 70° air temperature (heating demand 0%), SCR reheat operates at full capacity and compressor 1 operates continuously from 100% cooling demand to 200% heating demand.
- At 200% heating demand, compressor 1 deactivates until the temperature increases to 70° setpoint (0% heating/cooling demand).
- As cooling demand increases from 0% to 100%, SCR reduces heating capacity proportionally and stops operating at 100% cooling demand.
- At 100% cooling demand, compressor 2 starts and operates until the air temperature returns to 70° (0% cooling demand) when it stops operation.

  – at the same time –

  SCR increases heating capacity as the cooling demand decreases from 100% to 0%.

- When temperature decreases below the setpoint, SCR operates at full capacity as the air temperature drops and heating demand increases from 0% to 200%.

NOTE: Some cooling units are not suited for a strict, NO LOAD application and require a minimal load in the space. Consult a Vertiv representative for verification.

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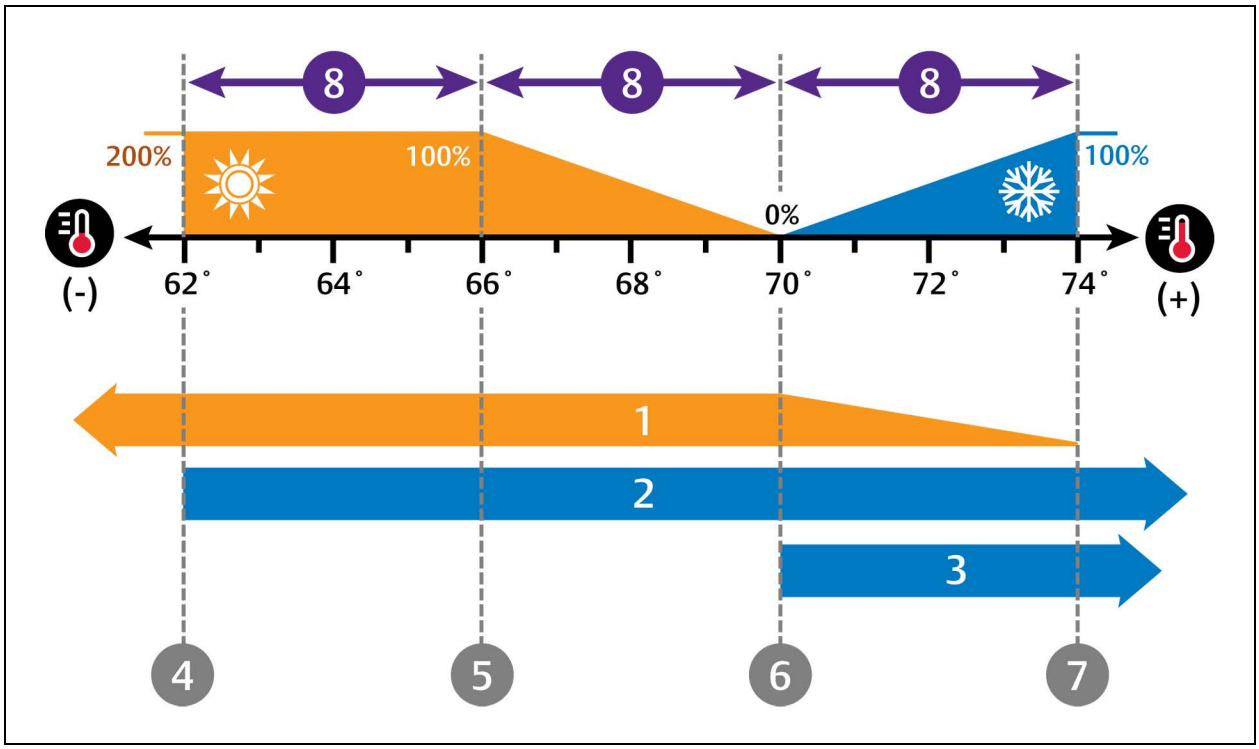
Figure 3.16 Temperature Control for Reheat—SCR in Tight Mode



No.	Description	No.	Description
1	SCR reheat operation	5	100% heating
2	Compressor 1 operation	6	SCR reheat capacity is decreased as temperature nears 100% cooling, and compressor 2 stops operating.
3	Compressor 2 operation	7	SCR reheat stops operating, and Cooling begins operating.
4	SCR reheat is operates at full capacity from 0% to 200% heating, and compressor 1 stops operating at 200% heating and remains inactive until temperature returns to the setpoint.	8	½ of proportional band

3.3.8 Setting Humidifier Options

The type of humidifier used depends on the cooling unit model and application requirements for your system.

NOTE: Except for externally mounted humidifiers, humidifier operation is limited by the return air temperature. If return air temperature reaches 80°F (26°C) or higher, the humidifier is disabled. The humidifier will not resume operation until the temperature falls to 75°F (24°C) or remains below 80°F (26°C) for 20 minutes.

1. Touch SERVICE, then ☰ > *Options Setup* > *Humidifier Settings*. The HUMIDFIER SETTINGS panel displays.
2. Make adjustments as needed and click *Save*. The option settings are updated.
   - Touch *Cancel* to discard the changes without saving.

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NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

Humidifier Settings Options

Humidification System Enabled

Enables/disables group wide (network wide) humidification by the cooling units in the group. Once enabled at the system level, individual units may be enabled using the Humidification Unit Enabled parameter.

Humidification Unit Enabled

Enables/disables humidification at the unit level.

Humidifier Control

Controls humidifier operation.

- Proportional: Calculates based on humidification setpoints.
- On-Off: Sends a start-stop command to a remote mounted humidifier.

Humidifier Model

The type of humidifier installed.

Humidifier Steam Rate

Selects capacity of steam generation.

Infrared Flush Rate

Adjustable rate of flush for the infrared humidifier, range 110 %to 500%.

3.3.9 Setting Dehumidification Options

1. Touch 

, then  > *Options Setup* > *Dehumidification Settings*. The DEHUMIDIFICATION SETTINGS panel displays.
2. Make adjustments as needed and click *Save*. The option settings are updated.
    - Touch *Cancel* to discard the changes without saving.

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NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

Dehumidification Settings Options

Capacity Increase on Dehum

Capacity increase permitted during dehumidification.

Dehum Fan Ctrl

Enables/disables fan-speed operation during dehumidification.

Dehum System Enabled

Enables/disables whether or not the compressor/valve is used for dehumidification when humidity is above the setpoint.

Dehum Timer

Length of time, in minutes, the dehumidifier may operate.

Dehum Unit Enabled

Enables/disables dehumidification for the cooling unit.

3.3.10 Setting Water Leak Detector Options

1. Touch 

, then  > *Options Setup* > *Water Leak Detector*. The WATER LEAKAGE DETECTOR panel displays.
2. Make adjustments as needed and click *Save*. The option settings are updated.
   - Touch *Cancel* to discard the changes without saving.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

Water Leak Detector Settings Options

Water Detector

Type of water leak detector installed.

3.3.11 Setting Q15 Options

1. Touch 

, then  > *Options Setup* > *Q15 Settings*. The Q15 SETTINGS panel displays.
2. Make adjustments as needed and click *Save*. The option settings are updated.
   - Touch *Cancel* to discard the changes without saving.

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Q15 Settings Options

Damper Switch Feedback Timer

If output function is Damper and End Switch, the length of time Vertiv Liebert iCOM waits for the feedback signal from the damper motor, that is, if it is open or closed.

Fan Delay for Damper

Length of time that must elapse during damper opening/closing. During this span, all functions associated with the on/off state are eligible.

Medium Board: Q15 Map to K11

Maps the Q15 function to the K11 (warning) relay because a medium-sized board does not have Q15 output.

Q15 Output Direction

Selects whether the output is normally on or normally off.

Q15 Output Function

Selects the reason for which the digital output is activated. Options are:

- 1: Dehum On
- 3: Reheat On
- 4: Comp On
- 5: Comp 1 On
- 6: Comp 2 On
- 7: Humi On
- 9: Free Cool On
- 10: Damper
- 11: High Temp
- 12: Low Temp
- 13: Loss Power
- 14: Power Source

Q15 Output Sensor

Selects a sensor reading to compare to the set threshold that activates Q15 output. Options are:

- 0: Return
- 1: Supply
- 2: Rem Max
- 3: Rem Low
- 4: Rem Avg

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Q15 Output State

Status of Q15 output, on or off.

Q15 Temp Actual

Current value of the sensor selected as the Q15 Output Sensor.

Q15 Temp Output Threshold

Temperature threshold above or below which Q15 output activates.

3.3.12 Temperature Control: Setting Loss of Cooling Operation

Loss of cooling is defined as a state where the Vertiv unit can no longer support cooling operation. During a loss of cooling situation, airflow output is still provided. This feature is supported on direct expansion (DX), chilled water (CW), and free cooling (FC) applications. The following scenarios represent the operational situations where a given unit may experience a loss of cooling:

1. Unit is OFF (excluding Standby operation, see A105.1 'Loss of cooling - Fan Operation')
2. Unit is ON but in Manual Mode
3. For Direct Expansion (DX) unit when one or more of the following are considered true:
    a. DX unit is ON with Free Cooling unavailable and all refrigerant circuits are either:
        - Low Pressure Phase 9 (LP w/ 90 min delay)
        - Low Pressure Phase 6 (freeze protection 10 minute delay)
    b. DX unit is ON with Free Cooling unavailable and compressors unavailable due to:
        - Pump down failure
        - High pressure lockout
        - High discharge
        - GC remote shutdown
        - Compressor overload
        - Various EEV alarm(s) preventing EEV operation
        - Unit is ON, all cooling operations are unavailable due to customer alarm input (Comp Lockout, FC Lockout, Flow AL LC, etc).
    c. Free Cooling unavailable due to one of the following reasons:
        - Unit not within mixed mode/pump mode
        - Free Cooling status is continuously off for 130 seconds with a call for cooling because
            - U305.2 'FC Status' is not "ON".
            - Current call for cooling is less than 1%.

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4. For Chilled Water unit when ALL of the following are considered to be true:
    a. The unit has been powered ON for a least 30 min AND
    b. Call for cooling is greater than A105.5 'Loss of Cooling - CW Threshold' (default 50%) AND
    c. Temperature difference between Return Temp - Supply Temp is less than A105.2 'Loss of Cooling - Delta RET - Sup' (default 0.55k) AND
    d. One or more of the following are true:
        - Unit return temperature is above S203 'Std. Sensor High Return Temperature'.
        - The above conditions a. - d.) are continuously true for A105.3 'Loss of Cooling - CW Delay' (default 1800 seconds).

When the unit is in this state, the end-user may define the desired unit operation.

3.3.13 Max Cool (Customer Alarm Input)

Max Cool (Customer Alarm Input) parameters include:

- MCF.001 Include Max Cool Fan Speed Override
- MCF.002 Max Cool Fan Speed
- MCF.003 Transition Time to Max Cooling
- MCF.004 Transition Time to Normal Cooling

3.4 Vertiv™ 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., Vertiv™ 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/freecooling 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. The comparator circuit has four settings (DT Between Room / FC Type, [Service Menu, Setpoints]):

- Disabled
- Contact
- Temp
- Set

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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 Vertiv unit via contact closure.

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

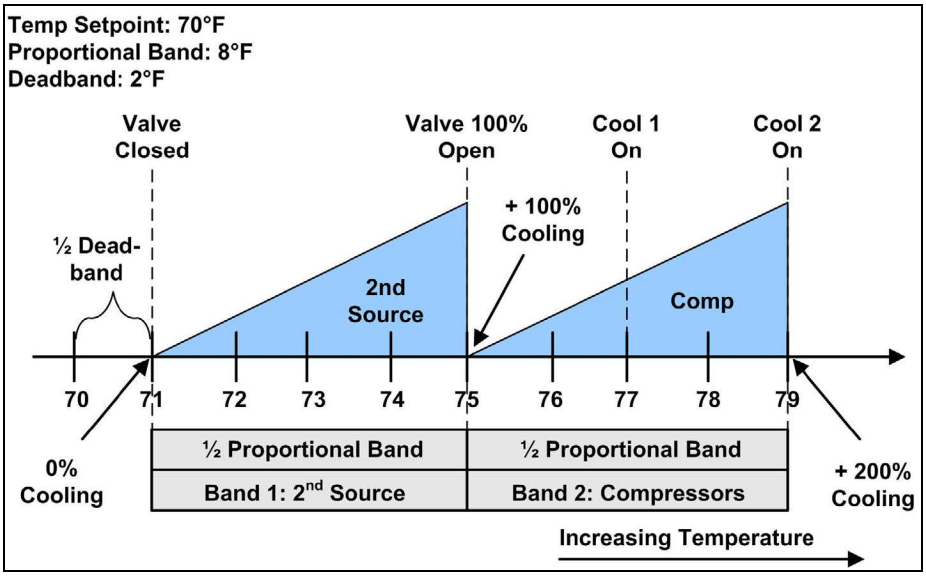
The Temp setting is the factory default (12°F [-11.1°C]) on free-cooling and dual cooling units. If the temperature difference between the second source cooling fluid parameter, Free-cooling Fluid Temperature (User Menu, Sensor Data) and room air is equal to or greater than the adjustable DT Between 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. The primary and secondary source of cooling will stage accordingly. See the next sections for more information.

Figure 3.17 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.

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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 Differential Temperatures/Controls (Comparator Circuit) on page 77) 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—Freecooling

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

- Operate freecooling or compressor(s) to maintain temperature (factory default)
- Operate freecooling 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 Differential Temperatures/Controls (Comparator Circuit) on page 77 . 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 freecooling 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 3.17** on the previous page illustrates how the cooling proportional band is broken out on a freecooling unit with two step compressors.

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 freecooling 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 3.17** on the previous page illustrates how the cooling proportional band is broken out on a free-cooling unit with two step compressors.

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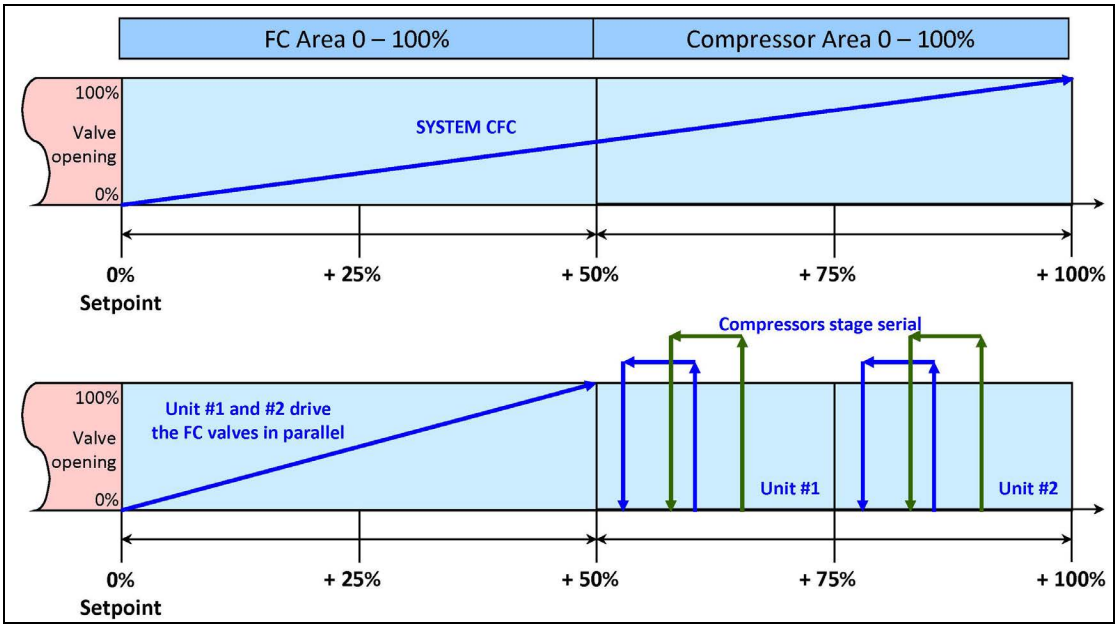
Cooling Control Band for Simultaneous Operation = (Temperature Proportional Band/2) / 2 + (Temperature Deadband/2)

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

Figure 3.18 Freecooling and Compressorized Operation



3.4.2 Vertiv™ Liebert® Air Economizer

The Liebert® Air Economizer is an option for Vertiv 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 Vertiv 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 Vertiv CoolPhase Perimeter and Vertiv™ Liebert® CW are shown in Figure 3.19 on the facing page . Connect the supply air thermistor as shown in Figure 3.19 on the facing page (it must be routed from the cooling unit and secured). The illustration shows connections for the Vertiv CoolPhase Perimeter and Vertiv Liebert CW.

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Figure 3.19 Temperature and Humidity Sensor Connections—Vertiv™ CoolPhase Perimeter and Vertiv™ Liebert® CW

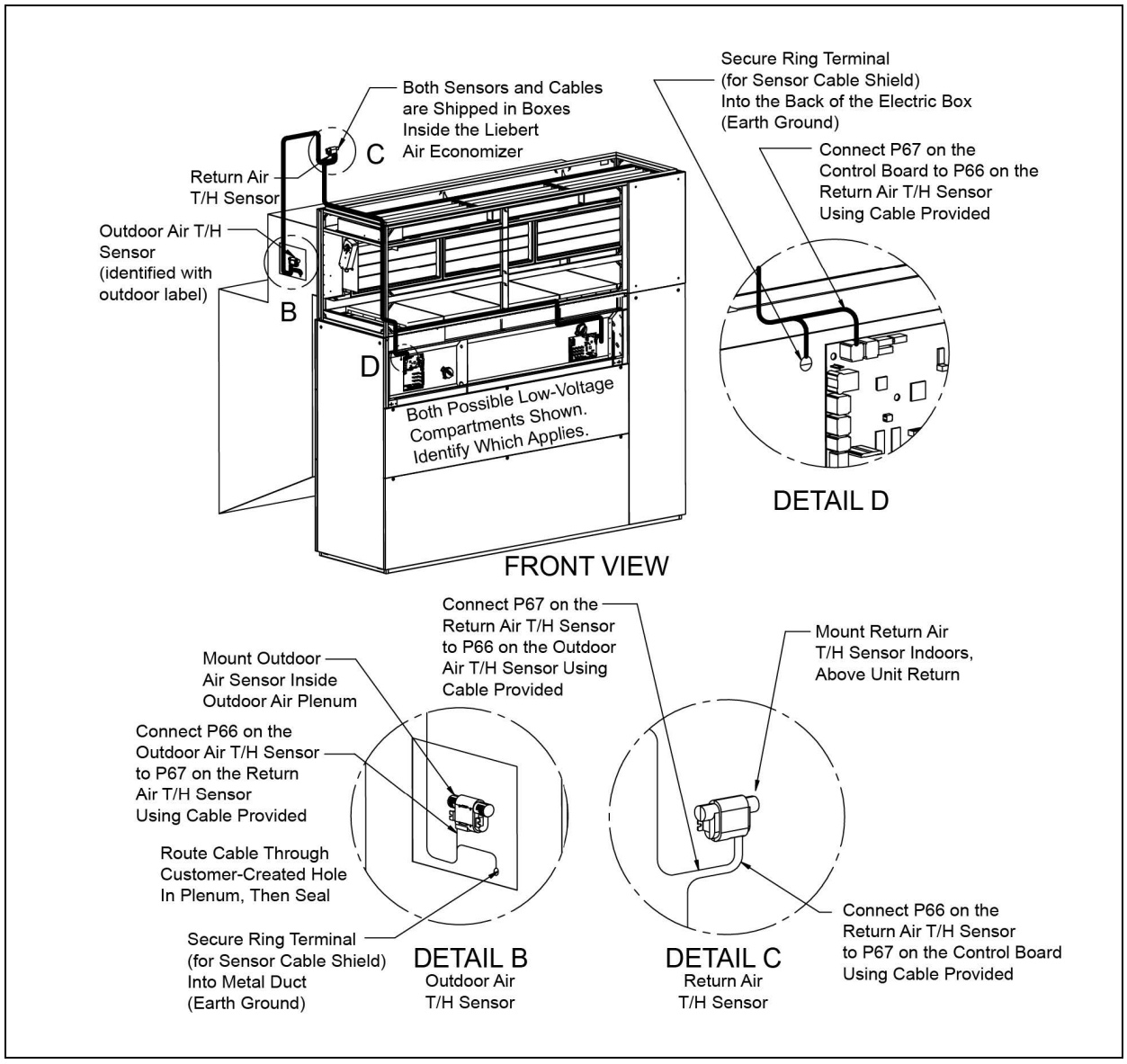

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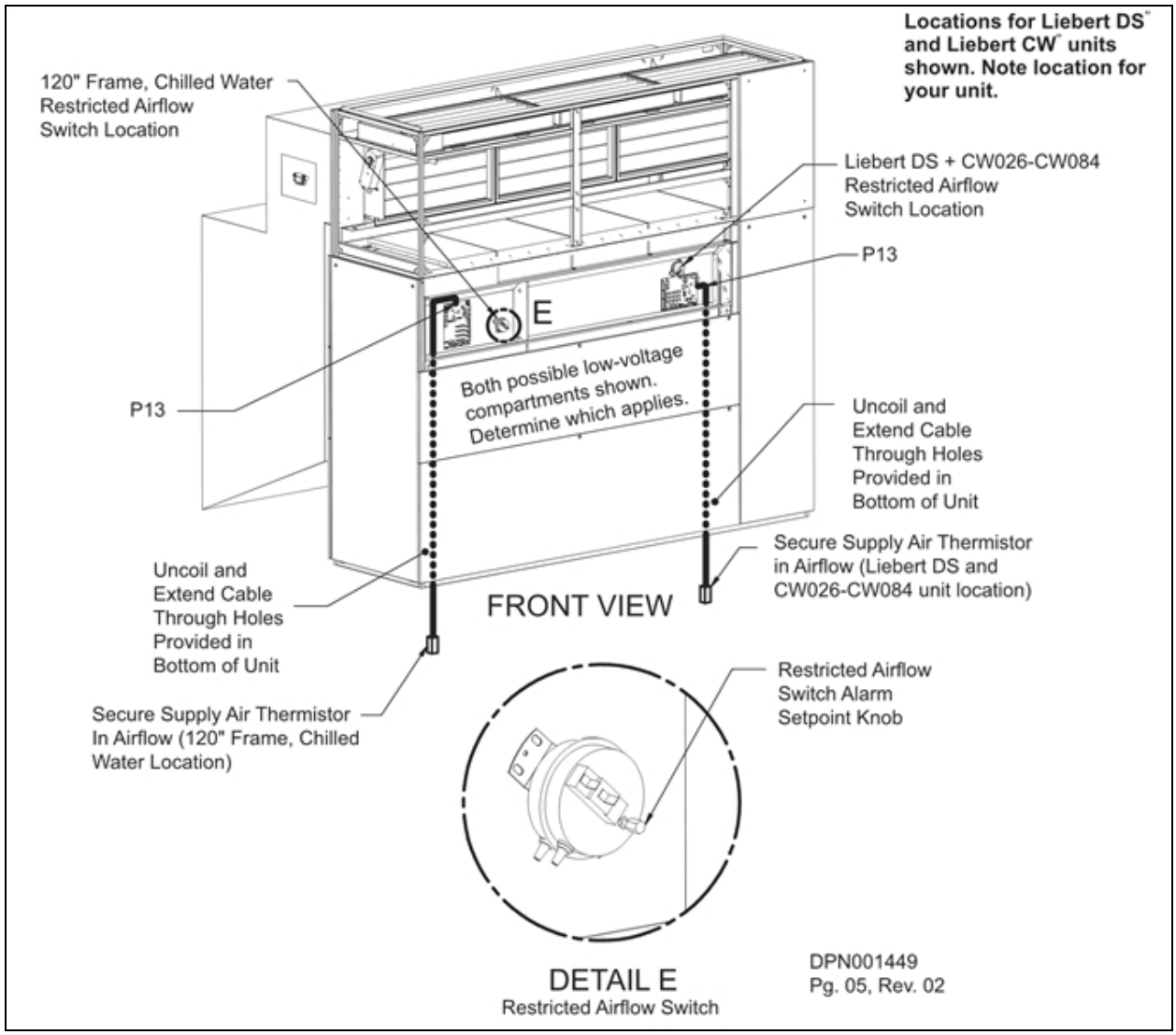
Figure 3.20 Supply Limit Thermistor Wiring and Restricted Airflow Switch Location



3.5 Vertiv™ Liebert® Air Economizer Operation

Vertiv cooling units control the Liebert® Air Economizer with the analog outputs of the Vertiv Liebert iCOM control. The Vertiv Liebert iCOM can be used with a Liebert® Air Economizer or with an air economizer supplied by others if equipped with 0-10VDC or 2-10VDC dampers. The Vertiv 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.

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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 Disable the Vertiv™ Liebert® Air Economizer on page 86 . This can be achieved by either connecting a freeze stat that interrupts the economizer signal or by wiring a freeze stat directly into the Vertiv 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.

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3.5.1 Vertiv™ 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 Vertiv Liebert iCOM.

Figure 3.21 below below 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 3.21 Air Flow Pattern of a Liebert® Air Economizer System—Regular Ceiling

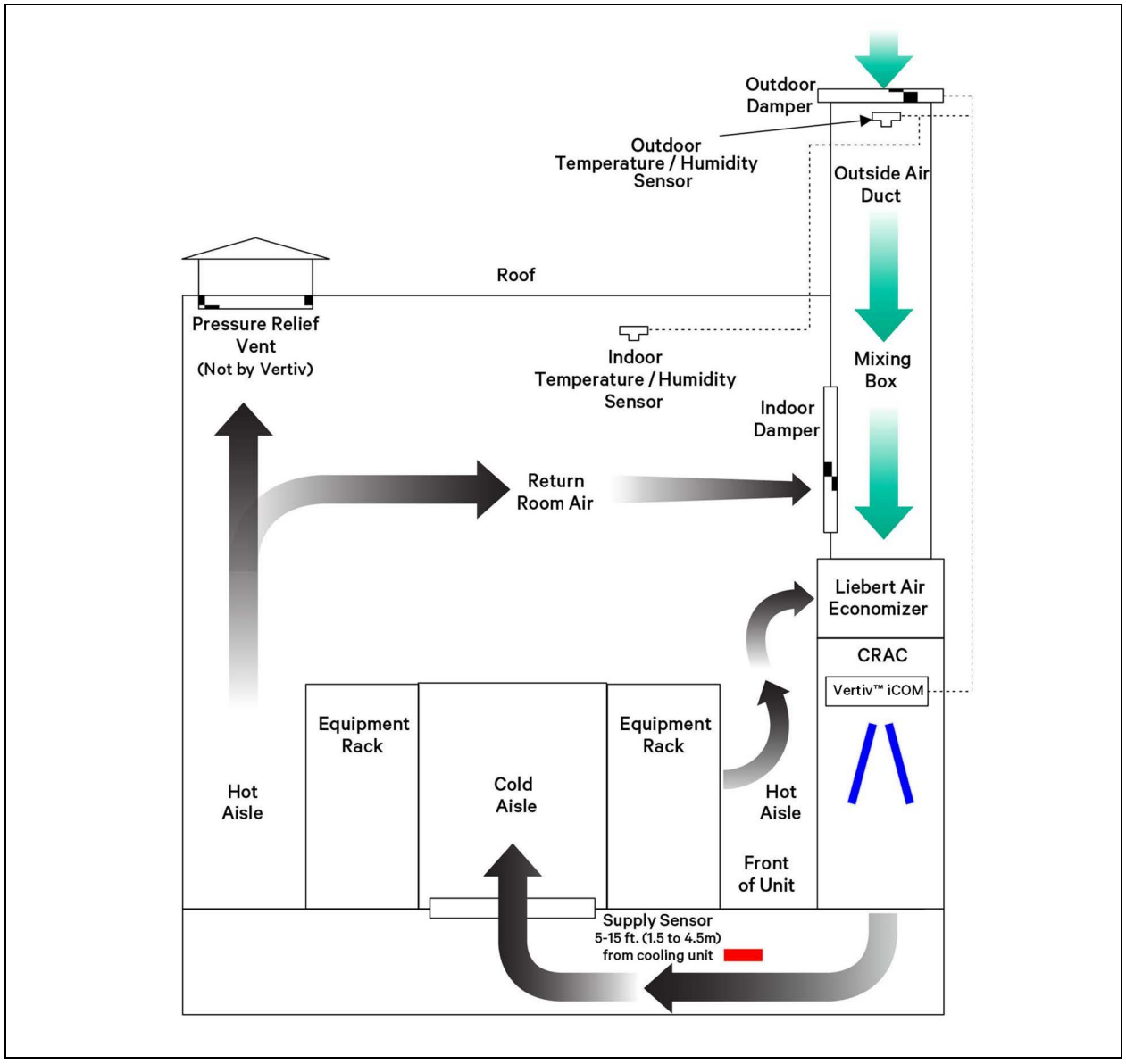

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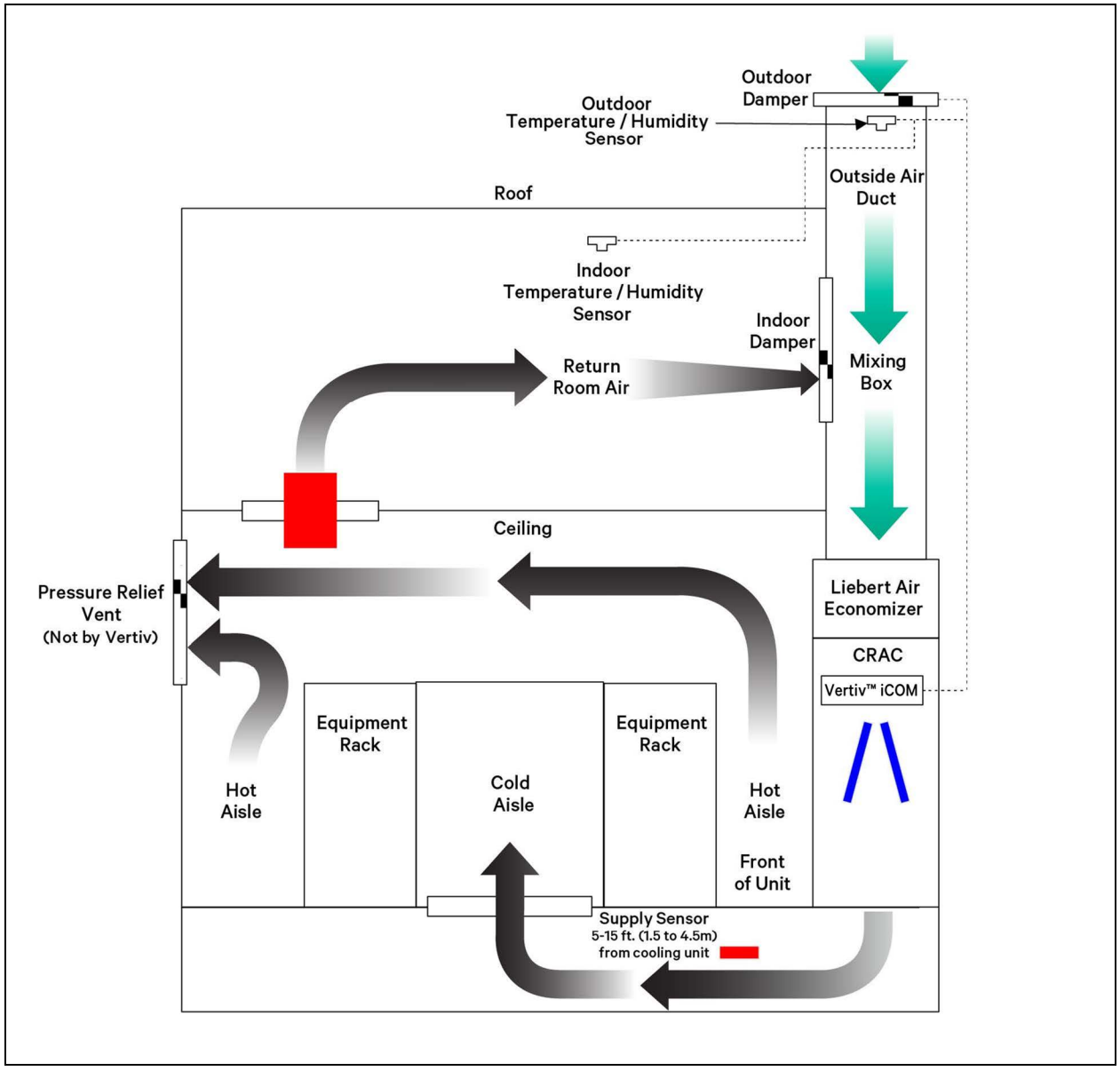
Figure 3.22 Air Flow Pattern of a Liebert® Air Economizer System-Dropped Ceiling



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.

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Startup Configurations

When a non-Vertiv 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 Vertiv 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 Vertiv 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 Disable the Vertiv™ Liebert® Air Economizer

The Liebert® Air Economizer can be disabled using a hard-wired deactivation switch, through the Vertiv Liebert iCOM display, or through a remote monitoring system using a Vertiv 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 3.23 on the facing page) 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 Vertiv Liebert IntelliSlot Modbus 485, Modbus IP and BACnet IP Reference Guide, SL-28170, for additional information. The manual is available at www.Vertiv.com. Deactivating the Liebert® Air Economizer will transfer all cooling to the secondary source.

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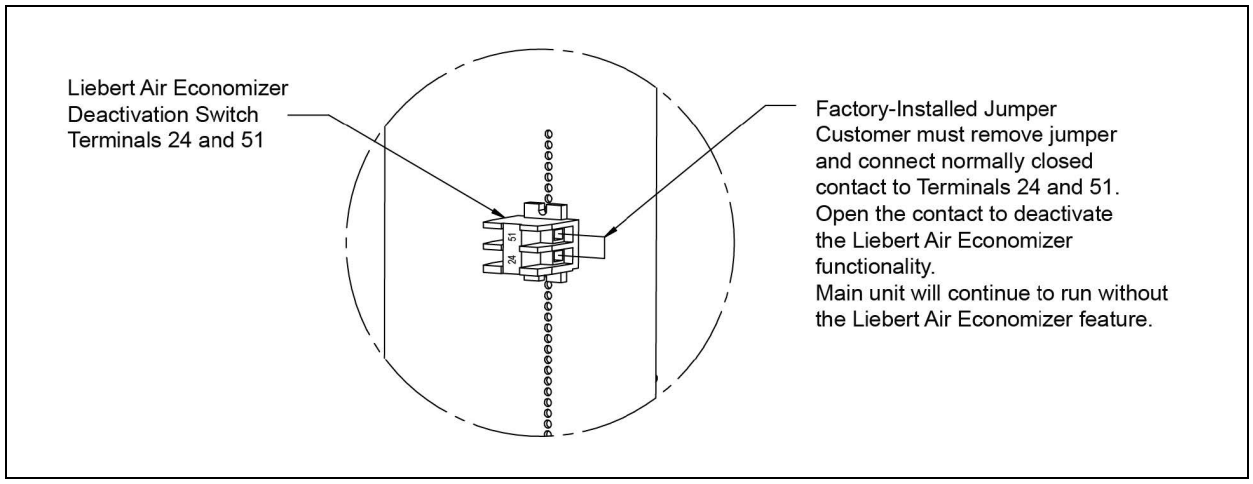
Air Economizer Remote Status Indication

The K11 relay can be activated when the Vertiv 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 3.23 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.

3.5.3 Adjust the Restricted Airflow Switch on the Vertiv™ 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 3.18 on page 45 shows the switch location in both the Vertiv Liebert CW and Vertiv CoolPhase Perimeter).

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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 Vertiv Liebert iCOM and cycling power to the cooling unit. The unit will now resume normal operation.

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4 Managing Events: Alarms, Warnings and Messages

Events are notifications of operating status for the cooling unit, its components, and auxiliary devices. All events are recorded in the Event Log, and alarm and warning events are also displayed on the Alarms panel (See Viewing the Event Log on page 21 , and Viewing Unit Alarms on page 17 .)

In some cases, depending on configuration, an alarm event may power off the cooling unit, but not always. However, if a standby unit is configured, all alarm events stop the faulty unit and start the standby unit. Message and warning events do not.

4.1 Event Properties

The ALARMS & EVENTS panel lists all events available on the system. You can view and modify events and the criteria that trigger visual/audible alarms including:

- Critical thresholds
- Time delays
- Enable/disable
- Event type
- Adding custom events

NOTE: Not all event properties may be adjusted, depending on the criticality of the event, which is factory set.

To open the panel:

Touch 

, then  > *Alarm/Event Setup*.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

4.1.1 Alarms and Events Panel Fields

Property

Lists groups of events, expanding displays the events in each group. See Enabling Events and Editing Event Settings on the next page .

Type

Event type. See Selecting Event Type and Setting Alarm/Warning Notification on page 91 .

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Ack

Indicates type of acknowledgment required. See Acknowledging Alarms on page 20 . This option is not available with all alarm types.

- Auto: The alarm is acknowledged automatically. It goes away if the situation that triggered alarm event is no longer true.
- Manual: The alarm goes away only when acknowledged, even if the situation that triggered the alarm event is resolved/no longer true.

Reset

Indicates type of reset required for the event. This option is not available with all alarm types:

- Auto: The alarm resets automatically after acknowledgment.
- Manual: The alarm must be reset manually after acknowledgment. See Acknowledging Alarms on page 20 .

4.2 Enabling Events and Editing Event Settings

In the ALARMS & EVENTS panel, events are grouped into categories for easier management, for example, the factory set remote sensor alarms and humidification/dehumidification events. In some cases, touch the group heading provides edit options for the entire group, like thresholds, delays and enable/disable. Each event includes settings specific for that event and the notification option where event type and alarm notifications are selected (See Selecting Event Type and Setting Alarm/Warning Notification on the facing page).

1. Touch 

, then  > *Alarm/Event Setup*. The ALARMS & EVENTS panel opens.
2. Scroll or search to find the event, touch the set's heading to display the properties and values for the entire set in the EDIT panel.
   – or –
   Touch an individual alarm or event to display it's specific values in the EDIT panel.

NOTE: To edit the event type and notification, see Selecting Event Type and Setting Alarm/Warning Notification on the facing page .

3. Use the EDIT panel to adjust the settings for the selected event or group of events.

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4.3 Selecting Event Type and Setting Alarm/Warning Notification

Setting notification delays and disabling visual notification prevents nuisance notifications. Customize to notify of critical events on your cooling system.

NOTE: If the event includes a safety function, such as high pressure, low pressure, main fan overload, etc., the safety function executes regardless of event type or notification setting. However, notification timing delays still apply.

Table 4.2 on the next page , lists the default and adjustable notification settings for events. Table 4.3 on page 95 , describes evens for the Vertiv CoolPhase Condenser. Table 4.4 on page 96 , describes events for the Vertiv EconoPhase unit. Table 4.5 on page 98 , describes events for the Vertiv CoolPhase Perimeter compressors. Table 4.6 on page 99 , describes events for the EEV alarm board.

To select event type and notification:

1. Touch 

, then  > *Alarm/Event Setup*.
2. Scroll or search to find the event and touch the alarm or event.
3. On the EDIT panel, touch *Notifications*. The EDIT panel displays the notification properties.
4. Adjust the notification properties described in the Notification Properties below , then touch *Save*. The notification is updated.
    - Touch *Cancel* to discard the changes without saving.

4.3.1 Notification Properties

Delay

Time, in seconds, to delay notification after event trigger. Depending on the event, the delay may or may not be adjusted. Table 4.2 on the next page , lists the delays and their default settings.

- If the notification delay for the event is greater than the delay set for the event group, the group's delay includes the event's delay.

Enable

Enables/disables notification. Touch the switch to set On or Off.

- When disabled, events are not logged or displayed and visual/audible alarm notifications are not made.

Type

Logging and notification level of the event. Table 4.1 on the next page , describes the event type and notification it generates. Table 4.2 on the next page , lists the default types for events.

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Table 4.1 Notification Types

Type	Description
Message	Stored in event log only. No visual or audible notification.
Warning	Listed with a yellow status dot on the ALARMS panel and the LED flashes. See **Table 11.1** on page 185 , and Viewing Unit Alarms on page 17 .
Alarm	Listed with a red status dot on the ALARMS panel, the LED flashes, and the audible alarm sounds. See **Table 11.1** on page 185 , Viewing Unit Alarms on page 17 , and Enabling the Audible Alarm Notification on page 100 .

Table 4.2 below , lists the default settings for each event.

- Internal delay is factory set and not adjustable. It is the time delay after event trigger that notification is sent.
- Default delay may or may not be adjustable and is added to the internal delay of event notification.
- Type may be adjustable or may be fixed.

NOTE: Depending on customization, some events may not be available on your cooling unit.

Table 4.2 Event Notification Defaults

Event	Internal Delay	Default Delay/Range for Adjustment	Type
MAIN FAN OVERLOAD	2 sec	5 sec/0 – 9999 *	ALM
LOSS OF AIRFLOW	3 sec	3 sec/0 – 9999 *	ALM
CLOGGED FILTERS	2 sec	2 sec/0 – 9999 *	WRN
HIGH ROOM TEMP	1 min. after fan on	30 sec/0 – 9999	Fixed to WRN
LOW ROOM TEMP	1 min. after fan on	30 sec/0 – 9999	Fixed to WRN
HIGH ROOM HUM	1 min. after fan on	30 sec/0 – 9999	Fixed to WRN
LOW ROOM HUM	1 min. after fan on	30 sec/0 – 9999	Fixed to WRN
HIGH TEMP SENSOR A	1 min. after fan on	30 sec/0 – 9999	Fixed to WRN
LOW TEMP SENSOR A	1 min. after fan on	30 sec/0 – 9999	Fixed to WRN
HIGH HUM SENSOR A	1 min. after fan on	30 sec/0 – 9999	Fixed to WRN
LOW HUM SENSOR A	1 min. after fan on	30 sec/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

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Table 4.2 Event Notification Defaults (continued)

Event	Internal Delay	Default Delay/Range for Adjustment	Type
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
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 sec	0 sec/0 – 9999WRN	
Condensate 1 Failure	0 sec	5 sec/0 – 9999	WRN
Condensate 2 Failure	0 sec	5 sec/0 – 9999	WRN
EC Fan Fault	0 sec	10 sec/0 – 9999	ALM

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Table 4.2 Event Notification Defaults (continued)

Event	Internal Delay	Default Delay/Range for Adjustment	Type
HIGH SUP TEMP	0 sec	30 sec/0 – 9999	WRN
LOW SUP TEMP	0 sec	30 sec/0 – 9999	ALM
REDUCED ECO AIRFLOW	0 sec	3 sec/0 – 9999	WRN
ECO HI TEMP OVERRIDE	0 sec	10 sec/0 – 9999	WRN
TEMP CTRL SENSOR FAIL	0 sec	3 sec/0 – 99999	ALM
HIGH DEW POINT	0 sec	30 sec/0 – 9999	WRN
LOW DEW POINT	0 sec	30 sec/0 – 9999	WRN
HI DEW POINT SENSOR A	0 sec	30 sec/0 – 9999	WRN
LOW DEW POINT SENSOR A	0 sec	30 sec/0 – 9999	WRN
HIGH REMOTE SENSOR	0 sec	30 sec/0 – 9999	WRN
POWER “A” FAILURE	0 sec	10 sec/0 – 9999	ALM
POWER “B” FAILURE	0 sec	10 sec/0 – 9999	ALM
AIRFLOW SENSOR FAILURE	0 sec	10 sec/0 – 9999	WRN
HUM CTRL SENSOR FAIL	0 sec	30 sec/0 – 9999	WRN
LOSS OF FLOW	0 sec	5 sec/0 – 9999	ALM
STAT PRES SENSOR FAIL	0 sec	120 sec/0 – 9999	ALM
LOW STATIC PRESSURE	0 sec	120 sec/0 – 9999	WRN
HIGH STATIC PRESSURE	0 sec	120 sec/0 – 9999	WRN
STATPRES OUT OF RANGE	0 sec	150 sec/0 – 9999	WRN
DAMPER FAILURE	0 sec	10 sec/0 – 9999	ALM
BMS DISCONNECTED	0 sec	ENABLED/DIS - ENAB	WRN

Table 4.3 on the facing page , describes events available with a Vertiv CoolPhase Condenser.

NOTE: A CANbus connection between the Vertiv CoolPhase Condenser and Vertiv Liebert iCOM is required to trigger these events.

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Table 4.3 Events Specific to Vertiv™ CoolPhase Condenser

Event	Description
CAN GC 1 or 2	• The Vertiv Liebert iCOM board cannot establish communication with the Vertiv CoolPhase Condenser board for 10 seconds consecutively. • Alarm notification displayed for the corresponding circuit. • Vertiv EconoPhase pump operation disabled for the circuit affected. • When Vertiv Liebert iCOM re-establishes communication with the Vertiv CoolPhase Condenser board, the event is reset.
GC 1 or 2 Rem Shutdown	• Remote shut down requested. • Compressor(s) and Vertiv EconoPhase pump(s) in the corresponding circuit are powered-off. • If event occurs on the lead circuit, then the lead-lag order of the compressors/tandem banks changes. • When the Vertiv CoolPhase Condenser remote-shutdown circuit returns to inactive state (closed), the event is reset and the compressors in that circuit may be powered-on. • Normal compressor lead-lag sequence resumes when both compressors are Off.
GC 1 or 2 Board Fail	An unrecoverable failure of the Vertiv CoolPhase Condenser control board has occurred causing a condenser shutdown.
GC Pres Sens Fail C1 or C2	Condenser pressure sensor failure
GC High Cond Press C1 or C2	High condensing pressure
GC Low Cond Press C1 or C2	Low condensing pressure
GC 1 or 2 Amb Sens Fail	Ambient-temperature sensor failure
GC 1 or 2 Amb Temp Limit	High/low ambient temperature
GC Temp Sens Fail C1 or C2	Refrigerant liquid line temperature-sensor failure
GC High Cond Temp C1 or C2	High refrigerant liquid line temperature

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Table 4.3 Events Specific to Vertiv™ CoolPhase Condenser (continued)

Event	Description
GC Low Cond Temp C1 or C2	Low refrigerant liquid line temperature
GC 1 or 2 Fan 1 through 4 FAIL	The following events may result from a fan failure alarm. Refer to the specific fan manufacturer's literature for troubleshooting information. • VSD high link current • VSD drive error • VSD earth to ground fault • VSD electronics heat sink thermal overload • VSD hall failure • VSD IGBT failure • VSD line fault • VSD motor locked • VSD motor thermal overload • VSD phase failure • VSD-specific uncategorized alarm detected • VSD electronics high-temperature condition • VSD high link voltage • VSD low link voltage • RS-485 communications failure
GC 1 or 2 TVSS Failure	TVSS alarm

Table 4.4 below , describes events available with a Vertiv EconoPhase.

Table 4.4 Events Specific to Vertiv™ EconoPhase

Event	Description
PB1 BOARD FAIL	An unrecoverable failure of the pump control board has occurred. Pump shut down. • Pump board must be rebooted to reset event.
PB1 CAVITATE SHUTDOWN	Pump has cavitated and shut down. • Event is reset when Vertiv Liebert iCOM requests a new startup.
PB1 IN PRES SENS FAIL	Inlet refrigerant pressure sensor failure. Pump shut down. • Event is reset when condition clears.
PB1 IN TEMP SENS FAIL	Inlet refrigerant temperature sensor failure. Pump shut down. • Event is reset when condition clears.
PB1 INV DATA SHUTDOWN	Invalid data detected and pump shut down. • Event is reset when Vertiv Liebert iCOM requests a new startup.
PB1 LO DIFF PRESSURE	Pump differential pressure fell below a lower threshold and pump shut down. Event is reset when Vertiv Liebert iCOM requests a new startup.

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Table 4.4 Events Specific to Vertiv™ EconoPhase (continued)

Event	Description
PB1 LO OUTLET TEMP	Pump outlet-refrigerant temperature fell below a lower threshold and pump was shut down. • Event is reset when Vertiv Liebert iCOM requests a new startup.
PB1 OUT PRES SEN FAIL	Outlet refrigerant pressure sensor failure. Pump shut down. • Event is reset when condition clears.
PB1 OUT TEMP SEN FAIL	Outlet refrigerant-temperature-sensor failure. Pump shut down. • Event is reset when condition clears.
PB1 CAN DISCONNECTED	Vertiv Liebert iCOM lost CAN communications with pump board. Pump shut down. • Event is reset when condition clears.
PB1 REMOTE SHUTDWN	Remote shut-down requested. Pump shut down. • Event is reset when condition clears.
PB1 STARTUP FAIL	Three pump start up attempts in a row have failed. • Event must be reset manually.
PB2 BOARD FAIL	An unrecoverable failure of the pump control board occurred. Pump shut down. • Reboot pump board to reset event.
PB2 CAVITATE SHUTDOWN	Pump has cavitated and shut down. Event is reset when Vertiv Liebert iCOM requests a new startup.
PB2 IN PRES SENS FAIL	Inlet refrigerant-pressure-sensor failure. Pump shut down. • Event is reset when condition clears.
PB2 IN TEMP SENS FAIL	Inlet refrigerant-temperature-sensor failure. Pump shut down. • Event is reset when condition clears.
PB2 INV DATA SHUTDOWN	Invalid data detected and pump shut down. • Event is reset when Vertiv Liebert iCOM requests a new startup.
PB2 LO DIFF PRESSURE	Pump differential pressure fell below a lower threshold and pump shut down. • Event is reset when Vertiv Liebert iCOM requests a new startup.
PB2 LO OUTLET TEMP	Pump outlet-refrigerant-temperature fell below a lower threshold and pump shut down. • Event is reset when Vertiv Liebert iCOM requests a new startup.
PB2 OUT PRES SEN FAIL	Outlet refrigerant pressure-sensor failure. Pump shut down. • Event is reset when condition clears.
PB2 OUT TEMP SEN FAIL	Outlet refrigerant temperature sensor failure. Pump shut down. • Event is reset when condition clears.
PB2 CAN DISCONNECTED	Vertiv Liebert iCOM lost CAN communication with pump board. Pump shut down. • Event is reset when condition clears.
PB2 REMOTE SHUTDWN	Remote shut-down requested. Pump shut down. • Event is reset when condition clears.

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Table 4.4 Events Specific to Vertiv™ EconoPhase (continued)

Event	Description
PB2 STARTUP FAIL	Three pump start-up attempts in a row have failed. • Event must be reset manually.
PB1 COMMUNICATE FAIL	Ethernet communications failure. Pump not shut down. • Event is reset when condition clears. USB communications failure. Pump not shut down. • Event is reset when condition clears.
PB2 COMMUNICATE FAIL	Ethernet communications failure. Pump not shut down. • Event is reset when condition clears. USB communications failure. Pump not shut down. • Event is reset when condition clears.
PB1 COND TO PUMP TEMP	Temperature variance from condenser 1 output to pump 1 input exceeds allowed parameters. Pump shut down. • Event is reset when Vertiv Liebert iCOM requests a new start up.
PB2 COND TO PUMP TEMP	Temperature variance from condenser 2 output to pump 2 input exceeds allowed parameters. Pump shut down. • Event is reset when Vertiv Liebert iCOM requests a new startup.
MM Cycle Lock Out	Vertiv EconoPhase operating in Mixed Mode has failed to control cooling 10 times in 6 hours. • Mixed Mode operation is disabled until the event is manually reset.
PB Cycle Lock Out	Vertiv EconoPhase in Pump Mode has failed to control cooling 5 times consecutively at full-pump-capacity temperature conditions. • Vertiv EconoPhase operation is disabled until the event is manually reset.

Table 4.5 below , describes events available with the Vertiv CoolPhase Perimeter compressor.

Table 4.5 Events Specific to Vertiv™ CoolPhase Compressor

Event	Description
COMP 1A OVERLOAD	Compressor overloaded. • The corresponding compressor is disabled until the condition resets. Some external overloads may require the device to be reset manually.
COMP 1B OVERLOAD	
COMP 2A OVERLOAD	
COMP 2B OVERLOAD	
COMP 1A HRS EXCEEDED	Compressor run-hour limit exceeded by actual run hours.
COMP 1B HRS EXCEEDED	
COMP 2A HRS EXCEEDED	
COMP 2B HRS EXCEEDED	

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Table 4.5 Events Specific to Vertiv™ CoolPhase Compressor (continued)

Event	Description
COMP 1A HIGH TEMP	High discharge temperature. Compressor is powered off.
COMP 1B HIGH TEMP	
COMP 2A HIGH TEMP	
COMP 2B HIGH TEMP	
COMP 1A DISCH SENSOR FAIL	Compressor discharge pressure sensor failed.
COMP 1B DISCH SENSOR FAIL	
COMP 2A DISCH SENSOR FAIL	
COMP 2B DISCH SENSOR FAIL	
COMP 1A SHORT CYCLE	Compressor exceeded the maximum number of stop/starts allowed in the time period.
COMP 1B SHORT CYCLE	
COMP 2A SHORT CYCLE	
COMP 2B SHORT CYCLE	
CIRCUIT 1 HIGH PRESS	Circuit 1 or 2 high discharge pressure.
CIRCUIT 2 HIGH PRESS	
CIRCUIT 1 LOW PRESS	Circuit 1 or 2 low suction pressure.
CIRCUIT 2 LOW PRESS	

Table 4.6 below , describes events available with the EEV alarm board.

Table 4.6 Events Specific to EEV Alarm Board

Event	Description
EEV 1 or 2 Communication Error	Vertiv Liebert iCOM lost communication with the EEV board. • The compressor(s) shut-off and the unit exits Vertiv EconoPhase while the error is active.
EEV 1 or 2 Sensor Error	Vertiv Liebert iCOM lost communication with a connected EEV sensor. • If a sensor value is not reported for 10 seconds, a sensor error occurs. The compressor(s) shut-off and the unit exits Vertiv EconoPhase while the error is active. • If 4 sensor errors occur in a 30-minute window, the Sensor Error event remains active until reset manually.
EEV 1 or 2 Motor Error	Problem with the stepper motor. • The corresponding compressor(s) are disabled until the condition is cleared.
EEV 1 or 2 Low Superheat	Superheat dropped below 1°F (–17°C) for 1 minute. • The corresponding compressor(s) are powered-off for the minimum “off time” while the event is active.

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Table 4.6 Events Specific to EEV Alarm Board (continued)

Event	Description
EEV 1 or 2 High discharge temp	Discharge temperature exceeded the high-temperature threshold. • The corresponding compressor(s) are powered-off until the alarm is manually reset.
EEV 1 or 2 Feedback Failure	The EEV control monitors feedback from the compressor contactor. Feedback Failure is reported if the contactor is de-energized while the EEV is operating for superheat control. • The corresponding compressor is disabled until the alarm is manually reset.
EEV 1 or 2 Battery Warning	The EEV control tests the EEV battery back-up (if included), and indicates low battery life. • If this warning remains active for 24 hours, a battery failure event occurs and the circuit is locked-out.
EEV 1 or 2 Battery Failure	The EEV control tests the EEV battery backup (if included), and indicates battery failure. • The corresponding EEV circuit is locked-out until the failure code is reset. See Resetting EEV Battery Failure Counter on page 190 .
EEV 1 or 2 Driver Failure	EEV unexpectedly closes with the compressor(s) powered on. • The corresponding compressor is disabled until the alarm is reset manually.
Comp 1 or 2 High Superheat	Superheat is above the high threshold for 30 minutes. • The compressor is powered-off for the minimum off time.

4.4 Enabling the Audible Alarm Notification

1. Touch 

, then  > *Display Options* > *Display Properties*.
The UNIT DISPLAY panel opens.
2. Touch the *Alarm Buzzer Pattern* value, and select a pattern from the drop-down list.
   - Selecting *None* disables the audible notification.
3. Touch *Save* to save the property settings.
   - Touch *Cancel* to discard changes.

4.5 Remote Alarm Device and Customer Input Events

Remote alarm devices are various sensors and detectors outside the cooling unit that provide information about conditions and situations that may affect operation. Remote alarm devices include smoke detectors, filter condition, valve status.

Included in the remote alarm devices option are up to four customer input events depending on cooling unit configuration. In some cases, 2 additional, optional customer-input events are available. See Setting Up Customer Input Events on the facing page .

Remote alarm devices and customer input notifications are set in the same way as other events. See Selecting Event Type and Setting Alarm/Warning Notification on page 91 .

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4.5.1 Setting Up Customer Input Events

Input devices must be wired to Terminal 24 through a dry contact to locations 50, 51, 55 and 56 for alarms 1 through 4 respectively (For the terminal location, refer to the cooling unit electrical schematic and installation manual). Table 4.7 below , maps the customer input to the remote alarm devices (RAD).

Table 4.7 Customer Input Terminals to Remote Alarm Device Terminals

Customer Input	Customer-input Terminal	RAD Number	RAD Terminal
1	24	1	50
2	24	2	51
3	24	3	55
4	24	4	56

1. Touch 

, then  > *Alarm/Event Setup* > *Remote Alarm Device Input*. The EDIT panel opens.
2. In *Customer Input X (where X is the input number)*, select the input type that best describes the wired device/input, see Table 4.8 on the next page .
3. In *Customer Input X Active When*, select whether the input is active (triggers events) when *Opened* or *Closed*.
4. Once input(s) are set, touch *Save*. The customer-input settings are saved.

Customer Input Options

Customer Input X

Selects the customer wired input, where X is the input number. See Table 4.8 on the next page , for a description of available values.

Customer Input *X* Active When

Selects when the input triggers an event. Options are:

- Opened: Events are triggered when the contacts across the corresponding RAD terminal strip are open.
- Closed: Vents are triggered when the contacts across the corresponding RAD terminal strip are closed.

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NOTE: Depending on customization, some events listed in Table 4.8 below , may not be available with your system.

Table 4.8 Customer Input Options

Input	Action/Description
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 + Electric heaters disabled.
Hum Lockout	Event + Humidifier disabled.
Rht+Hum Lock	Event + Electric 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 operating. 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-down the unit.
2ND SETPOINT	No event, but switches to the second setpoint.
Emergency Power	Event + Disables unit.
LSI	Event + Activates humidifier-problem Alarm and stop filling bottle when full.
COND 1 FAIL	Event only.

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Table 4.8 Customer Input Options (continued)

Input	Action/Description
COND 2 FAIL	Event only.
D-SCROLL RED	Event + Reduces requested compressor capacity by 20%.
SWAP VALVE	No event -Active X valve closes and Y opens/Inactive Y closes and X opens. See 7.3 - Custom Dual Chilled Water Valve Staging.
EC FAN FAULT	Event + Set analog output to 10 V.
ECO AIRFLOW	Event + Reduce Liebert® air economizer air flow.
DAMPERSWITCH	Damper + End switch.
POWER A	Event only.
POWER B	Event only.
Flow AL LFC	Activates event 'LOSS OF FLOW' and stops fluid free cooling operations.
Hand Mode	Activates event 'HAND MODE' when unit is on.
Fan Overrd.	Sets the fanspeed to the value defined by parameter S151 'Airflow Calibration'
Cool Overrd.	Sets call for cooling (CFC) to 100%.
Fluid Source 1	Triggers event 'FLUID SOURCE 1' indicating a loss of flow on supply source 1, no further reaction.
Fluid Source 2	Triggers event 'FLUID SOURCE 1' indicating a loss of flow on supply source 2, no further reaction.
ATS	Changes the ATS status switch in Service/Diagnostics menu from 'PS1' to 'PS2', and drives the front-screen Power Source information, no further reaction.
ATS PS1	Changes the ATS PS1 status switch in Service/Diagnostics from 'OK' to 'NOK', no further reaction.
ATS PS2	Changes the ATS PS2 status switch in Service/Diagnostics from 'OK' to 'NOK', no further reaction.
Harmonic Filter Temp	Triggers event 'HARMONIC FILTER TEMP' and shuts the unit down.
Door Open	Triggers event 'DOOR OPEN' and shuts unit down.
Water Leak Internal	Triggers event 'WATER LEAKAGE', no further action.
Max Cool Fan	Drives call for cooling (CFC) and call for fan speed (CFC) to 100% output. • MCF.003 'Transition Time to Max Cooling' - Configured time frame that defines how long it will take call for cooling to ramp to full cooling once MAX COOL is enabled. • MCF.004 ' Transition Time to Normal Cooling' - Configured time frame that defines how long it will take unit to ramp from MAX COOL to normal cooling output.
High Power Voltage	For units equipped with Modbus ATS, the highest phase-to-phase voltage of the currently utilized supply voltage (A or B line) may be monitored with a defined high voltage-threshold in place which will triggers event 'HIGH POWER VOLTAGE' once crossed.

NOTE: Max Cool operation may cause Vertiv CoolPhase Perimeter unit to transition out of Vertiv Econophase or Mixed Mode operation and into full mechanical cooling.

NOTE: When Max Cool is utilized on Vertiv CoolPhase Perimeter, upon exiting Max Cool operation, Vertiv Liebert iCOM shall reassess current conditions prior to transitioning to Vertiv Econophase (PRE pump) or Mixed Mod operation.

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5 U2U Networking

Vertiv Liebert iCOM-controlled thermal management units connected in an Ethernet unit to unit (U2U) network are able to efficiently cool and control humidity in the conditioned space by exchanging data in several modes of operation.

U2U networking is required to set up and control the following operating features:

- Teamwork
- Standby (lead/lag)
- Rotation
- Cascading

NOTE: The U2U network must be separate from other networks. Use a communication card, such as a Vertiv Liebert IntelliSlot Unity, to communicate securely between your building-management system or other networks.

5.1 Preparing for U2U Group Set Up

Cooling units in the network will be assigned to groups, which affects how units function in teamwork, standby, rotation, and cascading operations. Especially in large rooms, it is important to consider several factors before setting up groups to balance cooling unit operation with room conditions.

NOTE: For ease of set-up and use, we recommend using only one group unless you have multiple rooms, differing software versions, or different types of cooling units.

1. Make a map of the room and indicate the location of all heat-generating devices and cooling units to plan for proper heat load management and cooling-air distribution.
2. Note the type of units by product/model, size, etc.
3. Determine the number of units to network together to ensure proper air flow and environmental control, up to 32 units.
4. Determine number of standby units.
5. Determine if using teamwork and if so, which mode.
6. Plan U2U address assignments.
   - Refer to the U2U Control Board Settings on page 107 , for guidelines assigning cooling unit control board addresses.
   - Balance/Alternate unit address assignments based on room layout and because standby and teamwork operate in numeric order by unit number. Figure 5.1 on the next page , shows an example layout assignment with half of the cooling units in standby and half operating. Without a plan, adjacent units could be operating or inactive, which may not provide proper heat-load balance or efficient use of cooling capacity.

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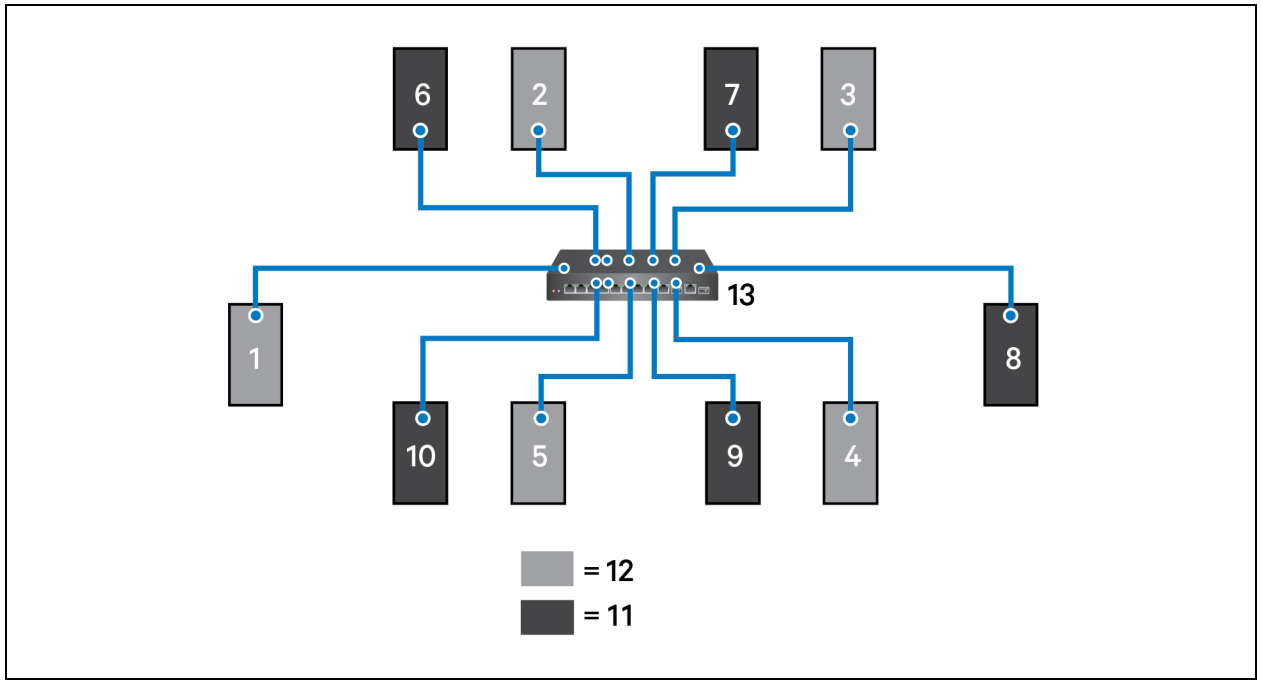
7. Read and record all programmed settings for each of the individual units (see Backing Up and Restoring Control Board Settings on page 181).
8. Verify that network cabling and switches are provided, ready to connect, and labeled by unit at the network switch.

NOTE: Cooling units are factory-wired for stand alone operation. Do not connect the U2U network cabling before setting the U2U network configuration/groups. Network communication conflicts and unreliable display readings will result. Configure the network using Configuring U2U Network Settings on the facing page , then refer to U2U Wiring Connections on page 222 , to connect the network cabling and hardware.

Figure 5.1 Example Layout Standby/Operating Unit Address Assignment



Item	Description
1 to 10	Assigned address of the thermal management unit
11	Operating units
12	Units on standby
13	Network switch

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5.2 Configuring U2U Network Settings

The U2U NETWORK SETTINGS configure Vertiv Liebert iCOM's unit to unit communication and includes information buttons, , that display pop-up field descriptions. The panel also indicates issues with the network settings. For resolution, see Troubleshooting Network Settings Issues on the next page .

To configure unit to unit networking:

1. Touch , then  > *BMS & Teamwork Setup* > *U2U Setup*.
   The U2U NETWORK SETTINGS panel opens.
2. Touch the field to edit. The keypad opens.
3. Type the entry and touch .
4. When all fields to edit are updated, touch *Save & Restart*.

NOTE: Depending on the changes made, the Save button updates to indicate the components that need rebooted or restarted. If the control board reboots, the cooling unit suspends operation for 60 seconds, then resumes operating.

5.2.1 U2U Control Board Settings

Broadcast

Logical address at which connected units receive datagrams.

NOTE: Messages sent to the broadcast address is typically received by all network-attached hosts.

CB Firmware Version

Display configuration based on the firmware version of the control board, as follows:

- PA-2.06: CW/DS, DSE, PDX/PCW

Gateway

Routes data and acts as proxy server/firewall for control board during network set up. Display and control board must be identical on the U2U network.

IP Address

Network address of the control board.

NOTE: Last three digits must be a unique value and need not be sequential. However, we recommend that they match the U2U address for easier reference later.

Netmask

Divides IP addresses in subnet and specifies network available to hosts for the control board.

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MAC Address

Unique, read-only identifier of the control board Ethernet device.

U2U Address

Unique identifier for each control board on the U2U network. Address range is 1 to 32 and must be consecutive from the previous control board address in the U2U group. This is the address used for standby/lead lag and cascade operation, see Figure 5.1 on page 106 .

NOTE: We recommend matching the U2U address to the last three digits of the IP address for easier reference later.

U2U Group

For the control board, selects the zone/group with which the unit will be configured in teamwork/standby/rotation scenarios.

NOTE: Units with a specific thermal area of influence should be assigned to the same zone/group, typically when a network spans separate rooms rather than by aisles. Groups are also handy when cooling units vary by cooling type, compressor type, or version of Vertiv Liebert iCOM firmware and otherwise do not operate together efficiently or at all.

5.2.2 Troubleshooting Network Settings Issues

At the bottom of the U2U NETWORK SETTINGS panel, an Issues button indicates whether or not there are problems with the network settings. The button indicates the number of issues and changes color when a problem exists, see Table 5.1 below .

Table 5.1 Issues Button Status Colors

Color	Description
Green	No problems. Number of issues is zero.
Red	Problem(s) detected. Number of issues displays.

To view network issues:

1. When an issue is indicated, touch the Issues(s) button on the U2U NETWORK SETTINGS panel. The ISSUES dialog opens.
2. Note the problems and *Close* the dialog, then address the issue:
   - Touch the setting to correct. The on-screen keyboard opens.
   - Make adjustments and touch *Go*.
   - Continue making corrections until no problems are indicated.
3. Verify that unit to unit communication is established, then touch *Save*.

NOTE: Depending on the changes made, the Save button updates to indicate the components that need rebooted or restarted. If the control board reboots, the cooling unit suspends operation for 60 seconds, then resumes operating.

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5.2.3 Modifying U2U Network Settings

1. Touch 

, then  > *BMS & Teamwork Setup* > *U2U Setup*.
The U2U NETWORK SETTINGS panel opens.
2. Touch the setting to edit and make adjustments, then touch .
3. Verify that unit to unit communication is established, then touch *Save*.

NOTE: Depending on the changes made, the Save button updates to indicate the components that need rebooted or restarted. If the control board reboots, the cooling unit suspends operation for 60 seconds, then resumes operating.

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6 Teamwork, Standby and Rotation for Cooling Units

U2U communication via private network and additional hardware (see U2U Networking on page 105) allows the following operating features for the cooling units:

- Teamwork
- Standby (Rotation)
- Cascade

6.1 Continuous Control with Virtual Master

The Virtual Master function maintains smooth control if group communication is compromised. In these operating configurations, a lead (master) unit is in charge of component staging in teamwork mode, unit staging, and standby rotation. If the lead unit gets disconnected, Vertiv Liebert iCOM automatically assigns a virtual master, which assumes the responsibilities of the lead unit until communication is restored.

6.2 Teamwork Modes

When Vertiv Liebert iCOM controlled thermal management units are connected to a network in a group or team, use teamwork to optimize performance and efficiency depending on the mode chose and its application.

In a panel with Status content, the Teamwork Mode icon indicates the mode selected, **Figure 6.1** on the next page . Touching the icon displays the Teamwork dialog from which you can access the teamwork-control settings.

6.2.1 To Set Up Teamwork

1. Touch the Teamwork-mode icon, then touch *Edit* on the teamwork dialog.
   – or –
   Touch 

, then  > *BMS & Teamwork Setup* > *Teamwork / Standby* > *TeamworkMode*.
2. Select the mode from the *Teamwork Mode* drop down in the TEAMWORK MODE CONTROL panel. The TEAMWORK/STANDBY panel opens.
3. Touch *Save*. Teamwork mode is set.
   - Touch *Cancel* to discard changes.

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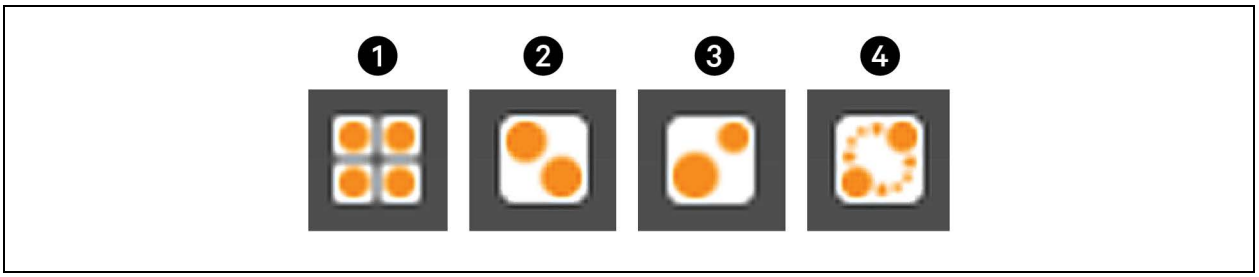
Figure 6.1 Teamwork Icons



Item	Description
1	No teamwork.
2	Mode 1 - Parallel teamwork
3	Mode 2 - Independent teamwork
4	Mode 3 - Optimized aisle teamwork

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

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Teamwork Control Options

Qty. Units included in Average

Defines the quantity of units sensor values (X) within a given network group that are included within the 'System' average calculation and used for control. The primary unit ranks the units by temperature value of:

- Temperature Control Sensor value (for modes B and C)
- Fan Control sensor values (for modes A, D, and E).

Vertiv Liebert iCOM shall use the (X) highest sensor values to calculate the system average used for control.

NOTE: This parameter is only available when units are configured for Teamwork Mode and the aggregation method is configured for "average".

NOTE: When Return Sensors are utilized for Fanspeed control, Return Sensor values on units placed in standby will not be used within the weighted aggregation of all Return Sensor values in the network group. Only Return Sensor values on operating units (Fan ON/Cooling ON) shall be included.

NOTE: When Remote Sensors are assigned to Fanspeed Control, Remote Sensor values on units in Standby shall be included within the weighted average and used for control.

Cascade Units

Stages on standby units based on room temperature/humidity load. Available in Teamwork modes 1 and 3, the options differ for each:

- Teamwork mode 1 Parallel options are:
  - Yes: Standby units cascade on based on a call for heating, cooling, humidification, or dehumidification.
  - Cool/Heat: Standby units cascade on with a call for heating or cooling only.
  - Cooling: Standby units cascade on with a call for cooling only.
- Teamwork mode 3 Optimized Aisle options are:
  - Fan P: Standby units cascade on based on the inability of active units to reach setpoint temperature or if using static pressure control, setpoint pressure while operating at full capacity.
  - Fan speed: Standby units cascade on based on the inability of active units to reach setpoint temperature or if using static pressure control, setpoint pressure while operating at full fan speed.

Cascaded Units Delay

Length of time in minutes to delay the activation of a stand-by unit after the previously activated unit starts, to prevent staged cascaded units from starting too close together or at the same time.

Cascaded Units Min Run

Length of time in minutes that an cascade on unit must run before powering off.

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Cascaded Units Off Delay

Length of time, in minutes, to delay powering-off a cascaded unit after fan speed drops below the *Stop Next Unit at SYS Fan Speed* setting.

Cascaded Units Quick Start

After a power cycle of the master unit, identical to Cascaded Units Delay except that it should be shorter to get units to start more quickly after a power cycle.

- This delay remains in effect until all cascaded units have been restarted, then the delay reverts to setting of Cascaded Units Delay.

Max. Intermediate System Speed

Limits the fan speed of the group until all units in cascade are powered on. Once all units are operating, the fan speed may increase beyond this setting.

Number of Connected Units

Number of units connected in the group if U2U networked.

Start Next Unit at SYS Fan Speed

Fan speed at which the next cascaded unit is powered on.

Stop Next Unit at SYS Fan Speed

Fan speed at which the next cascaded unit is powered off. Unit power off may be delayed by *Cascaded Units Off Delay*.

Based on

Select the way the sensor readings from each cooling unit in the group are used to control temperature and humidity. Options are:

- Maximum: based on the highest reading from a sensor in the group.
- Average: based on the average readings from the sensors in the group.

Type

Teamwork mode to use for the group.

6.2.2 No Teamwork—Multiple Zones in One Room

When a teamwork mode is not used, cooling units work independently based on their own sensors. Standby and unit rotation may be used, but cascading cannot.

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6.2.3 Teamwork Mode 1—Parallel Operation

In Teamwork mode 1, fan speed and cooling capacity are ramped up in parallel, which means that all units operate identically.

Teamwork mode 1 is best for small rooms with balanced heat loads. A master unit collects the controlling readings for temperature and humidity from all the operating (fan on) units in the group, then determines the average or worst-case reading, and sends operating instructions to efficiently distribute cooling capacity across available units.

In Teamwork mode 1, most parameters are shared and, when set in any unit, are set in all units in the group.

NOTE: Teamwork Mode 1 - Parallel is not supported on the Vertiv CoolPhase Perimeter product line.

6.2.4 Teamwork Mode 2—Independent Operation

Teamwork mode 2 works well for most applications, and best in large rooms with un-balanced heat loads by preventing units in a group from operating in opposing modes, some cooling and some heating. All temperature and humidity parameters are shared by the group. The master unit monitors all available unit-sensor readings and determines the demand for cooling, heating, humidification and dehumidification, then sends operating instructions to address the greatest demand.

In Teamwork mode 2, the setpoints for all units must be identical. The proportional band, deadband, and related settings may differ by unit. Fan speed is modulated per unit. Rotation and cascading is not available, so expect uneven distribution of work hours.

6.2.5 Teamwork Mode 3—Optimized Aisle Operation

In Teamwork Mode 3, the fan speed for all units operates in parallel, which means fan speed operation is identical at each unit. However, cooling capacity operates independently for each unit.

Teamwork mode 3 takes advantage of variable speed fan options and variable capacity component options to maintain rooms with an unbalanced load and to prevent units in a group from operating in opposing modes. All units operate in the same mode based on the average or worst case (maximum) readings from the unit sensors. A local control (cooling capacity supply sensor) provides input to manage and maintain the discharge-air temperature at each unit. In addition, fan speed and operation are controlled based on readings from the unit temperature or static pressure sensors to control air delivery to the cold aisle.

NOTE: Standby and lead/lag are available when using optimized aisle mode, but is not recommended because it requires less power to run all units at reduced capacity.

NOTE: The temperature setpoint for cooling capacity is shared across the network group in all Teamwork Modes. When sensor is assigned as the temperature control sensor, an additional parameter S103.3 Setpoint Calibration may be adjusted in order to include a temperature offset (positive or negative) on the supply temperature setpoint. This parameter allows the support of individual setpoints at each unit versus a shared setpoint across a network group.

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Setting Up Teamwork Mode 3

Teamwork mode 3 requires the following:

- Vertiv Liebert iCOM connection to a U2U network.
- Variable capacity compressors in the cooling unit.
- Variable speed fans in the cooling unit.
- Supply control air temperature sensors.

In addition, specific settings for wired remote (rack) sensors and setpoints are needed as described in the following steps.

To Set Up Optimized Aisle Operation

1. Set wired remote sensor function and mode:
   - Touch 

, then  > *Auxiliary Device Setup* > *Sensors* > *Wired Remote Sensors*.
   - Touch each sensor name, and select *Control* or *Reference* in *Function* based on rack set-up or preference, then touch *Save*.
   - On the SENSORS panel, touch *Setup* under Wired Remote Sensors, and select *Maximum* or *Average* in *Unit Remote Sensors Mode*, then touch *Save*.
     See Wired Remote Sensors on page 172 , for descriptions of all the wired remote sensor settings.
2. At each unit in the group:
   - Touch 

, then  > *Setpoints* > *Temperature Control*.
   - In *Temperature Control Sensor*, select *Supply Sensor*, then touch *Save*.
   - In *Temperature Setpoint*, select the setpoint based on the cooling unit's area of influence, then touch *Save*.
3. At the master unit:
   - Touch 

, then  > *Setpoints* > *Fan Control*.
   - In *Fan Control Sensor*, select *Remote Sensor*, then touch *Save*.
     The other units in the group are set automatically.
   - Touch 

, then  > *BMS & Teamwork Setup* > *Teamwork / Standby* > *Teamwork Mode*.
   - In *Teamwork Mode*, select *3 Optimized Aisle*.
   - In Teamwork is based on, select *Maximum* or *Average*, then touch *Save*.

   Teamwork mode 3 is set.
4. Monitor operation of the cooling units and adjust setpoints and control bands as necessary.

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6.3 Assigning Cooling Units to Standby (Lead/Lag)

Standby assigns some units to operate while others are on standby, meaning a unit is idle but ready to become active in the event of an alarm condition in one of the operating units or based on a rotation schedule.

When a unit is in standby mode, fan(s) are off and no cooling occurs. In multiple cooling unit systems, assigning units to standby lets you:

- Configure redundancy in case of failure scenarios (standby).
- Manage cooling unit run time (lead/lag). See Setting a Rotation Schedule on the next page .
- Modulate for very low loads to full design load (to be temperature reactive) by cascading activation of standby units (configured when setting up teamwork mode).

The U2U network has built-in fail over conditions that are automatically employed when standby units have been assigned:

- During single cooling unit or component failure, a standby unit is activated to replace the failed unit.
- Alarm event causes unit shut down, a standby unit is activated. If the activated unit also has an alarm event, the next available standby unit is activated. If all units have an alarm event, and no more stand-by units are available, a unit with a non-critical alarm event will be activated.

NOTE: Redundancy is employed if units are assigned to standby regardless of the teamwork mode selected, including no teamwork.

6.3.1 To Set Up Lead/Lag Operation

1. Touch 

, then  > *BMS & Teamwork Setup* > *Teamwork / Standby*. The TEAMWORK/STANDBY panel opens.
2. Touch *Standby*. The STANDBY CONTROL panel displays.
3. Adjust the settings, then touch *Save*.
   - Touch *Cancel* to discard the changes.

Standby Options

High Temperature Threshold

Temperature at which all standby units are activated.

Number of Standby Units

Number of units in standby mode.

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Standby Fan Timer at Reheat/Humidification

Length of time in minutes that the fan continues to operate after the cooling unit enters standby mode if reheat or the humidifier were operating when unit powered-off.

Start All Standby Units by High Temperature

When enabled, all units are activated to cool when a high temperature alarm occurs.

6.4 Setting a Rotation Schedule

You can set a rotation schedule to switch operating and standby units to manage run-time of the cooling units.

1. Touch 

, then  > *BMS & Teamwork Setup* > *Teamwork / Standby*. The TEAMWORK/STANDBY panel opens.
2. Touch *Unit Rotation*. The UNIT ROTATION CONTROL panel displays.
3. Adjust the settings, then touch *Save*.
   - Touch *Cancel* to discard the changes.

6.4.1 Unit Rotation Options

Lead Lag Overlap Timer

Length of time in minutes that cooling units operate in parallel when one begins operating (from standby) and the other goes into standby.

Rotate At

Selects exact time at which rotation occurs. Adjustable, based on 24-hour clock where minutes are 0 to 59 and are 0 to 23.

Rotate By

Number of positions by which the cooling units rotate. For example, rotate by 3 in a group of 10 units and start with unit 1 operating. At rotation, unit 1 goes to stand-by and unit 4 activates, then 7, 10, 2, and so on. You can select 1 to 8 units in a single rotation schedule.

Rotate Every

Selects rotation period. Valid values:

- 12 hrs
- 24 hrs

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Rotate Now

Immediately performs rotation.

Rotation Frequency

Frequency at which rotation occurs. Options include:

- No: Rotation disabled.
- Daily: Rotation occurs every day.
- Every [Day of Week]: Rotation occurs weekly on the same day.
- Monthly [Day of Week]: Rotation occurs monthly on the same day.

Dynamic Unit Staging Enable: Feature allows the end-user to redefine the unit-to-unit (U2U) staging order of the thermal units all from the Vertiv™ Liebert® iCOM-S supervisory layer of controls without having to make changes to the U2U address at each individual unit-level controller.

- Disabled = Traditional staging method based on U2U order defined at the Vertiv Liebert iCOM unit-level controller.
- Enabled = Dynamic unit staging as defined by U2U order configured via Vertiv Liebert iCOM-S.

Dynamic Unit Staging Order Time Delay:

- Time delay prior to unit transition
- Range = 0 - 600 sec, default = 10 sec

NOTE: Vertiv Liebert iCOM-S is required in order to utilize the Dynamic Unit Staging feature.

6.4.2 Manually Rotating the Operating and Standby Units

You can rotate the operating and standby units outside of the set schedule using Rotate Now.

NOTE: Manual rotation may only be performed at the cooling unit designated as the lead unit, "U2U Address = 1," of the group.

NOTE: The Rotate Now button may only be available when a Rotation Frequency is selected. See Setting a Rotation Schedule on the previous page .

1. At the cooling unit, verify that it is the lead unit of the group:
   - Touch 

, then 
 > *BMS & Teamwork Setup* > *U2U Setup*.
   - In the CONTROL BOARD column, verify that the *U2U Address* is **1**.

     If it is the lead unit, continue with step 2 .

     If it is not the lead unit, find the lead unit and start at step 1 .
2. Touch 

, then 
 > *BMS & Teamwork Setup* > *Teamwork / Standby*. The TEAMWORK/STANDBY panel opens.

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3. Touch *Unit Rotation*. The UNIT ROTATION CONTROL panel displays.
4. Touch *Rotate Now*, then touch *Save*. The operating and standby units are rotated.

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7 Configuring Economizer Operation

Use Vertiv Liebert iCOM to configure the economizer installed on your cooling unit.

NOTE: Depending on customization to your cooling system, one of two types of economizer may be installed: the Vertiv™ Liebert® Fluid Economizer or the Vertiv Liebert Air Economizer. Menu options differ depending on the type of economizer installed and significant differences are noted when they occur.

7.1 Fluid Economizers

Fluid economizers provide a secondary chilled water or glycol coil (Vertiv™ Liebert® Econ-o-Coil) for cooling. Economizer operation is commonly referred to as free cooling because it reduces or eliminates the use of the compressor(s) in the right environmental conditions.

Your system may have one of two kinds of fluid economizers:

- GLYCOOL Economizer: A two pipe system that feeds a second glycol coil in the cooling unit and also the compressor(s) and heat exchanger (Vertiv Liebert Paradenser, tube-in-tube condenser, or brazed-plate heat exchanger).
- Dual Cool Economizer: A two pipe or four pipe system.
  - A two pipe system provides chilled water to a second coil, bypassing the air cooled/condenser compressorized loop.
  - In a four pipe system, two fluid lines are dedicated to a second chilled water coil and two fluid lines are dedicated to a glycol cooled or chilled water cooled compressorized loop.

The fluid economizer option appears on the Vertiv Liebert iCOM service menu and opens the FLUID ECONOMIZER panel to configure operation.

7.1.1 Fluid Economizer Control Options

Override

Configures cooling unit override of economizer operation. See Overriding the Fluid Economizer Operation on the next page .

Setup

Configures the activation setpoints of the economizer. See Setting Up Fluid Economizer Operation on the next page .

Status

Status of economizer properties. See Viewing Fluid Economizer Statuses on page 127 .

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7.1.2 Overriding the Fluid Economizer Operation

Overrides the economizer's settings with those of the cooling unit.

1. Touch 

, then  > *Economizer* > *Override*. The OVERRIDE panel opens.
2. Select the override settings and touch *Save*.

Fluid Economizer Override Options

Enable Fluid Economizer

Enables/disables economizer operation.

Lockout FC at FC Fluid Below

When enabled, prevents frost on free cooling pipes by disabling the free cooling unit when the FC Fluid Temperature falls below the specified limit. The default setting is 32°F.

Stop FC at Setpoint Value

Temperature at which free cooling is locked out.

7.1.3 Setting Up Fluid Economizer Operation

Configures activation points of the economizer. The sensors used to control/activate secondary cooling are room/local air temperature sensor or return-air sensor and an Aquastat Sensor (AQ) that measures the glycol/chilled water temperature.

1. Touch 

, then  > *Economizer* > *Setup*. The SETUP panel opens.

   Indicator dots next to the parameters show the status of the property. Table 7.1 below , describes the color dots that indicate whether or not differential temperature (DT) Between Room and Fluid Value (depending on the selection for DT Between Room and Fluid Value) is within range for economizer operation. Indicators must be green to condition the space using the economizer. If an indicator is yellow, the economizer will not condition the space.

2. Refer to the Fluid Economizer Set Up Options on the facing page , and Temperature Control with a Fluid Economizer on page 124 , to adjust the setpoint options, then touch *Save*.

Table 7.1 Economizer Property Status Indicators

Indicator color	Definition
Green	The air or fluid meets the requirements for use.
Yellow	The air or fluid does not meet requirements and is ineligible for use.

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NOTE: Depending on the type of economizer with your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

Fluid Economizer Set Up Options

DT Between Room and Fluid Type

Selects the glycol/chilled water temperature input used by the comparator circuit to determine if the DT warrants use of secondary cooling.

- Disabled: Disables the second cooling source in dual cool configurations and is the default setting for standard, compressorized units and for chilled water units without a second cooling source.
- Contact: An external input is used to determine secondary cooling activation based on the open/closed status of the contact:

  Open: Activate second cooling source.

  Closed: Deactivate second cooling source.
- Temp: The difference between the fluid temperature and the room air temperature (Temperature Setpoint) determines use of secondary cooling. (The difference parameter is set with the DT between room and fluid value slider. When the difference is equal to or greater than the selected value, secondary cooling is used.)
- Set: Enables free cooling when the sensed fluid temperature is colder than the Temperature Setpoint. (The difference parameter is set using the DT between room and fluid value slider. When the difference is equal to or greater than the selected value, secondary cooling is used.)

DT Between Room and Fluid Value

Temperature difference between fluid and room air at which secondary cooling activates. For example, when set at the factory default 12°F (–11.1°C), secondary cooling activates when the fluid temperature is 12 or more degrees colder than the room air temperature/setpoint.

Minimum CW Temp

Enables/disables setting a minimum chilled water temperature that controls simultaneous operation of chilled water secondary cooling and compressor(s).

Minimum CW Temp Value

Temperature of the fluid that determines whether or not secondary cooling and compressor(s) operate simultaneously:

- If the fluid temperature is below the minimum temperature and if the temperature differential is satisfied (DT between room and fluid value), then the compressor(s) are locked out and the secondary chilled-water coil provides cooling.

NOTE: If secondary cooling fails (for example, loss of water flow), this setting is overridden and the compressor(s) activated. If this occurs, free cooling is locked out for one hour.

- If the fluid temperature is above the minimum temperature, chilled water and the compressorized cooling will operate simultaneously if needed.

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Enable Free Cooling Flush

Number of hours between flushes of the free cooling coil.

Free Cooling Flush Duration

Length of time the for flush of the free cooling coil.

Free Cooling Flush Starts K11

When enabled, the Q15 relay is activated during the free cooling flush.

Ramp Up Fan at 100% FC

Enables/disables an increase in fan speed when free cooling reaches 100% capacity.

7.1.4 Temperature Control with a Fluid Economizer

When an economizer is installed, the cooling requirement (determined by the temperature proportional band) is addressed first by the economizer's secondary cooling, if the economizer cooling capacity is insufficient, the compressor(s) begin cooling to bring the room air temperature down to the temperature setpoint.

The fluid economizer employs a motorized ball valve that controls the flow of chilled water/glycol to provide a cooling capacity from 0% to 100%.

Simultaneous Operation, Partial Economizer Operation, and Staging Cooling Sources

When simultaneous operation of the compressor(s) and secondary cooling is enabled, the portion of the proportional band assigned to the fluid capacity valve may be reduced by the comparator circuit based on the DT settings. When this occurs, the compressor control proportional band moves closer to the setpoint, and compressorized cooling begins before secondary cooling reaches 100% (as shown in the example Secondary Cooling Temperature Control with Two Step Compressor on the facing page) or shuts off.

CAUTION: On units with a GLYCOOL fluid economizer and standard scroll or semi-hermetic compressors without unloaders, there is a risk of over cooling and low refrigerant pressure when free cooling/secondary cooling operates simultaneously with compressor/DX cooling. Make sure adequate flow is provided when 100% free cooling and compressorized cooling occur at the same time. If the fluid temperature is too cold while the compressors are running, the refrigerant pressure will drop. Contact technical support at 1-800-543-2778, opt. 5 for more information on setting up simultaneous operation.

NOTE: The compressor control method is not affected by economizer operation and operates across the assigned proportional band based on the compressor configuration of your system (1 step, 2 step, 4 step, or digital scroll). See Compressor Control by Cooling Requirement on page 31 , for a description compressor control methods.

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Secondary Cooling Temperature Control with Two Step Compressor

When the fluid temperature meets the set up requirements, secondary cooling provides temperature control as follows. If the fluid is not cold enough, primary compressorized cooling operates as normal.

NOTE: The compressor control method is not affected by economizer operation and operates across the assigned proportional band based on the compressor configuration of your system (one step, two step, four step, or digital scroll). See Compressor Control by Cooling Requirement on page 31 , for a description compressor control methods.

- 70° temperature setpoint
- 8° temperature proportional band
- 2° temperature deadband

In Figure 7.1 on the next page :

The proportional band is divided evenly on each side of the setpoint, and an additional half of the proportional band is added to the cooling side for 200% cooling.

- At 71° air temperature (cooling demand 0%), the fluid control valve is closed.
- As cooling demand increases from 0% to 100%, the fluid control valve opens incrementally to increase cooling capacity proportionally until fully open at 75° (cooling demand 100%).

NOTE: If simultaneous operation of economizer cooling and compressor (DX) cooling is enabled, the compressor(s) may begin operation before the valve is open 100% because the fluid temperature differential is calculated to provide insufficient cooling.

- At 100% cooling demand, the compressor control method is employed across the additional half of the proportional band, a single scroll compressor with unloaders in this example:
  - The compressor starts unloaded at 77° when the cooling requirement is 150%.
  - At 79° when the cooling requirement is 200%, the compressor operates loaded until 77° is reached when cooling requirement is 150% when it returns to unloaded operation.

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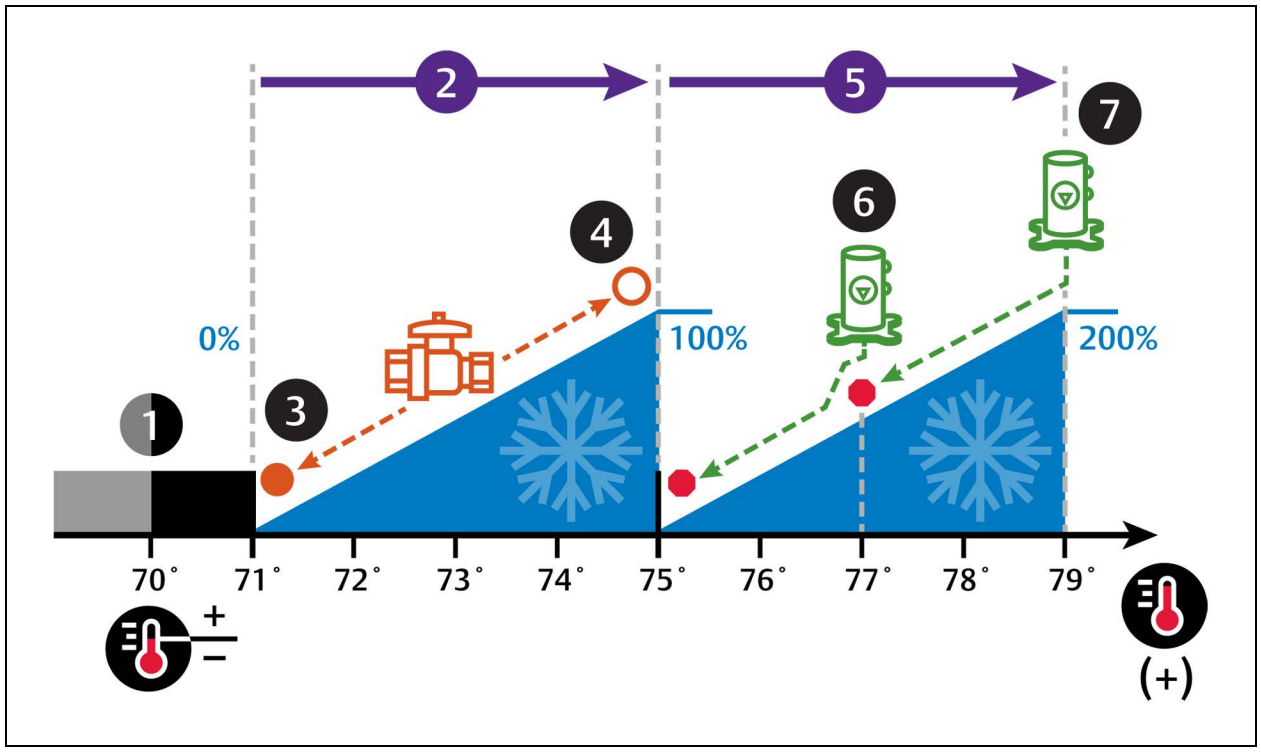
Figure 7.1 Temperature Control—Fluid Economizer and Example Two Step Compressor Capacity



No.	Description	No.	Description
1	Deadband.	5	½ of proportional band assigned to compressor(s) operation.
2	½ of proportional band assigned to valve operation.	6	Scroll compressor step 1. (Compressor 1 in dual compressor configuration, Unloaded in single compressor configuration.)
3	Fluid control valve closed.	7	Scroll compressor step 2. (Compressor 2 in dual compressor configuration, Loaded in single compressor configuration.)
7	Fluid control valve fully open.		

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7.1.5 Viewing Fluid Economizer Statuses

Display the status of the economizer features installed in the cooling unit.

- Touch 

, then  > *Economizer* > *Status*. The STATUS panel opens.
    - If the status indicators are not all green, the economizer is not used to condition the unit. To adjust the settings, see Setting Up Fluid Economizer Operation on page 122 .

Fluid Economizer Status Options

FC Capacity

Cooling capacity of the fluid economizer.

Free Cooling Fluid Temperature

Current temperature of the free cooling fluid.

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8 External Monitoring and Building Management Systems

Vertiv Liebert iCOM-controlled cooling units are equipped with embedded Vertiv™ Liebert® IS-Unity-DP™ software to communicate with external monitoring systems including Building Management Systems (BMS), Network Monitoring Systems (NMS) and Vertiv™ Liebert® SiteScan™ Web.

Embedded Unity communicates with multiple third-party protocols to monitor and manage a range of parameters and events. The Embedded Unity software delivers:

NOTE: Because the Vertiv Liebert iCOM U2U network must be separate from other networks, use external monitoring or BMS to communicate securely between networks.

- Velocity Protocol for Vertiv™ Trellis™, Vertiv Liebert SiteScan and Vertiv™ Liebert® Nform.
- Embedded Vertiv™ LIFE™ Technology for Remote Service Delivery.
- SNMP (v1/v2/v3) for NMS.
- HTTP/HTTPS for web page viewing.
- SMTP for e-mail.
- SMS for mobile messaging.
- Modbus RTU-Modbus Remote Terminal Unit communication protocol for BMS over an RS-485 serial network (Modbus RTU RS-485).
- Modbus TCP-Modbus Transmission Control Protocol for BMS over Internet or LAN.
- BACnet IP—BACnet over Internet Protocol for BMS over Internet or LAN.
- BACnet MSTP—BACnet Primary-Secondary/Token-Passing communication protocol for BMS over an RS-485 serial network (Modbus MSTP RS-485).

8.1 BMS and Vertiv™ Liebert® IntelliSlot™ Settings

When communicating with a building management system (BMS) with an optional Vertiv Liebert IntelliSlot Unity card or via embedded Unity function, the BMS settings are identical and include:

- Disconnect fail safe
- Manual fan speed control
- Allowing the BMS to change fan speed
- Backup fan control

8.1.1 Configuring BMS Communication with Embedded Unity

By default, built-in Unity function is disabled. You must enable communication with the BMS via the Vertiv Liebert IS-UNITY options in Vertiv Liebert iCOM.

To configure Modbus, BACnet, SNMP, SMS, SMTP, and HTTP communication, see Communication Setup with Embedded Unity on page 132 .

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To Enable Embedded Unity Function

1. Touch 

, then  > *BMS & Teamwork* > *BMS Setup*.
The BMS SETUP panel opens.
2. Select *IntelliSlot Card Settings* and one of the following in *Monitoring Protocol*:
   - *Embedded* to use built-in Unity function.
   - *Embedded & IS V4* to use built-in Unity and additional Vertiv Liebert IntelliSlot™ card or Vertiv™ Liebert® SiteLink connection.
3. Touch *Save & Restart (Unit Only)*.

IntelliSlot Options

Monitoring Address

Address used by an optional, installed Vertiv Liebert IntelliSlot card. Factory default is 3.

- Do not modify the monitoring address unless directed to do so by Vertiv technical support.

Monitoring Protocol

Protocol used for communication with BMS. Options are:

- Velocity V3: Legacy Velocity communication card.
- IGM: IGMNet communication cards.
- Velocity V4: Vertiv Liebert IntelliSlot Card or Vertiv Liebert Sitelink/Vertiv Liebert Sitescan. This is the factory default.
- Embedded: Embedded Vertiv Liebert IS-UNITY function.
- Embedded and IS V4: To use built-in Unity and an additional Vertiv Liebert IntelliSlot card or Vertiv Liebert SiteLink/Vertiv Liebert Sitescan connection.

NOTE: If a Vertiv Liebert Sitelink/Vertiv Liebert Sitescan Connection and MODBUS RTU or BACnet MSTP RS-485 connection is required simultaneously, then the purchase of the RS-485 expansion board is required.

8.1.2 Setting BMS Control Settings

1. Touch 

, then  > *BMS & Teamwork* > *BMS Setup* > *Control Settings*. The CONTROL SETTINGS secondary panel opens.
2. Adjust the settings, and touch *Save*. The settings are configured.

NOTE: Use Configure Timeout to configure the setpoints used in the event of an outage and BMS takes control. See Setting BMS Backup Setpoints on the facing page .

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

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BMS Control Settings Options

BMS is Connected To

- Velocity
- Analog Input 1-4

BMS Fan Speed Local Override

Enables/disables local override of the fan-speed set via BMS.

Fan Control Sensor

Currently-selected fan control sensor. Must be set to Manual for BMS control. See Configuring Fan Setpoints on page 45 .

Monitoring Handshake

Sets a time period, in minutes, in which communication between the BMS and Vertiv Liebert iCOM must occur.

Maximum Fan Speed

Current fan speed setting (set via fan setpoints or by BMS).

8.1.3 Setting BMS Backup Setpoints

1. Touch 

, then  > *BMS & Teamwork* > *BMS Setup* > *Configure Timeout* button on the lower-right of the panel. The CONFIGURE TIMEOUT secondary panel opens.
2. Adjust the values, and touch *Save*. The settings are configured.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

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BMS Timeout Settings Options

BMS Backup Fan Operation

Enables/disables BMS operation of the fans during back up operation. Options are:

- Disabled - There is no reaction when BMS is disconnected. Unit shall remain as is.
- BMS Backup Spd - Fanspeed shall change to setting defined by parameter S162 "BMS Backup Fanspeed" when the BMS is disconnected.
- Coupled - Links the call for fanspeed percentage (%) to the call for cooling percentage (%). The fan shall still ramp between the minimum percentage and the STD speed percentage (MAX), still respecting the airflow calibration.
- BMS Backup Set - When configured, the current fan setpoint used for control (S147 "Fan Setpoint") shall be replaced by value configured by Vertiv Liebert iCOM parameter S162 "BMS Backup Fan Setpoint".
- SP Control - S146 "Fan Control Sensor" shall change back from 'Manual' to 'Return' and the static pressure related to the fan speed starts at the most recent BMS manual speed, eventually controlling to that speed.

  The BMS timer must be configured for this setting to activate.

BMS Backup Temp Setpoint

Temperature that the cooling unit maintains during BMS back up operation.

8.2 Communication Setup with Embedded Unity

The following sections describe the configuration options for embedded Unity function including Modbus, BACnet, SNMP, SMTP, and HTTP communication.

NOTE: The Unity configuration is also accessible through the Unity web interface. For details on accessing and using the web interface, refer to the *Vertiv™ Liebert® IntelliSlot™ Unity Card Installer/User Guide*, available at www.vertiv.com.

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Vertiv Liebert IS-UNITY setup includes the following options to configure Unity function and communication:

- Connection
  - Connecting to the BMS below
  - Embedded Unity User and Password on page 137
  - Troubleshooting Unity Connection and Set Up on the next page
- Configuration
  - System Configuration on page 137
  - Local Users Configuration on page 139
  - Network Configuration on page 140
  - Web Server Configuration on page 143
  - Remote Services Configuration on page 145
  - Velocity Protocol Configuration on page 148
  - Messaging Configuration on page 149
- Protocols
  - BACnet Protocol Setup on page 155
  - Modbus Protocol Setup on page 158
  - SNMP Protocol Setup on page 160
- Unity Status Readings on page 165
- Unity Support Information on page 166

8.2.1 Connecting to the BMS

The embedded Unity software resides on the Vertiv Liebert iCOM control board. There are two methods of connecting to a BMS, via Ethernet or RS-485.

For a network connection, connect the Ethernet cable from the BMS to P74 on the Vertiv Liebert iCOM control board. **Figure 8.1** on the next page , shows the connector location.

For an RS-485 connection, connect the serial cable form the BMS to TB3 on the Vertiv Liebert iCOM control board. Pin 1 is the positive terminal on the right in **Figure 8.1** on the next page .

If the optional RS-485 expansion board is purchased, TB1 on the expansion board is used for BACnet MSTP or MODBUS RTU and TB3 on the Vertiv Liebert iCOM board directly to a Vertiv Liebert Sitelink/Vertiv Liebert Sitescan system.

Please see Configuring BMS Communication with Embedded Unity on page 129 .

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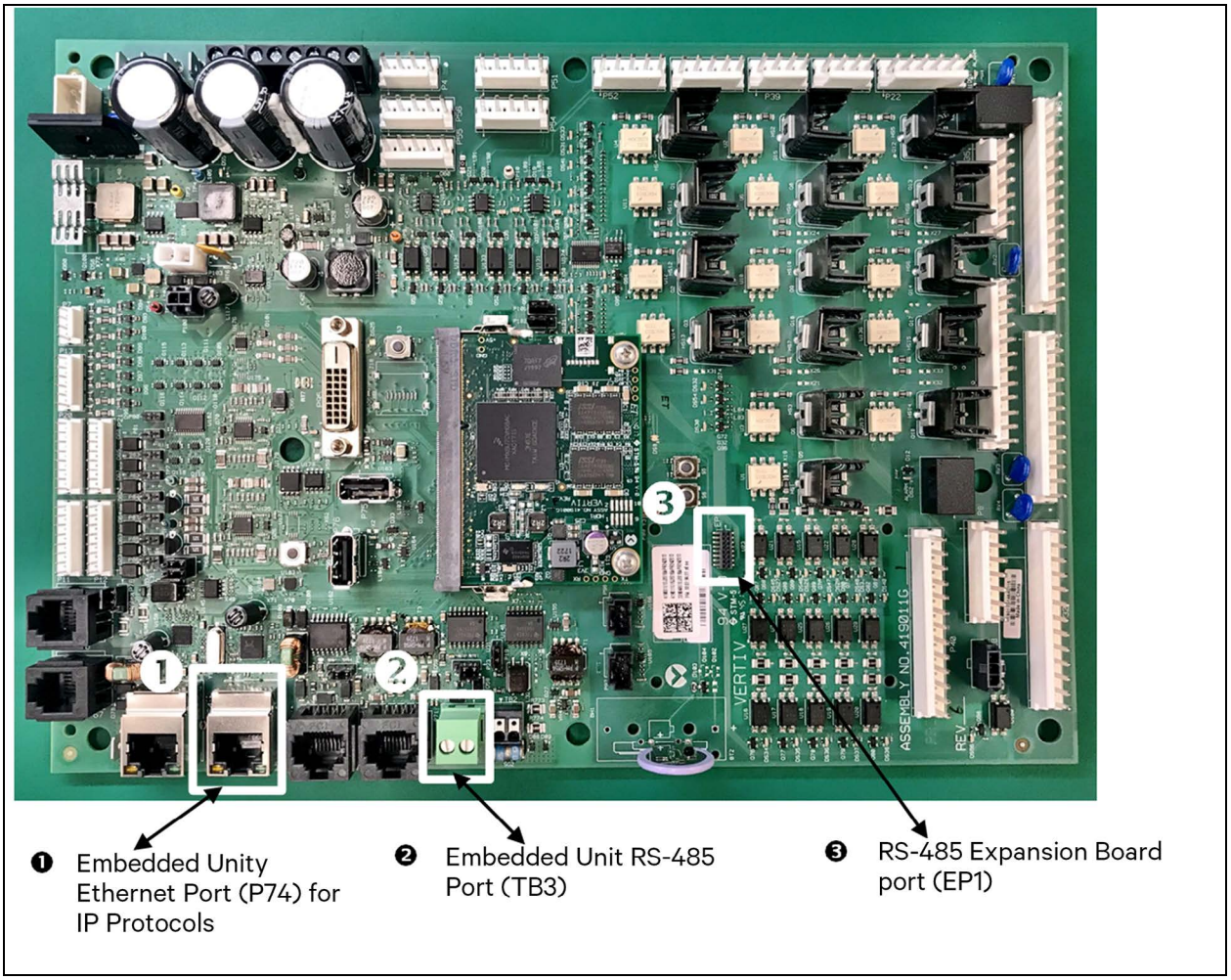
Troubleshooting Unity Connection and Set Up

Figure 8.1 RS-485 Expansion Board



No.	Description
1	Embedded Unity Ethernet port (P74) for IP protocols
2	Embedded Unity RS-485 Terminal Block (TB3) for BACnet or Modbus over twisted pair
3	RS-485 Expansion board port (EP1)

The expansion board is needed only if there is a requirement to do Velocity 4 to Vertiv Liebert IntelliSlot based cards and BACnet or Modbus RS-485 simultaneously. See Figure 8.2 on the facing page for the expansion board.

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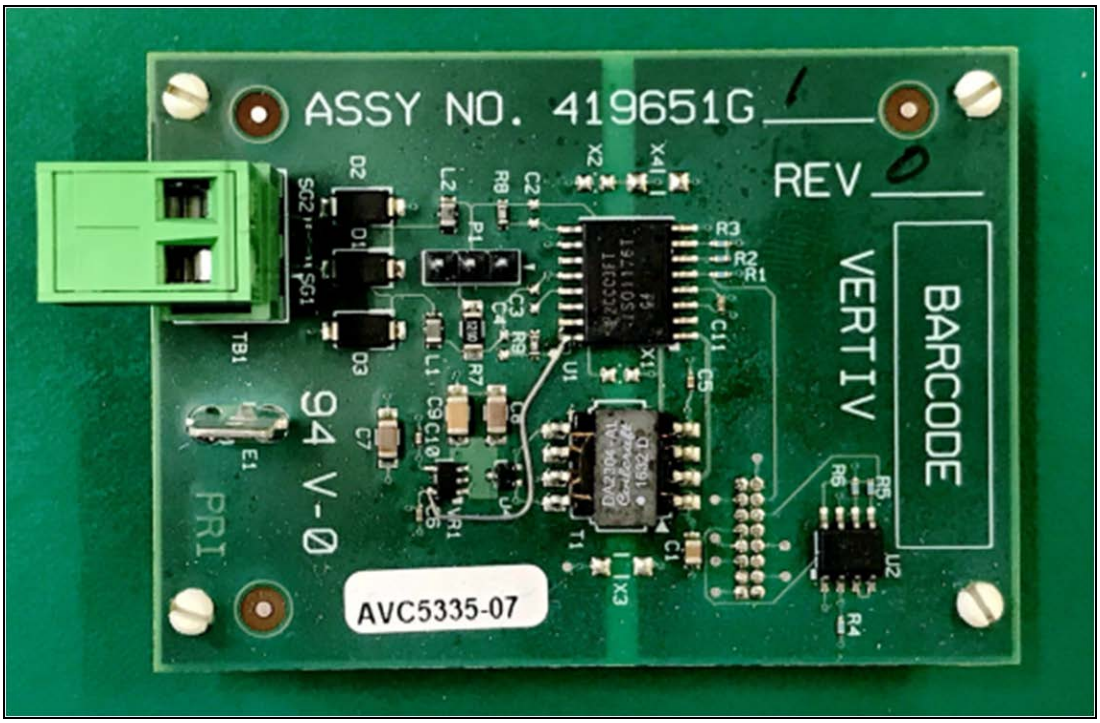
Figure 8.2 Expansion Board



NOTE: The TB1 for RS-485 Terminal Block is used if a Vertiv Liebert Sitelink/Vertiv Liebert Sitescan connection and MODBUS or BACnet MSTP is required simultaneously.

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Table 8.1 below , lists problems you may encounter with the Unity software and possible solutions.

Table 8.1 Embedded Unity Troubleshooting

Problem	Possible cause	Suggested Remedy
Settings are not available in local unit Vertiv Liebert iCOM display, show as "*IS-Unity Service is Unavailable*"	Embedded Unity is not enabled.	Make sure the correct monitoring protocol is selected in BMS Setup. See Configuring BMS Communication with Embedded Unity on page 129 .
	Unity software needs more time to boot up since most recent Vertiv Liebert iCOM controller or Unity reboot.	Wait no more than 10 minutes to give enough time to boot up.
	The Vertiv Liebert iCOM user and password for Unity are incorrect.	Enter a valid user name and password for the Vertiv Liebert iCOM-to-Unity connection. See Embedded Unity User and Password on the facing page .
	Embedded Unity has crashed.	Restart, and wait at least 5 minutes to fully boot up. See Unity Restart and Restore Defaults on the facing page .
	Unity configuration had become corrupt.	Restore to defaults, see Unity Restart and Restore Defaults on the facing page . **NOTE: All customized Unity configuration settings will be lost. Use this as a last resort.**
Ethernet to BMS network not communicating or connecting	BMS Ethernet drop is connected to the wrong RJ-45 connector on the Vertiv Liebert iCOM control board.	Make sure that the cable is connected to P74 on the Vertiv Liebert iCOM control board, and corrected if needed.
	Ethernet cable is bad or incorrectly made.	Use a cable tester that gives a quality rating and length (sends a true data packet) to test the cable and correct as needed.
	Incorrect network settings.	Correct the IPv4 network settings, see IPv4 and IPv6 Configuration on page 141 . **NOTE: If you adjust the settings, you must restart the Unity software for the changes to take effect.**
485 twisted pair to BMS network not communicating or connecting	Incorrect polarity.	Correct the polarity. See Connecting to the BMS on page 133 .
	Incorrect protocol settings.	Verify and correct the settings. Refer to the configuration settings that apply to your system: • BACnet Protocol Setup on page 155 . • Modbus Protocol Setup on page 158 . • SNMP Protocol Setup on page 160 .
	Protocol settings have not been saved.	Save the settings, and restart Unity so the configuration is authorized/applied. See Unity Restart and Restore Defaults on the facing page .

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8.2.2 Embedded Unity User and Password

Changes to the Unity configuration are authenticated with a user/password that is stored in Vertiv Liebert iCOM. The stored user name and password must match that of a user account in embedded Unity, see Local Users Configuration on page 139 , for a description of the Unity accounts.

You will be prompted to create a new administrator login in the initial setup.

NOTE: CWE-521, Password Complexity requires the following:

Minimum of 8 to a maximum of 30 case-sensitive, printable characters (excluding: \'<>~?#, double quote and space). Also must contain a combination of upper and lower case, digit and special characters. The password cannot contain the username.

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Settings*.
2. Adjust the Username and Password, and touch *Save*.

8.2.3 Unity Restart and Restore Defaults

Some types of configuration changes require a restart of the embedded Unity software to take effect. Using the Restart IS-Unity option, does not affect the Vertiv Liebert iCOM controller.

You also have the option of restoring the configuration to factory defaults if communication problems occur and cannot be remedied with troubleshooting

To Restart Embedded Unity

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Settings*.
2. Touch *Restart IS-Unity*, then *Save*.

To Reset the Configuration to Factory Defaults

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Settings*.
2. Touch *Default IS-Unity Setup*, then *Save*.

8.2.4 System Configuration

System displays general information about the monitored and managed device. You can select the temperature units displayed, which is Celsius by default.

To Update the System Settings

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Configuration* > *System*.
2. Adjust the information, and touch *Save*. The settings are configured.

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Time Service Settings

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Configuration* > *System* > *Time Service*.
2. Adjust the settings, and touch *Save*.

Time Service Setting Options

External Time Source

The external source to use for time synchronization. Default is NTP Server.

Primary NTP Time Server

URL, Hostname, or IP address of the primary NTP time source. Has a 64 character maximum.

Backup NTP Time Server

URL, Hostname, or IP address of the back-up NTP time source. Has a 64 character maximum.

NTP Time Sync Rate

The rate at which time will be synchronized with the network time protocol server, if NTP is the external time source.

Time Zone

Time zone where the device is located.

Enable Auto-Sync to Managed Device

Enable automatic writing time to the managed device.

Managed Device Auto-Sync Rate

Rate at which time will be written to the managed device, if an external time source has been selected.

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8.2.5 Local Users Configuration

Local Users offers up to 10 users and three access levels described in Table 8.2 below .

Table 8.2 User Access Levels

Level Name	Access/ Permission Type	Description
No Access	None	The No Access level is enforced when Password Protected Site is enabled.
General User	Read-only	Able to view all tabs, folders and sub-folders of the user interface. A General User will only need to enter the assigned password if Password Protected Site is enabled, see Web Server Configuration on page 143 .
Administrator	Read/Write	Able to edit settings using the assigned password, which is always required to edit settings/configuration. CWE-521: Minimum of 8 to a maximum of 30 case-sensitive, printable characters (excluding: \'<>~?#, double quote and space). Also must contain a combination of upper and lower case, digit and special characters. The password cannot contain the username.

IMPORTANT! Record user names and passwords and save them in a secure place where they can be found if forgotten. A lost password cannot be retrieved from the Vertiv Liebert IS-UNITY card. If the administrator password is lost, the card must be reset to factory defaults and reconfigured.

To Change the User Names and Passwords

NOTE: CWE-521, Password Complexity requires the following:

Minimum of 8 to a maximum of 30 case-sensitive, printable characters (excluding: \'<>~?#, double quote and space). Also must contain a combination of upper and lower case, digit and special characters. The password cannot contain the username.

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Configuration* > *Users* > *User [n]*.
2. Enter a new user name and password.
3. Re-enter the password to confirm it.
4. In *Authorization for User*, select the type of access, see Table 8.2 above .
5. Touch *Save*.

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8.2.6 Network Configuration

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Configuration* > *Network*.
2. Adjust the settings, and touch *Save*.

Network Setting Options

Speed Duplex

Selects the speed and duplex configuration of the card's Ethernet port. It is set to Auto by default. If it requires changing, contact the system administrator for the proper settings.

Hostname

Identifies the network node. Default is UNITY-*serial_number_of_card*.

Domain Name Suffix List

Listing of domain name suffixes for resolution of host names. If it requires changing, contact the system administrator for the proper setting.

Telnet Server

Enables/disables telnet access to the card to prevent unauthorized changes. The default setting disables telnet access.

SSHv2 Server

Enables/disables SSHv2 (Secure Shell) access to the card to prevent unauthorized changes. The default setting disables SSHv2 access.

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IPv4 and IPv6 Configuration

The IPv4 and IPv6 settings determine which internet protocol will be used for communication over the network connected to the Ethernet port. IPv4 and IPv6 networks will run in parallel (dual stack network), but the protocols are different. See your network administrator to determine which protocol should be enabled and to determine the correct settings.

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Configuration* > *Network* > *IPv4* or *IPv6*.
2. Adjust the settings, and touch *Save*.

IPv4 Settings

IPv4 Protocol

Enables IPv4 in the card

IP Address Method

Mode the card boots into to be a network ready device (Static, DHCP, BootP). Default is DHCP.

Static IP Address

Network address for the interface.

Subnet Mask

Network mask for the interface which divides a network into manageable segments

Default Gateway

IP address of the gateway for network traffic destined for other networks or subnets.

DNS Server Address Source

Source of DNS server identification (None, Automatic, Configured).

Primary DNS Server

Network address of the primary DNS server.

Secondary DNS Server

Network address of the secondary DNS server.

IPv6 Settings

IPv6 Protocol

Enables IPv6 in the card.

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IP Address Method

Mode the card boots into to be a network ready device (Static, Auto). Default is Auto.

Static IP Address

Network address for the interface.

Prefix Length

Prefix length for the address that divides a network into manageable segments.

Default Gateway

IP address of the gateway for network traffic destined for other networks or subnets. Default is 64.

DNS Server Address Source

Source of DNS server identification (None, Automatic, Configured). Default is Automatic.

Primary DNS Server

Primary DNS Server

Secondary DNS Server

Secondary DNS Server

Domain Name Server Test

The Domain Name Server (DNS) test checks key points of a DNS setup for a given domain.

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Configuration* > *Network* > *DNS Test*.
2. Adjust the settings, and touch *Save*.

DNS Test Settings

Last Query Response

Response from a DNS to the last query.

Example: *gxtwebdemo.liebert.com* resolved to *126.4.203.251*

Type of Query

Type of DNS query. (Hostname, IP Address)

Query Value

Value for the domain name server (DNS) to resolve. Example: *gxtwebdemo.liebert.com*

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8.2.7 Web Server Configuration

Web Server Settings configures some security settings, such as HTTP or HTTPS, and password enabling.

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Configuration* > *Web Server*.
2. Adjust the settings, and touch *Save*.

Web Server Settings

Web Server Protocol

Select the operation mode of the web server (HTTP, HTTPS).

HTTP Port

Standard web port not encrypted. Required if HTTP is enabled as web server protocol. Default is 80. Must be set to 80 for correct Vertiv Liebert iCOM connection.

HTTPS Port

Standard secure web port; all communication is encrypted. Required if HTTPS is enabled as web server protocol. Default is 443. Must be set to 443 for correct Vertiv Liebert iCOM connection.

Password Protected Site

When enabled, a log in session is required before any device information is displayed to the user. User level credentials will allow only viewing of device information. Administrator level credentials are required to make any changes. Default: enabled.

Remote Write Access

When enabled, all web browsers have write access to data on all Unity card web pages when the user is logged in with Administrator credentials. When disabled, write access is restricted to web browsers connected on an Autoconfiguration IPv4 address. An Autoconfiguration IPv4 address is of the form 169.254.x.x, and is negotiated automatically when a direct connection is made between the Ethernet port of your PC and the Ethernet port of the Unity card. Regardless of this setting, all web browsers always have read access to the web pages (subject to the setting of the Password Protected Site parameter), and the diagnostic information file can be generated when the user is logged in with Administrator credentials (see Unity Support Information on page 166).

NOTE: When remote write access is disabled, an indicator is displayed in the upper right corner of the web page as a reminder, shown in the following figure.

NOTE: Only disable remote write access if you are absolutely sure that you do not need to administer the managed device or the Unity card through a remote web browser session.

Session Idle Timeout

The interval the software will wait before logging off a user unless there is user activity. The default is five minutes.

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Certificate Configuration

When the web server protocol is configured to use HTTPS communications, all web server communication with all browsers is encrypted and validated based upon the security algorithms and validity checks specified in the SSL certificate that is currently installed in the card. By default, the card generates its own unique, self-signed SSL certificate when it is first powered up. However, many installations want to install and use SSL certificate files that were generated by their own Certificate Authority (CA).

Selections in Certificate provide commands to Upload SSL Certificate PEM Files or Generate Self-Signed SSL Certificate.

Certificate Commands

Generate Self-Signed SSL Certificate

Generates and installs a new self-signed certificate based on the mode selected for Generate Self-Signed SSL Certificate Mode. See Generating a Self-Signed SSL Certificate on the facing page .

Generate Self-Signed SSL Certificate Mode

Method used to generate a self-signed SSL certificate. Options are:

- Use Default Values: The values used in place of the user configurable fields are the same as those used when the original SSL certificate was generated by the card on first power up. The default values are not displayed.
- Use Configured Settings: The user entered values in the configurable fields are used to generate the certificate.

NOTE: When using configured settings, all of the configurable fields, described below, must have an entry to successfully generate a certificate.

Common Name

Fully qualified domain name that browser clients will use to reach the card's web server when it is running with the certificate generated with the name entered here.

Organization

Organization or company identified as the owner of the generated certificate.

Organizational Unit

Organizational unit or company division of the organization identified as the owner of the generated certificate.

City or Locality

City or locality of the organization identified as the owner of the generated certificate.

State or Province

State or province of the organization identified as the owner of the generated certificate.

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Country Code

Country code (two letter abbreviation) of the organization identified as the owner of the generated certificate.

Email Address

E-mail address of the contact within the organization identified as owner of the generated certificate.

Generating a Self-Signed SSL Certificate

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Configuration* > *Web Server* > *Certificate*.
2. In Generate Self-Signed SSL Certificate Mode, select the mode to use.
   - If you select *User Configured Settings*, make entries in all of the configurable-value fields (required).
3. Touch *Save*.
4. Follow the instructions in the dialog to generate and install the certificate.

8.2.8 Remote Services Configuration

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Configuration* > *Remote Services*.
2. Adjust the settings, and touch *Save*.

The folder contains sub-folders for connectivity and diagnostics:

- Remote Services Connectivity on the next page
- Remote Services Diagnostics on page 147

Remote Service Options and Settings

Serial Number From Device

Serial number obtained from the managed device. Identifies the device to the system unless *Device Serial Number Override* is enabled.

Reset Remote Services Config

Resets configuration of the remote service back to factory defaults.

NOTE: Does not reset the communication card configuration.

Remote Service

Enables/disables remote service connection.

Device Data Sampling

Enables/disables, data sampling of the device.

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Device Serial Number

Serial number used when *Device Serial Number Override* is enabled.

Device Serial Number Override

Enables/disables use of the serial number obtained from the managed device.

Site Equipment Tag Number

Number from the site equipment tag.

Site Identifier

Site identification number.

Device Instance ID

Manufacturer's device identification number.

Service Center Country

Country in which the device is serviced.

Remote Services Connectivity

Remote Service Connectivity Options and Settings

Connectivity Test Result

Result of most recent connectivity test.

Test Connectivity

Initiates connectivity test.

Evaluate Remote Services Configuration

Attempt to connect to the remote service to verify the configuration.

Remote Service Platform URL

URL address of the remote-service platform. Do not enter the "http://" or "https://" prefix.

Connection Retry Time

Length of time to attempt reconnection in the event of a communication failure. Range is 30 to 600 seconds.

Proxy Enable

Enables use of remote service platform URL to connect with a proxy server.

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Proxy Authentication

Enables authentication of the proxy server.

Proxy Address

IP or URL address of the proxy server.

Proxy IP Port Number

Port number of the proxy server. Range is 1 to 65535.

Proxy User Name

User name of the proxy server.

Proxy User Password

Password of the proxy server.

Remote Service Cloud URL

URL address of the remote-service cloud. Do not enter the "http://" or "https://" prefix.

Remote Services Diagnostics

Remote Service Diagnostic Settings

Communication Status

Results of the most recent transaction.

Communication Error Count

Number of communication errors since reboot.

Last Communications Error

Most recent communication error message since reboot with date and time stamp.

Monitored Device Rule File Information

Details about the remote service rule file in effect for the monitored device.

Remote Services Operating Status

Status of the remote service.

Managed Device Status

Status of managed device's communication with the card.

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8.2.9 Velocity Protocol Configuration

Velocity protocol contains four sub-folders: Managed Device, MSTP, Ethernet, and Internal.

NOTE: With the exception of changing the node ID when multiple cards are used or when disabling Velocity Protocol IP access, the settings in the Velocity Protocol sub-folders should not be modified unless directed by a Vertiv representative.

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Configuration* > *Velocity Protocol*.
2. Adjust the settings, and touch *Save*.

Velocity Protocol Options

Velocity Protocol IP Access

When disabled, prevents access from a remote, IP-based system using the Velocity Protocol.

Velocity Protocol Managed Device Options

Connection State

Status of connection to managed device.

FDM Version

Version of the managed device.

Product Sequence ID

Product sequence identifier of the managed device.

LAN Type

Type of interface connection to the managed device. Must be set to MSTP Internal for correct communication with Vertiv Liebert iCOM.

Node ID (MSTP Only)

Identifier of the managed device on an MSTP LAN.

IP Address (IP Only)

Address of the managed device on an IP LAN.

Velocity Protocol MSTP Options

Interface

Type of MSTP interface.

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Data Rate

Communication rate in bps.

Max Master Address

Maximum node ID in-use on the MSTP interface.

Network Number

Network number of the MSTP interface. 1 to 65534.

Node ID

Node ID of the agent card on the MSTP LAN. 0 to 127.

Velocity Protocol Ethernet Options

Velocity Protocol IP Port Number

Port number of the IP interface, 1 to 65535.

Network Number

Network number of the Ethernet interface, 1 to 65534.

Velocity Protocol Internal Options

Network Number

Internal network number used on the agent card. Not available to other interfaces.

8.2.10 Messaging Configuration

Messaging enables and disables email and text messaging about events. It includes a test to determine if email and text messages can be successfully sent. Settings specify message recipients, the format or the messages, and other details.

Messaging Options

Email

May be enabled to send email messages about events

SMS

May be enabled to send text messages about events

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E-mail Messaging Configuration

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Configuration* > *Messaging* > *Email*.
2. Adjust the settings, and touch *Save*.

E-mail Settings

E-mail From Address

Sender's e-mail address. In most cases this will be the e-mail address of the person to whom replies should be sent. For example, *Support@company.com*

E-mail To Address

E-mail address of the recipient. Multiple e-mail addresses should be separated by a semicolon.

E-mail Subject Type

Subject of the email. This value will default to the event description. The subject line can be customized.

Custom Subject Text

The subject of the email can be changed

SMTP Server Address

Fully qualified domain name or IP address of the server used for relaying email messages. If using a server name, a DNS server may need to be configured under Network Settings.

SMTP Server Port

SMTP server port.

SMTP Connection

SMTP server connection type. Determines the capabilities of the SMTP server. Options are:

- Clear: Do not use encryption
- SSL/TLS: Encryption using SSL/TLS connection
- STARTTLS: SSL/TLS encryption initiated using STARTTLS.

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SMTP Authentication

Enable or disable email SMTP authentication. An e-mail account must be provided for the SMTP service provider to authenticate.

NOTE: Some e-mail servers may require account-configuration changes to allow communication with the Unity card. For example, Gmail only recognizes Google applications as being secure. However, they provide an account setting that allows authentication with what they consider "less-secure apps." Please see your network administrator or service provider for configuration details.

SMTP Username

Username of the e-mail account to use when e-mail SMTP authentication is enabled.

SMTP Password

Password for the e-mail account to use when e-mail SMTP authentication is enabled.

Include IP Address in Message

If checked, the IP Address of the agent card will be included in outgoing messages.

Include Event Description in Message

If True, SNMP event description will be included in outgoing messages.

Include Name in Message

If checked, the agent card Name will be included in outgoing messages.

Include Contact in Message

If checked, the agent card contact will be included in outgoing messages.

Include Location in Message

If checked, the agent card location will be included in outgoing messages.

Include Description in Message

If checked, the agent card description will be included in outgoing messages.

Include Web Link in Message

If checked, a web link to the agent card and web server listening port number will be included in outgoing messages.

Enable Event Consolidation

If checked, multiple events will be sent per outgoing message.

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Consolidation Time Limit

If Event Consolidation is enabled, a message will be sent when Consolidation Time Limit seconds has passed since the first buffered event was received.

Consolidation Event Limit

If Event Consolidation is enabled, a message will be sent when the number of buffered events reaches the Consolidation Event Limit.

SMS Messaging Configuration

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Configuration* > *Messaging* > *SMS*.
2. Adjust the settings, and touch *Save*.

SMS Settings

SMS From Address

The sender's SMS address. In most cases this will be the SMS address of the person to whom replies should be sent. For example, Support@company.com.

SMS To Address

The SMS address of the recipient. Multiple SMS addresses should be separated by a semicolon.

SMS Subject Type

Subject of the message, either default or custom.

Custom Subject Text

The subject of the message. The subject can be customized by the customer.

SMTP Server Address

Fully qualified domain name or IP address of the server used for relaying SMS messages.

NOTE: If using a server name, a DNS server may need to be configured under Network Settings.

SMTP Server Port

SMTP server port.

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SMTP Connection

SMTP server connection type. Determines the capabilities of the SMTP server. Options are:

- Clear: Do not use encryption.
- SSL/TLS: Encryption using SSL/TLS connection.
- STARTTLS: SSL/TLS encryption initiated using STARTTLS.

SMTP Authentication

Enable or disable SMS SMTP authentication. An SMS account must be provided for the SMTP service provider to authenticate.

NOTE: Some messaging servers may require account configuration changes to allow communication with the Unity card. For example, Gmail only recognizes Google applications as being secure. However, they provide an account setting that allows authentication with what they consider less-secure apps. Please see your network administrator or service provider for configuration details.

SMTP Username

Username of the SMS account to use when SMS SMTP authentication is enabled.

SMTP Password

Password for the SMS account to use when SMS SMTP authentication is enabled.

Include IP Address in Message

If True, the IP Address of the agent card will be included in outgoing messages.

Include Event Description in Message

If checked, SNMP event description will be included in outgoing messages.

Include Name in Message

If checked, the agent card name will be included in outgoing messages.

Include Contact in Message

If checked, the agent card contact will be included in outgoing messages.

Include Location in Message

If checked, the agent card location will be included in outgoing messages.

Include Description in Message

If checked, the agent card description will be included in outgoing messages.

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Include Web Link in Message

If checked, a web link to the agent card and web server listening port number will be included in outgoing messages.

Enable Event Consolidation

If checked, multiple events will be sent per outgoing message.

Consolidation Time Limit

If Event Consolidation is enabled, a message will be sent when Consolidation Time Limit seconds has passed since the first buffered event was received.

Consolidation Event Limit

If Event Consolidation is enabled, a message will be sent when the number of buffered events reaches the Consolidation Event Limit.

Messaging Test

Tests the set up for e-mail and SMS messages. If the test fails, incorrect settings should be changed to ensure that proper notifications are sent if an event should occur.

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Configuration* > *Messaging* > *Messaging Test*.
2. Enter the settings, select the type of test in *Send Test Message*, and touch *Save*.

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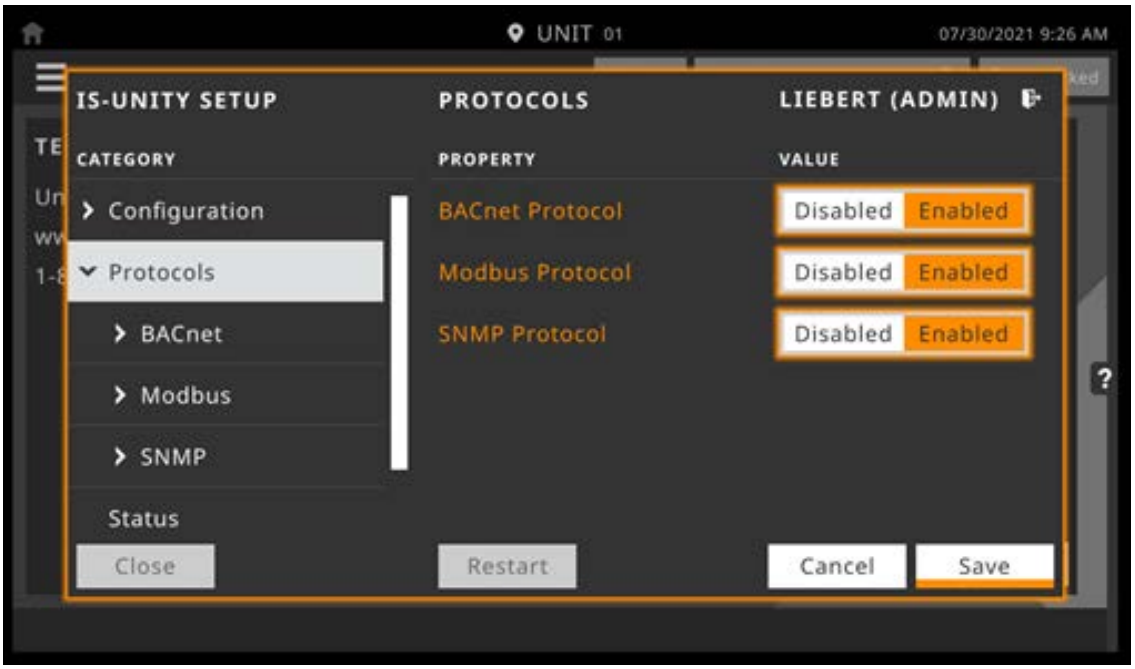
8.2.11 BACnet Protocol Setup

1. Touch SERVICE, then ☰ > *BMS & Teamwork* > *IS-Unity Setup* > *Protocols* > *BACnet*.
2. Adjust the settings, and touch *Save*.
3. Configure the BACnet interface chosen.
   See Configuring BACnet IP Protocol on the next page , or Configuring BACnet MSTP Protocol on page 157 .

The BACnet protocol does need to be enabled. See **Figure 8.3** below .

Figure 8.3 Vertiv™ Liebert® IS-Unity Setup, Protocol Enable/Disable



BACnet Settings

Managed Device Write Access

Enable or disable the BACnet server to write to the managed device.

BACnet Interface

BACnet server interface: BACnet IP or BACnet MSTP.

Device Object Instance Number

The instance number (0-4194302) of the BACnet server's device object.

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Device Object Name

The name of the BACnet server's device object.

APDU Timeout

The timeout in milliseconds between APDU retries (1-65535).

APDU Retries

The number of times to retransmit an APDU after the initial attempt (0-8).

Configuring BACnet IP Protocol

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Protocols* > *BACnet* > BACnet IP.
2. Set the BACnet MSTP Node ID.
   - The Node ID defaults to 1, but must have a value from 0 to 127 that is unique among devices connected through the RS-485 interface.
3. Set the BACnet MSTP data rate.
4. Set the BACnet MSTP max master address.
5. Set the BACnet MSTP max info frames.
6. Touch *Save*.
7. Restart Unity:
   a. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Settings*.
   b. Touch *Restart IS-Unity*, then touch *Yes*.

BACnet IP Settings

BACnet IP Port Number

The port for the BACnet server's UDP/IP connection.

Register as Foreign Device

Enable or Disable registration as a foreign device.

IP Address of BBMD

IP Address of the BACnet Broadcast Management Device (BBMD) to be accessed for Foreign Device Registration

Foreign Device Time to Live

Time to remain in the BBMD Foreign Device table after registration.

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Configuring BACnet MSTP Protocol

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Protocols* > *BACnet* > BACnet IP.
2. Set the BACnet MSTP Node ID.
   - The Node ID defaults to 1, but must have a value from 0 to 127 that is unique among devices connected through the RS-485 interface.
3. Set the BACnet MSTP data rate.
4. Set the BACnet MSTP max master address.
5. Set the BACnet MSTP max info frames.
6. Touch *Save*.
7. Restart Unity:
   a. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Settings*.
   b. Touch *Restart IS-Unity*, then touch *Yes*.

BACnet MSTP Settings

Node ID

The BACnet server's MS/TP node ID (MAC).

Data Rate

The BACnet MSTP communication rate (bits per second).

Max Master Address

The maximum node ID (MAC) in use on the MS/TP network.

Max Info Frames

Maximum number of information frames this node may send before it must pass the token.

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8.2.12 Modbus Protocol Setup

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Protocols* > *Modbus*.
2. Adjust the settings, and touch *Save*.
3. Configure the Modbus interface chosen. See Configuring Modbus TCP Protocol below , or Configuring Modbus RTU Protocol on the facing page .

Modbus Settings

Managed Device Write Access

Enable or disable the Modbus server to write to the managed device

Modbus Interface

Select the Modbus interface, either Modbus TCP or Modbus RTU

Configuring Modbus TCP Protocol

The Modbus TCP permits connection to the card by:

- Any client (open) permits communication by any IP address.
- Clients on the same subnet as the Unity card.
- Clients with specific IP addresses (Trusted IP Lists); only five addresses are permitted.

To configure Modbus TCP

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Protocols* > *Modbus TCP*.
2. Adjust the settings, and touch *Save*.
3. Restart Unity:
   a. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Settings*.
   b. Touch *Restart IS-Unity*, then touch *Yes*.

Modbus TCP Settings

Limit Network Access Type

IP Access List

- Open
- Same Subnet
- Trusted IP List

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Port

The TCP port used by the Modbus server to listen for and respond to Modbus protocol requests based on Limit Network Access Type setting.

Maximum Client Connection Count

Displays the maximum client connection count.

Configuring Modbus RTU Protocol

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Protocols* > *Modbus RTU*.
2. Enter the Node ID and the Baud Rate.
   - The Node ID defaults to 1, but must have a value from 1 to 247 that is unique among devices connected through the RS-485 interface.
   - The default baud rate is 9600. 19200 and 38400 are also available.

NOTE: Contact your system administrator if you are uncertain about the settings.

3. Touch *Save*.
4. Restart Unity:
   a. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Settings*.
   b. Touch *Restart IS-Unity*., then touch *Yes*.

Modbus RTU Settings

Node ID

Modbus Server ID for the interface; obtain from network administrator.

Baud Rate

Communication rate.

- 9600
- 19200
- 38400

Parity Check

The communication parity check.

- None
- Even
- Odd

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8.2.13 SNMP Protocol Setup

SNMPv1/v2c and SNMPv3 are enabled by default. The protocols may be configured or their default values may be accepted. Authentication traps are not enabled by default. The default heartbeat trap interval is 24 hours. This can be disabled or the interval may be changed.

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Protocols* > *SNMP*.
2. To enable Authentication Traps, touch to select *Enabled*.
3. To change the Heartbeat Trap Interval, choose a time from the drop-down list or choose *Disabled* to prevent any heartbeat traps from being sent.
   - The interval times offered are 5 or 30 minutes, or 1, 4, 8, 12 or 24 hours.
4. For each trap, choose whether or not to disable or set the interval to one of the periods on the menu.
5. Touch *Save*.
6. Restart Unity:
   a. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Settings*.
   b. Touch *Restart IS-Unity*., then touch *Yes*.

SNMP Settings

SNMPv3 Engine ID

Read-only. The generated SNMPv3 engine ID.

NOTE: A newly-generated ID appears only after rebooting the card.

SNMP v1/v2c Enable

Enable or disable SNMP v1/v2c.

SNMP v3 Enable

Enable or disable SNMPv3.

Authentication Traps

When enabled, an authentication trap is sent if an SNMP host tries to access the card via SNMP, but either the host address is not in the SNMP access settings or it is using the wrong community string.

Heartbeat Trap Interval

Enable or disable and set interval 5 or 30 minutes, or 1 ,4 ,8 ,12, or 24 hours.

RFC-1628 MIB

Enable or disable support for retrieval of data from the RFC-1628 MIB objects.

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RFC-1628 MIB Traps

Enable or disable support for sending RFC-1628 traps.

Liebert® Global Products (LGP) MIB

Enable or disable support for getting and setting data using the Liebert® Global Products MIB.

LGP MIB Traps

Enable or disable support for Liebert® Global Products MIB traps.

NOTE: LGP traps will not be sent unless LGP MIB is enabled.

LGP MIB System Notify Trap

Enable or disable support for the LGP System Notification trap. This is a single trap sent each time an alarm or warning is added or removed from the conditions table. It provides a text description of the event in a varbind of the trap message.

NOTE: LGP System Notify traps will not be generated unless the LGP MIB is enabled.

SNMPv3 Engine ID Format Type

Selects method to build the engine ID. Valid values:

- MAC Address (default): Engine ID built from the Unity card's MAC address.
- Text: Engine ID built from text entered in SNMPv3 Engine ID Text. See Select SNMPv3 Engine ID Format below .

SNMPv3 Engine ID Text

Text on which the engine ID is built when SNMPv3 Engine ID Format Type is *Text*.

NOTE: If this field is left blank, the engine ID is built from the Unity card's MAC address.

Select SNMPv3 Engine ID Format

By default, the Engine ID is automatically generated using the MAC address. Optionally, you can select a text based ID instead.

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Protocols* > *SNMP*.

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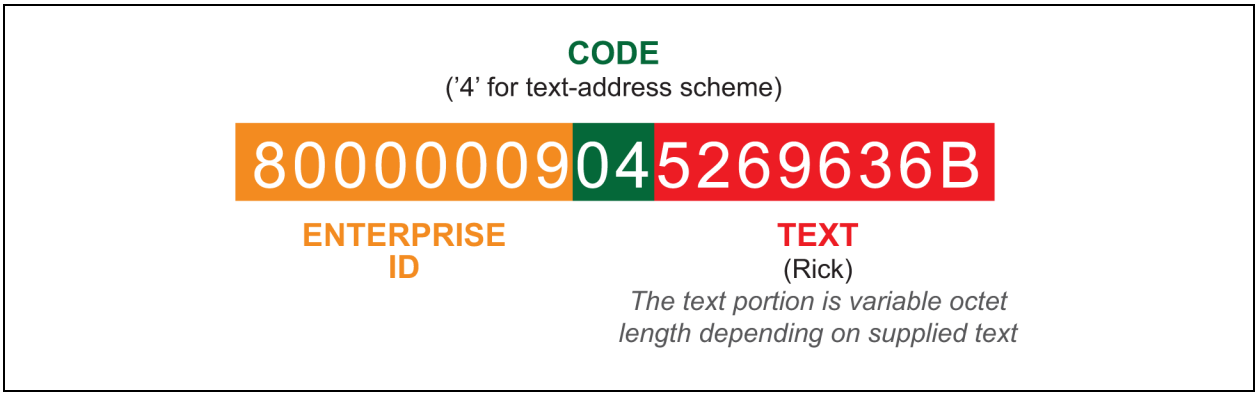
2. Select the format. Refer to SNMP Protocol Setup on page 160 , for descriptions of the settings and options.
   - In SNMPv3 Engine ID Format Type, select *MAC Address* or *Text*.
   - If you selected Text, type the text on which the generated engine ID will be based.
   - Click *Save* to confirm the changes or *Cancel* to discard them.
     The new engine ID is not displayed until after rebooting the card in Step 3 .
     The text generated engine ID is a hexadecimal representation of ASCII characters similar to that shown in Figure 8.4 below .

NOTE: If the format type or text for the Engine ID are incomplete or invalid, the Engine ID is generated based on the MAC Address.

3. Restart Unity:
   a. Touch SERVICE, then ☰ > *BMS & Teamwork* > *IS-Unity Settings*.
   b. Touch *Restart IS-Unity.*, then touch *Yes*.

Figure 8.4 SNMP Engine ID Generated Using Text Format Scheme



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Configuring SNMPv3 Users

IS-Unity supports up to 20 SNMPv3 users. The top level is a list of all 20.

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Protocols* > *SNMP* > *SNMPv3 Users*, then one of the listed users.
2. Enter the information and set the permissions appropriate to the user, and touch *Save*.
3. Repeat steps 1 and 2 for additional users.
4. Restart Unity:
   a. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Settings*.
   b. Touch *Restart IS-Unity*., then touch *Yes*.

SNMPv3 User Settings

SNMPv3 User Enable

Select to enable read, write or sending notifications with the user's credentials.

SNMPv3 Username

The User name the authentication and privacy settings apply to. This string can be composed of printable characters except colon, tab, double quote, and question mark.

SNMPv3 Access Type

Read-only, Read/Write, or Traps only

SNMPv3 Authentication

Cryptographic algorithm used for authentication: None, MD5 or SHA-1

SNMPv3 Authentication Secret

Pass phrase or password used for SNMPv3 Get request. This string can be composed of printable characters with the exception of colon, tab, double quote, and question mark. The entry must be from eight to 64 characters.

SNMPv3 Privacy

Cryptographic algorithm used for encryption. Options are:

- None
- DES
- AES

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SNMPv3 Privacy Secret

Pass phrase or password used for SNMPv3 Get request. This string can be composed of printable characters with the exception of colon, tab, double quote, and question mark. The entry must be from eight to 64 characters.

SNMPv3 Trap Target Addresses

Network hosts that will receive SNMPv3 traps, identified with either a network name or IP address. Multiple addresses must be separated by commas.

SNMPv3 Trap Port

Port used by the target host for receiving SNMPv3 traps; default is 162.

Configuring SNMPv1 Traps

You may configure up to 20 network hosts that receive SNMPv1 traps. The top level is a list of all 20.

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Protocols* > *SNMP* > *SNMPv1 Traps*, then one of the listed traps.
2. Enter the information and set the permissions appropriate to the host/trap, and touch *Save*.
3. Repeat steps 1 and 2 for additional traps.
4. Restart Unity:
   a. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Settings*.
   b. Touch *Restart IS-Unity*., then touch *Yes*.

SNMPv1 Trap Settings

SNMP Trap Target Addresses

Configure network hosts that will receive alert notifications (SNMP Traps). The host can be identified as either an IP address or the host's network name.

SNMP Trap Port

Port used by the target host for receiving notifications; default is 162.

SNMP Trap Community String

String identifying a secret known only by those hosts that want to be notified of device status changes.

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Configuring SNMPv1/v2c Access

Unity supports up to 20 network hosts that access data using SNMPv1/v2c. The top level is a list of all 20.

1. Touch 

, then 
 > *BMS & Teamwork* > *IS-Unity Setup* > *Protocols* > *SNMP* > *SNMPv1v2c Access*, then one of the listed access options.
2. Enter the information and set the permissions appropriate to the network host, and touch *Save*.
3. Repeat steps 1 and 2 for additional users.
4. Restart Unity:
   a. Touch 

, then 
 > *BMS & Teamwork* > *IS-Unity Settings*.
   b. Touch *Restart IS-Unity*., then touch *Yes*.

SNMPv1/v2c Access Settings

SNMP Access IP Address

Configure network hosts interested in device information access. The host can be identified as either an IP address or the host's network name.

SNMP Access Type

SNMPv1/v2C access type: Read-only or Read/Write.

SNMP Access Community String

SNMP Community String.

8.3 Unity Status Readings

The read-only Status page displays the system status of IS-Unity and a list of events that affect its status.

To view the statuses, touch 

, then 
 > *BMS & Teamwork* > *IS-Unity Setup* > *Status*.

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8.4 Unity Support Information

Support displays information about IS-Unity for troubleshooting.

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Support*.
2. Adjust the settings, and touch *Save*.

Support Folder Settings

Agent Date and Time

Date and time setting for the card.

Agent Model

The card's model (Unity Platform).

Agent App Firmware Version

The card's firmware version (2.0 or higher).

Agent App Firmware Label

The card's firmware label.

Agent Boot Firmware Version

The card's Boot firmware version.

Agent Boot Firmware Label

The card's boot firmware label.

Agent Serial Number

The card's serial number.

Agent Manufacture Date

The card's manufacture date.

Agent Hardware Version

The card's hardware version.

GDD Version

The card's GDD version, current when the card's firmware was installed; the GDD is a proprietary reference document for device data.

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FDM Version

The card's FDM version; the FDM is a data model document that defines data supported by devices that use the Velocity Protocol.

Product Sequence ID

The card's product sequence identifier.

Device Assigned Label

Displays the label assigned to the device.

8.4.1 Configuring Active Networking Settings

Status of the currently active IP network settings for IS-Unity along with some previous values for troubleshooting IP communication issues.

1. Touch 

, then  > *BMS & Teamwork* > *IS-Unity Setup* > *Support* > *Active Networking*.
2. Adjust the settings, and touch *Save*.

Active Networking Settings

Ethernet MAC Address

Ethernet MAC Address for the Embedded-Unity Ethernet interface.

IPv4 Address

Presently used IPv4 network address.

IPv4 Default Gateway

Presently used IPv4 network address of the gateway for network traffic destined for other networks or subnets.

Primary DNS

Presently used IPv4 Primary DNS.

Secondary DNS

Presently used IPv4 Secondary DNS.

Last DHCP/BOOTP Address

Last known IPv4 address assigned by DHCP.

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Last DHCP Lease

Lease time of last known DHCP address.

IPv6 Global Address

Shows if DHCPv6 or Static address is presently being used.

StateLess Address AutoConfiguration

IPv6 SLAAC is assigned automatically from Router Advertisement, if “A” flag is set, combining Prefix with EUI-64 MAC.

Link Local

Presently used IPv6 Link Local Address.

IPv6 Default Gateway

Presently used IPv6 network address of the gateway for network traffic destined for other networks or subnets.

Primary DNS Server

IPv6 Primary DNS.

Secondary DNS Server

Presently used IPv6 Secondary DNS.

Last DHCPv6

Last known IPv6 address assigned by DHCPv6.

Last DHCPv6 Lease

Lease time of last known DHCPv6 address.

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9 Configuring Auxiliary Devices

With Vertiv Liebert iCOM, you can manage and control many devices that work with your thermal-management unit(s).

9.1 Power Monitoring

Up to six power meters may be connected to each cooling unit. Power meters are factory programmed to monitor individual components or whole cooling units. For efficient data-center control, power meters provide monitoring of:

- Connection status
- Input under voltage
- Input RMS voltage leg to leg and leg to ground
- Input current per phase
- Energy consumption in kilowatt hours
- Instantaneous power in watts
- Power consumption

To Setup Power Monitoring

1. Touch 

, then  > *Auxiliary Device Setup* > *Modbus Devices* > *Power Meters* > *Device X* (where X is the device number). The DEVICE X panel opens.
2. Adjust the power meter settings and touch Save. The power monitoring settings are saved.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

9.1.1 Power Monitoring Device Options

Address

Modbus address for the power meter.

Connection Status

Read only. The connection status of the Modbus. Valid values:

- 0 : Off
- 1 : Connected
- 2: Unknown
- 3: Comm Error
- 4: Disconnect
- 5: Cfg Error

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Device Enable

Enables/disables the Modbus power meter.

Device X

Editable field to describe the device.

SysType

Read-only, The type of feedback from the power meter. Valid values are:

- 0: 3Ph+N
- 1: 1Ph+N
- 2: 2Ph+N
- 3: 3Ph

Type

Read-only. The type of power meter.

9.2 Fluid Temperature Monitoring

Up to two supply and two return sensors may be connected to each cooling unit to monitor local and remote fluid temperature differential. A 2T sensor monitors fluid temperature (two 2T sensors on dual circuit units).

1. Touch 

, then  > *Auxiliary Device Setup* > *Sensors* > *Fluid Sensors* > *Fluid 2T Sensor*.
The SENSOR PROPERTIES panel opens.
2. Adjust the temperature offset, and touch *Save*. The fluid temperature sensor settings are saved.

NOTE: Only CAN IDs 30 + 31 may be utilized for Fluid 2T sensors. Please referenceTable 13.4 on page 217 .

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NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

9.2.1 Fluid Sensor Options

Current Fluid Temperature

Actual temperature reading.

Fluid Sensor Type

Type of sensor connected. Options are:

- 2T (single)
- Dual 2T

Fluid Temperature Offset

Correction (calibration) value added to the fluid temperature reading. Used in the event that the fluid temperature sensor readings are incorrect.

- May be a positive or negative value.

9.3 Configuring Analog Input Devices

1. Touch 

, then  > *Auxiliary Device Setup* > *Analog Input*.
The ANALOG INPUTS and ANALOG INPUT PROPERTIES panels open.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

2. Before you touch a specific analog input, the properties panel lists the inputs along with their configuration status:
   - *Factory Std* indicates that the input is configured for a factory-installed component such as a pressure transducer.
   - *Not Config* indicates that the input is configurable.
3. Select the associated Analog Input number, define the configuration type to be used for the Analog Input, and select the Input Range. Selectable options include 0-5V, 0-10V, and 4-20mA.

NOTE: Up is on, down is off on the DIP switch. Switches 9 and 10 are not used.

On Vertiv Liebert iCOM, touch 

, then  > *Auxiliary Device Setup* > *Analog Input* > Customer Analog Inputs, the touch an Analog Input.
The ANALOG INPUT PROPERTIES for that device displays.

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4. Select the configuration and touch *Save*. The analog input is configured.

NOTE: The Airflow, Static Pressure and Fluid Flow analog input settings configure factory options and require special instruction. Contact Vertiv Technical Support at 1-800-543-2778, opt. 5.

9.4 Wired Remote Sensors

Wired, remote, rack sensors can function as control sensors and subsequently, provide input individually at the unit level or at the system level for temperature control and teamwork functions.

For wired remote sensors, either 2T sensors or T/H sensors may be utilized. The Vertiv Liebert iCOM controller shall populate the user interface with the applicable data according to the sensor style utilized. For 2T sensors configured for Individual Sensor mode, the higher temperature reading or the average temperature reading of the two probes can be used. In Unit Sensors mode, some or all of the rack sensor's temperature readings are considered for higher (maximum) or average calculation. For example, setting three sensors as control and average for unit mode, averages the three highest temperature readings.

At the system level, using a U2U network, the same maximum or average calculations can be based on readings from all of the sensors in all of the units in group (including those in standby) using Teamwork. See Teamwork Modes on page 111 .

1. Touch 

, then  > *Auxiliary Device Setup* > *Sensors* > *Wired Remote Sensors* > *Setup*. The set-up SENSOR PROPERTIES panel opens.
2. Adjust the settings for the cooling units sensor array, and touch *Save*.
Wired Remote Sensor Setup Options below , describes the setting options.
3. Touch a specific sensor. The SENSOR PROPERTIES for that sensor open.

NOTE: The sensor number listed corresponds to the DIP switch assignment of the sensor made during installation.

4. Touch *Name*, and use the keyboard to give the sensor a descriptive name.

NOTE: This is the name displayed on the REMOTE SENSORS panel for non-service users.

5. Refer to the Wired Remote Sensor Sensor Property Options on page 174 to adjust the remaining settings, and touch *Save*. The wired-remote sensors for the cooling unit are configured.

9.4.1 Wired Remote Sensor Setup Options

Average Rack Temp

Calculated average of temperature readings from the control sensors.

Individual Remote Sensors Mode

When controlling at the sensor level, selects the method of using the readings from the two temperature thermistors (probes) on the sensor. Options are:

- Maximum: Use the highest temperature reading of the two thermistors.
- Average: Use the average of the readings from the two thermistors.

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Max Rack Temp

Highest temperature reading from the unit remote sensors.

REM Sensors Set to Control

Number of sensors set to control.

Unit Remote Sensors Mode

When controlling at the unit level, selects the method of using the inlet rack temperature readings from the control sensors to control fan speed. Options are:

- Maximum: Use the highest temperature reading of the sensors set to Control.
- Average: Use the average of the readings from the sensors set to Control and included in AVG.

Unit Remote Sensors Included in AVG

When Unit Remote Sensors Mode is *Average*, selects the number of sensors used to calculate the average temperature.

- If the number selected is smaller than the number of REM Sensors set to Control, only the highest readings are used for the calculation.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

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9.4.2 Wired Remote Sensor Sensor Property Options

Function

Sets the function of the sensor when Unit Remote Sensors Mode is enabled.

- Excluded - Remote sensor is not enabled in order to populate controller with applicable sensor readings and is not included in any form of control.
- Included - Remote sensor is enabled and will populate the controller with applicable sensor readings, sensor may be assigned to control as a 'remote' sensor'.
- Reference: Sensor readings are considered for Max Rack Temp, but are not used in maximum/average calculations that drive a form of control.
- Standby - When configured for Standby, a given sensor can be used to influence control over unit output. A Standby sensor will be treated as a controlling sensor when all other units within the network group (except for the given unit) report a Loss of Cooling event or if the unit has become standalone, meaning the primary unit lost communication with all other units or vice versa.

Left Lead Current Value

Current reading of the left sensor probe. The left probe is always a temperature reading.

Left Lead Offset

Correction (calibration) value added to the reading. Used in the event that the sensor reading is incorrect.

- May be a positive or negative value.

Name

Custom, descriptive name to assist in identifying the sensor's location/function in the facility, for example, the name of the rack on which it is installed. The name is limited to:

- Up to 4 alphanumeric characters in length.
- Upper and lower case characters.
- These special characters: & * / . + - : @ \.

Right Lead Current Value

Current reading of the right sensor probe. May be a temperature or humidity reading, depending on the connected sensor.

Right Lead Offset

Correction (calibration) value added to the reading. Used in the event that the sensor reading is incorrect.

- May be a positive or negative value.

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9.5 Supply Sensors

When the supply air sensor is set as the control sensor for temperature, additional supply air configuration parameters (valve pulse, cooling filters and return compensation) can be used to enhance the supply air control. See Control Sensor Aggregation on page 51 for additional information on configuring additional supply sensors.

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 Vertiv technical support for adjustments.

NOTE: Supply control air temperature sensors are required to use Optimized Aisle Teamwork (mode 3).

NOTE: On units equipped with a 3P actuator type valve, response can be improved by using the feedback signal.

9.6 Return Air Temperature/Humidity Sensor

The return temperature/humidity sensor is located in the unit return air section and is supplied on all Vertiv systems with Vertiv Liebert iCOM controls. The assembly connects to plug connection P67 on the Vertiv Liebert iCOM internal control board on all Vertiv Liebert iCOM based systems. See P67: Return Air Temperature—Humidity Board on page 205 and P67: Return Air Temperature—Humidity Board on page 205 for further information.

Troubleshooting is accomplished by observing a green LED located on the sensor internal control board. If the LED is solid green, the sensor is communicating properly with the Vertiv Liebert iCOM controller. If the LED is continuously flashing green, the sensor is not communicating properly and the P3 CANbus termination should be verified that it is properly terminated. No LED indicates the sensor does not have power present.

9.7 Modbus Devices

9.7.1 Power Meters

For products equipped with the additional Power Meter device. Device properties include:

- Device Enable
- Power Meter Type
- Address
- Type
- SysType
- Connection Status
- Device Name

9.7.2 Flow Meters

Used for monitoring of chilled water/fluid flow. Device properties include:

- Device Enable: ON / OFF
- Address: 0 - 247
- Flow Meter Type
- Connection Status
- Device Name

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9.7.3 Modbus Fans

For products configured with fans that are controlled through Modbus protocol. Device properties include:

- EC Fan Slope
- EC Fan Offset
- EC Fan Source
- Emergency Speed Operation
- Emergency Speed
- Communicate @ Fan OFF

9.7.4 Automatic Transfer Switch (ATS)

For products equipped with the Automatic Transfer Switch (ATS) hardware. Device properties include:

- Device Enable
- Address
- ATS Type
- Connection Status
- Device Name

9.7.5 Modbus Chilled Water Valve

Chilled Water Valve

For products equipped with the Modbus Chilled Water valves. Device properties include:

- Address
- Type
- Device Enable
- Connection Status
- Valve 1/2 Position
- Valve 1/2 Flow Rate
- Valve 1/2 Setpoint Analog
- Valve 1/2 Temperature 1
- Valve 1/2 Temperature 2
- Valve 1/2 Error Status

For products equipped with a flow meter + additional 2T sensor used for Cooling Capacity Calculation. Device properties include:

- Cooling Load Enable
- Cooling Load Filter Time
- Cooling Load on Delay
- Cooling Load C1/C2

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9.7.6 Diagnosing Refrigerant Leak Detection Issues

Refrigerant Leak Detection (RLD) Sensor is used on direct expansion-based products with R-454B Low Global Warming Potential (LGWP) refrigerant. The RLD shall detect flammable concentrations of gas within the ambient air during a refrigerant leak event. The RLD shall detect concentrations of gas as a percentage of the lower flammability limit (LFL) of the refrigerant and allow the unit to continue operation during low concentrations or run fan speeds at a dedicated mitigation speed should the concentration cross the high threshold.

If/When the lower flammability limit (LFL) is below 15%, the refrigerant leak detection sensors will not report any error states and normal cooling operation shall take place. If any sensor reports and LFL greater than 15% for a minimum of three seconds, warning event Elevated LFL Percent shall be annunciated and no further action is taken. Should any sensor report an LFL greater than 20% for a minimum of three seconds, a High LFL Mitigation alarm shall be annunciated, the mitigation routine shall shut down all compressors (with no pump down), ramp fans to the defined mitigation speed, and close any Safety Shutoff Valves (if provided). Once the LFL concentration falls to less than 10% for a minimum of 10 minutes continuously, the High LFL Mitigation alarm event shall reset, the fans will turn off, and the Safety Shutoff Valve can be reset (if provided) which will return the unit to normal operation.

Indoor units that carry over 35 lbs of R-454B refrigerant per circuit require Safety Shutoff Valves (SSV) that must be manually reset per UL/CSA regulations in a refrigerant leak event. This will apply to Vertiv split systems but not packaged / water cooled units. Manually resetting the SSV after the 10 minute timer will allow the unit to start back up in normal operation. The SSVs can be reset quickly through a push button on the board (S5, hold momentarily). For systems with a thermostatic expansion valve, units will utilize a solenoid valve certified as an SSV. For systems with an electronic expansion valve, the expansion valve will also be certified as an SSV. Units that do not utilize a SSV will incorporate a count function to prevent the potential of short cycling. If these units leak and repeatedly activate mitigation mode 4 times within an 8 hour window of the previous alarm, the unit will lockout normal operation and annunciate a RLS Comp Lockout alarm. This lockout alarm will need to be reset through the push button on the board (S5, hold momentarily).

These sensors also have internal diagnostics checks that should detect any issues with the sensor (potentially preventing false positives). The internal diagnostic can result in a Warning, Serious, or Critical sensor condition. In a Warning condition, the sensor will attempt to restart and perform the diagnostic again. In a Serious or Critical condition, the unit will send a “RLS Failure” alarm which requires the sensor to be replaced.

9.7.7 Refrigerant Leak Detection (RLD) Sensor

The Refrigerant Leak Detection Sensor used on direct expansion based products with R454b low global warming potential (LGWP) refrigerant. The RLD shall detect flammable concentrations of gas within the ambient air during a refrigerant leak event. The RLD shall aid in detecting the lower flammability limit (LFL) of the refrigerant and allow the unit to continue operation during low concentrations or run fan speeds at a dedicated mitigation speed should the concentration cross the high threshold.

When the lower flammability limit (LFL) is below 15%, the refrigerant leak detection sensors will not report any error states and normal cooling operation shall take place. If any sensor reports and LFL greater than 15% for a minimum of three seconds, warning event Elevated LFL Percent shall be annunciated and no further action is taken. Should any sensor report an LFL greater than 20% for a minimum of three seconds, a High LFL Mitigation alarm shall be annunciated, the mitigation routine shall shut down all compressors (with no pump down), ramp fans to the defined mitigation speed, and close any Safety Shutoff Valves (if provided). Once the LFL concentration falls to less than 10% for a minimum of 10 minutes continuously, the High LFL Mitigation alarm event shall reset, the fans will turn off, and the Safety Shutoff Valve can be reset (if provided) which will return the unit to normal operation.

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Units that carry over 35 lbs of R454B refrigerant per circuit require Safety Shutoff Valves (SSV) that must be manually reset per UL/CSA regulations in a refrigerant leak event. This will apply to Vertiv split systems but not packaged/water cooled units. Manually resetting the SSV after the 10 minute timer will allow the unit to start back up in normal operation. The SSVs can be reset quickly through the Vertiv Liebert iCOM display or through a push button on the board (S5). For systems with a thermostatic expansion valve, units will utilize a solenoid valve certified as a SSV. For systems with an electronic expansion valve, the expansion valve will also be certified as a SSV. Units that do not utilize a SSV will incorporate a count function to prevent the potential of short cycling. If these units leak and repeatedly activate mitigation mode four times within an eight hour window of the previous alarm, the unit will lockout normal operation and annunciate a RLS Comp Lockout alarm. This lockout alarm can be reset through the Vertiv Liebert iCOM display, push button on the board (S5), or by cycling power to the unit. It can also automatically reset if eight hours elapses.

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10 Administering Firmware, Settings and Security

10.1 Vertiv™ Liebert® iCOM™ Firmware Upgrades

NOTE: The Vertiv Liebert iCOM Service Tool (iST) is required to update control board firmware. Contact technical support at 1-800-543-2778, opt. 5 for information on control board updates.

10.1.1 Compatibility with Earlier Versions of Vertiv™ Liebert® iCOM™

Versions of Vertiv Liebert iCOM control firmware PA2.05.31R are incompatible with earlier firmware versions PA**1**.XX.XXXSTD.

The firmware versions PA2.05.31R and later cannot communicate with earlier versions. The Vertiv CoolPhase Perimeter and Vertiv CoolLoop Perimeter will not operate with PA1.XX.XXXSTD installed.

Contact your Vertiv representative to upgrade firmware.

10.1.2 Updating Vertiv™ Liebert® iCOM™ Control Board Firmware

The FIRMWARE UPGRADE panel shows the firmware version of the control board of the cooling unit. It also includes settings to use while performing the upgrade.

NOTE: Only personnel who have completed Vertiv training should perform a control board update. The Vertiv Liebert iCOM Service Tool (iST) is required to update control board firmware. Contact technical support at 1-800-543-2778, opt. 5 for information on control board updates.

1. Save the Vertiv Liebert iCOM software to a USB flash drive formatted with a FAT32 file system.
   - Make sure that the file-name extension is all lower case. For example, *.xbp* not *.XBP*.
   - Remove all other files with the .xpb extension from the flash drive.
2. At the Vertiv Liebert iCOM control:
   - Touch 

, then  > *Backup & Security* > Firmware Upgrade. The FIRMWARE UPGRADE panel opens.
   - Make sure the *Lock for Upgrade*, is selected.
   - Refer to Control Board Firmware Upgrade Options on the next page , for the reset and retain options.
3. On the Vertiv Liebert iCOM control board:
   - Insert the flash drive into the P76 USB port. After a few seconds, the DS25 LED lights up green.
   - P75 does not work for firmware upgrade.
   - To continue with the upgrade, press the S3 button near the LED within 15 seconds. The LED blinks blue to indicate that the upgrade has commenced. When the upgrade completes, the LED blinks fast green, and the board reboots with the new firmware.
4. Remove the USB flash drive after the board reboots.

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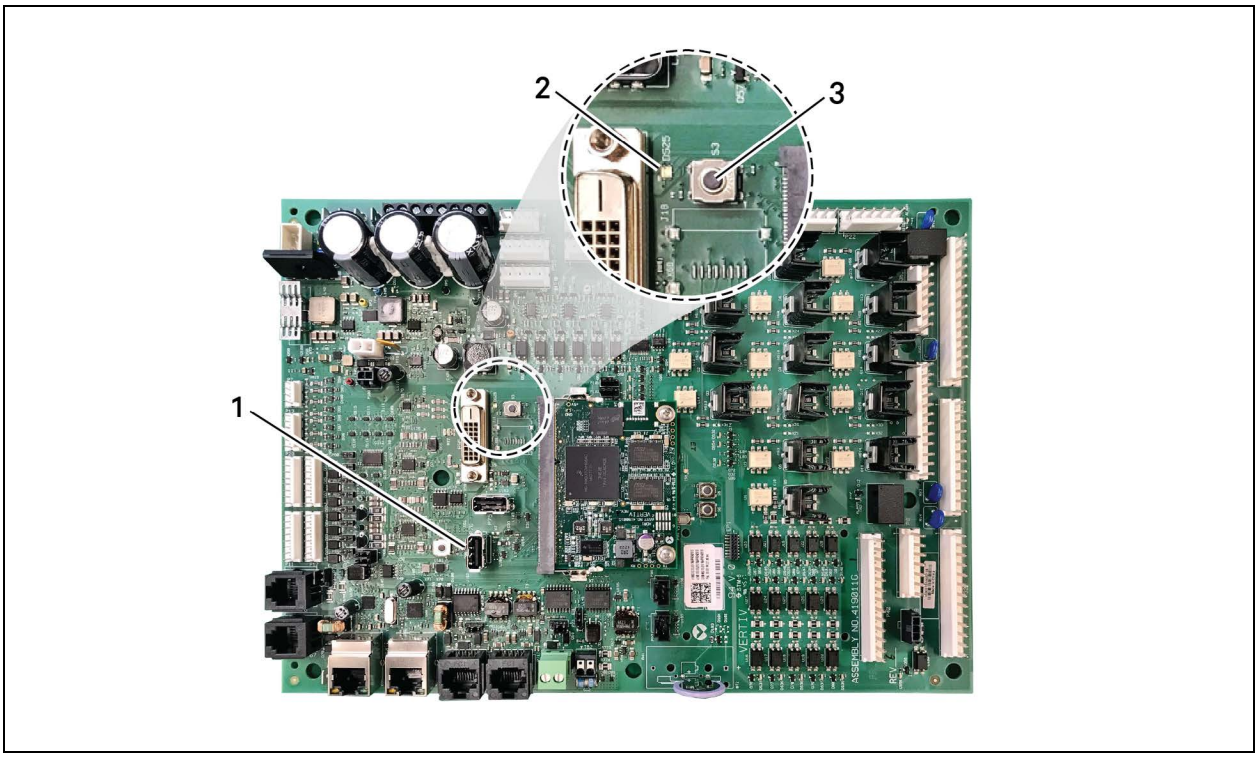
Figure 10.1 P76, S3 and DS25 LED on the Board



Item	Description
1	P76 port
2	DS25 LED
3	S3 button

Control Board Firmware Upgrade Options

Lock for Upgrade

When selected, the unit is locked for a firmware upgrade.

Reset to Default Configuration

When selected, the unit is reset to the factory-default configuration during the upgrade

Retain Network Configuration

When selected, the current network settings and options are retained while all other settings are reset to the factory default configuration.

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10.1.3 Reverting to Firmware in Dormant Partition

The Vertiv Liebert iCOM control board holds firmware in two partitions:

- The active partition holds the currently running firmware.
- The dormant partition holds the previously installed firmware.

Upon firmware upgrade, the new firmware writes to the dormant partition, which switches to the active partition when the upgrade is complete. If needed, you can revert to the previously installed version that is now in the dormant partition while the board boots after the upgrade.

To return to pre-upgrade firmware:

1. At boot, watch for the DS25 LED to flash red then blue for a second or two, and after it flashes red then blue, press-and-hold S3 for six to 10 seconds until DS25 lights solid red then release. Figure 10.1 on the previous page , shows DS25 and S3 on the board.
2. Upon releasing S3, DS25 blinks for three seconds, and you must press and release S3 during that 3 seconds. If completed correctly, DS25 lights solid green and the board is reverted to the pre-upgrade firmware in the dormant partition. If incorrect, DS25 is not lit and the board boots normally.

NOTE: Use these steps to switch between active/dormant partitions (current/previous firmware) as needed. The switch can only be initiated right after a boot of the system, so power-off the unit, wait five seconds, and power on the unit, then start at step 1 above, as the system boots.

10.2 Backing Up and Restoring Control Board Settings

Vertiv Liebert iCOM settings may be saved to a local disk or USB drive, and the saved files may be imported to restore Vertiv Liebert iCOM if it is replaced or if a problem occurs and to transfer settings to another Vertiv Liebert iCOM.

1. Touch 

, then  > *Backup & Security* > *Control Backup/Restore*. The BACKUP & RESTORE panel opens.
2. Touch the *Action Type* drop-down, and select the action to perform.
3. Select the location, site, and system to save back-up files or load restore/replicate files, see Control Board Back Up and Restore Options on the next page , for descriptions.

NOTE: USB drives are automatically detected and displayed as options for Location selection.

4. Touch the action button in the lower-right corner. A notification indicates that the back up/restore/replicate is complete.
5. Remove the USB drive from the port.

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10.2.1 Control Board Back Up and Restore Options

Action Type

Selects the back up or restore function. Options are:

- Back up: Saves a copy of the settings in a file named with the IP address of the Vertiv Liebert iCOM control board. Use a backup file to restore the unit settings in the event of a failure.
- Replicate: Loads only the configsafe files (general settings/setpoints) from a back-up file from another system.
- Restore: Loads a backup configuration from a previously saved backup file. For example, when a control board fails and must be replaced, you can load the configuration from a backup of the failed board.

Location

Indicates the port to which the USB drive is connected.

Site

Indicates the folder you created on the USB drive to which the back up system file is saved.

System

The back up file named with the IP address of the control board from which it was saved.

10.3 Managing Access Permission and Passwords

NOTICE

Risk of loss of access to Vertiv Liebert iCOM can cause operational problems.

When a password is changed, make sure you record the new password and inform authorized users. If problems arise, passwords can be reset by Vertiv Technical Support, visit https://www.vertiv.com/en-us/support/.

The default four-digit passwords provide certain levels of permission to access the various Vertiv Liebert iCOM menus levels within the Vertiv Liebert iCOM user interface. The end-user may edit the default four-digit passwords based on need so that only those provided with the current configured passwords may be granted access to the appropriate menus. You can change the value of each password so that only those provided with the current password may access the menus that it unlocks.

The factory-default password for user and service login are:

- **User Login Default:** 1490
- **Service Login Default:** 5010
- **Advanced:** Contact Vertiv Technical Support
- **Administrator:** Contact Vertiv Technical Support

NOTE: To change the password, you must use the Administrator password currently assigned to unlock the Service menu.

1. Touch , then 

> *Backup & Security* > *Manage Permissions*.
The MANAGE PINS panel opens.

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2. Touch the role to change, then touch the *Value* field for the password to change. The keypad opens.
3. Type a new four digit/character password, then touch , and touch *Save*. The password is saved.
    - Touch *Cancel* to discard the change.

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11 Performing Diagnostics

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

11.1 Cooling Unit Status LED

Just below the Vertiv Liebert iCOM touchscreen display is an LED that changes color and flashes on and off to indicate cooling unit status. See Table 11.1 below , for the LED colors and meanings.

Table 11.1 Cooling Unit LED Colors and State Meanings

State	Color(s)	Meaning
Solid	Green	Powered on and operating.
Solid	Amber	In diagnostic/service mode or powered-off.
Solid	Red	Active warning or alarm present and acknowledged.
Flashing	Amber/Green	In sleep or U2U stand-by mode and available to operate.
Flashing	Red/Green	Operating with an active warning or alarm.
Flashing	Amber/Red	Shut down (not operating) because of an unacknowledged alarm.
Flashing	Red	Active warning or alarm present but unacknowledged.
Flashing	Blue	Vertiv Liebert iCOM display is starting up or updating iCOM firmware.

11.2 Enabling Manual Mode for Diagnostics

Use manual mode to test components, validate operation, and evaluate performance.

NOTE: When manual mode is enabled, the cooling unit does not operate normally:

- Fan operation depends on the diagnostic category in use.
- Safety routines will prevent the use of some diagnostic features.
- Active alarms may prevent some the use of some diagnostic functions.
- In most cases, all components are turned off.

NOTE: When manual mode is disabled, all components and the cooling unit return to normal operation. See Disabling Diagnostics Manual Mode on the next page . Manual mode will timeout after 30 minutes of inactivity and normal operation resumes.

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *Manual Mode* in the Category list. The MANUAL MODE panel displays.
2. Touch the *Enable* check box in the upper-right of the *MANUAL MODE* panel. The MANUAL MODE confirmation dialog opens.
3. Touch *OK* to enable manual mode. Enable is checked and manual control for diagnostics enabled.
   - Touch *Cancel* to close the dialog and manual mode remains disabled.

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11.2.1 Disabling Diagnostics Manual Mode

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *Manual Mode* in the Category list. The MANUAL MODE panel displays.
2. Remove the check mark from the *Enable* box by touching it. Manual mode is disabled.

11.3 Diagnosing Evaporator Fan Issues

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* >*Evaporator Fan* in the Category list. The EVAPORATOR FAN panel displays.
2. Refer to Diagnostics—Evaporator Fan Options below , for descriptions of diagnostic options.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

11.3.1 Diagnostics—Evaporator Fan Options

Analog Output 1 – 4

0V to 10V analog output that drives the speed of the evaporator fan. Typically, the evaporator fan is Analog Output 1 by default.

Analog Output 1 Selection

Var SpeedDrive.

Fan Speed

Current speed of fan.

Motor Overload/EC Fan Fault

Indicates status of input feedback. If cooling unit has EC fans, it is the EC-fan fault input. If cooling unit has standard fans (no variable speed drive), it is the motor overload input.

Motors

Enables/disables fan motor during manual/diagnostic mode.

Status Airflow Loss

Indicates if the status of the Air Safety switch is open or closed.

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Status Filter

Status of the air filter.

Status Remote Shutdown

Indicates whether remote shutdown is on or off.

11.4 Diagnosing Compressor Circuit Issues

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *Compressor Circuit N (where "N" is the circuit number)* in the Category list. The COMPRESSOR CIRCUIT panel displays.
2. Refer to Diagnostics—Compressor Circuit Options below , for descriptions of diagnostic options.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

11.4.1 Diagnostics—Compressor Circuit Options

Compressor Capacity

Enables/disables compressor capacity during manual/diagnostics mode.

Compressor Freeze Protection

Indicates whether freeze protection influences compressor capacity (on) or not (off), based on low pressure values.

Compressor Mode

Selects compressor operation during manual/diagnostics mode. Options are:

- 0: Run (normal operation)
- 1: Evacuate
- 2: Charge

Compressor Overload

Compress overload status.

Compressor State

Compressor status, on or off.

Fan Freeze Protection

Indicates whether freeze protection influences fan speed (on) or not (off), based on low-pressure values.

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High Pressure Alarm Code

Code of high pressure alarm. To address the alarm condition, see Resetting High Pressure Alarm Code below .

- 0: Okay
- Non-zero: High head pressure situation.

High Pressure Status

Status of compressor's high pressure switch.

Liquid Line Solenoid Valve

Enables/disables the valve during manual/diagnostics mode.

Low Pressure Alarm Code

Code of low-pressure alarm. To address the alarm condition, see Resetting Low Pressure Alarm Code on the facing page .

- 0: Okay.
- Non-zero: Low suction pressure condition.

Low Pressure Status

Status of compressor's low pressure switch.

Pump Down Failure Counter

Number of pump down failure events.

Status HT1

Count of times compressor is powered off for high scroll temperature.

11.4.2 Resetting High Pressure Alarm Code

When a high pressure problem has caused a compressor to lock off, resetting the High Pressure Alarm Code to zero unlocks the compressor for operation.

NOTE: Cycling main power of the cooling unit will also unlock the compressor.

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *Compressor Circuit N*in the Category list *(where "N" is the circuit number)*.
2. On the COMPRESSOR CIRCUIT panel, touch *Set to Zero* next to High Pressure Alarm Code, then touch *Save*. The code is reset and the compressor can now operate.

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11.4.3 Resetting Low Pressure Alarm Code

When a low pressure problem has caused a compressor to lock off, resetting the Low Pressure Alarm Code to zero unlocks the compressor for operation.

NOTE: Cycling main power of the cooling unit will also unlock the compressor.

1. On the Service menu, touch *Diagnostic/Service* > *Diagnostics*.
   The DIAGNOSTICS panel opens.
2. Touch *Compressor Circuit N*in the Category list *(where "N" is the circuit number)*.
3. On the COMPRESSOR CIRCUIT panel, touch *Set to Zero* next to Low Pressure Alarm Code, then touch *Save*. The code is reset and the compressor can now operate.

11.4.4 Resetting High Temperature Alarm Counter

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *Compressor Circuit N*in the Category list *(where "N" is the circuit number)*.
2. On the COMPRESSOR CIRCUIT panel, touch *Set to Zero* next to High Temperature Alarm Counter, then touch *Save*. The code is reset and the compressor can now operate.

11.5 Diagnosing Electronic Expansion Valve Issues

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *Electronic Expansion Valve N* in the Category list.
   The ELECTRONIC EXPANSION VALVE panel displays.
2. Refer to Diagnostics—Electronic Expansion Valve Options below for descriptions of diagnostic options.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

11.5.1 Diagnostics—Electronic Expansion Valve Options

Current SH Setpoint

Setpoint for superheat.

EEV Batt Fail Counter C1

Number of battery test failures for the valve control board. To address the alarm condition, see Resetting EEV Battery Failure Counter on the next page .

Firmware Version

Current firmware data.

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Manual Valve Control

Sets the valve open percentage during manual/diagnostics mode.

Manual Valve Control Enabled

Enables/disables manual control of the valve in manual/diagnostics mode.

Saturation Suction Temp

Saturated suction temperature of the refrigeration circuit.

Status Battery

Status of the battery on the valve control board.

Status EEV

Current status of the valve control board.

Suction Pressure

Current pressure at valve.

Suction Temp

Suction temperature of the refrigeration circuit.

Superheat

Current superheat reading of the refrigeration circuit.

Valve Opening

Current percentage that valve is open.

11.5.2 Resetting EEV Battery Failure Counter

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *Electronic Expansion Valve N* in the Category list.
2. On the ELECTRONIC EXPANSION VALVE panel, touch *Set to Zero* next to EEV Batt Fail Counter, then touch *Save*. The counter is reset.

11.6 Diagnosing Vertiv™ EconoPhase Issues

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *EconoPhase* in the Category list. The ECONOPHASE panel displays,.
2. Refer to Diagnostics—Vertiv™ EconoPhase Options on the facing page , for descriptions of diagnostic options.

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NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

11.6.1 Diagnostics—Vertiv™ EconoPhase Options

Pump Board N Firmware

Firmware version of the pump control board, where N is the pump number.

Pump Board Test

Runs a diagnostic test on the board.

Pump N Diff Pressure

Current differential-pressure reading, where N is the pump number.

Pump N Inlet pressure

Current inlet-pressure reading, where N is the pump number.

Pump N Outlet Pressure

Current outlet-pressure reading , where N is the pump number.

Pump N Speed

Current pump speed, where N is the pump number.

Pump N Test Results

Results of board test, where N is the pump number.

11.7 Diagnosing Reheat Issues

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *Reheat* in the Category list. The REHEAT panel displays.
2. Refer to Diagnostics—Reheat Options on the next page , for descriptions of diagnostic options.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

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11.7.1 Diagnostics—Reheat Options

Analog Output 1 – 4

0V to 10V analog outputs that operate reheat.

Electric Heat N

Enables/Disables heaters in manual/diagnostic mode. (Where N = electric heat number.).

11.8 Diagnosing Humidifier Issues

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *Humidifier* in the Category list. The HUMIDIFIER panel displays.
2. Refer to Diagnostics—Humidifier Options below , for descriptions of diagnostic options.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

11.8.1 Diagnostics—Humidifier Options

Hum Cond Protect < 53°F / 11.6°C

Status of low temperature protection.

Hum Cond Protect > 55% RH

Status of high relative humidity protection.

Humidifier

Enables/disables humidification in manual/diagnostic mode.

Local Hum PI

Current humidity PI percentage.

Status Humidifier Problem

Current status of the humidifier. OK indicates that the status is good.

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Supply Humidity

Current supply air humidity.

Supply Temperature

Current supply air temperature.

11.9 Diagnosing Digital Output Issues

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *Digital Outputs* in the Category list. The DIGITAL OUTPUTS panel displays.
2. Refer to Diagnostics—Digital Output Options on the next page for descriptions of diagnostic options.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

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11.9.1 Diagnostics—Digital Output Options

Alarm Relay

Enables/disables alarms during manual/diagnostic mode.

K11 Relay

Enables/disables warnings during manual/diagnostic mode.

Q15 Output State

Enables/disables Q15 output during manual/diagnostic mode.

11.10 Diagnosing Analog Output Issues

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *Analog Outputs* in the Category list. The ANALOG OUTPUTS panel displays.
2. Refer to Diagnostics—Analog Output Options below , for descriptions of diagnostic options.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

11.10.1 Diagnostics—Analog Output Options

Analog Output N

Controls analog outputs during manual/diagnostic mode. *(Where N is the analog output number.)*

11.11 Diagnosing Customer Input Issues

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *Customer Inputs* in the Category list. The CUSTOMER INPUTS panel displays.
2. Refer to Diagnostics—Customer Input Options below , for descriptions of diagnostic options.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

11.11.1 Diagnostics—Customer Input Options

Input N

Status and description of customer-input sensors. *(Where N is the input number.)*

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11.12 Diagnosing Water Leak Detection Issues

1. Touch 

, then  > *Diagnostic/Service* > *Diagnostics* > *Water Detection* in the Category list. The WATER DETECTION panel displays.
2. Refer to Diagnostics—Water Leak Detection Options below , for descriptions of diagnostic options.

NOTE: Depending on the type of thermal management unit, included components, and control settings of your system, all of the options listed may not be available on your Vertiv Liebert iCOM display.

11.12.1 Diagnostics—Water Leak Detection Options

LWD Value

Current percentage of resistance measured from the leakage water detection sensor. See Setting Water Leak Detector Options on page 74 . Range of values across:

- 0%: Maximum resistance, sensor is dry.
- 100%: Minimum resistance, sensor is wet.

11.13 Diagnosing Refrigerant Leak Detection Issues

Steps to activate / reset test mode and unit operation:

1. Unlock the Vertiv Liebert iCOM Display.
2. Touch 

, then  > Diagnostic/Service > Diagnostics > Refrigerant Leak Sensors > RLS Zones. Under this section you will find the following test modes:
    - Fail Safe Test Mode: The leak sensors in the unit will be commanded into a test fail-safe state to simulate that the detector discovers a diagnostic error (Serious/Critical Error).
    - Alarm Test Mode: The leak sensors in the unit will simulate the behavior of a refrigerant leak.
3. Refer to Diagnostics - Refrigerant Leak Detection Options below , for descriptions of diagnostic options.

NOTE: Depending on the type of Thermal Management unit, included components, and control settings of your system, all the options listed may not be available on your Vertiv Liebert iCOM display.

11.13.1 Diagnostics - Refrigerant Leak Detection Options

- Activate either Fail Safe Test Mode or Alarm Test Mode to put the unit into Mitigation mode. When the unit enters mitigation mode, the following actions will occur:
    - Compressors / PRE Pumps will shut down.
    - Fans will turn on to their mitigation speed.
        - For more detail on the mitigation speed, please reference the unit manuals 20000578.
    - Vertiv Liebert iCOM will show a High LFL Mitigation alarm.
    - Safety Shutoff Valves will close (if provided).

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- For more detail on the Safety Shutoff Valves, please see Diagnosing Refrigerant Leak Detection Issues on page 177

- Any customer specific mitigation actions will be activated.
  - Mechanical ventilation is required when the space is smaller than the minimum required Effective Dispersal Volume (VED).
  - To trigger customer specific mitigation actions, please utilize at least the following monitoring points. These points should be mapped to the customers BMS.
    - Mitigation LFL % alarm (EVRLSMITG)
    - Sensor failure error warning (EVRLSFAIL)
    - Sensor critical error warning (EVRLSCRIT)
    - Status code (RLS_St_xx)
    - Status code meaning (NG_RLSSSTxx)
  - For more details regarding monitoring points, see SL-28170 Veritv™ Liebert® IntelliSlot™.
- Once mitigation mode is validated, the system can be reset by activating the Reset Devices button.
  - For a true leak event, see Section 9.7.6 above for more details on mitigation mode.

NOTE: The sensors will still perform normal diagnostic and detecting operations while in the test mode in the case that a true leak event occurs.

11.13.2 Refrigerant Leak Sensor: Test Mode

Refrigerant Leak Sensors used for Refrigerant Leak Detection (RLD) may be placed into a testing mode where each individual sensor shall run through an internal routine which will help report issues with the sensors. These sensors possess internal diagnostics checks that should detect any issues with the sensor. The internal diagnostic can result in a Warning, Serious, or Critical sensor condition. In a Warning condition, the sensor will attempt to restart and perform the diagnostic again. In a Serious or Critical condition, the unit will send an “RLS Failure” alarm which requires the sensor to be replaced.

The “RLS Failure” alarm will not activate mitigation unless all sensors in the same Zone result in the same sensor failure event. The majority of units currently utilize two zones, one being located near the airflow cabinet and another near the compressor cabinet. In each zone there are two sensors, meaning both of these sensors would need to have a “Sensor Failure” alarm before entering mitigation mode. Having multiple sensors also serves as a level of redundancy in the case any given sensor with a known issue is not replaced right away and an actual leak occurs.

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12 Customizing the Vertiv™ Liebert® iCOM™ Display

12.1 Setting General Display Properties

NOTE: You must be logged in to adjust the settings. See Powering On the Vertiv™ Liebert® iCOM™ and Logging In/Unlocking Controls on page 6 .

1. Touch 

, then  > *Display Options* > *Display Properties*.
The DISPLAY PROPERTIES panel opens.
2. Touch a value to select the setting from the drop-down list
3. Touch *Save* to save the property settings.
   - Touch *Cancel* to discard changes.

12.1.1 Unit Display Options

Alarm Buzzer Pattern

Selects or disables the audible alarm notification. See Enabling the Audible Alarm Notification on page 100 .

Allow System On/Off

Enables/disables powering on/off the entire system of networked units from the Vertiv Liebert iCOM display.

Backlight Brightness

Selects the brightness of the display back light.

Inactivity Timer

Time to elapse before display locks and dims.

Language

Selects the display language.

LED Brightness

Percentage brightness of the display.

Measurement System

Selects the units of measurement. Options are:

- Imperial (°F)
- Metric (°C)

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Skin

Selects the color/background format of the user interface. Options are:

- Dark blue
- White
- Dark grey

Touch Beep

Enable/disable sound when display is touched.

Touch Shockwave

Enable/disable visual shockwave when display is touched.

Turn Unit On/Off without Password

When enabled, a Power On/Off button displays in the upper-right corner of the Vertiv Liebert iCOM main display so personnel can turn the unit on or off with out logging in and accessing the User/Service menus.

12.2 Customizing Main Display Views

The default Vertiv Liebert iCOM display view is essentially a layout of two panels, one with status content and the other with alarms content. You can create custom display views by adding, changing, moving, and resizing the content objects.

NOTE: You must be logged in to customize the view. See Powering On the Vertiv™ Liebert® iCOM™ and Logging In/Unlocking Controls on page 6 .

12.2.1 Moving Content

You can drag and drop content objects anywhere you like on the main display.

1. Touch 

, then .
2. Touch  in the upper-right corner of the display and just below the control header.
3. Touch an object to select it (highlighted green), and drag it to the new location.

12.2.2 Resizing Content

You can resize content objects on the main display.

1. Touch 

, then .
2. Touch  in the upper-right corner of the display and just below the control header.

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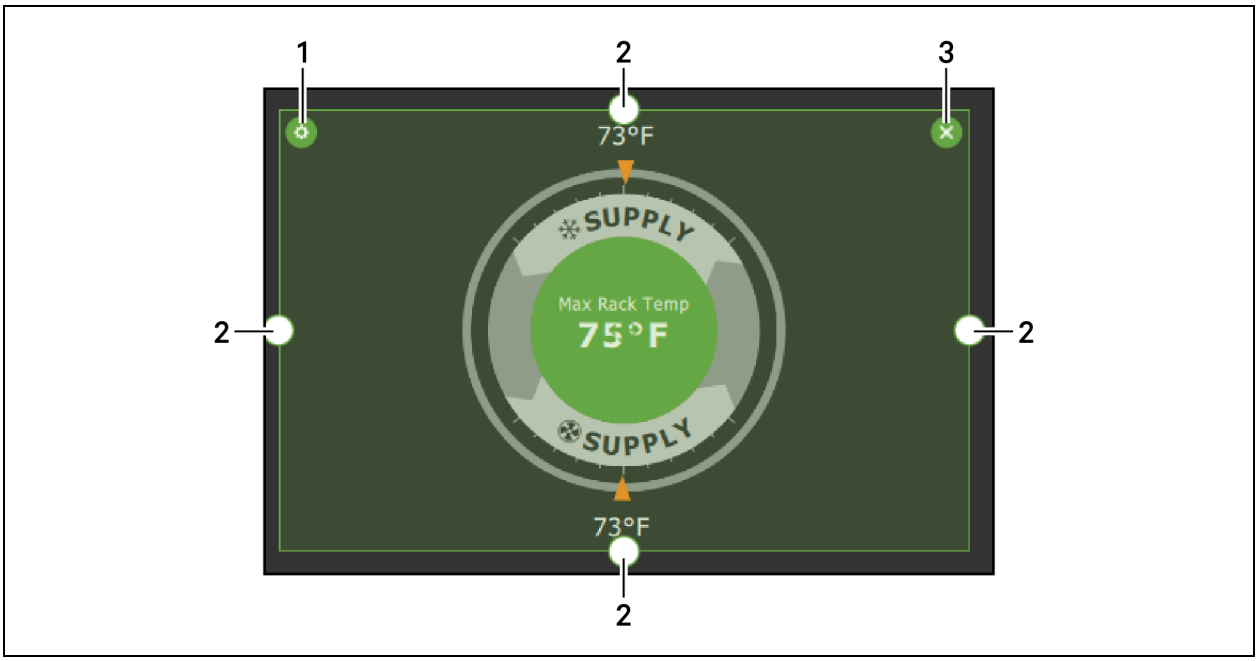
3. Touch an object to select it (highlighted green), touch and drag a handle to re-size the object, see Figure 12.1 below .

Figure 12.1 Add/Remove Content Icons and Resizing Handles



Item	Description
1	Content adjustment icon
2	Resizing handles
3	Remove content icon

12.2.3 Adding and Adjusting Content

You can add a variety of content to the main display.

1. Touch , then .
2. Touch  in the upper-right corner of the display and just below the control header, then touch . A menu of content options opens, described in Table 12.1 on the next page .
3. Touch the Move icon next to the content and drag it onto the display, the use the re-size handles to adjust as needed.
4. To adjust the content object or the way the it displays, touch , see Figure 12.1 above .

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Table 12.1 Main Use Display Content Options

Content	Description
Separator	Separating line to place between content sections. You can adjust the thickness and orientation of the separator.
Dial	Status dial. You can select the sensor readings displayed in the center of the status dial when you touch to scroll through the readings.
Setpoint Readout	Displays the current reading of a connected sensor, for example: return temperature at 72°F.
Setpoint Bar	Displays a bar graph for a selected setpoint with customizable empty and full limits. For example, if a temperature setpoint bar is empty at 60°F and full at 80°F, and the reading is 70°, the graph will be filled half way.
Sensor Bar	For remote sensors only, functions the same as the setpoint bar, but only offers connected remote sensors, and displays the customer-assigned name of the sensor next to the graph.
Shortcut	Shortcut opens panels directly instead of browsing through menus. You can select the destination of the shortcut, whether or not an icon displays, and the size, label, and frame of the shortcut.
Alarms	Alarms panel. You can select whether or not the information may be exported.
Event Log	Event log panel. You can select whether or not the information may be exported.
Run Hours	Run hours panel. Summary of the component run hours and limits.
EconoPhase Diagram	Vertiv EconoPhase operating diagram.
EconoPhase Status	Compressor/Vertiv Econophase status bar. Indicates the operating mode and the percentage at which the component is operating.

12.2.4 Removing Content

You can easily remove content from the main display.

1. Touch 

, then .
2. Touch  in the upper-right corner of the display and just below the control header.
3. Touch an object to select it (highlighted green), then touch , see Figure 12.1 on the previous page .

12.3 Customizing Parameter and Field Labels

You can customize header labels for parameters in the menus and you can customize field names.

NOTE: You can export labels for back up or to use a text editor to customize the labels. See Exporting, Importing and Customizing Labels Using a Text Editor on page 202 .

1. Before going to the customization panel, use the search box and on-screen keyboard to find the label(s) that you want to customize. Once you know where they are, you'll be able to find them in the categories on the Customize Labels panel.

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2. Touch 

, then  > *Display Options* > *Custom Labels*.
The CUSTOM LABELS panel opens. The labels are divided into categories that represent the names of menus, sub-menus, and screen panels.
3. Locate the category that contains the label(s) to customize that you determined in step 1, and touch to expand it.
4. In the Custom Text column, touch the text box to edit, make changes and touch . See **Figure 12.2** below, for an example of changing the column names for Property and Value (in the Analog Inputs panel) to Input and Configuration.
   - Touch *Cancel* to discard the change.
5. When finished editing labels, make sure the Enable Custom Labels is selected (or your updates will not display), and touch *Save*. The label(s) are updated. **Figure 12.3** on the next page, shows the Analog Input Properties panel with the custom labels that replaced Property and Value.

Figure 12.2 Custom Text for the Analog Input Properties Labels

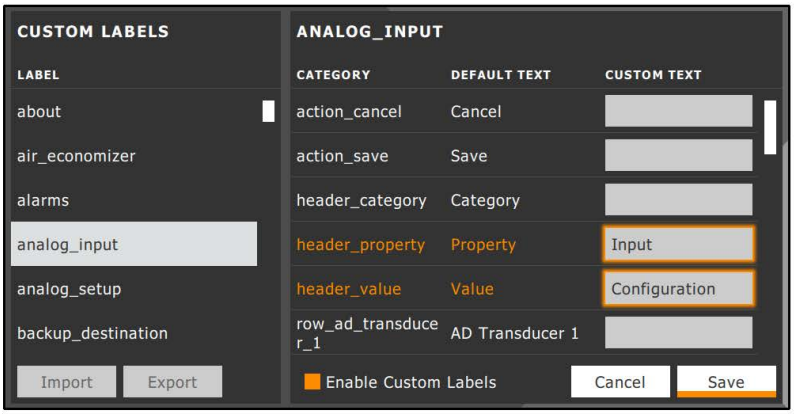

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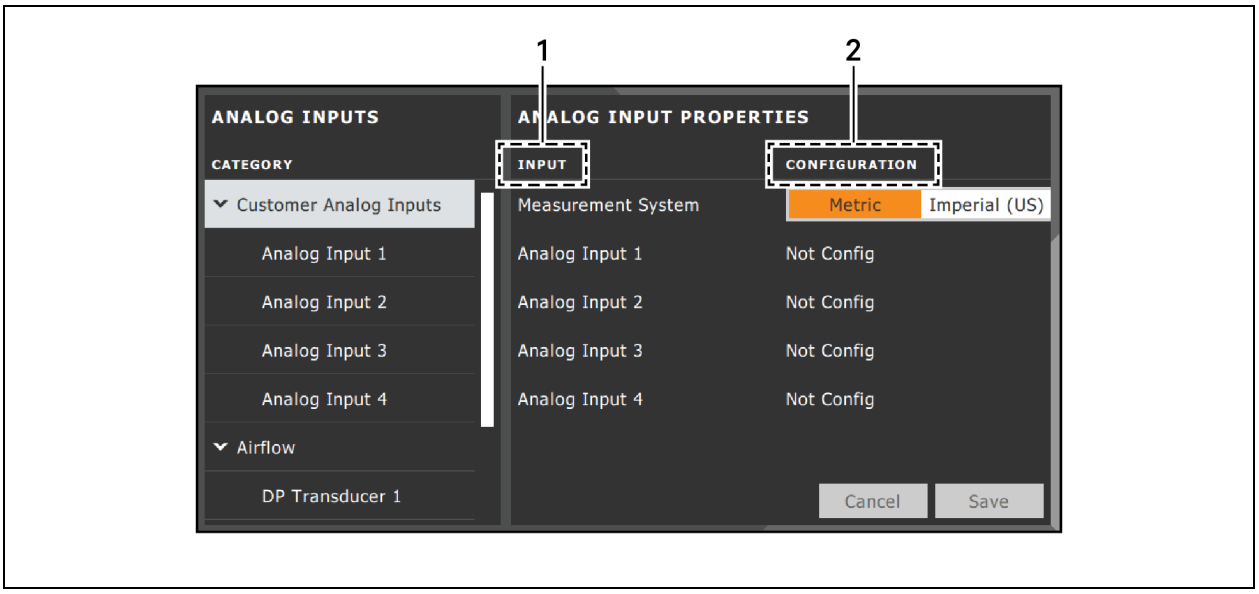
Figure 12.3 Customized Label Text on Analog Input Properties Panel



Item	Description
1	Former Parameter heading is now Input.
2	Former Value heading is now Configuration.

12.3.1 Exporting, Importing and Customizing Labels Using a Text Editor

You can export custom label settings to a text file for back up or to modify the labels using a text editor. The text file is exported and imported using a USB drive.

1. Insert a USB drive into an open USB port on the rear of the touchscreen display, then navigate to the Custom Labels panel and touch *Export*.
   The EXPORT FILE dialog opens, and the connected USB drive is automatically detected.
   - If you are prompted No USB devices are available, check the connection or try re-inserting the drive.
2. Touch *Name* and type a descriptive name for the file, then touch *Go*.
3. Touch *Export* and wait at least 15 seconds, then you can remove the USB drive.
4. Insert the USB drive into a PC or laptop and locate the file, which is named with the Name you entered and the extension cl.txt. For example, if you named your export MyLabels, the file will be MyLabels.cl.txt.

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5. Open the file in a text editor. The file contains all of the labels available for customization listed with the menu/panel on which the label is located, the label identifier, and an equal sign (=) as shown in the following example:

NOTE: You must use an editor that interprets Linux line endings, otherwise all of the lines will run together. For example, Microsoft WordPad will interpret the Linux line endings, but Microsoft Notepad will not.

```
analog_input/row_customer_analog_inputs=Unit A Inputs

analog_input_properties/header_property=Property

analog_input_properties/header_value=Value
```

6. To customize, type a new label name to the right of =, and save the text file.
   The following example will result in the same custom labels shown in Figure 12.3 on the previous page .

```
analog_input/row_customer_analog_inputs=Unit A Inputs

analog_input_properties/header_property=Input

analog_input_properties/header_value=Configuration
```

7. Remove the USB drive with the updated/saved text file from the PC/laptop, insert it into an open USB port on the rear of the touchscreen display, then navigate to the Custom Labels panel and touch *Import*.
8. Locate the updated text file in the drop-down list, and touch *Import*.
   The dialog closes and the customizations display on the menus and panels that you updated.

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13 Vertiv™ Liebert® iCOM™ Hardware Installation

Your unit includes the Vertiv Liebert iCOM controller. This section describes the installation of connections and cabling to fully utilize the Vertiv Liebert iCOM features.

13.1 P67: Return Air Temperature—Humidity Board

P67-1: CAN communication

P67-6: CAN communication

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Figure 13.1 Standard Return Air Sensor

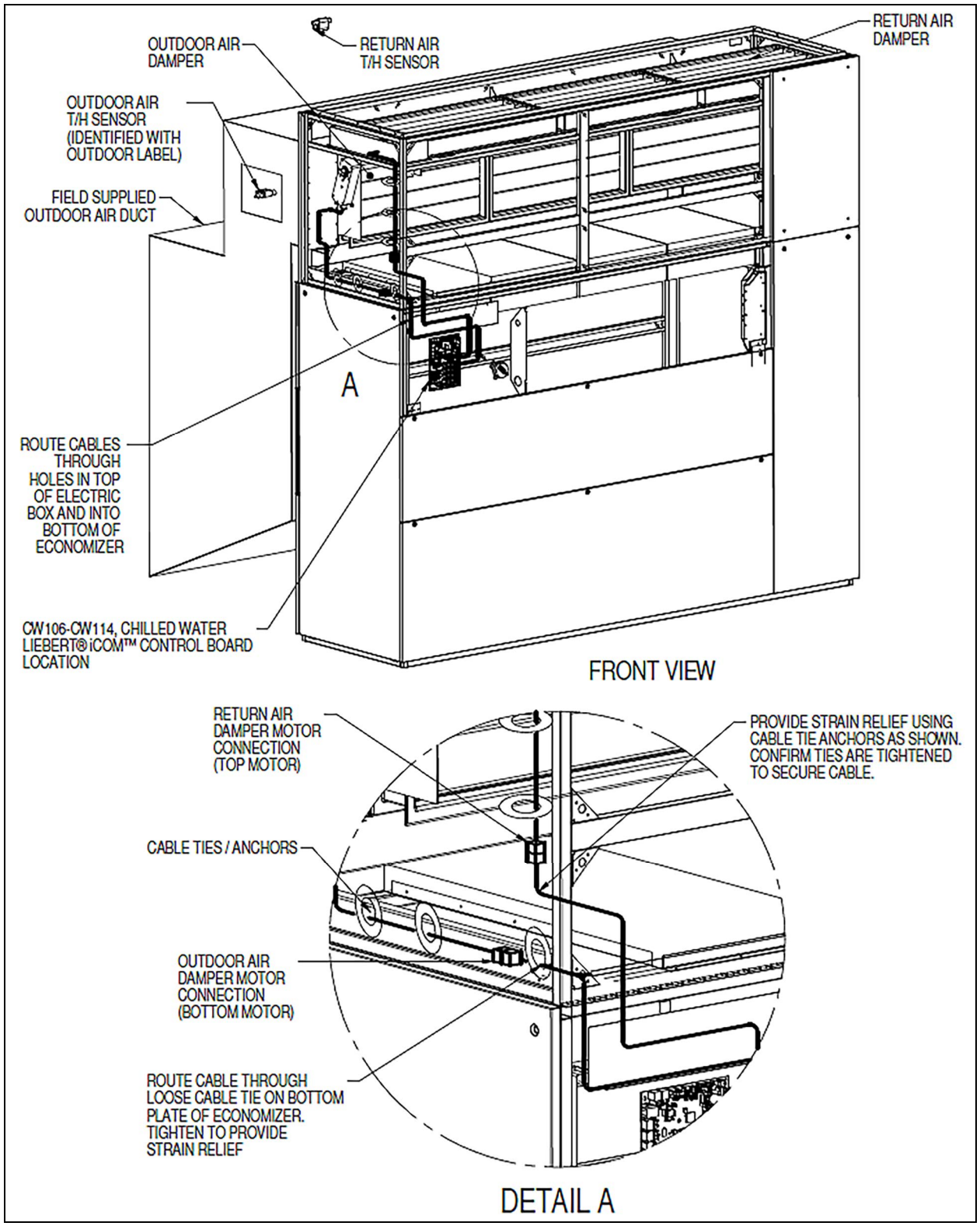

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Figure 13.2 Optional Remote T/H Sensor



Table 13.1 Temperature/Humidity Sensor Dip Switch Settings

Sensor	Pos. #1	Pos. #2	Pos. #3	Pos. #4	Pos. #5	Pos. #6	Pos. #7	Pos. #8
Return T/H Sensor	Off	Off	Off	Off	On	Off	Off	Off

Table 13.2 Temperature/Humidity Sensor Jumper Settings

P2	BDM Header	*Open
P3	CANbus Termination	*Shunt on Pins 2 and 3
P4	Programming	*Open
E10-E13	Serial Port	*Open

*Factory default positions and settings.

13.2 Jumper P3 CANbus Termination

The correct position of this jumper is dependent on your system configuration. If the sensor is physically the first or last node in the CANbus device loop, the jumper must be terminated or shunted across pins #2 and #3 (default position). If the sensor is a middle node in the CANbus device loop, the jumper must be unterminated or shunted across pins #1 and #2.

13.3 Installing Wired Remote Sensors

Up to 10 remote sensor modules, installed in the monitored racks and connected to the cooling unit, provide control and reference input to Vertiv Liebert iCOM and building-management systems. Using remote, rack sensors combats cooling problems related to recirculation air, uneven rack loading, and air distribution.

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The sensor array may consist of either T/H or 2T sensors. A T/H sensor shall provide a single temperature reading and a single humidity reading. A 2T sensor possesses two probes attached to 6 ft. (1.8 m) cabling, see**Figure 13.3** below , and requires several steps to prepare, connect, and begin monitoring the racks:

- Set DIP switches in each sensor.
- Terminate final sensor on CANbus link.
- Install sensors on racks.
- Install CANbus cabling between sensors.
- Connect CANbus cable to the cooling unit.
- Configure the sensors in Vertiv Liebert iCOM.

NOTE: The 2T sensor shown in Figure 13.3 below , may differ slightly for your system, depending on equipment installed.

Figure 13.3 2T Sensor for Remote Temperature Monitoring



13.3.1 Setting DIP Switches and Labeling Remote Sensors

Tools required:

- Small, non-conductive tool to set switches.
- Small, Phillips head screw driver to open 2T housing.

Each sensor requires a unique address in the CANbus loop connected to the cooling unit. We recommend that you set the DIP switch sensor number setting to correspond to the sensor's location on the CANbus run. If settings are incorrect, the control will not operate properly.

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NOTE: Sensors are connected in a daisy chain via CANbus cabling to the cooling unit control board. You can extend the sensor network (up to 10) by adding sensors to the end of the chain and adjusting the termination settings. Do not run individual wires from the sensors to the cooling unit.

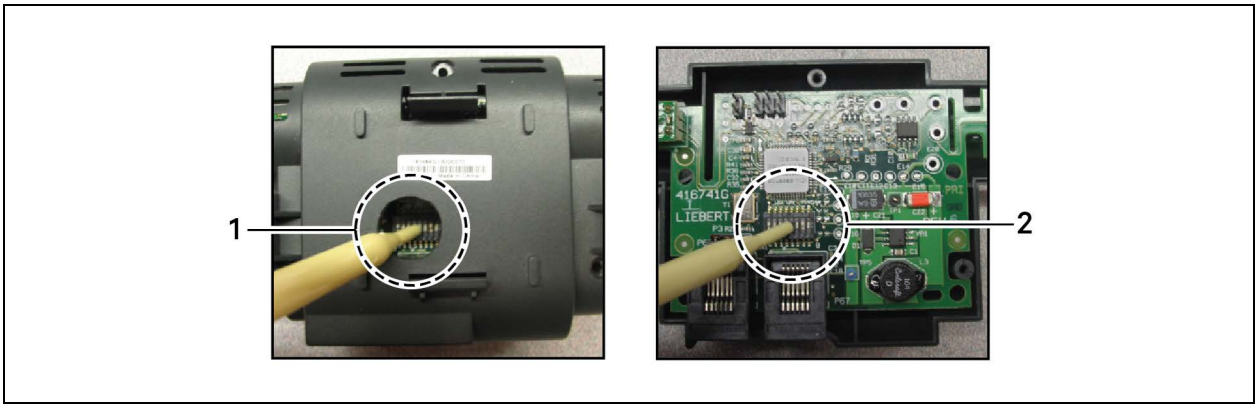
1. Apply numbered stickers to the sensor housing that corresponds to the sensor's position in the chain.
2. Locate the DIP switch hole on the rear of the sensor housing, Figure 13.4 below .

   – or –

   If the hole is not present, or the settings are difficult to make through the hole, remove the cover by removing the Phillips head screws (typically 3). See Figure 13.4 below .

NOTE: Use the non-conductive DIP switch tool (included) or a similar tool to set switches. Do not insert any metal object into the sensor case.

Figure 13.4 DIP Switch Opening/DIP Switches Inside of 2T Sensor



Item	Description
1	Hole in sensor housing
2	Cover removed

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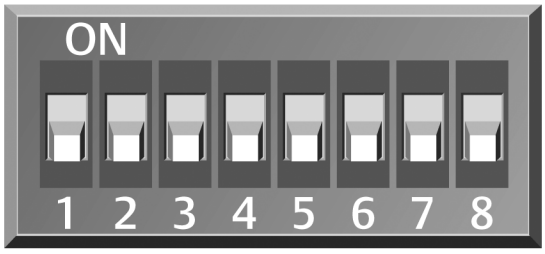
3. Referring to Table 13.3 below , and using the non-conductive tool, set the DIP switches for each sensor to its number in the chain (from sticker applied in step 1).
   Figure 13.5 below , shows a representation of the DIP switches.
4. Confirm that the DIP switches are set correctly for each sensor, and replace the housing cover if necessary.

Table 13.3 DIP Switch Settings for Wired Remote Sensors

Remote Sensor Number/Vertiv Liebert iCOM Label	CAN ID*	DIP Switch Position							
		1	2	3	4	5	6	7	8
Remote Sensor 1	20	Off	Off	On	Off	On	Off	Off	Off
Remote Sensor 2	21	On	Off	On	Off	On	Off	Off	Off
Remote Sensor 3	22	Off	On	On	Off	On	Off	Off	Off
Remote Sensor 4	23	On	On	On	Off	On	Off	Off	Off
Remote Sensor 5	24	Off	Off	Off	On	On	Off	Off	Off
Remote Sensor 6	25	On	Off	Off	On	On	Off	Off	Off
Remote Sensor 7	26	Off	On	Off	On	On	Off	Off	Off
Remote Sensor 8	27	On	On	Off	On	On	Off	Off	Off
Remote Sensor 9	28	Off	Off	On	On	On	Off	Off	Off
Remote Sensor 10	29	On	Off	On	On	On	Off	Off	Off

NOTE: Up is on, down is off on the DIP switch.

Figure 13.5 DIP Switches in 2T or T/H Sensor



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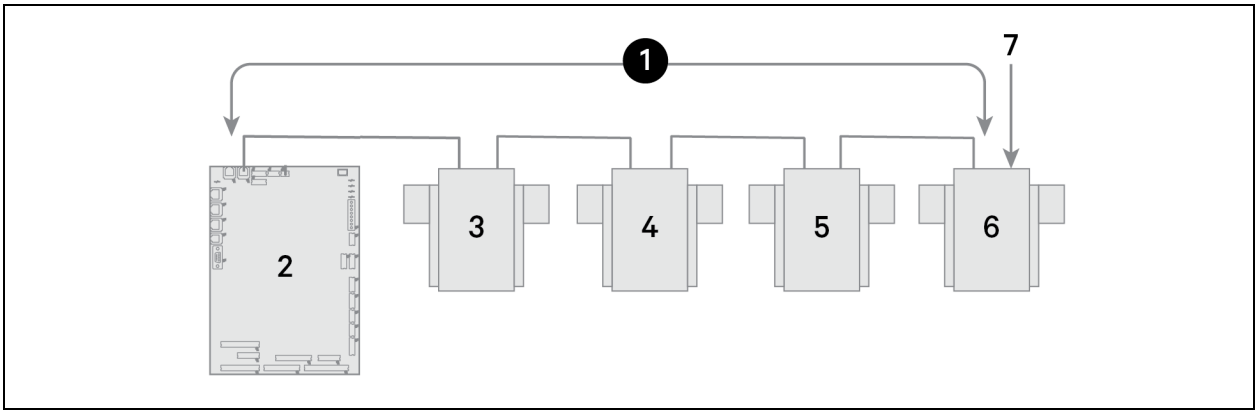
13.3.2 Terminating the Last Sensor on the CANbus link

The remote sensor need not be installed in the numeric-order of their address/sensor number (although it may be easier for later maintenance). However, the last sensor in the chain must be terminated. All others must remain un-terminated. We also recommend that you make a record of the sensor numbers along with the name/number of the rack on which they are installed. Figure 13.6 below , shows an example CANbus arrangement.

NOTE: To add sensors, unterminate final sensor, add sensors to the chain, and terminate the new final sensor.

Figure 13.6 Example Sensor CANbus Arrangement



Item	Description
1	CANbus communication loop
2	Vertiv Liebert iCOM control board
3	2T sensor
4	2T sensor
5	2T sensor
6	2T sensor
7	Terminated sensor

To terminate the last sensor:

1. Locate the sensor that will be last on the network.

NOTE: The last sensor on the network will be the sensor with only one CAN cable after all sensors are connected to the CANbus network. See Connect the CANbus Cable and Ground on page 215 .

2. Open the sensor's case by removing the Phillips head screws (typically 3) on the rear of the housing to access the jumper used for terminating.
3. Remove the black jumper from pins 1 and 2 on the P3 pin connector, and install it on pins 2 and 3 as shown in Figure 13.7 on the next page .
4. Replace the sensor cover. The remote sensor is terminated in the CANbus link.

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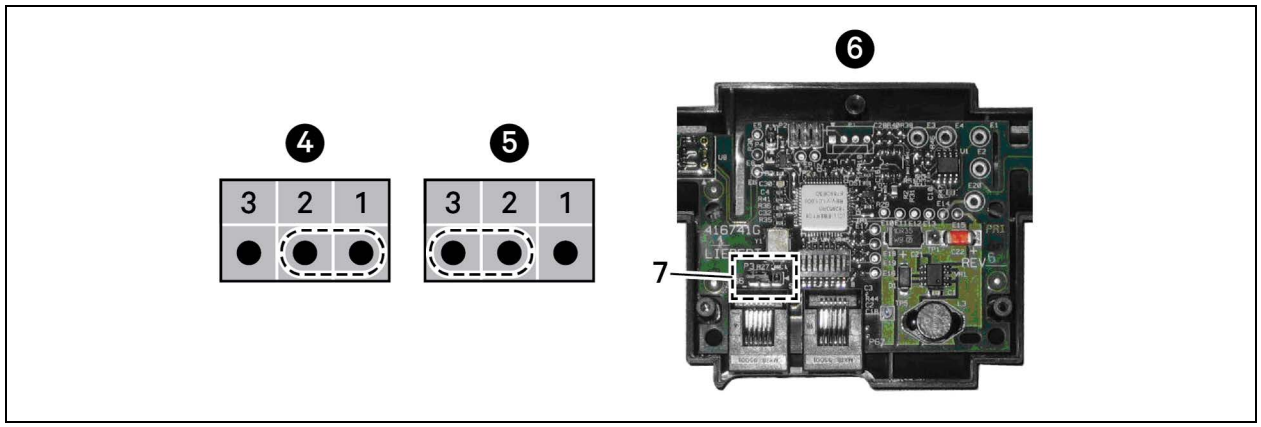
Figure 13.7 Termination Jumper on 2T or T/H Circuit Board



Item	Description
1	Position 1 (P3 jumper)
2	Position 2 (P3 jumper)
3	Position 3 (P3 jumper)
4	Unterminated
5	Terminated
6	Rear of sensor, cover removed
7	P3 termination jumper

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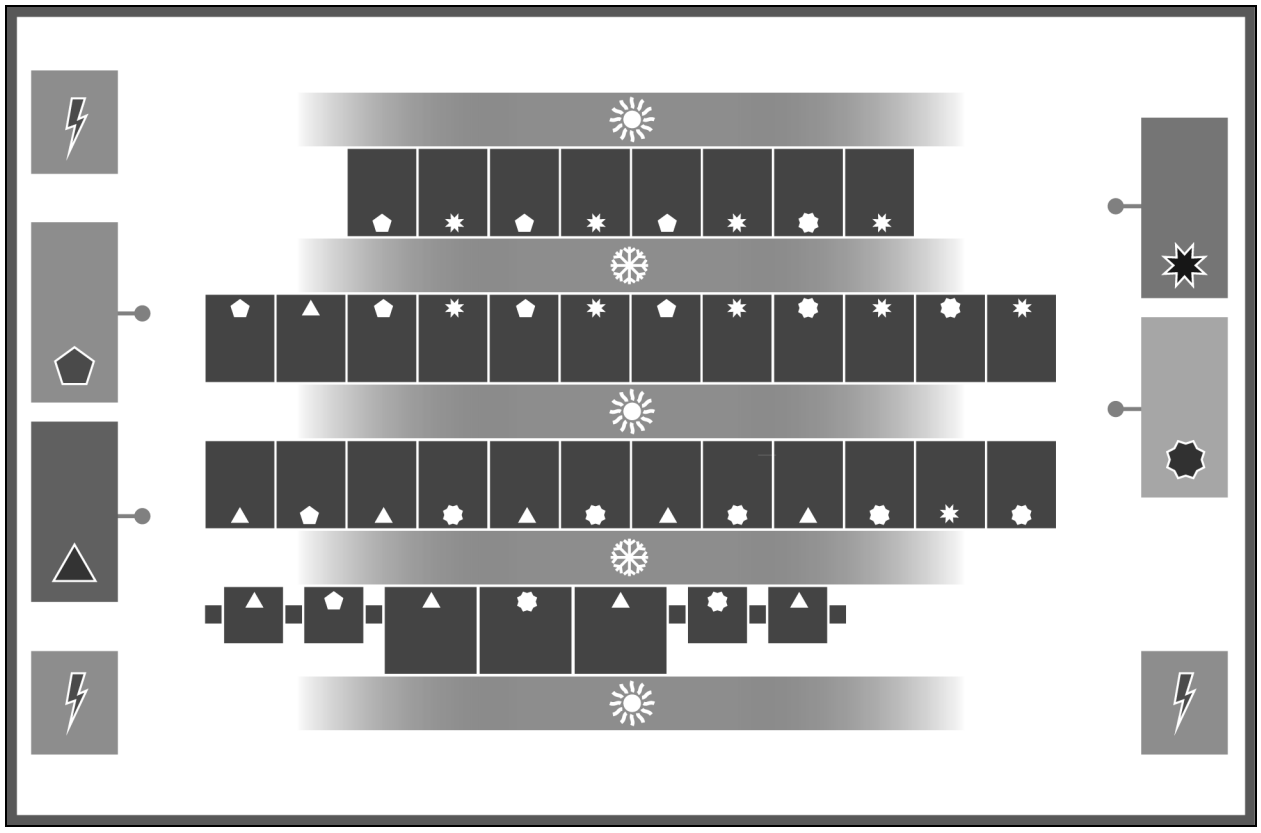
13.3.3 Installing Remote Sensors in the Remote Space to Monitor

Tools required:

- Medium, flat head screw driver to open electric panel dead front
- Cutting tool to trim cable ties

The cooling units and rack sensors in Figure 13.8 below are symbol coded to show how interlacing sensors from different cooling units provides redundancy and effective operation by sharing sensor data from the cooling units in Teamwork mode.

Figure 13.8 Interlacing Sensor Placement



Item	Description	Item	Description
⬟	Unit 1	❄	Cold aisle (front of racks)
▲	Unit 2	☀	Hot aisle (rear of racks)
✸	Unit 3	⊸	Supply (discharge) temperature sensor
✹	Unit 4	ϟ	Power distribution unit

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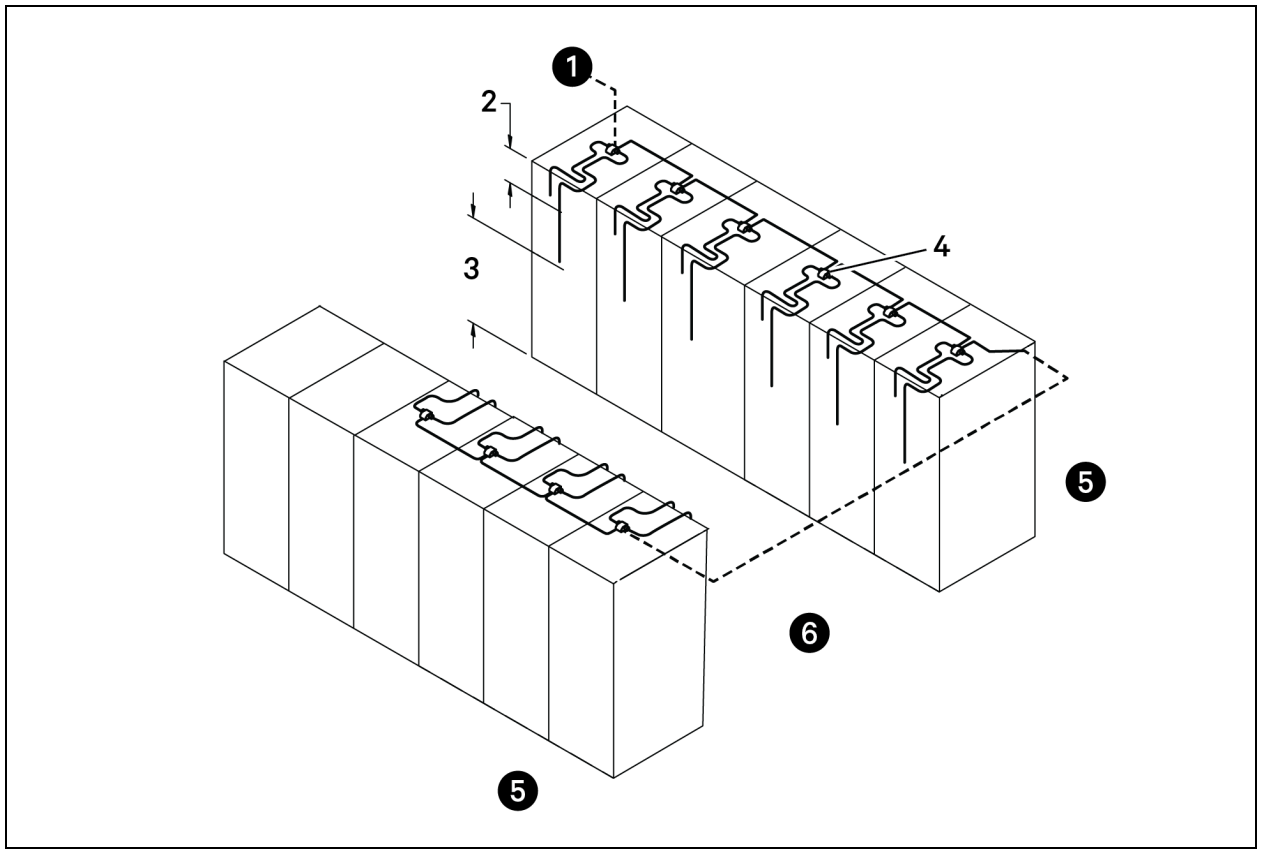
To install the sensors on the racks:

NOTE: Do not leave sensor probes coiled on top or coiled inside of a rack. Do not install a sensor in the hot aisle, or if a sensor is installed in the hot aisle, make sure that it is set to reference to ensure that its readings are not used for fan or cooling control.

1. Install the inlet rack temperature sensors on a rack in the area cooled by its connected unit as shown in **Figure 13.9** below .

Figure 13.9 Remote Sensor Placement



Item	Description
1	To cable entry in cooling unit
2	First probe, 12 in. (305 mm) from top
3	Second probe, in approximate center of rack and in front of the equipment
4	2T sensor with label visible
5	Hot aisle
6	Cold aisle

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NOTE: Both probes on the 2T sensor must be installed on the same rack.

2. Install the 2T sensor probes the front door of the rack:
    a. Using a cable tie, secure the sensor wire so that a probe is approximately 12 in. (305 mm) from the top and in the center of the front door. This sensor monitors hot air coming over the top of the rack from the hot aisle.

NOTE: Do not wrap cable ties around the actual sensor probe. If the rack has no door, secure the probes to the rack at the side of the front opening.

    b. Use a cable tie to secure the sensor wire of the second probe to the front door so that it is centered in front of the heat generating equipment drawing air.

       If the cabinet is completely filled with equipment, determine the center based on cabinet width and height.

    c. With probes in place, use cable ties to route the wires neatly up the rack door and into the rack leaving enough slack in the wire so that the rack door opens and closes without binding or pinching the wire.
    d. Using the supplied, hook-and-loop fastener, connect the 2T-sensor housing to the rack in an easily accessible location and with the sensor number visible.
3. Repeat step 2 until all sensors are installed.

13.3.4 Connect the CANbus Cable and Ground

WARNING! Risk of electric shock. Can cause equipment damage, injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.

Cabling considerations:

- For cable up to 150 ft. (45-m) long, no special considerations are needed.
- Cable 150 ft. (45 m) to 300 ft. (91 m) require a CANbus isolator.
- For cable longer than 300 ft. (91 m), contact the factory.
- The CANbus cable network requires a ground wire.

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To connect the cables:

1. Connect CANbus cable and a ground wire between each sensor for the cooling unit, Figure 13.10 below , taking the following precautions:

NOTE: Remember that the last sensor on the chain must be terminated as described in Terminating the Last Sensor on the CANbus link on page 211 .

- Use only approved hangers, and do not secure cables in a way that could damage them.
- Limit bends to less than four times the diameter of the cable.
- When securing and hanging, avoid deforming the cable.
- Keep cables away from devices that may cause interference such as high voltage wires, machinery, fluorescent lights and electronics.

NOTE: High voltage sources much be at least 12 in. (305 mm) from CAN wires.

- Avoid stretching cables.
- Avoid using excess cable between sensors.
- Make sure that cables have the correct pin out. Mismatched pins at the RJ12 connection will damage the CAN device.

Figure 13.10 CANbus and Ground Connection on 2T Sensor



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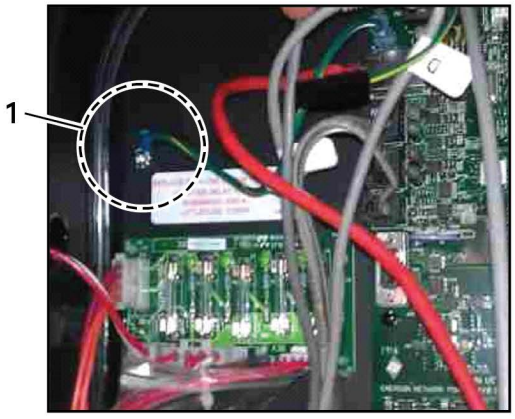
2. Terminate the ground wire to a field installed ground ring in the low voltage electrical panel, as shown in Figure 13.11 below .
3. Connect the CANbus cable to the cooling unit.
   On most cooling units, the connection points for the CANbus link are P66 and P67.

Figure 13.11 Ground Wire Ring Connection



Item	Description
1	CANbus cable grounding ring connected to grounding screw in unit.

13.4 Installing a Fluid Temperature Sensor

1. Locate the DIP switches in the 2T sensor(s) by removing rear housing or via pre-cut hole in housing, Figure 13.12 on the next page , and program according to Table 13.4 below .
   Figure 13.13 on the next page , shows the switch and on/off setting.

Table 13.4 DIP Switch Settings 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 IDs in firmware. These sensors might also be used for monitoring supply temperature. Before installing fluid temperature sensors, determine whether or not the supply-temperature 2T sensors are in use. Adding duplicate sensors will cause sensor communication loss.									

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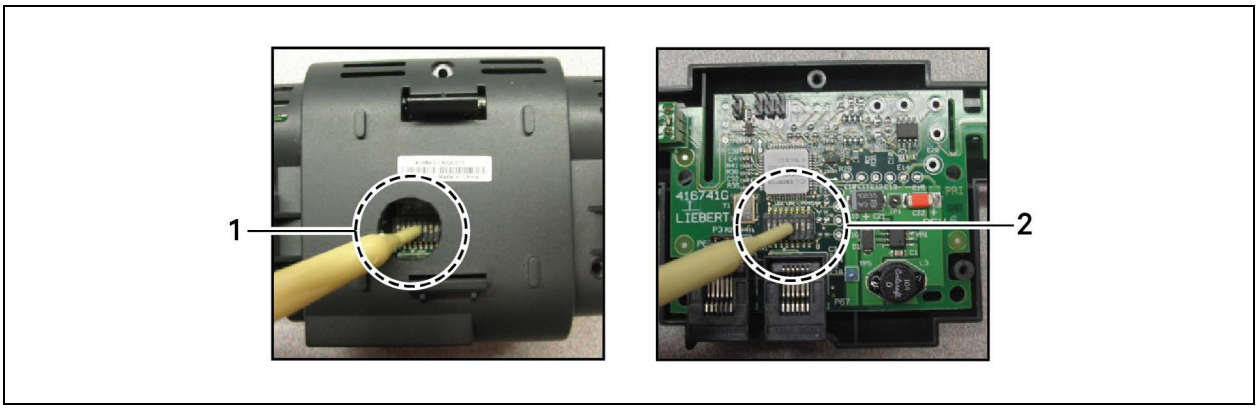
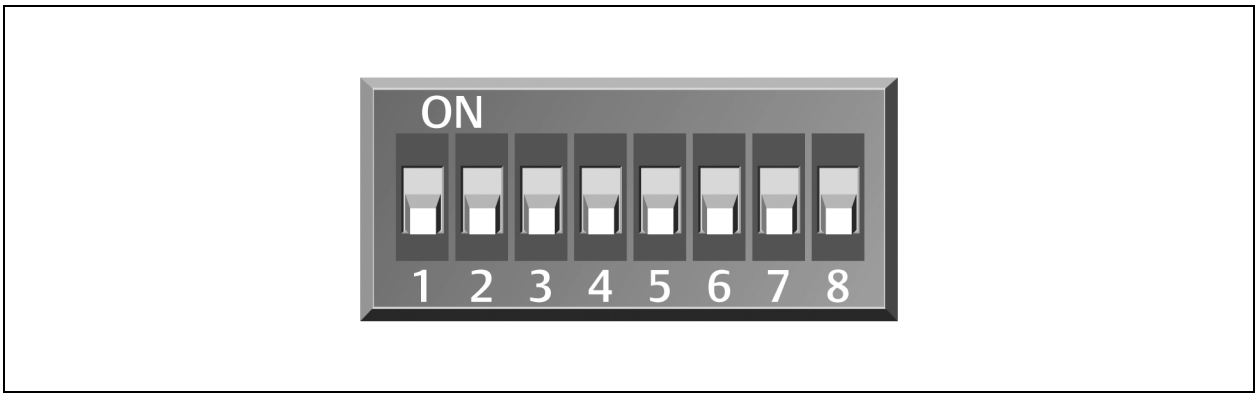
Figure 13.12 Locating DIP Switches in 2T Sensor



Item	Description
1	Hole in sensor housing
2	Cover removed

NOTE: Up is on, down is off on the DIP switch.

Figure 13.13 DIP Switches in 2T Sensor



2. Once DIP switches are set, refer to Terminating the Last Sensor on the CANbus link on page 211, then continue with step 3.
3. On Vertiv Liebert iCOM:
   - In the Service menu, touch *Auxiliary Device Setup* > *Sensors* > *Fluid Sensors* > *Fluid 2T SensorCW T*. The SENSOR PROPERTIES panel opens.
   - In *Fluid Sensor Type*, select the type of 2T sensor.
4. At the fluid inlet and outlet, use a field supplied temperature sensor to verify the temperature readings, compare the Vertiv Liebert iCOM readings to the actual measured temperatures, and calibrate as needed.
   - If inlet and outlet temperature readings in Vertiv Liebert iCOM are reversed based on the field measurements, use Fluid Sensor 1/2 Placement to swap the readings.
5. Touch *Save*. The fluid temperature sensor settings are saved.

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13.5 Installing Supply Air Temperature Sensors

13.5.1 Deploying the Supply Air Temperature Sensor

The supply temperature sensor is connected to P8, Pins 1 and 2 at the factory and requires no configuration.

1. Place the sensor in an area that is influenced only by the unit to which it is connected to provide an accurate reading: 5 ft. to 15 ft. (1.5 m to 4.5 m) from the cooling unit, Figure 13.14 on the next page .

NOTE: A 50 ft. (15 m) extension cable is available from Vertiv if the sensor must be more than 15 ft. (4.5 m) from the Vertiv Liebert iCOM unit.

2. Confirm connectivity via SENSOR DATA. See Viewing Sensor Data on page 21 .

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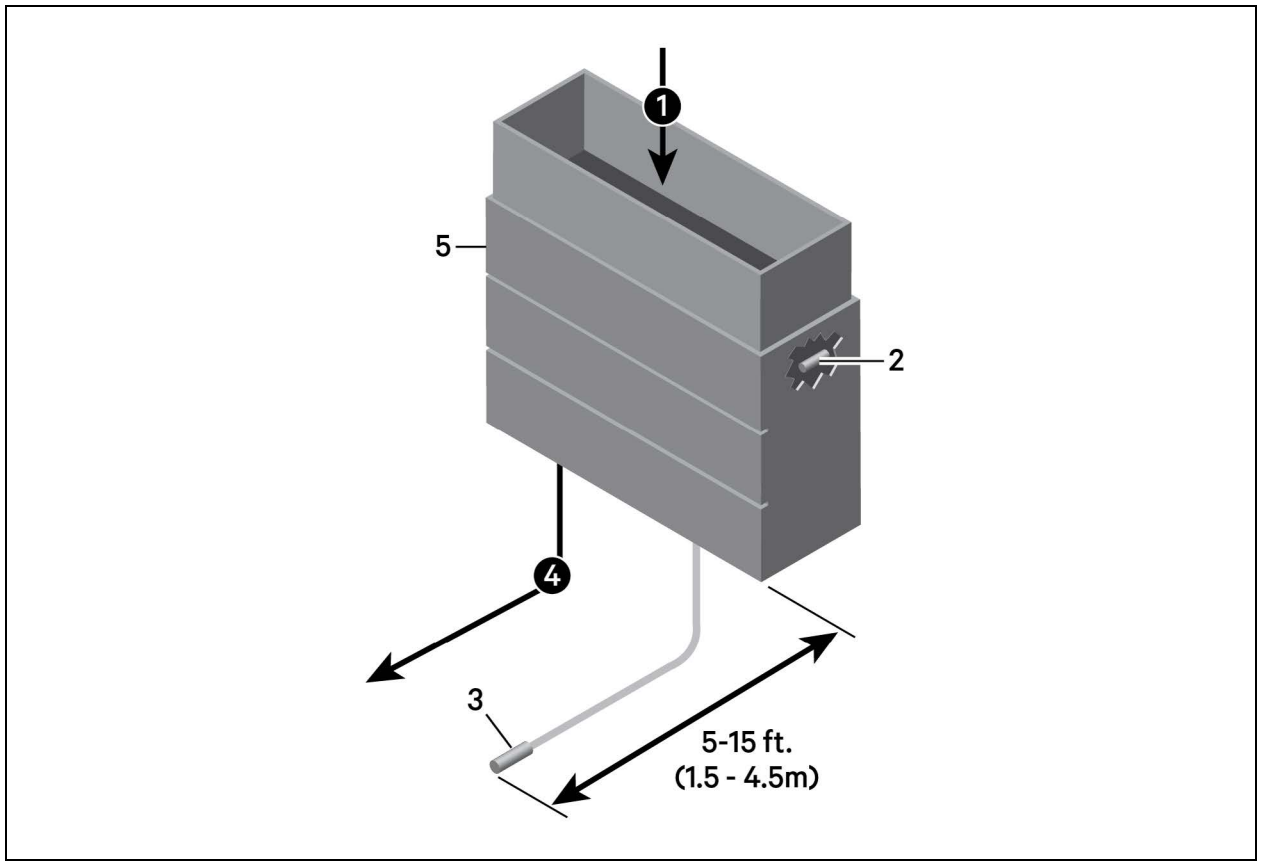
Figure 13.14 Placement of the Supply Air Temperature Sensor



Item	Description
1	Return air
2	Internal temperature/humidity sensor
3	Temperature sensor
4	Supply air
5	Vertiv Thermal Management unit

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13.5.2 Installing Additional Aggregated Supply Air Temperature Sensors

On systems with large supply air plenums, up to five additional 2T or T/H sensors may be connected (via CANbus) in addition to the standard supply air sensor. Vertiv Liebert iCOM then aggregates the readings and converts to average or maximum values for supply control.

NOTE: The sensors used for supply sensor aggregation must be programmed as Sensors A-E (Vertiv Liebert iCOM labels). You may utilize either 2T or T/H sensors when configuring Supply Sensor Aggregation. When using T/H sensors, the humidity values will not be utilized in the aggregated calculation.

The sensor array consists of 2T sensors that each have two temperature probes on a 6 ft. (1.8 m) probe connection cable and requires several steps to prepare, connect, and begin monitoring the racks:

- Set DIP switches in each sensor.
- Terminate final sensor on CANbus link.
- Install sensors.
- Install CANbus cabling between sensors.
- Connect CANbus cable to the cooling unit.
- Configure the sensors in Vertiv Liebert iCOM.

13.6 Installing Analog Input Devices

External sensors and analog devices may be connected to Vertiv Liebert iCOM using an electrical connection on the iCOM control board to a required, factory-supplied plug, harness and terminal strip. (Contact Vertiv technical support for parts.)

When equipped, devices as follows can be connected to terminals 41, 42, 43 and 44, 45 and 46, or 47 and 48. Table 13.5 below , lists available analog inputs depending on the type of cooling unit.

See Configuring Analog Input Devices on page 171 , to configure the Vertiv Liebert iCOM settings for the device.

Table 13.5 Number of Analog Inputs Available by Cooling Unit Type

Cooling Unit	Inputs Available
Vertiv Liebert CW and Vertiv CoolLoop Perimeter with MBV	4 2 may be used for valve feedback on CW, 1 on Vertiv CoolLoop Perimeter.
Vertiv Liebert CW and Vertiv CoolLoop Perimeter with 3P (floating point actuator)	4 2 may be used for valve feedback on CW, 1 on Vertiv CoolLoop Perimeter.
Vertiv CoolPhase Perimeter and Vertiv CoolPhase Perimeter Air-cooled	2 Both used for low pressure transducers.
Vertiv CoolPhase Perimeter Water/Glycol Cooling	0 Models without high pressure transducers may have 2.
Vertiv CoolPhase Perimeter Air Cooled	3 1 is used for low pressure transducers.
Vertiv CoolPhase Perimeter Water/Glycol Cooled	2 1 is used for a low pressure transducer. Optionally, a second for a high pressure transducer.

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13.7 Installing the U2U Network

13.7.1 Required Network Equipment

Ethernet cable CAT5 or greater

- Maximum cable length is 328 ft. (100 m).
- An Ethernet repeater is required for cable lengths greater than 328 ft. (100 m).

Network switch

- IEEE 802.3; IEEE 802.3u
- 10/100 Mbps speed
- Multiple 10/100 RJ-45 ports, one shared.
- RJ-45 up link port

NOTE: Up to 32 cooling units may be connected in a U2U network.

13.7.2 Plan Wiring Runs

When planning the layout of the conditioned space, consider the following:

- Good wiring practices.
- An Ethernet repeater is required for cable lengths greater than 328 ft. (100 m).
- A private network that only connects and manages the cooling units is required.
- Keep control and communication cables away from power cables to prevent electromagnetic interference.
- Keep cables away from noise introducing devices such as machines, fluorescent lights, and electronics.
- Do not bend cables to less than four times the diameter of the diameter of the cable.
- Do not deform cables when hanging or securing in bundles.
- Do not exceed 25 lb (11 kg) of tension when pulling cables to avoid stretching.
- Do not damage cables when securing them. Use only approved hangers, such as telephone wire/RG-6 coaxial wire hangers.

13.7.3 U2U Wiring Connections

NOTICE

Cooling units are factory wired for stand alone operation. Do not connect the U2U network cabling before setting the U2U network configuration/groups. Network communication conflicts and unreliable display readings will result.

Before you begin, refer to Preparing for U2U Group Set Up on page 105 , and Configuring U2U Network Settings on page 107 .

– or –

Contact Vertiv Technical Support at 1-800-543-2778, opt. 5 or https://www.vertiv.com/en-us/support/.

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U2U Network Requirements

The network must be private:

- Isolated from other network traffic/non-Vertiv Thermal equipment.
- Switches connecting the units must be dedicated to Vertiv Liebert iCOM communication only.
- Do not connect the U2U network to the building or IT network. If the U2U network experiences a failure, the cooling units continue to operate independently.

Vertiv Liebert iCOM supports up to 64 nodes on the U2U network. The following are considered nodes:

- Input/output board (one in each cooling unit)
- Nine inch color touchscreen display or vNSA14-iCOM-H

Of the 64 nodes, up to 32 may be cooling unit input/output boards connected as a group. Table 13.6 below , provides U2U network configuration examples.

Table 13.6 Example Vertiv™ Liebert® iCOM™ U2U Network Configurations

Configuration Example	No. of Input/Output Boards (Cooling Units)	No. of Wall Mount Displays	Private Switch Required?
A	2	0	No
B	2	1	Yes
C	3	0	Yes
D	8	1	Yes
E	32	5	Yes
F	32	32	Yes

13.7.4 Wiring Cooling Units without Wall Mount Displays

NOTE: Cooling units are factory wired for stand alone operation. Do not connect the U2U network cabling before setting the U2U network configuration/groups. Network communication conflicts and unreliable display readings will result.

NOTE: Before you begin, refer to Preparing for U2U Group Set Up on page 105 , and Configuring U2U Network Settings on page 107 .

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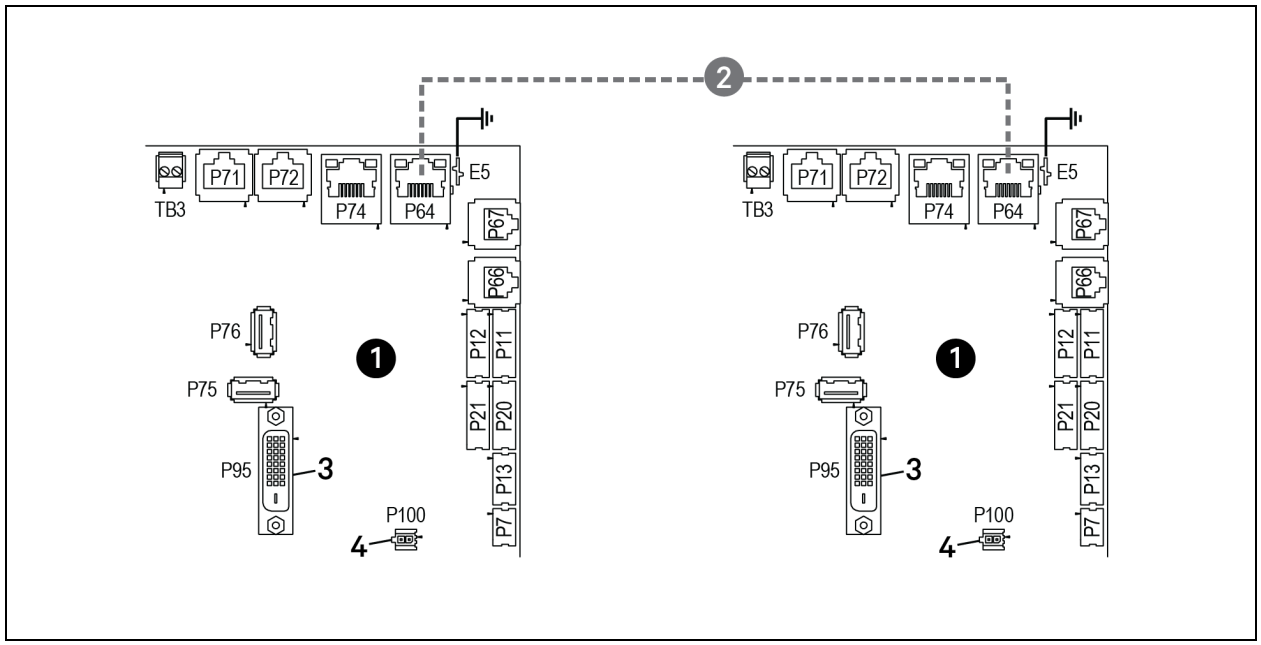
To connect two cooling units with a touchscreen, a network switch is not needed.

- Connect an Ethernet cable to the P64 connector on each Vertiv Liebert iCOM control board as shown in **Figure 13.15** below .

Figure 13.15 Connection Between Only Two Cooling Units—No Network Switch Needed



Item	Description
1	Vertiv Liebert iCOM microprocessor and I/O board
2	Ethernet cable (field supplied)
3	P95 DVI-D cable connection to Vertiv Liebert iCOM display
4	P100, power supply to Vertiv Liebert iCOM display

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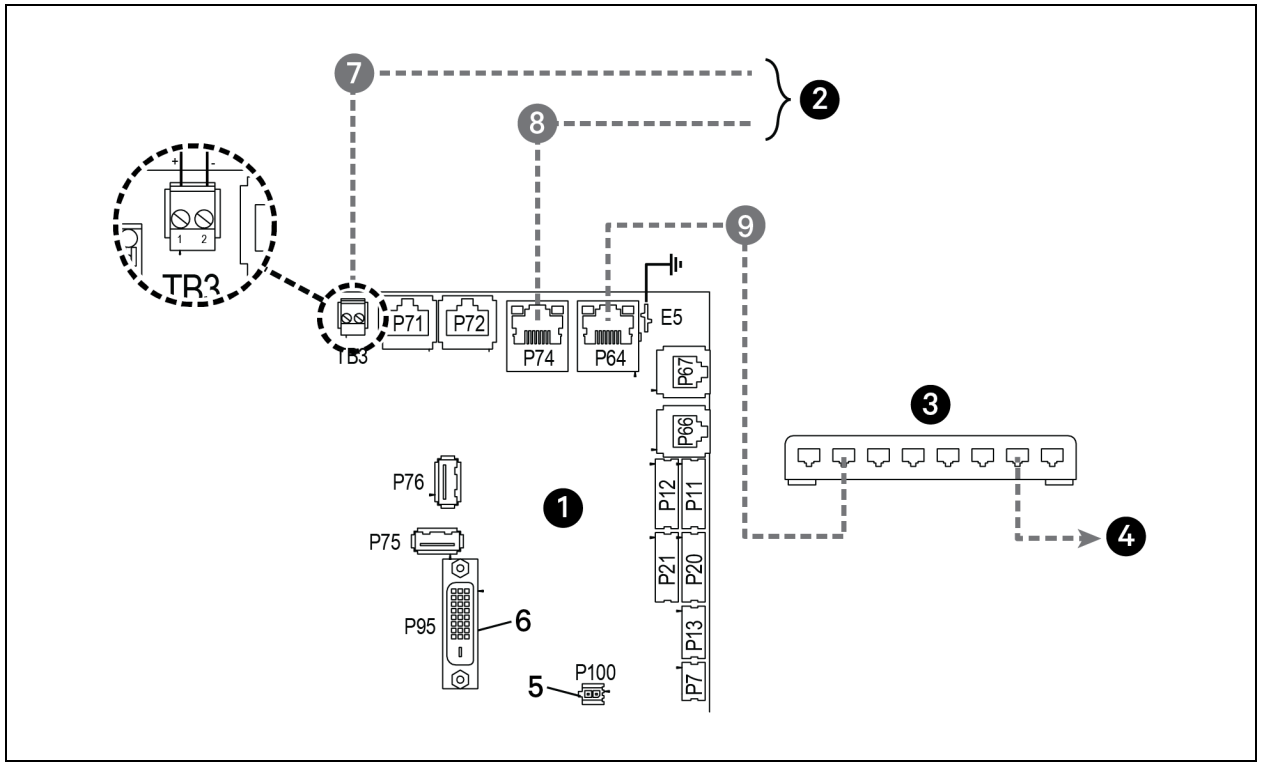
To connect two or more cooling units into one group (maximum of 32 units per group, up to 99 groups), a network switch is required.

- On each unit, connect one end of an Ethernet cable to the P64 connector on each Vertiv Liebert iCOM control board, and the other end to the U2U network switch, see Figure 13.16 below .

Figure 13.16 Connecting Two or More Units with a Network Switch



Item	Description
1	Vertiv Liebert iCOM microprocessor and I/O board
2	Site and BMS communication connections
3	Network switch (field supplied)
4	To/From other networked units
5	P100, power supply to Vertiv Liebert iCOM display
6	P95 DVI-D cable connection to Vertiv Liebert iCOM display
7	RS485 cable
8	Ethernet cable
9	Ethernet cable (field supplied)

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13.7.5 Wiring Cooling Units with Wall Mount Displays

NOTE: Cooling units are factory wired for standalone operation. Do not connect the U2U network cabling before setting the U2U network configuration/groups. Network communication conflicts and unreliable display readings will result.

NOTE: Before you begin, refer to Preparing for U2U Group Set Up on page 105 , and Configuring U2U Network Settings on page 107 .

Nine inch color touchscreen display or VNSA14-iCOM-H may be used to remotely configure, control. and monitor all cooling units connected on the U2U network.

- Each display requires 120 VAC or 230 VAC input power.

To connect wiring:

1. On each wall mount display (32 maximum), connect one plug of a straight through Ethernet cable to port P64 on the rear of the display.
2. Connect the other end to the U2U network switch.

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Appendices

Appendix A: Technical Support and Contacts

A.1 Technical Support/Service in the United States

Vertiv Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Vertiv Thermal Management Products

1-800-543-2378

Vertiv Channel Products

1-800-222-5877

Vertiv AC and DC Power Products

1-800-543-2378

A.2 Locations

United States

Vertiv Headquarters

505 N. Cleveland Ave.

Westerville, OH 43082, USA

Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road

Wanchai, Hong Kong

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Appendix B: Setpoints and Alarm Settings by Line ID

These tables list the parameters by the line identification assignments employed before the Vertiv Liebert iCOM touchscreen. The tables include range/options of the parameter, the factory-default setting, and a description of the parameter function.

The line IDs are not listed in the User or Settings menus, only in the parameter directory. You can search the parameter list to find the line ID and it's associated label and value in the Vertiv Liebert iCOM user interface.

To search the parameters list:

1. Log in at the Service level, then touch 

>  > Parameter Directory.
2. Enter a line ID or term in the Search field, and touch .

B.1 Line IDs for Setpoint Parameters

Table B.1 Service Menu Setpoints by Line ID

Line ID	Parameter Name	Range	Default Setting	Description
S102.1	Temperature Control Sensor	Supply Sensor Return Sensor Remote Sensor	Return Sensor	Selects which sensor will be controlling/influencing the cooling capacity. Cooling capacity is either the chilled water valve, compressor, free cooling 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 sensor.
S103.1 S103.2	Temperature Setpoint Actual Temperature Setpoint	32 - 113 °F 0.0 - 45.0°C 41 - 104°F 5.0 - 40.0°C	73°F 23.0°C 73°F 23.0°C	The temperature setpoint actual value is a read-only value that indicates if another routine, such as supply compensation has internally modified the Temperature controlling value. If compensation has not been activated, the ACT and SET will always match. Selects a temperature that the cooling unit will maintain by applying cooling and/or reheats. The temperature setpoint value that has been set by the User to control the temperature.
S104.1	Temperature Control Type	Proportional PI Adaptive PID Intelligent	PI	Sets the type of control to be followed: Proportional, PI, Adaptive PID (auto-tuning), Intelligent
S105.1 S105.2	Temperature User Low Limit Temperature User High Limit	41 - 104°F 5.0 - 40.0°C 41 - 104°F 5.0 - 40.0°C	41°F 5.0°C 10°F 40.0 °C	Defines the temperature range below setpoint; temperature setpoint cannot be adjusted below this value. If the setpoint value has been adjusted lower than this setting, then the setpoint will automatically default back to its previous setting. Defines the temperature range above setpoint; temperature setpoint cannot be adjusted above this value. If the setpoint value has been set higher than this setting, then the setpoint will automatically default back to its previous setting.
S106.1	Temperature Proportional Band	4 - 200°F 2.2 - 111.0 K	12°F 6.7 K	Adjusts the activation points of compressors/chilled water valves or rate of changed based on the actual sensor values deviation from setpoint. The smaller this number, the faster the compressors/chilled water values will increase capacity. Too small of a number may cause the unit to short cycle compressors or excessively reposition the valve.
S106.2	Temperature Integral Time	0.0 - 15.0 min	5.0 min	Adjusts the capacity of the units based on time away from setpoint so that accurate temperature control can be maintained. The proportional and integral time settings

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Table B.1 Service Menu Setpoints by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
				work together to maintain setpoint. Large p-band and small integral time is typical when controlling to supply air.
S107.1	Temperature Derivative Time	0 - 900 sec	0 sec	
S108.1	AutoSet Enable	No Yes	Yes	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.
S109.1	Temperature Deadband	0 - 36°F 0 - 20.0 K	2°F 1.1 K	Avoids overshooting of the setpoint and cycling between cooling and reheats. The value entered in this field will be split in half by the temperature setpoint.
S110.1	Supply Limit Enabled	No Yes	No	Chilled water units may be set up with the supply air sensor to maintain a minimum air temperature under the 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 values. The control compares the deviation from the return air setpoint & the supply limit setpoint, and calculates the output to the actuator from the smaller deviation.
S110.2	Supply Limit Setpoint	41 - 81°F 5.0 - 27.0°C	41°F 5.0°C	
S111.1	Heater Deadband	0 - 36°F 0 - 20.0 K	0°F 0.0 K	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.
S113.1	Enable Temperature Compensation	No Return Supply Ret+Sup	No	Temperature compensation allows for a second or even a third sensor to be used that will influence the units cooling or heating. Return compensation can be used when the supply or remote sensors are being used for control. Then the return sensor is then monitored to maintain a minimum return temperature. Supply compensation can be used only when Optimized Aisle (TW3) is enabled. The supply sensor will not only be used for controlling cooling capacity but will also monitor the cold aisle temperature to ensure that the cold aisle temperature setpoint is met.
S114.1	Return Compensation Setpoint	41 - 104°F 5.0 - 40.0°C	73°F 23.0°C	The temperature setpoint where compensation begins to operate by increasing the supply air setpoint.
S115.1	Return Compensation Value	0 - 18°F 0.0 - 10.0 K	0°F 0.0 K	The return compensation band/value will determine how quickly the cooling capacity is adjusted as the return temperature drops below the return compensation setpoint.
S115.2	Return Compensation Band	0 - 18°F 0.0 - 10.0 K	0°F 0.0 K	
S116.1	Supply Compensation Value	0 - 18°F 0.0 - 10.0 K	0°F 0.0 K	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.
S121.1	CW Capacity Filter @ 100%	0.01 - 99.99 %/s	0.60 %/s	At the end of the p-band (at 100% call for cooling), it is typically set higher (faster)

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Table B.1 Service Menu Setpoints by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
	BMS Backup Temp Setpoint	41 - 104°F 5.0 - 40.0°C	73°F 23.0°C	Selects a temperature setpoint that will be activated in the event of a BMS timeout. The BMS timer must be configured for this parameter to be active.
U113.1	2nd Temperature Setpoint	41 - 104°F 5.0 - 40.0°C	73°F 23.0°C	Selects a temperature setpoint that will be activated in the event of a customer input signal configured as the second setpoint. The customer input must be configured for the parameter to activate.
S124.1	Humidity Control Sensor	Remote Sensor Return Sensor	Return Sensor	Defines which humidity sensor the humidity setpoint is compared with. The return sensor is equipped with a Temp/Hum sensor and can calculate the dew point based on Vertiv Liebert iCOM's internal look up table. If a sensor other than the return sensor is selected, the Vertiv Liebert iCOM will calculate the corresponding RH % based on that sensors actual temperature.
S125.1	Dew Point Setpoint & Humidity Setpoint	41 - 65°F 5.0 - 18.3°C	48°F 8.9°C	Selects a humidity level 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.
S126.1	Humidity Control Type	Relative Compensated Predictive Dew Point	Predictive	Selects the humidity control calculation. Setting this parameter to relative (%RH) 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. Compensated is recalculated with the actual deviation from temperature setpoint. 1° Celsius is equal to 3 % RH, indirect proportional. If temperature increases, the humidity setpoint is decreased and vice versa.
S127.1	Humidity Proportional Band	1 - 20%	0.2	Adjusts the activation points of the humidifier and compressors based on the actual sensor values deviation from setpoint. The smaller this number, the faster the compressors and humidifier will increase capacity. Too small of a number may cause the unit to short cycle or overshoot setpoint.
S127.2	Dew Point Proportional Band	2 - 18°F 1.1 - 10.0 K	8°F 4.4 K	
S128.2	Humidity Integration Time	0.0 - 25.0 min	0.0 min	Adjusts the capacity of the unit based on a 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 integration time is set, the control mode changes to PI control
S129.1	Humidity Deadband	0 - 18°F 0.0 - 10.0 K	4°F 2.2 K	Prevents overshooting of the setpoint and cycling between humidification and dehumidification. The value entered in this field will be split in half by the temperature setpoint.
S146.1	Fan Control Sensor	Supply Sensor Remote Sensor Return Sensor Manual	Return Sensor	Controls the fan speed for modulation. If MANUAL is selected, then the fan speed can be controlled from the local display or through a building management system.
S147.1	Fan Setpoint	41 - 104°F 5.0 - 40.0 °C	73°F 22.8°C	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 fan speed STD for control.

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Table B.1 Service Menu Setpoints by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
S148.1	Fan Temperature Control Type	Proportional PI Adaptive PID	PI	Sets the type of control the unit will use to control fan speed. PI control 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.
149.1	Fan Temperature Control Prop Band	4 - 200°F 2.0 - 111.0 K	36°F 20.0 K	Adjusts the fan speed rate of change based on the actual sensor values deviation from setpoint. The small this number, the faster the fans will increase speed. Too small of a number may cause the fans increase/decrease to overshoot setpoint
149.2	Fan Temperature Control Integration Time	0.0 - 15.0 min	1.0 min	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 integral time is a typical way to achieve stable control.
S150.1	Fan Hysteresis	0 - 20%	0.02	Modifies the reaction of the fan speed when fan speed is being dictated by the Call for Cooling. Adding the Hysteresis may result in a lagged response to changes in fan speed.
S150.2	Fan Deadband	0 - 36°F 0 - 20.0 K	°F 0.6 K	Avoids overshooting of the setpoint. The value entered in this field will be split in half by the fan speed setpoint.
S151.1	Airflow Calibration	3.0 - 10.0 V	10.0 V	Allows the front display to be scaled to show the actual percentage of airflow independent of the voltage operating the fan speed. This value cannot be set above/below the Analog Output High/Low Limit for the fan set in the Advanced Menu. This also includes the service menu fan speed parameters.
S152.1	Fanspeed VSD Setpoint Minimum	0 - 100%	0.7	Sets the range for the variable fans. Min sets the minimum speed at which the fan will operate. Fan speed is modulated between MIN and STD based on which sensor is set as the controlling sensor, setpoint and the PI settings. If the controlling sensor is set to manual, then the STD setting will control the current fan speed. This parameter is also adjustable through the BMS.
S152.2	Fanspeed VSD Setpoint Standard	0 - 100%	1	
S157	Fan Startup Time	0 - 600 sec	3 sec	Determines the speed of the fan at system start up. The fan will operate at the set speed (%) until the set time has elapsed; at this point the fan will assume normal operation.
	Fan Startup Speed	0 - 100%	100%	

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B.2 Line IDs for Alarm Setting Parameters

Table B.2 Service Menu Alarm Settings by Line ID

Line ID	Parameter Name	Range	Default Setting	Description
S202	Return Sensor Alarms Enable	Disabled Enabled	Enabled	Enables or disables the return temperature and humidity sensor alarms.
	Return Sensor Alarms Init Delay	10 - 9999 sec	90 sec	
S203	High Return Temperature Alarm Low Return Temperature Alarm	34 - 210 °F 1.0 - 99.0 °C 34 - 210 °F 1.0 - 99.0 °C	100 °F 65 °F	Sets the temperature threshold for the high/low return temperature alarms.
S204	High Return Humidity Alarm	1.0 - 99.0 %	0.65	Sets the humidity threshold for the high/low return temperature alarms.
	Low Return Humidity Alarm	1.0 - 99.0 %	0.35	
S205	Sensor A Alarms Enable Sensor A Alarms Init Delay	Disabled Enabled 10 - 9999 sec	Disabled 90 sec	Enables or disables the alarms associated with Sensor A and sets the time delay before the alarm is annunciated.
S206	Sensor A Low Temperature Alarm	34 - 210 °F 1.0 - 99.0 °C	55 °F	Sets the temperature threshold when Sensor A high/low temperature alarm will occur.
	Sensor A High Temperature Alarm	34 - 210 °F 1.0 - 99.0 °C	90 °F	
S207	Sensor A Low Humidity Alarm Sensor A High Humidity Alarm	1.0 - 99.0% 1.0 - 99.0%	30.0% 70.0%	Sets the temperature threshold when Sensor A high/low humidity alarm will occur.
S208	Warning Activates Alarm Relay	No Yes	Yes	When set for Yes, a Warning event type will activate the Alarm Relay as well as an Alarm event type.
S209	K11 (WA Relay) Active On	0 = Dehum 1 = Warning 2 = Emergency Pwr 3 = Freecooling 4 = FC Start	Warning	The Warning Relay (WA Relay) can be activated for different purposes; during a call of Dehumidification during a warning event type, when unit is on Emergency Power and a Customer Input Alarm is configured for Emergency Pwr, during free cooling, or during free cooling (FC) Start.
S210	K11(WA Relay) and AL Relay	Direct Reverse	Direct	Determines whether the K11 (WA Relay) is direct or reverse acting.
S211	Water Alarm Shuts Down Unit Water Alarm Hum Fill Down	No Yes No Yes	No No	The controller can be configured to shut the following down during an active Water Alarm: • Shutdown the entire unit • Shutdown humidification operation

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
S21A	Loss of Flow Compressor Timer	0 - 180 sec	0 sec	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/glycol-cooled systems
S21B	Loss of Flow Threshold	0 - 100 %	0.1	Sets the threshold for call for cooling loss of flow.
S213	Supply Sensor Alarms Enable	Disabled Enabled	Disabled	Enables or disables the supply sensor alarms. If the unit is not equipped with a supply temperature sensor, then this parameter will show Disabled. A user may also select the time delay before the alarm will become active.
	Supply Sensor Alarms Init Delay	10 - 9999 sec	90 sec	
S214	High Supply Temperature Low Supply Temperature	34 - 210 °F 1.0 - 99.0 °C 34 - 210 °F 1.0 - 99.0 °C	75 °F 50 °F	Sets the high and low supply temperature threshold at which the alarms will be triggered.
S215	Dew Point Alarms Enable	Disabled Enabled	Disabled	Enables or disables the Return Air Dew Point alarm. Dew point alarms can be enabled with any humidity control type. Dew point alarms may be used with or without humidification or dehumidification options selected. A user may adjust the time delay before the alarm is activated.
	Dew Point Alarms Init Delay	10 - 9999 sec	90 sec	
S216	High Dew Point Low Dew Point	34 - 210 °F 1.0 - 99.0 °C 34 - 210 °F 1.0 - 99.0 °C	59 °F 39 °F	Sets the high/low dew point threshold.
S217	Sensor A Dew Point Alarms Enable	Disabled Enabled	Disabled	Enables or disables the optional Sensor A Dew Point alarm. Dew Point alarms can be enabled with any humidity control type. Dew point alarms may be used with or without humidification or dehumidification options selected. A user may adjust the time delay before the alarm is activated.
	Sensor A Dew Point Alarms Init Delay	10 - 9999 sec	90 sec	
S218	High Dew Point Sensor A Low Dew Point Sensor A	34 - 210 °F 1.0 - 99.0 °C 34 - 210 °F 1.0 - 99.0 °C	62 °F 36 °F	Sets the high/low Sensor A dew point thresholds.
S219	Remote Sensor Alarms Enable	0 = Disabled 1 = Com Set 2 = Sep Set	Disabled	Disable prevents remote temperature sensor alarms from occurring. Com Set or common setting allows remote alarm activation based on a common alarm setting. Sep Set, or separate setting allows the user to program unique temperature alarm settings. A user may adjust the time delay before the alarm is activated.
	Remote Sensor Alarms Init Delay	10 - 9999 sec	180 sec	

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
S220	High Remote Temperature Low Remote Temperature	34 - 210 °F 1.0 - 99.0 °C 34 - 210 °F 1.0 - 99.0 °C	90 °F 55 °F	Sets the high/low remote sensor alarm thresholds.
S222	EEV Alarm Board	0 = NO 1 = NC	1 (NC)	
S22A	Operation on Sensor Failure Operation on Sensor Failure Cooling Mode	0 = Cooling 1 = Shutdown 0 = Full 1 = Hold	0 (Cooling) 0 (Full)	Selects function to occur if the temperature control sensor fails. Full = Full, CFC Hold = hold last CFC
S224 - S233, S23A,	Customer Input 1 - 11	0 = Smoke 1 = Water Alarm 2 = C PMP Alarm 3 = Flow Alarm 4 = Stdby G Pump 5 = Stdby Unit 6 = C-Input 1 7 = C-Input 2 8 = C-Input 3 9 = C-Input 4 10 = Rht Lockout 11 = Hum Lockout 12 = Rht+Hum Lock 13 = Comp Lockout 14 = Call Service 15 = High Temp 16 = Air Loss 17 = FC Lockout 18 = Heater Alarm 19 = Flow AL SD 20 = Flow AL LC	1 (Water Alarm) for inputs 1-4 38 (Not Used) for inputs 5-11	Selects the device and operation of the Customer Inputs. Each event reflects a different alarm scenario and possible action to the unit. A user may select whether the customer input is normally open or normally closed. If the parameter is configured for Factory STD., then it indicates that this input is factory configured and is not configurable in the field.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
S224 - S233, S23A, (Cont'd)	Customer Input 1 - 11 (Cont'd)	21 = Comp Lock PD 22 = Enable FC 23 = HTRJ VFD 24 = HTRJ SPD 25 = Fire Alarm 26 = 2nd Setpoint 27 = Emergency Pwr 28 = LSI 29 = Cond 1 Fail 30 = Cond 2 Fail 31 = D-Scroll Red 32 = Swap Valve 33 = EC Fan Fault 34 = Eco Airflow 35 = Damper Switch 36 = Power A 37 = Power B 38 = Not Used 39 = Flow AL LFC 40 = Hand Mode 41 = Fan Overrd. 42 = Cool Overrd	1 (Water Alarm) for inputs 1-4 38 (Not Used) for inputs 5-11	Selects the device and operation of the Customer Inputs. Each event reflects a different alarm scenario and possible action to the unit. A user may select whether the customer input is normally open or normally closed. If the parameter is configured for Factory STD., then it indicates that this input is factory-configured and is not configurable in the field.
S224 - S233, S23A, (Cont'd)	Customer Input Active open/closed	Closed Open	Closed	A user may select if the customer input is active when contacts are open or closed.
S236	Event Delay Time (sec) Event Enabled Event: MAIN FAN OVERLOAD	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled ALARM	Main fan overload.
S237	Initial Loss of Airflow Delay	10 - 600 sec	30 sec	Loss of airflow.
	Event Delay Time (sec)	10 - 9999 sec	30 sec	
	Event Enabled	Disabled Enabled	Enabled	
	Event: LOSS OF AIRFLOW	MESSAGE WARNING ALARM	ALARM	
S238	Event Delay Time (sec) Event Enabled Event: CLOGGED FILTERS	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled WARNING	Clogged filters.
S239	Event Delay Time (sec)	10 - 9999 sec	30 sec	High room temperature.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
	Event Enabled	Disabled Enabled	Enabled	
	Event: HIGH ROOM TEMP	MESSAGE WARNING ALARM	WARNING	
S240	Event Delay Time (sec) Event Enabled Event: LOW ROOM TEMP	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	30 sec Enabled WARNING	Low room temperature.
S241	Event Delay Time (sec)	10 - 9999 sec	30 sec	High room humidity.
	Event Enabled	Disabled Enabled	Enabled	
	Event: HIGH ROOM HUM	MESSAGE WARNING ALARM	WARNING	
S242	Event Delay Time (sec) Event Enabled Event: LOW ROOM HUM	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	30 sec Enabled WARNING	Low room humidity.
S243	Event Delay Time (sec)	10 - 9999 sec	30 sec	High temperature Sensor A.
	Event Enabled	Disabled Enabled	Disabled	
	Event: HIGH TEMP SENSOR A	MESSAGE WARNING ALARM	WARNING	
S244	Event Delay Time (sec) Event Enabled Event: LOW TEMP SENSOR A	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	30 sec Disabled WARNING	Low temperature Sensor A.
S245	Event Delay Time (sec)	10 - 9999 sec	30 sec	High humidity sensor A.
	Event Enabled	Disabled Enabled	Disabled	
	Event: HIGH HUM SENSOR A	MESSAGE WARNING ALARM	WARNING	
S246	Event Delay Time (sec) Event Enabled	10 - 9999 sec Disabled Enabled	30 sec Disabled	Low humidity sensor A.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
	Event: LOW HUM SENSOR A	MESSAGE WARNING ALARM	WARNING	
S249	Event Delay Time (sec)	–	–	Compressor 1 overload.
	Event Enabled	Disabled Enabled	Enabled	
	Event: COMP 1 OVERLOAD	MESSAGE WARNING ALARM	ALARM	
S250	Event Delay Time (sec)	–	–	Compressor 2 overload.
	Event Enabled	Disabled Enabled	Enabled	
	Event: COMP 2 OVERLOAD	MESSAGE WARNING ALARM	ALARM	
S251	Event Delay Time (sec)	–	–	Circuit 1 high pressure.
	Event Enabled	Disabled Enabled	Enabled	
	Event: CIRCUIT 1 HIGH PRESS	MESSAGE WARNING ALARM	ALARM	
S252	Event Delay Time (sec)	–	–	Circuit 2 high pressure.
	Event Enabled	Disabled Enabled	Enabled	
	Event: CIRCUIT 2 HIGH PRESS	MESSAGE WARNING ALARM	ALARM	
S253	Event Delay Time (sec)	–	–	Circuit 1 low pressure.
	Event Enabled	Disabled Enabled	Enabled	
	Event: CIRCUIT 1 LOW PRESS	MESSAGE WARNING ALARM	ALARM	
S254	Event Delay Time (sec)	–	–	Circuit 2 low pressure.
	Event Enabled	Disabled Enabled	Enabled	
	Event: CIRCUIT 2 LOW PRESS	MESSAGE WARNING ALARM	ALARM	
S255	Event Delay Time (sec)	–	–	Circuit 1 pump down failure.
	Event Enabled	Disabled Enabled	Enabled	
	Event: CIRCUIT 1 PUMPD. FAIL	MESSAGE WARNING ALARM	ALARM	
S256	Event Delay Time	–	–	Circuit 2 Pump down failure.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
	(sec) Event Enabled Event: CIRCUIT 2 PUMPD. FAIL	 Disabled Enabled MESSAGE WARNING ALARM	 Enabled ALARM	
S257	Event Delay Time (sec)	—	—	Digital scroll 1 high temperature.
	Event Enabled	Disabled Enabled	Enabled	
	Event: DIG SCROLL1 HIGH TEMP	MESSAGE WARNING ALARM	ALARM	
S258	Event Delay Time (sec) Event Enabled Event: DIG SCROLL2 HIGH TEMP	— Disabled Enabled MESSAGE WARNING ALARM	— Enabled ALARM	Digital scroll 2 high temperature.
S259	Event Reset Type	0 = AR 1 = MR	0 (AR)	Electric heat high temperature. AR = Auto Reset, MR = Manual Reset.
	Event Delay Time (sec)	10 - 9999 sec	10 sec	
	Event Enabled	Disabled Enabled	Enabled	
	Event: EL HEAT HIGH TEMP	MESSAGE WARNING ALARM	ALARM	
S262	Event Delay Time (sec) Event Enabled Event: UNIT HRS EXCEEDED	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled WARNING	Working hours exceeded.
S263	Event Delay Time (sec)	10 - 9999 sec	10 sec	Smoke detected.
	Event Enabled	Disabled Enabled	Enabled	
	Event: SMOKE DETECTED	MESSAGE WARNING ALARM	ALARM	
S264	Event Delay Time (sec) Event Enabled Event: WATER UNDER FLOOR	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled ALARM	Water under floor.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
S265	Event Delay Time (sec)	10 - 9999 sec	10 sec	Cond. pump high water.
	Event Enabled	Disabled Enabled	Enabled	
	Event: COND PUMP-HIGH WATER	MESSAGE WARNING ALARM	ALARM	
S266	Event Delay Time (sec) Event Enabled Event Number 107 Enabled Event: LOSS OF FLOW	0 = AR 1 = MR 10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	0 (AR) 10 sec Enabled ALARM	Loss of flow. AR = Auto Reset, MR = Manual Reset.
S267	Event Delay Time (sec)	10 - 9999 sec	10 sec	Standby glycol pump ON.
	Event Enabled	Disabled Enabled	Enabled	
	Event: STANDBY GLYCOL PUMP ON	MESSAGE WARNING ALARM	ALARM	
S268	Event Delay Time (sec) Event Enabled Event: STANDBY UNIT ON	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled ALARM	Standby unit ON.
S269	Event Delay Time (sec)	10 - 9999 sec	10 sec	Humidifier problem.
	Event Enabled	Disabled Enabled	Enabled	
	Event: HUMIDIFIER PROBLEM	MESSAGE WARNING ALARM	ALARM	
S270	Event Delay Time (sec) Event Enabled Event: NO CONNECTION W/ UNIT1	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	300 sec Enabled WARNING	No connection with Unit 1.
S271	Event Delay Time (sec)	–	–	Unit X disconnected.
	Event Enabled	Disabled Enabled	Enabled	
	Event: UNIT 01 DISCONNECTED	MESSAGE WARNING ALARM	WARNING	

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
S272	Event: Loss of power Autoreset Delay Event Enabled Event: LOSS OF POWER	60 - 3600 sec Disabled Enabled MESSAGE WARNING ALARM	300 sec Enabled WARNING	Loss of power.
S275	Event Delay Time (sec)	10 - 9999 sec	10 sec	Customer input 1.
	Event Enabled	Disabled Enabled	Enabled	
	Event: CUSTOMER INPUT 1	MESSAGE WARNING ALARM	ALARM	
S276	Event Delay Time (sec) Event Enabled Event: CUSTOMER INPUT 2	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled ALARM	Customer input 2.
S277	Event Delay Time (sec)	10 - 9999 sec	10 sec	Customer input 3.
	Event Enabled	Disabled Enabled	Enabled	
	Event: CUSTOMER INPUT 3	MESSAGE WARNING ALARM	ALARM	
S278	Event Delay Time (sec) Event Enabled Event: CUSTOMER INPUT 4	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled ALARM	Customer input 4.
S279	Event Delay Time (sec)	10 - 9999 sec	10 sec	Call service.
	Event Enabled	Disabled Enabled	Enabled	
	Event: CALL SERVICE	MESSAGE WARNING ALARM	ALARM	
S280	Event Delay Time (sec) Event Enabled Event: HIGH TEMPERATURE	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled ALARM	High temperature.
S281	Event Delay Time (sec)	10 - 9999 sec	10 sec	Loss of Air Blower 1.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
	Event Enabled	Disabled Enabled	Disabled	
	Event: LOSS OF AIR BLOWER 1	MESSAGE WARNING ALARM	ALARM	
S282	Event Delay Time (sec) Event Enabled Event: REHEAT LOCKOUT	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled WARNING	Reheat Lockout
S283	Event Delay Time (sec)	10 - 9999 sec	10 sec	Humidifier lockout.
	Event Enabled	Disabled Enabled	Enabled	
	Event: HUMIDIFIER LOCKOUT	MESSAGE WARNING ALARM	WARNING	
S284	Event Delay Time (sec) Event Enabled Event: FC LOCKOUT	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled WARNING	FC lockout.
S285	Compressor Lockout Option	0 = ALL 1 = 1 (A) 2 = 2 (A) 3 = 1B 4 = 2B 5 = 1A + 2A 6 = 1B + 2B 7 = 1A + 1B 8 = 2A + 2B	0(ALL)	Compressor(s) lockout.
	Event Delay Time (sec)	10 - 9999 sec	10 sec	
	Event Enabed	Disabled Enabled	Enabled	
	Event: COMPRESSOR (S) LOCKOUT	MESSAGE WARNING ALARM	WARNING	
S27B	Edit Cust Input 1	(20 digits) 0-9 A-Z a-z &* / . + - _ : @ \	CUSTOMER INPUT 1	Edit customer input 1 text.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
S27C	Edit Cust Input 2	(20 digits) 0-9 A-Z a-z &* / . + - _ : @ \	CUSTOMER INPUT 2	Edit customer input 2 text,
S27D	Edit Cust Input 3	(20 digits) 0-9 A-Z a-z &* / . + - _ : @ \	CUSTOMER INPUT 3	Edit customer input 3 text
S27E	Edit Cust Input 4	(20 digits) 0-9 A-Z a-z &* / . + - _ : @ \	CUSTOMER INPUT 4	Edit customer input 4 text.
S288	Event Delay Time (sec) Event Enabled Event: COMP 1 SHORT CYCLE	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled WARNING	Compressor 1 short cycle.
S289	Event Delay Time (sec)	10 - 9999 sec	10 sec	Compressor 2 short cycle.
	Event Enabled	Disabled Enabled	Enabled	
	Event: COMP 2 SHORT CYCLE	MESSAGE WARNING ALARM	WARNING	
S290	Event Delay Time (sec) Event Enabled Event: EMERGENCY POWER	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled WARNING	Emergency power.
S291	Event Delay Time (sec)	10 - 9999 sec	10 sec	Condenser 1 failure.
	Event Enabled	Disabled Enabled	Enabled	
	Event: CONDENSER 1 FAILURE	MESSAGE WARNING ALARM	WARNING	
S292	Event Delay Time (sec) Event Enabled Event:	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled WARNING	Condenser 2 failure.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
	CONDENSER 2 FAILURE			
S293	Event Delay Time (sec)	10 - 9999 sec	15 sec	EC fan fault.
	Event Enabled	Disabled Enabled	Enabled	
	Event: EC FAN FAULT	MESSAGE WARNING ALARM	ALARM	
S294	Event Delay Time (sec)	10 - 9999 sec	30 sec	High supply temperature.
	Event Enabled	Disabled Enabled	Enabled	
	Event: HI SUPPLY TEMPERATURE	MESSAGE WARNING ALARM	WARNING	
S295	Event Delay Time (sec)	10 - 9999 sec	30 sec	Low supply temperature.
	Event Enabled	Disabled Enabled	Enabled	
	Event: LO SUPPLY TEMPERATURE	MESSAGE WARNING ALARM	WARNING	
S296	Event Delay Time (sec)	10 - 9999 sec	10 sec	Reduced eco airflow.
	Event Enabled	Disabled Enabled	Enabled	
	Event: REDUCED ECO AIRFLOW	MESSAGE WARNING ALARM	WARNING	
S297	Event Delay Time (sec)	10 - 9999 sec	10 sec	Eco high temperature override.
	Event Enabled	Disabled Enabled	Enabled	
	Event: ECO HI TEMP OVERRIDE	MESSAGE WARNING ALARM	WARNING	
S298	Event Delay Time (sec)	10 - 9999 sec	10 sec	Temperature control sensor fail.
	Event Enabled	Disabled Enabled	Enabled	
	Event: TEMP CTRL SENSOR FAIL	MESSAGE WARNING ALARM	ALARM	
S2A2	Event Delay Time (sec)	10 - 9999 sec	30 sec	High dew point.
	Event Enabled	Disabled Enabled	Enabled	
	Event: HIGH DEW POINT	MESSAGE WARNING ALARM	WARNING	
S2A3	Event Delay Time	10 - 9999 sec	30 sec	Low dew point.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
	(sec) Event Enabled Event: LOW DEW POINT	 Disabled Enabled MESSAGE WARNING ALARM	 Enabled WARNING	
S2A4	Event Delay Time (sec)	10 - 9999 sec	30 sec	High dew point sensor A.
	Event Enabled	Disabled Enabled	Enabled	
	Event: HI DEW POINT SENSOR A	MESSAGE WARNING ALARM	WARNING	
S2A5	Event Delay Time (sec) Event Enabled Event: LOW DEW POINT SENSOR A	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	30 sec Enabled WARNING	Low dew point sensor A.
S2A6	Event Delay Time (sec)	10 - 9999 sec	30 sec	High remote sensor.
	Event Enabled	Disabled Enabled	Enabled	
	–	MESSAGE WARNING ALARM	WARNING	
S2A7	Event Delay Time (sec) Event Enabled –	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	30 sec Enabled WARNING	Low remote sensor.
S2A8	Event Delay Time (sec)	10 - 9999 sec	10 sec	Power A failure.
	Event Enabled	Disabled Enabled	Enabled	
	Event: POWER A FAILURE	MESSAGE WARNING ALARM	ALARM	
S2A9	Event Delay Time (sec) Event Enabled Event: POWER B FAILURE	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled ALARM	Power B failure.
S2B1	Event Delay Time (sec)	10 - 9999 sec	10 sec	Airflow sensor failure.
	Event Enabled	Disabled Enabled	Enabled	
	Event: AIRFLOW SENSOR FAIL	MESSAGE WARNING ALARM	WARNING	

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
S2B2	Event Delay Time (sec) Event Enabled Event: HUM CTRL SENSOR FAILURE	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	30 sec Enabled WARNING	Humidity control sensor failure.
S2B6	Event Delay Time (sec)	10 - 9999 sec	120 sec	Low static pressure.
	Event Enabled	Disabled Enabled	Disabled	
	Event: LOW STATIC PRESSURE	MESSAGE WARNING ALARM	WARNING	
S2B7	Event Delay Time (sec) Event Enabled Event: HIGH STATIC PRESSURE	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	120 sec Disabled WARNING	High static pressure.
S2B8	Event Delay Time (sec)	10 - 9999 sec	150 sec	Static pressure 1 out of range.
	Event Enabled	Disabled Enabled	Disabled	
	Event: STATPR 1 OUT OF RANGE	MESSAGE WARNING ALARM	WARNING	
S2B9	Event Delay Time (sec) Event Enabled Event: STATPR 2 OUT OF RANGE	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	150 sec Disabled WARNING	Static pressure 2 out of range.
S2C1	Event Delay Time (sec)	10 - 9999 sec	150 sec	Static pressure 3 out of range.
	Event Enabled	Disabled Enabled	Disabled	
	Event: STATPR 3 OUT OF RANGE	MESSAGE WARNING ALARM	WARNING	
S2C2	Event Delay Time (sec) Event Enabled Event: STATPR 4 OUT OF RANGE	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	150 sec Disabled WARNING	Static pressure 4 out of range.
S2C3	Event Delay Time (sec)	10 - 9999 sec	120 sec	Static pressure 1 sensor failure.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
	Event Enabled	Disabled Enabled	Disabled	
	Event: STAT PR 1 SENS FAIL	MESSAGE WARNING ALARM	ALARM	
S2C4	Event Delay Time (sec) Event Enabled Event: STAT PR 2 SENS FAIL	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	120 sec Disabled ALARM	Static pressure 2 sensor failure.
S2C5	Event Delay Time (sec)	10 - 9999 sec	120 sec	Static pressure 3 sensor failure.
	Event Enabled	Disabled Enabled	Disabled	
	Event: STAT PRES 3 SENS FAIL	MESSAGE WARNING ALARM	ALARM	
S2C6	Event Delay Time (sec) Event Enabled Event: STAT PRES 4 SENS FAIL	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	120 sec Disabled ALARM	Static pressure 4 sensor failure.
S2D1	Event Delay Time (sec)	10 - 9999 sec	10 sec	Compressor 1A overload.
	Event Enabled	Disabled Enabled	Enabled	
	Event: COMP 1A OVERLOAD	MESSAGE WARNING ALARM	ALARM	
S2D2	Event Delay Time (sec) Event Enabled Event: COMP 1B OVERLOAD	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled ALARM	Compressor 1B overload.
S2D3	Event Delay Time (sec)	10 - 9999 sec	10 sec	Compressor 2A overload.
	Event Enabled	Disabled Enabled	Enabled	
	Event: COMP 2A OVERLOAD	MESSAGE WARNING ALARM	ALARM	
S2D4	Event Delay Time (sec) Event Enabled	10 - 9999 sec Disabled Enabled	10 sec Enabled	Compressor 2B overload.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
	Event: COMP 2B OVERLOAD	MESSAGE WARNING ALARM	ALARM	
S2D5	Event Delay Time (sec)	10 - 9999 sec	10 sec	Compressor 1A high temperature.
	Event Enabled	Disabled Enabled	Enabled	
	Event: COMP 1A HIGH TEMP	MESSAGE WARNING ALARM	ALARM	
S2D6	Event Delay Time (sec) Event Enabled Event: COMP 1B HIGH TEMP	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled ALARM	Compressor 1B high temperature.
S2D7	Event Delay Time (sec)	10 - 9999 sec	10 sec	Compressor 2A high temperature.
	Event Enabled	Disabled Enabled	Enabled	
	Event: COMP 2A HIGH TEMP	MESSAGE WARNING ALARM	ALARM	
S2D8	Event Delay Time (sec) Event Enabled Event: COMP 2B HIGH TEMP	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled ALARM	Compressor 2B high temperature.
S2D9	Event Delay Time (sec)	10 - 9999 sec	10 sec	Compressor 1A short cycle.
	Event Enabled	Disabled Enabled	Enabled	
	Event: COMP 1A SHORT CYCLE	MESSAGE WARNING ALARM	WARNING	
S2E1	Event Delay Time (sec) Event Enabled Event: COMP 1B SHORT CYCLE	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled WARNING	Compressor 1B short cycle.
S2E2	Event Delay Time (sec)	10 - 9999 sec	10 sec	Compressor 2A short cycle.
	Event Enabled	Disabled Enabled	Enabled	
	Event: COMP 2A SHORT CYCLE	MESSAGE WARNING ALARM	WARNING	

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
S2E5	Event Delay Time (sec) Event Enabled Event: COMP 2B SHORT CYCLE	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled WARNING	Compressor 2B short cycle.
S2E6	Event Delay Time (sec)	10 - 9999 sec	60 sec	GCB ambient temperature differential.
	Event Enabled	Disabled Enabled	Enabled	
	Event: GCD AMBIENT TEMP DIFF	MESSAGE WARNING ALARM	WARNING	
S2E7	– Event Enabled Event: C1 FREEZE PROTECTION	– Disabled Enabled MESSAGE WARNING ALARM	– Enabled ALARM	C1 freeze protection.
S2E8	–	–	–	C2 freeze protection.
	Event Enabled	Disabled Enabled	Enabled	
	Event: C2 FREEZE PROTECTION	MESSAGE WARNING ALARM	ALARM	
S2E9	Event Delay Time (sec) Event Enabled Event: DAMPER FAILURE	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	10 sec Enabled ALARM	Damper failure.
SF2F	–	–	–	BMS disconnected.
	Event Enabled	Disabled Enabled	Enabled	
	Event: BMS DISCONNECTED	MESSAGE WARNING ALARM	WARNING	
S2F9	Phase Loss MB01 shuts unit down Event Delay Time (sec) Event Enabled Event: POWER 1 PHASE LOSS	0 = No 1 = Yes 10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	1 (Yes) 10 sec Enabled ALARM	Power 1 phase loss.
S2G1	Phase Loss MB02 shuts unit down	0 = No 1 = Yes	1 (Yes)	Power 2 phase loss.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
	Event Delay Time (sec)	10 - 9999 sec	10 sec	
	Event Enabled	Disabled Enabled	Enabled	
	Event: POWER 2 PHASE LOSS	MESSAGE WARNING ALARM	ALARM	
S2G2	Phase Loss MB03 shuts unit down Event Delay Time (sec) Event Enabled Event: POWER 3 PHASE LOSS	0 = No 1 = Yes 10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	1 (Yes) 10 sec Enabled ALARM	Power 3 phase loss.
S2G3	Phase Loss MB04 shuts unit down	0 = No 1 = Yes	1 (Yes)	Power 4 phase loss.
	Event Delay Time (sec)	10 - 9999 sec	10 sec	
	Event Enabled	Disabled Enabled	Enabled	
	Event: POWER 4 PHASE LOSS	MESSAGE WARNING ALARM	ALARM	
S2G4	Phase Loss MB05 shuts unit down Event Delay Time (sec) Event Enabled Event: POWER 5 PHASE LOSS	0 = No 1 = Yes 10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	1 (Yes) 10 sec Enabled ALRM	Power 5 phase loss.
S2G5	Phase Loss MB06 shuts unit down	0 = No 1 = Yes	1 (Yes)	Power 6 phase loss.
	Event Delay Time (sec)	10 - 9999 sec	10 sec	
	Event Enabled	Disabled Enabled	Enabled	
	Event: POWER 6 PHASE LOSS	MESSAGE WARNING ALARM	ALARM	
S2G6	Event Delay Time (sec) Event Enabled	10 - 9999 sec Disabled Enabled	60 sec Enabled	Flow sensor fail C1.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
	Event: FLOW SENSOR FAIL C1	MESSAGE WARNING ALARM	WARNING	
S2G7	Event Delay Time (sec)	10 - 9999 sec	60 sec	Flow sensor fail C2.
	Event Enabled	Disabled Enabled	Enabled	
	Event: FLOW SENSOR FAIL C2	MESSAGE WARNING ALARM	WARNING	
S2G8	Event Delay Time (sec) Event Enabled Event: TSA SENSOR FAIL	10 - 9999 sec Disabled Enabled MESSAGE WARNING ALARM	60 sec Enabled ALARM	TSA sensor fail.
617	Event Delay Time (sec)	1 - 9999 sec	10 sec	XDU pump inverter fail 1.
	Event Enabled	DisabledEnabled	Enabled	
	Event: PUMP INVERTER FAIL 1	MESSAGEWARNINGALARM	ALARM	
618	Event Delay Time (sec) Event Enabled Event: PUMP INVERTER FAIL 2	1 - 9999 sec DisabledEnabled MESSAGEWARNINGALARM	10 sec Enabled ALARM	XDU pump inverter fail 2.
619	Event Delay Time (sec)	1 - 9999 sec	10 sec	XDU pump flow fail 1.
	Event Enabled	DisabledEnabled	Enabled	
	Event: PUMP FLOW FAIL 1	MESSAGEWARNINGALARM	ALARM	
620	Event Delay Time (sec) Event Enabled Event: PUMP FLOW FAIL 2	1 - 9999 sec DisabledEnabled MESSAGEWARNINGALARM	10 sec Enabled ALARM	XDU pump flow fail 2.
621	Event Delay Time (sec)	1 - 9999 sec	10 sec	XDU fluid flow check filter.
	Event Enabled	DisabledEnabled	Enabled	
	Event: CHECK WATER SYSTEM	MESSAGEWARNINGALARM	WARNING	
622	Event Delay Time	1 - 9999 sec	10 sec	The current XDU supply fluid temperature is above the

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
	(sec) Event Enabled Event: HIGH SUPPLY WATER TEMP	 DisabledEnabled MESSAGEWARNINGALARM	 Enabled WARNING	threshold.
623	Event Delay Time (sec)	1 - 9999 sec	10 sec	The current XDU return fluid temperature is above the threshold.
	Event Enabled	DisabledEnabled	Enabled	
	Event: HIGH RETURN WATER TEMP	MESSAGEWARNINGALARM	WARNING	
624	Event Delay Time (sec) Event Enabled Event: PUMP OPERATION WITH NO FLOW	1 - 9999 sec DisabledEnabled MESSAGEWARNINGALARM	10 sec Enabled ALARM	XDU pump operation with no flow.
625	Event Delay Time (sec)	1 - 9999 sec	10 sec	XDU supply fluid sensor failure.
	Event Enabled	DisabledEnabled	Enabled	
	Event: SUPPLY FLUID SENSOR FAILURE	MESSAGEWARNINGALARM	ALARM	
626	Event Delay Time (sec) Event Enabled Event: RETURN FLUID SENSOR FAILURE	1 - 9999 sec DisabledEnabled MESSAGEWARNINGALARM	10 sec Enabled ALARM	XDU return fluid sensor failure.
627	Event Delay Time (sec)	1 - 9999 sec	10 sec	XDU fluid flow sensor failure.
	Event Enabled	DisabledEnabled	Enabled	
	Event: FLOW SENSOR FAILURE	MESSAGEWARNINGALARM	ALARM	
628	Event Delay Time (sec) Event Enabled Event: PUMP 1 HOURS	1 - 9999 sec DisabledEnabled MESSAGEWARNINGALARM	- Enabled WARNING	Current working hours of fluid pump 1 are above the threshold.

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Table B.2 Service Menu Alarm Settings by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
	EXCEEDED			
629	Event Delay Time (sec)	1 - 9999 sec	-	Current working hours of fluid pump 2 are above the threshold
	Event Enabled	DisabledEnabled	Enabled	
	Event: PUMP 2 HOURS EXCEEDED	MESSAGEWARNINGALARM	WARNING	
	Refrigerant Leak C1: Refrigerant leak detected on Circuit 1	Defaults = Enabled, Warning, 300 sec time delay	Warning,	300 sec time delay
	Refrigerant Leak C2: Refrigerant leak detection on Circuit 2	Defaults = Enabled, Warning, 300 sec time delay	Warning	2 300 sec time delay

B.3 Line IDs for Cascade Operation Parameters

Table B.3 Service Menu Cascade Parameters by Line ID

Line ID	Parameter Name	Range	Default Setting	Description
S515	Cascade Units	No Yes Cool/Heat Cooling Fan PI Fan Speed	No	User may select the method to which the next standby unit will stage ON. • No: Disabled • Yes: Enabled via TW Mode 1 • Cool/Heat: Enabled via TW Mode 1 • Cooling: Enabled via TW Mode 1 • Fan PI: Enabled via TW Mode 3 • Fan Speed : Enabled via TW Mode 3
S516	Cascaded Units Delay	0 - 30 min	10 min	This is the amount of time that must surpass prior to the standby unit staging ON, once a standby unit receives an ON command from the Master (U2U 1).
S517	Cascaded Units Quick Start	0 - 30 min	2 min	This control delay time is used (shorter time than S516) after the Master (U2U 1) has restarted after a power cycle. The timer changes back to using S516 when the time of power cycle is equal to S517 min/sec. **NOTE: This setting is not required. If set to a value of 0, then S517 Cascade Units Quick Start is disabled.**
	Cascaded Units QS Delay	15 - 1800 sec	120 sec	
S518	Cascaded Units Control Delay	0 - 30 min	5 min	This is the amount of time that must surpass before the normal unit control is used once a standby unit has been cascaded ON.
S519	Cascaded Units OFF Delay	0 - 360 min	0 min	This timer starts to count down once a cascaded ON system has received an OFF request from the master. The cascaded unit will stop after this timer and S520 have elapsed.

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Table B.3 Service Menu Cascade Parameters by Line ID (continued)

Line ID	Parameter Name	Range	Default Setting	Description
S520	Cascaded Units Min Run	2 - 360 min	30 min	Once the cascaded system is energized, this is the minimum ON time that it will run before staging OFF.
S521	Start Next Unit at SYS Fanspeed	50 - 100%	100%	When the system (network) fan speed operates at or above S521, the S516 timer is started. Once S516 has elapsed, the next single unit will energized. **NOTE: Fan speed must be continuously at or above the value set in S521, The timer restarts any time the fan speed falls below.**
S522	Max. Intermediate System Speed	50 - 100 %	100%	Defines the value to which the system (network) fan speed may increase when not all units in the network are in operation.
S523	Stop Next Unit SYS Fanspeed	20 - 70 %	70%	When the current System (network) fan speed operates at or below S523, two timers must elapse before the cascaded ON unit turns OFF; S519 and S520.
S524	Cascaded Units OFF Master Delay	0 - 360 min	1 min	In the event that the Virtual Master takes control, the new Master unit shall control staging OFF of the currently operating units for the amount of time set in S524. After S524 time has elapsed, S519 value is used.

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Appendix C: Communication Protocol

Table C.1 Communication Protocols

Communication Protocol (A though H)										
Third-Party Protocols (B through H)										
Communication Card	**LIFE Services Support**	**Sensor Support**	**A HTTP/ HTTPS**	**B Velocity Protocol**	**C Email**	**D SMS**	**E SNMP v1, v2, v3**	**F BACnet IP/MSTP**	**G MODBUS TCP/RTU**	**H YDN23**
IS-UNITY-DP	✓	✓	✓	✓	✓	✓	✓	✓	✓	NXL, EXL-S1 & PEX
IS-UNITY-SNMP	✓	–	✓	✓	✓	✓	–	–	–	–
EMBEDDED UNITY	✓	–	✓	✓	✓	✓	✓	✓	✓	–
IS-UNITY-LIFE[2]	✓	✓	✓	✓	✓	✓	–	–	–	–
RDU101	✓	✓	✓	✓	✓	✓	✓	✓[1]	✓[1]	–
SN-Sensor Support	–	–	✓	✓	✓	✓	✓	–	–	–

[1] Please note that BACnet MSTP and Modbus RTU require P/N USB485I, a USB to RS-485 adapter.

[2] The Vertiv Liebert IS-UNITY-LIFE card cannot be ordered. It is provided to customers free of charge as part of a Remote Service Delivery contract.

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