Smart Equipment™ Control

Technical Bulletin

Smart Equipment™ Control Board, 2-Stage

Smart Equipment™ Control Board, Single Stage with Optional Communication Board

Document introduction

Smart Equipment™ Controls is a unified platform for controllers in commercial unitary, chiller, and air handling products manufactured by Johnson Controls. The product line introduces the Smart Equipment™ Controls (SEC) unit control board (UCB) as the primary system control. The controller incorporates basic compressor protection, indoor blower control, and advanced features such as integration of ventilation control.

The SEC board provides flexibility for comfort control input from the following:

- A wall thermostat
- Thermistor sensors included with the unit
- A communicating NetSensor
- Communicated sensor values when building automation systems (BAS) integration is utilized

Technicians can access the control parameters of individual SEC boards through the on-board joystick, the enter or cancel buttons, and the 2-line by 8-character display. Technicians and end-users can use the MAP Gateway device to access individual and networked SEC boards through a web browser. Technicians can also back-up and restore control parameters and perform SEC board firmware upgrades through the on-board USB port.

Networking-capable options for unit integration to building automation systems have a communication sub-board added to the UCB. The sub-board is the termination point for the network cable. BACnet MSTP is the standard communication protocol for networking-capable SEC board options. Other supported protocols are Modbus and N2. The SEC platform design does not support LON as one of the native protocols. The LON protocol is supported with external MSTP to LON gateway. A gateway manufacturer is certified and available through UPGnet.

The unit control board is the main controller for the rooftop unit. With the modular design of the SEC platform you can connect additional controllers based on the configuration of the rooftop unit. Other controllers are supported and provided as a communicating controller to the UCB through a sensor and actuator communicating bus. The communication provides a plug and play mechanism of other controllers without the need for external programming or hardware setup. This feature is especially important for the repair and replacement of the controls. The other types of controllers include the following items:

- UCB-2: additional stages of cooling and heating
- 4-stage: additional support for 4 stage units
- Economizer controller
- Fault Detection Diagnostic (FDD)

Related documentation

Table 1: Related documentation

For information on	See document	LIT or part number
Features, benefits, and applications of SEC	Smart Equipment™ Controls (SEC) Product Bulletin	LIT-12011934
Setting up the fault code capability sensor	NS Series Network Sensors with Fault Code Capability Installation Instructions	Part No. 24-10094-76
Inspecting the system, design application, and warranty information	Start-Up and Service Data Setup Guide	LIT-12011916
Configuring and commissioning your unit	Smart Equipment™ Controls (SEC) Quick Start Guide	LIT-12011938
Operating modes and strategies of the SEC	Smart Equipment™ Controls (SEC) Sequence of Operation Overview Technical Bulletin	LIT-12011950
Reviewing BACnet® interoperability for the unit control board (UCB)	Unit control Board (UCB) Protocol Implementation Conformance Statement	LIT-12011996
Product overview, features, and benefits of the economizer controller	SE-ECO1001-0 Economizer Controller Catalog Page	LIT-1900885
Product overview, features, and benefits of the fault detecting diagnostics board	SE-FDD1001-0 Fault Detection Diagnostics (FDD) Board Catalog Page	LIT-1900886
Product overview, features, and benefits of the four stage expansion control board	SE-SPU1004-0 Four-Stage Expansion Control Board Catalog Page	LIT-1900884
Product overview, features, and benefits of the series unit control boards (UCBs)	SP-SPU Series Unit Control Boards (UCBs) Catalog Page	LIT-1900883

Table 1: Related documentation (continued)

For information on	See document	LIT or part number
Configuring settings, performing a parameters within SEC, menu navigation, fault tables	Smart Equipment™ Controls (SEC) Technical Bulletin	LIT-12011998

Mobile Access Portal Gateway

The Mobile Access Portal (MAP) Gateway provides a wireless mobile user interface to Smart Equipment™. The MAP Gateway gives you access to any Smart Equipment™ device that is on a connected BACnet MS/TP field bus. The intuitive, browser-based interface displays the same menus as the UCB local display. This document does not differentiate between procedures performed from either the MAP Gateway or the UCB local display because the menu options and parameters are the same.

For additional information on MAP Gateway, refer to the Mobile Access Portal Gateway Product Bulletin LIT-12011884.

Unit control board overview

Screen layout

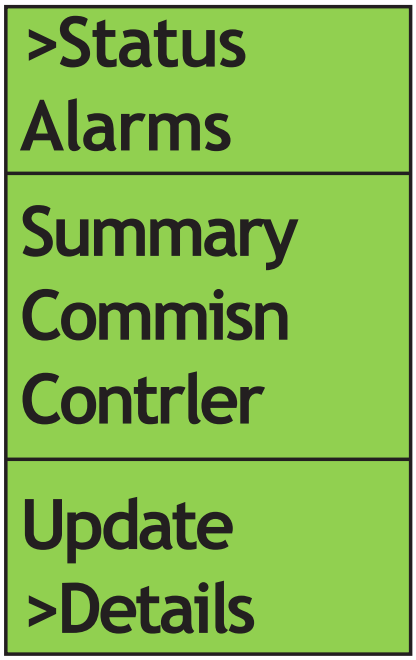

Figure 1: UCB main level menus

Status menu

The Status menu displays the current states and parameters for the unit.

Demand ventilation mode (DVent-Mode)

You can enable or disable the **DVent-Mode**. This option is controlled by the indoor air quality (IAQ). The DVent-Mode is calculated by the differential between the IAQ and outdoor air quality (OAQ). An economizer board must be present for this option to enable.

Operational setpoint (OprST)

The OprST displays the current operational setpoint. The OprST may be based on the return air temperature (RAT) thermistor or supply air temperature (SAT) thermistor input, SA Bus network sensor, or FC bus communicated value sources.

Supply air temperature (SAT)

The SAT displays the current UCB thermistor input. The default is 60.7°F.

Return air temperature (RAT)

The RAT displays the current UCB thermistor input. The default is 73.0°F.

Operational supply humidity (OprSH)

OprSH displays the space humidity. The reading may come from the UCB RAH 0 to 10 VDC input, SA Bus Network Sensor, or FC Bus communicated value. The default is 49.6%. You require input to the UCB RAH pins, humidity from the network sensor, or a communicated value.

Return air humidity (RAT)

RAT displays the return air humidity. You must have an input to the UCB RAH pins, humidity from the network sensor, or a communicated value.

Operational outdoor air temperature (OprOAT)

Enthalpy calculated from OAH 0-10 VDC input to the economizer board and OprOAT. `0B/#` is indicated if OAH 0-10 VDC input to the economizer board is not present.

Operational outdoor air humidity (OprOAH)

The buffered outdoor air humidity in use. This may be from economizer board OAH 0-10 VDC input or FC BUS communicated value sources. `?Unrel` indicates that OAH input is currently not present.

Operational outdoor air quality (OprOAQ)

The buffered outdoor air quality in use. This may be from economizer board OAQ 0-10 VDC input or FC BUS communicated value sources. `?Unrel` indicates OAQ input is currently not present.

Operational indoor air quality (OprIAQ)

The buffered indoor air quality in use. This may be from economizer board IAQ 0-10 VDC input, SA BUS NetSensor, or FC BUS communicated value sources. `?Unrel` indicates IAQ input is currently not present.

Alarms menu

No Events

No notification in the active alarm register.

Alarm Description

Most recent notification in the active alarm register.

Summary menu

HVAC Zone Fan

Cooling (Clg)

Cooling and heating hidden if number of heat pump stages installed > 0.

Heating (Htg)

Heat pump. Only present when the number of heat pump stages installed > 0.

Economizer (Econ)

Demand Ventilation (DVent)

Power Exhaust (PowerEx)

Hot gas reheat. This is present when hot gas reheat enabled for operation is set to yes.

Sensors

Network

Commissioning menu

HVAC Zone

The source of occupied/unoccupied status.

Indoor Fan (Fan)

UCB FAN 24 VAC output status.

Cooling (Clg)

UCB C1 24 VAC output status

Heating (Htg)

UCB H1 24 VAC output status

Economizer (Econ)

Yes indicates that economizer free cooling is available, No indicates that economizer free cooling is not available. The indication depends on FreeClg-Mode effective and current outdoor/indoor conditions.

Demand Ventilation (DVent)

Demand Ventilation mode selection. Disabled permits no demand ventilation function, Controlled by IAQ requires IAQ input, Diff between IAQ and OAQ requires IAQ and OAQ inputs.

Power Exhaust (PowerEx)

1. Hot gas reheat, only present when hot gas reheat enabled for operation is set to yes.

2. WarmupCooldown, only present when thermostat only control enabled is set to no.

3. Title 24 Load Shed

4. Defrost, only present when the number of heat pump stages installed > 0.

Network

Single Zone VAV, only present when SZ VAV enabled is set to enabled.

Controller menu

Firmware (Firm)

FirmVer; UCB firmware revision and UCB firmware status.

Firm-S: UCB firmware status.

Time

Set the time zone. The default is Central.

Network

DevName: device name that appears on the FC BUS BACnet network.

BASCom: BACnet indicated with communication sub-board option.

Comm-S: effective when an optional communication sub-board is present. `Waiting For Pol` indicates that FC BUS network communication is not present, `Active` indicates that FC BUS network communication is present.

Address: effective with communication sub-board option. FC BUS BACnet network address.

OprBaudRate: effective with communication sub-board option. FC BUS baud rate to be used.

BaudRate: effective with communication sub-board option. FC BUS baud rate in use.

DeviceId: device ID number that appears on the FC BUS BACnet network; adjustment increments of 1s.

Miscellaneous (Misc)

Language: the language used in the UCB parameter display.

Units: **IP** uses imperial units of measurement in the UCB parameter display, for example, °F and "wc, **SI** uses metric units of measurement in the UCB parameter display, for example, °C and kPA.

System Controllers (SysCntlrs)

Misc: **Relearn**, **#NetSensors**, **EconCntlr**, **4StgCntlr**, **FDDMCntlr**, and **FDDSCntlr**.

UCB: the UCB firmware revision, UCB software application revision and UCB hardware revision.

Econ: the economizer board firmware revision, economizer board software application revision, and economizer board hardware revision.

Update menu

The update menu displays the following information: View Version (**ViewVer**), Load Firmware (**LoadFirm**), Backup, Restore, Full Clone, Part Clone, Factory Default (**FactryDft**), Date and Time (**DateTime**). You can also Export Trends to a USB flash drive. Use the flash drive to save settings and update the control.

Details menu

Unit

The unit menu displays the name, model number, serial number, and reset lockout (**ResetLO**). The control name, model number, and serial number have a 14-character maximum. The default setting for the **ResetLO** is set to `On`. This resets all active hard lockout alarms.

Setpoints

The setpoints menu displays the current values for all the setpoints in use.

Zone

The zone menu displays all the current values for either the indoor or outdoor zone.

Control

The control menu lists all the current values for the control; indoor fan, cooling (**Clg**), heating (**Htg**), heat pump, economizer, power exhaust, demand ventilation, air monitoring station, hot gas reheat, and smoke control.

Service

The service menu lists the current information for the inputs. This includes the following items: sensors, coil sensors, thermostat, binary inputs, unit protection, and network inputs. Information for the outputs both relay and analog. The Factory options displays the current control configuration data. For example, cooling stages set to 2, no heating stages.

Self Test

The self test menu contains the controls to execute a diagnostic test for the rooftop equipment.

View Results

The view results menu lists the results of the self test and can be used to identify any equipment failures.

Detailed Procedures

Startup sequence

After you apply 24 VAC power to the C and 24V terminals, the UCB begins the following startup sequence. During the startup sequence, the joystick, the ENTER button, and the CANCEL button do not function.

1. The display backlight lights up. `Johnson Controls, JCI` scrolls across the display. The power LED lights up and remains lit.
2. The red fault LED lights up and flashes intermittently. The green SA Bus LED briefly lights up.
3. The local display begins a countdown sequence after power is applied. During the countdown sequence the green SA Bus LED does one of the two following actions:
   a. It lights up to indicate that the UCB is awaiting communication from SA Bus devices, such as the economizer board or network sensor.
   b. It flashes to indicate that the UCB established communication with SA Bus devices.
4. When the startup sequences is complete, the local display is blank.

The joystick, the ENTER button, and the CANCEL button function to navigate through the menu.

Active alarms at startup

When alarms are active after the startup sequence, the following sequence occurs:

1. The display shows #1 text on the top line and the most recent alarm scrolls across the bottom line.
2. If more than one alarm is active, the display scrolls through each alarm in the active alarm register. The display shows up to five alarms scrolling through each from most recent alarm to oldest alarm.
3. The red fault LED light flashes when active alarms are present and stops when all active alarms are cleared.

When the alarms are cleared, you can use the joystick and navigation arrows to navigate through the menu.

USB port startup sequence

1. When you insert a compatible flash drive into the UCB USB port, `USB:Wait` appears on the display.
2. The UCB displays the number of files and folders transferring over to the flash drive, see Figure 2.

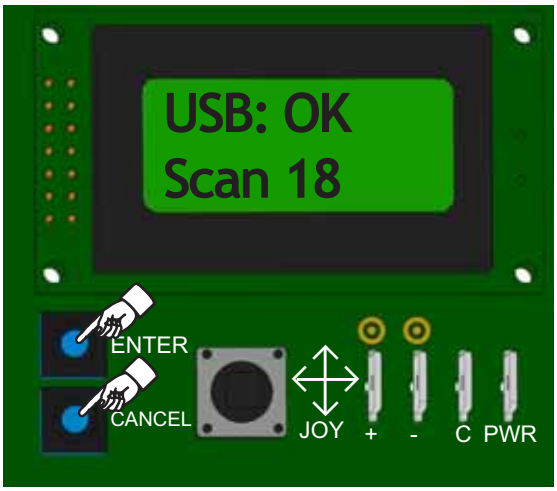

Figure 2: USB flash drive back-up complete

You can leave the flash drive connected for other functions. Press the CANCEL button or move the joystick to resume menu navigation.

Using the USB back-up function

Note: A USB flash drive must be connected to the UCB.

- Use the joystick to select **Update** then **Backup** and press ENTER. The backup is in progress, see Figure 3.

Figure 3: Back-up in progress

Note: During the back-up process, the colon (`:`) flashes.

After the backup completes, a comma separated value (.csv) restoration file is created in the top level of the flash drive. The file name is drawn from the date and time settings in the UCB at the time you create the file. The restoration file size is generally less than 30 KB. Figure 4 shows an example of the .csv file name structure.

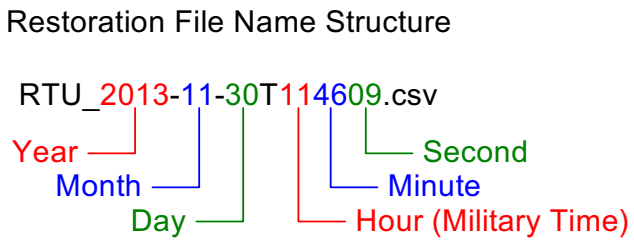

Figure 4: Restoration file name structure

Restore function

You must place restoration files in the top level of the flash drive storage. The unit serial numbers on the UCB and the restoration file must match in order to successfully restore the information.

1. Insert your flash drive into the USB port. Select **Update** then **Backup** and press ENTER, see Figure 5.

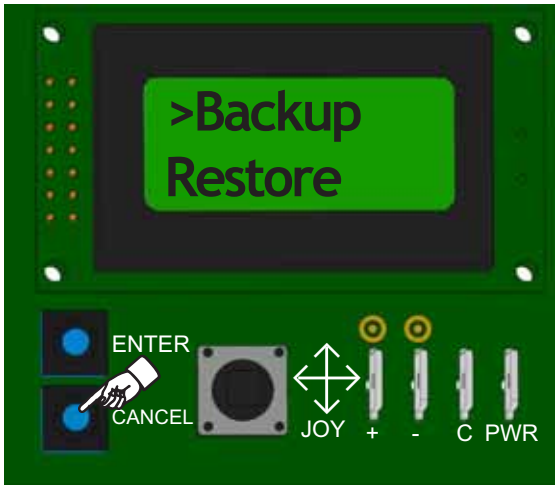

Figure 5: Backup menu option

BKP: Wait appears when the backup is in progress. During the backup procedure, the colon (:) flashes on the top line and the percentage increases on the bottom line of the display.

The backup completes in approximately 30 seconds and BKP: OK appears on the screen. The percentage shows 100.

Figure 6: Backup complete

2. When the backup is complete, you may remove the flash drive from the USB port.

After the backup completes, a comma separated value (.csv) restoration file is created in the top level of the flash drive. The file name is drawn from the date and time settings in the UCB at the time you create the file. The restoration file size is generally less than 30 KB. Figure 4 shows an example of the .csv file name structure.

Failed restore attempt

If the USB drive is removed before the firmware upload is complete, you must perform two updates/upload procedures to successfully complete and update all the necessary files. If power is lost during the upload process, you must repeat only one update/upload procedure.

Updating SE firmware

To update the SE firmware you require a USB flash drive with the appropriate update file that ends in .pkg. The file must be at the top level of the flash drive.

1. Connect the USB flash drive to the USB port on the UCB.
2. When USB OK appears on the display, use the joystick on the UCB to select **Update** and press ENTER.

Figure 7: Display update

The first line displays View Ver.

3. **Optional**: If you want to verify the version in the UCB, press ENTER. The current version appears on the display. Press CANCEL to return to **Update**.
4. Select **Backup** and press ENTER.
5. Wait until the top line displays BKP: OK and the second line displays 100% then press CANCEL.
6. When **Update** appears on the display, press ENTER.
7. Use the joystick to select **LoadFirm** and press ENTER. The list of firmware versions appears on the display, select the current firmware version and press ENTER.
8. When Confirm? appears on the display, press ENTER.

   The firmware may take 5 to 15 minutes to load, FWU WAIT appears on the display. The UCB reboots during the process and the display goes blank.When the display shows the main menu and the startup timer ends, the upload is finished.
9. Use the joystick on the UCB to select **Update** and press ENTER. Then select **Restore** and press ENTER.
10. Select the backup configuration file that ends with .csv and press ENTER. When Confirm? appears on the display, press ENTER.

    The display shows RTR: OK and reboots. When the startup timer ends, the configuration is restored.
11. Press ENTER. When Confirm? appears on the display, press ENTER.

Note: If the software update fails, reset the unit and perform the update again.

Checking the firmware version of the economizer

1. With Econ and UCB attached together, see Step 1 above. Use the joystick to select **Contrler** and press ENTER.

   The first line shows Firm.
2. Select **SysCntlrs** and press ENTER.

   The first line shows Misc.
3. Select **Econ** and press ENTER.
4. When the first line shows **EconMainVer**, press ENTER.

   The second line shows the version of software installed in the Economizer.

Alarm appendix

Alarm list

Alarms are categorized into three groups based on severity: critical, service priority, and service. Table 2 describes the alarms.

Table 2: Alarms

Severity	Alarm	How It Happens
Critical	C1 Locked Out Due to High Pressure	Three HPS1 trips within two hours.
	C2 Locked Out Due to High Pressure	Three HPS2 trips within two hours.
	C3 Locked Out Due to High Pressure	Three HPS3 trips within two hours.
	C4 Locked Out Due to High Pressure	Three HPS4 trips within two hours.
	C1 Locked Out Due to Low Pressure	Three LPS1 trips within one hour.
	C2 Locked Out Due to Low Pressure	Three LPS2 trips within one hour.
	C3 Locked Out Due to Low Pressure	Three LPS3 trips within one hour.
	C4 Locked Out Due to Low Pressure	Three LPS4 trips within one hour.
	C1 Locked Out Due to Coil Freeze	Three FS1 trips within two hours. (Evap Coil Temp < Evap Coil Temp Cutout SP)
	C2 Locked Out Due to Coil Freeze	Three FS2 trips within two hours. (Evap Coil Temp < Evap Coil Temp Cutout SP)
	C3 Locked Out Due to Coil Freeze	Three FS3 trips within two hours. (Evap Coil Temp < Evap Coil Temp Cutout SP)
	C4 Locked Out Due to Coil Freeze	Three FS4 trips within two hours. (Evap Coil Temp < Evap Coil Temp Cutout SP)
	Exhaust Fan VFD Failure	EX VFD BI trips (must be set up as Exhaust or Variable Frequency Fan)
	HS1 Locked Out Due to Limit Switch	Three LS1 trips within one hour.
	HS2 Locked Out Due to Limit Switch	Three LS2 trips within one hour.
	HS3 Locked Out Due to Limit Switch	Three LS3 trips within one hour.
	Unit Shutdown Due to Smoke, etc.	SD input loses 24 VAC.
	Supply Fan VFD Failure	Fan VFD Input trips (must be set up as NOT Single Speed)
	No Heat-Cool Due to Unreliable Space-T	Input Unreliable
	4-Stage Communication Failure	4-Stage board goes from Online to Offline.
	Economizer Communication Failure	Economizer board goes from Online to Offline.
	Outputs Disabled Due to Low Input V	Blackout Conditions
	Outputs Limited Due Brownout Input V	Brownout Conditions
	Unit Locked Out Due to APS	Three APS trips within 1.5 hours. (if APS is installed or based on Duct Pressure if Variable Speed Fan enabled).
	Unit Locked Out Due to Supply Fan OL	Three FAN OVR trips within two hours.
	Unit Locked Out Due to High Duct-P	Duct Static Pressure is greater than the High Duct Static Pressure Setpoint.
Service Priority	Evaporator Coil Temp 1 Sensor Failure	Input unreliable and Number of Cooling Stages >= 1
	Condenser Coil Temp 1 Sensor Failure	Input unreliable and Number of Cooling Stages >= 1
	Evaporator Coil Temp 2 Sensor Failure	Input unreliable and Number of Cooling Stages >= 2
	Condenser Coil Temp 2 Sensor Failure	Input unreliable and Number of Cooling Stages >= 2

Table 2: Alarms (continued)

Severity	Alarm	How It Happens
Service Priority (Continued)	Evaporator Coil Temp 3 Sensor Failure	Input unreliable and Number of Cooling Stages >= 3
	Condenser Coil Temp 3 Sensor Failure	Input unreliable and Number of Cooling Stages >= 3
	Evaporator Coil Temp 4 Sensor Failure	Input unreliable and Number of Cooling Stages >= 4
	Condenser Coil Temp 4 Sensor Failure	Input unreliable and Number of Cooling Stages >= 4
	Building Pressure Sensor Failure	Input unreliable
	Outdoor Air Temperature Sensor Failure	Input unreliable
	Return Air Temperature Sensor Failure	Input unreliable and Variable Speed Fan
	Supply Air Temperature Sensor Failure	Input Unreliable AND (Econ Comm Status = Online OR Mixed Air Sequencer = DAT Control)
	Unit Shutdown Due to Supply Fan Overload	FAN OVR Trip (but less than three in one hour as that would cause 'Unit Locked Out Due to Supply Fan OL')
	Main Controller Calibration Error	Missing Cal Data
	FDDM Controller Calibration Error	Missing Cal Data
	Econ Controller Calibration Error	Missing Cal Data
	4-Stage Controller Calibration Error	Missing Cal Data
	Unit Shutdown Due to Air Proving Switch	Cmd but no proof for >= 90 seconds (if this happens less than three in 1.5 hours; otherwise that would cause 'Unit Locked Out Due to APS')
	FDDS Controller Calibration Error	Missing Cal Data
Service	Duct Pressure Sensor Failure	Input Unreliable and Variable Speed Fan
	Return Air Humidity Sensor Failure	Input unreliable
	Outdoor Air Humidity Sensor Failure	Input unreliable
	Supply Humidity Sensor Failure	Input unreliable
	Indoor Air Quality Sensor Failure	Input unreliable
	Outdoor Air Quality Sensor Failure	Input unreliable
	Fresh Air Intake Sensor Failure	Input unreliable
	Mixed Air Temp Sensor Failure	Input unreliable
	Space Indoor temp Sensor Failure	Input unreliable
	Space Offset Sensor Failure	Input unreliable
	C1 Shutdown Due to High Pressure	HPS1 Trip
	C2 Shutdown Due to High Pressure	HPS2 Trip
	C3 Shutdown Due to High Pressure	HPS3 Trip
	C4 Shutdown Due to High Pressure	HPS4 Trip
	C1 Shutdown Due to Low Pressure	LPS1 Trip
	C2 Shutdown Due to Low Pressure	LPS2 Trip
	C3 Shutdown Due to Low Pressure	LPS3 Trip
	C4 Shutdown Due to Low Pressure	LPS4 Trip
	C1 Shutdown Due to Coil Freeze	FS1 Trip (Evap Coil Temp < Evap Coil Temp Cutout SP)
	C2 Shutdown Due to Coil Freeze	FS2 Trip (Evap Coil Temp < Evap Coil Temp Cutout SP)
	C3 Shutdown Due to Coil Freeze	FS3 Trip (Evap Coil Temp < Evap Coil Temp Cutout SP)
	C4 Shutdown Due to Coil Freeze	FS4 Trip (Evap Coil Temp < Evap Coil Temp Cutout SP)

Table 2: Alarms (continued)

Severity	Alarm	How It Happens
Service (Continued)	Low Outdoor Air Temp Cooling Cutout	OAT < OAT Cooling Cutout
	Econ Economizing When it Should Not	Economizer Damper % Command > Min OA Position + FDD Damper Min Position Tolerance
	Econ Not Economizing When It Should	Economizer Damper % Command < Min OA Position + FDD Damper Min Position Tolerance
	Economizer Damper Not Modulating	ABS(Economizer Damper % Command - Economizer Damper Position) > FDD Economizer Damper Allowed Error
	Economizer Letting In Excess Outdoor Air	(Economizer Damper % Command > Min OA Position + FDD Damper Min Position Tolerance AND Ramp Min OA) **OR** (Economizer Damper % Command > FDD Damper Min Position Tolerance AND Ramp Closed)
	HS1 Shutdown Due to Limit Switch	LS1 Trip
	HS2 Shutdown Due to Limit Switch	LS2 Trip
	HS3 Shutdown Due to Limit Switch	LS3 Trip
	HS1 Off Due to Gas Valve	H1 with no GV1 for >=6 minutes
	HS2 Off Due to Gas Valve	H2 with no GV2 for >=6 minutes
	HS3 Off Due to Gas Valve	H3 with no GV3 for >=6 minutes
	Dirty Filter	DFS Trip
	FDD 1 Communication Failure	FDD Master Online -> Offline
	FDD 2 Communication Failure	FDD Slave Online -> Offline
	Unit has Received a Purge Request	PURGE-S on Econ trip
	Excessive Supply Air Temp Cooling	SAT < Excessive SAT Cooling Sp AND SAT Limit for Cooling Enable
	HS1 Gas Valve Failure	GV1 on without H1 for >= 5 seconds
	HS2 Gas Valve Failure	GV2 on without H2 for >= 5 seconds
	HS3 Gas Valve Failure	GV3 on without H3 for >= 5 seconds
	Excessive Supply Air Temp Heating	SAT > Excessive SAT Heating SP AND SAT Air Temp Limit for Heat Enabled
	Space Temperature Cooling Alarm	Space Temp > Operating Cooling SP for more than 60 minutes
	C1 Refrigerant Flow Restriction	FDD Alarm, see Table 3.
	Hot H20 FS Open to Prevent Coil Freeze	Hydronic Heating Enabled **and** (HW Freeze BI trip and Unreliable OAT) **or** HW Freeze BI trip **and** OAT is less than 40°F
	Hot H20 FS Opened When It Should Not	Hydronic Heating Enabled **and** OAT is greater than 40°F and HW Freeze BI trip
	Space Temperature Heating Alarm	Space Temp is less than Operating Heating SP for more than 60 minutes.
	Not Economizing - No Supply Air Sensor	Free Cooling Available and MA Sequencer = DAT Control and SAT Unreliable **or** SAT Unrealiable and MA Sequence = Zone Control and MA State = Mech and Free Cooling Available **or** Tstat Only and Mech and Free Cooling Available
	Using Return Instead of Space Temp	Effective Zone Source = Return Air Temp and Not TStat Only
	Air Proving Switch is Stuck Closed	APS is closed, but fan command is not given

Fault detection diagnostics

Fault Detection Diagnostics (FDD) is the integral tool to maintain HVAC systems at their optimal performance and reliability. In addition, FDD supports continuous commissioning through its continuous performance monitoring functionality. Studies indicate that the use of FDD can result in 10-30% energy savings on an ongoing basis, support efficient maintenance practices, extend equipment life, and provide more consistent occupant comfort and indoor air quality.

Outside of Johnson Controls, studies and the implementation of FDD are more in a central tool format. Johnson Controls uses years of industry experience and data collection to implement FDD algorithms embedded into our Smart Equipment™ Control platform. FDD is programmed and continuously running within the economizer section and refrigeration sections of Johnson Controls/York packaged equipment.

FDD is fault diagnosis, that is, fault detection combined with fault isolation. Fault diagnosis finds the causes of problems in order to take corrective action.

The equipment layer within the Smart Building architecture is a key to our Smart Equipment™ FDD intelligence. It is a foundation that provides essential information on the equipment and provides that information throughout the system for further evaluation and actions. When FDD is embedded in the equipment layer, the advantage is complete access to the internal state of the equipment in real time. This is important when the algorithms are focused around refrigeration circuits. It is challenging to identify and isolate refrigeration problems when there are continuous changes in equipment data points and thermodynamics. FDD at the equipment level creates precise information to lower energy costs and operating costs, and to increase comfort level.

Some key advantages of embedded FDD are the following points:

- Visibility of the performance of all unit components and how they interact together. For example, fully integrated economizer control, simultaneous heating and cooling, low refrigerant, and foul tubes.
- It is an excellent place to insert unit-level performance models and analytical algorithms in the factory. for example, overall unit control expectations.

Description

The SE-FDD1001-0 Fault Detection Diagnostics (FDD) board in packaged equipment can predict faults before they become a major failure, cause comfort issues, or result in efficiency problems. Embedded algorithms continuously run within the FDD controller. The algorithms monitor the types of inputs to precisely indicate faults and recommend how to correct them. This innovative feature is optional with the Smart Equipment™ Controls (SEC) product line for Series 5 to 40, and the Series 12R. The FDD controller meets all California Energy Code Regulations (Title 24) and for rooftop units (RTU) with an enabled economizer.

During the startup process, the FDD controller calculates the efficiency and capacity of the equipment, and generates a baseline for future measurements. The algorithms provide this type of information during the equipment life cycle. You can view this information from the unit control board (UCB) local display, Mobile Access Portal (MAP), or through a building management system (BMS) connection. The two indices, efficiency and capacity, provide you with the information to make smart decisions about your equipment. You can quickly and easily see when it is not performing at the baseline efficiency level.

Refer to the Smart Equipment™ Controls (SEC) Product Bulletin (LIT-12011934) for important product application information.

Table 3: FDD alarms

BACNet State Number	FDD alarm	Diagnosis explanation	Recommendation
235 236 237 238	C1, C2, C3, C4 Refrigerant Low	In a TXV system, the refrigerant circuit has a lower sub-cooling value than expected and the superheat is not high. The target sub-cool is 10°F, with an acceptable tolerance of +/-5°F, therefore the sub-cool value is <5°F.	This may indicate that there is less refrigerant charge in the system than expected. • Inspect both evaporator and condenser coils for proper airflow • Check the system for leaks
239 240 241 242	C1, C2, C3, C4 Excessive Refrigerant Flow	The evaporating temperature is high (>7°F of goal), the superheat is low (see below), and the sub-cooling is low (<5°F). In a TXV system, the superheat is acceptable when it is within +/-5°F of the goal. The goal is determined by the normal model based on the design EER, the type of metering device, the return air wet bulb temperature, and the ambient temperature. In a Fixed orifice system, the superheat is acceptable when it is within +/-10°F of the goal. The goal is determined from the charging chart, using the ambient temperature and return air wet bulb temperature.	There is excessive refrigerant flow into the evaporator and giving it the ability to absorb heat. • The CFM is potentially too high • Inspect TXV for normal function • Inspect percentage of outside air as there is excessively high amount of mixed air across the evaporator
243 244 245 246	C1, C2, C3, C4 Inefficient Compressor	The evaporator temperature is >15°F of the goal value	• Inspect the high-side and low-side pressure • Verify TXV operation • Inspect filter drier for excessive delta T • Inspect the outside air damper/ economizer for excessive outside air • Contact Technical Services before changing the compressor
247 248 249 250	C1, C2, C3, C4 Refrigerant Flow Restriction	Possible Condition 1) The superheat is high (>10°F of the goal) AND the sub-cool is high (>10°F of the goal). Possible Condition 2) Evaporator temperature is low (>10°F of the goal) AND Superheat is high (>10°F of the goal) AND sub-cool is high (>15°F) AND COA is greater than the goal	• Inspect for plugged or restricted filter drier • Inspect TXV for normal operation • Inspect condenser coil for possible restriction • Inspect unit refrigerant piping for damage or possible restriction
251 252 253 254	C1, C2, C3, C4 High Side Heat Transfer Problem	The condensing temperature is high (>10°F of the goal). The goal is determined by the normal model based on the design EER, the metering device type, and the refrigerant type and in the case of a fixed orifice machine the return air wet bulb temp.	It is difficult for the condenser to reject heat. • Inspect the condenser coil for debris. Clean coils if debris present • Inspect the condenser fan assembly, electrical supply, motor capacity, fan blades

Table 3: FDD alarms (continued)

BACNet State Number	FDD alarm	Diagnosis explanation	Recommendation
255 256 257 258	C1, C2, C3, C4 Low Side Heat Transfer Problem	The Evaporator temperature is colder than expected (<10°F of the goal). The goal is determined by the normal model based on the design EER, the metering device type, the refrigerant type, the return air wet bulb temp and the ambient temp. AND the superheat is low (<10°F of the goal). For a TXV system, the goal is determined by the normal model based on the design EER, the metering device type, the refrigerant type, the return air wet bulb temp and the ambient temp. For a Fixed Orifice System, The goal is determined from a charging chart using ambient temp and return air wet bulb temp.	• Inspect the evaporator for debris • Inspect the evaporator blower, clean wheel, motor electrical, VFD drive parameters, motor capacitor, belts, bearing • Inspect registers and grills for proper setting and airflow • Measure the unit airflow per instruction manual
259 260 261 262	C1, C2, C3, C4 Reduced Evaporator Airflow	The Evaporator temperature (suction pressure) is higher than expected (>7°F of the goal). The goal is determined by the normal model based on the design EER, the metering device type, the refrigerant type, the return air wet bulb temp and the ambient temp. AND the superheat is high (>10°F of the goal). For a TXV system, the goal is determined by the normal model based on the design EER, the metering device type, the refrigerant type, the return air wet bulb temp and the ambient temp. *For a Fixed Orifice System, The goal is determined from a charging chart using ambient temp and return air wet bulb temp. AND the sub-cool is high (>15°F)*	• Adjust airflow per instruction manual • Consider the fact that high-static drive models may develop more CFM than desired
263 264 265 266	C1, C2, C3, C4 Add Charge	The system has lower than expected sub-cooling and the evaporating temperature (suction pressure) is low. This may indicate there is less refrigerant charge in the system than expected. The system has lower than expected sub-cooling and the evaporating temperature (suction pressure) is low. This may indicate there is less refrigerant charge in the system than expected.	• Inspect the unit for leaks • Recover unit charge • Repair leaks if found • Weigh-in refrigerant per unit data tag charge
267 268 269 270	C1, C2, C3, C4 Insufficient Refrigerant Flow Indicates A Restriction	Possible Condition 1) The superheat is high (>10°F of the goal) AND the sub-cool is high (>10°F of the goal). Possible Condition 2) Evaporator temperature is low (>10°F of the goal) AND Superheat is high (>10°F of the goal) AND sub-cool is high (>15°F) AND COA is greater than the goal	Same as restriction. Follow the same actions
271 272 273 274	C1, C2, C3, C4 Recover Charge	The system has higher than expected sub-cooling and the condensing temperature (discharge pressure) is higher than expected at that specific ambient temperature. This may indicate there is more refrigerant charge than expected.	There is too much refrigerant in the system. • Remove refrigerant while monitoring refrigerant performance

Table 3: FDD alarms (continued)

BACNet State Number	FDD alarm	Diagnosis explanation	Recommendation
199 200 201 202	C1, C2, C3, C4 Liquid Temp Greater Than Cond Temp	The Liquid line temperature is >4F of the Condenser temperature target. It appears there is hot gas in the liquid line.	Substantially under-charged unit with hot gas passing through the condenser coil, thus affecting the liquid line sensor. • Look for the cause of the undercharge
171 172 173 174	C1, C2, C3, C4 Basic Data Not Available	One or more sensors are not available. Sensor inputs provide a 'Present Value' attribute along with a 'Reliability' attribute which varies based upon sensor type. Reliability – Reliability of the Present Value. One of the values from the Reliability enumeration set. Value can come from 3 sources: Hardware: This is the normal source of the reliability, it comes with the Present Value updates. Different hardware implementations may generate different values for Reliability. Out of Service CMD: The Out of Service command will place the object in out of service state, and specify a value for Present Value and set the Reliability to “Reliable”. Out of Service: While out of service the object will allow the Reliability to be written directly. Some examples: UNRELIABLE_HIGH, UNRELIABLE_LOW, OPEN, SHORTED, COMM_LOSS, INPUT_OUT_OF_RANGE.	• Inspect the unit electrical supply. Identify any high (wild) leg. Place on L2 if present • Inspect the low voltage transformer tap for correct selection • Inspect the unit for proper unit electrical grounding • Inspect units equipped with 2 control transformers for proper phasing. Should be 1-2 volts between the two 24V outputs.
303 304 305 306	C1, C2, C3, C4 Unit Off	The compressor appears to not be running because the differences in suction and liquid pressures are too small to prove operation.	
175 176 177 178	C1, C2, C3, C4 Return Air Wet-Bulb Temp Out of Range	In a fixed orifice system ONLY. The valid range of ambient temperature in the charge chart is between 55°F and 115°F. The target superheat value is not available	• Inspect the integrity of the sensor • Inspect the integrity of the sensor wiring
179 180 181 182	C1, C2, C3, C4 Ambient Temp Too Low	The measured ambient temperature (OAT) is <55°F or there is an issue with the sensor or its connection.	Consider using an additional source to determine the actual outdoor ambient temperature. If it is <55°F, it is too low to make a reliable diagnosis. • Consider installing a low-ambient operating kit for low ambient operation

Table 3: FDD alarms (continued)

BACNet State Number	FDD alarm	Diagnosis explanation	Recommendation
183 184 185 186	C1, C2, C3, C4 Ambient Temp Too High	The measured ambient temperature (OAT) is >115°F or there is an issue with the sensor or its connection.	Consider using an additional source to determine the actual outdoor ambient temperature. If it is >115°F, it is too high to make a reliable diagnosis. • Verify the proper application and placement of unit. Ensure that all clearances are met per Tech Guide
187 188 189 190	C1, C2, C3, C4 Return Air Wet-Bulb Temp Too Low	The Return air wet bulb temperature is lower than the return air wet bulb temperature correlating to 0% Relative humidity for the given return air temperature. RAT is from a wired TYPE3 10Kohm Thermistor RAH is from a wired 0-10VDC Humidity sensor (or an optional Network Sensor). The Return-Air Wet Bulb Temperature is a calculated value from the Super Application within the UCB. The value is only used for FDD and not used for control (not presented when FDD option is not available).	• Verify space conditions compared to the sensor reading • Verify sensor integrity • Verify sensor wiring
191 192 193 194	C1, C2, C3, C4 Return Air Wet-Bulb Temp Too High	The Return air wet bulb temperature is >76°F, or higher than the return air wet bulb temperature corresponding to 95% return air humidity for a given return air temperature. RAT is from a wired TYPE3 10Kohm Thermistor RAH is from a wired 0-10VDC Humidity sensor (or an optional Network Sensor). The Return-Air Wet Bulb Temperature is a calculated value from the Super Application within the UCB. The value is only used for FDD and not used for control (not presented when FDD option is not available).	• Verify space conditions compared to the sensor reading • Verify sensor integrity • Verify sensor wiring
195 196 197 198	C1, C2, C3, C4 Condensing Temp Less Than Ambient	The condensing temperature is 4°F below the Ambient temperature (OAT)	• Verify condenser coil sensor integrity • Verify sensor wiring • Inspect the condenser coil for restriction ahead of the sensor
203 204 205 206	C1, C2, C3, C4 Suction Temp Less Than Evap Temp	The condensing temperature is lower than the ambient temperature.	• Inspect if the unit is operating in a low ambient environment without a low ambient kit installed
207 208 209 210	C1, C2, C3, C4 Evap Temp Greater Than Ambient Temp	The evaporating temperature is higher than the ambient temperature by >2°F	• The unit may be operating in a low outdoor ambient condition • Inspect the unit for proper application and unit placement • The unit may be installed in a process cooling environment

Table 3: FDD alarms (continued)

BACNet State Number	FDD alarm	Diagnosis explanation	Recommendation
211 212 213 214	C1, C2, C3, C4 Liquid Temp Less Than Ambient Temp	The liquid line temperature is less than the ambient temperature.	• Inspect the unit for possible restriction on the liquid line ahead of the liquid line sensor
215 216 217 218	C1, C2, C3, C4 Invalid Suction or Ambient Temp	Suction line temperature is >2°F higher than the OAT.	• The unit may be operating in a low ambient condition • Verify sensor integrity
219 220 221 222	C1, C2, C3, C4 Invalid RA Dry-Bulb or Wet-Bulb Temp	Diagnostic module detects that the return air wet bulb temperature is warmer than the return dry wet bulb temperature. Suspect sensors interchanged or one or both sensors are faulty. RWB cannot be less than RA.	• Inspect sensor integrity • Verify the correct sensor location as connected to the control
223 224 225 226	C1, C2, C3, C4 Invalid Liquid and Suction Pressure	Suction line pressure is greater than the liquid line pressure. (should be very rare in a fixed piping DX circuit)	• Verify actual pressures • Verify sensor integrity • Verify that the sensor electrical connection point is correct
227 228 229 230	C1, C2, C3, C4 Invalid Suction Temp	Suction line temperature is > than the condensor temperature.	• Inspect for proper sensor wiring connection point • Inspect sensor integrity of both sensors
279 280 281 282	C1, C2, C3, C4 Return Air Dry-Bulb Temp Too Low	The measured return air temperature is <62°F	• Inspect space conditions • Verify that the unit application is not installed to a process cooling environment • Inspect the return duct for unwanted infiltration • Inspect sensor integrity
283 284 285 286	C1, C2, C3, C4 Return Air Dry-Bulb Temp Too High	The measured return air temperature is >84°F	• Inspect space conditions • Verify that the unit application is not installed to a process cooling environment • Inspect the return duct for unwanted infiltration • Inspect sensor integrity
314 315 316 317	C1, C2, C3, C4 EI Below 75% Expected Performance	Efficiency Index (EI) is the ratio of measured cooling efficiency to expected cooling efficiency under that set of driving conditions. This ratio is converted to a percentage (if the ratio is 0.75, percentage is 75%). Measured performance (efficiency and capacity) is calculated by reading the sensors installed on the unit. Expected performance is calculated based on a proprietary algorithm that takes into account the unit setup information and the driving conditions (RAT, RAH, OAT). The performance model is tuned to predict unit performance within +/- 10%.	• Inspect the unit installation for application suitability • Verify all system operations • Verify adequacy of ductwork and outside air quantities • Verify that the unit is not applied to a process cooling environment

Table 3: FDD alarms (continued)

BACNet State Number	FDD alarm	Diagnosis explanation	Recommendation
275 276 277 278	C1, C2, C3, C4 CI Below 75% Expected Performance	Capacity Index (CI) is the ratio of measured cooling capacity to expected cooling capacity under that set of driving conditions. This ratio is converted to a percentage (if the ratio is 0.75, percentage is 75%). Measured performance (efficiency and capacity) is calculated by reading the sensors installed on the unit. Expected performance is calculated based on a proprietary algorithm that takes into account the unit setup information and the driving conditions (RAT, RAH, OAT). The performance model is tuned to predict unit performance within +/- 10%.	• Inspect the unit installation for application suitability • Verify all system operations • Verify the adequacy of ductwork and outside air quantities • Verify that the unit is not applied to a process cooling environment
322 323 324 325	C1, C2, C3, C4 EI+CI Below 75% Expected Performance	Efficiency Index and Capacity Index are <75%	• Inspect the unit installation for application suitability • Verify all system operations • Verify the adequacy of ductwork and outside air quantities • Verify that the unit is not applied to a process cooling environment
287 288 289 290	C1, C2, C3, C4 FDD Not Functioning Sensor Unreliable	For a given cooling circuit, a Pressure or Temperature AI sensor wired directly to the FDD module has a 'Present Value' reading which is 'Unreliable' (refer to the previous reliability definition).	• Verify sensor integrity • Verify sensor wiring • Verify proper unit control voltages
291 292 293 294	C1, C2, C3, C4 FDD Not Monitoring Conditions Unreliable	Error reading the RWB, RDB, or OAT information which is being provided by the UCB to the FDD module(s).	• Verify sensor integrity • Verify sensor wiring • Verify proper unit control voltages
295 296 297	C1, C2, C3, C4 FDD Not Monitoring	There is an error with reading the Equipment Model configuration data (e.g. number of cooling circuits, refrigerant-type, elevation, etc). Factory settings might not be established - or are invalid.	This unit may have a replacement board where the factory parameters/data may be missing, or data have been compromised. • Verify that unit data is present in the control data parameters

Table 4: SE USB display menu guide

Menu/Submenu				Default settings and conditions for parameter display
Status	**Thermostat**			Y1 - Thermostat **Y1-Tstat** Off (24vac input to Y1 term)
				Y2 - Thermostat **Y2-Tstat** Off (24vac input to Y2 term)
				Y3 - Thermostat **Y3-Tstat** Off (24vac input to Y3 term)
				Y4 - Thermostat **Y4-Tstat** Off (24vac input to Y4 term)
				W1 - Thermostat **W1-Tstat** Off (24vac input to W1 term)
				W2 - Thermostat **W2-Tstat** Off (24vac input to W2 term)
				W3 - Thermostat **W3-Tstat** Off (24vac input to W3 term)
				G - Thermostat **G-Tstat** Off (24vac input to G term)
				Local Occupancy Input - Thermostat **Occ-Tstat** On (T-Stat Input Only)
	Smoke Control **SmokeCtrl**			Operating Purge Command **OprPurgeCmd** False
				Purge Command Source **PurgeCmdSrc** RATemp
				Local Purge Command Input **Purge** False (Purge input status)
				Network Override Purge Command **NetPurge** False (Purge command status)
				Shutdown Input/Smoke Detector **SD** Normal (SD 24 VAC input status)
	Status			Unit Status **Unit-S** Idle
				Economizer Status **Econ-S** Disabled
				Exhaust Fan Status **ExF-S** Off-Idle
				Fan Status **Fan-S** Off-Idle
				Hot Gas Reheat Status **HGR-S** Off-Idle
				Cooling Status **Clg-S** Off-Idle
				Dirty Filter Switch **DFS** Normal
				UCB 24VAC Input **UCB24VAC ForOutp** .3VAC (UCB 24VAC Input)
	Control **SysCntlrs**			Econ Controller **EconCntlr** Not Present (Econ board comm status)
				4 Stage Controller **4StgCntlr** Not Present (FC BUS BACnet network address)
				FDD Master Controller **FDDMCntlr** Not Present (Refr Circ 1-2 status)
				FDD Slave Controller **FDDSCntlr** Not Present (Refr Circ 3-4 status)
Alarms	No Events (No active alarm) Alarm Description (recent Alarm)			
Summary	**Sensors**	**Operational Mode**		Operational Outdoor Air Temperature **OprOAT** 73.0 F
				Operational Space Temperature **OprST** 73.0 F
				Operational Space Temperature Setpoint Offset **OprSSO** .0 F
				Operational Space Humidity **OprSH** 49.6 %H
				Operational Outdoor Air Humidity **OprOAH** 19%H
				Operational Indoor Air Quality **OprIAQ** 477ppm
				Operational Outdoor Air Quality **OprOAQ** 990ppm
				Operating Purge Command **OprPurgeCmd** False

Table 4: SE USB display menu guide (continued)

Menu/Submenu			Default settings and conditions for parameter display
Summary (continued)	**Sensors** (continued)	**Sensors**	Supply Air Temperature **SAT** (60.7 F) (S A Temp Thermistor input)
			Return Air Temperature **RAT** (73.0 F) (R A Temp Thermistor input)
			Outdoor Air Temperature Input **OAT** 73.0 F (UCB OAT Thermistor Input)
			Outdoor Air Temperature Source **OATSrc** Local Input
			Space Temperature Input **ST** 69.9 F
			Space Temperature Source **STSrc** Network Sensor
			Space Temperature Alarm Setpoint Offset **STAlarmOffset** (5 F)
			Space Temperature Alarm Time Delay **STAlarmDelay** (60min)
			Space Temp Setpoint Offset Input **SSO** .0 F
			Space Temperature Setpoint Offset Source **SSOSrc** Network Sensor
			Space Temperature Setpoint Offset Range **SSORange** (3.0 F)
			Space Humidity RAH Input **RAH** 79.4 %H
			Space Humidity Source **SHSrc** Local Input
			Outdoor Air Humidity Input **OAH** 50.2 %H
			Outdoor Air Humidity Source **OAHSrc** Local Input
			Indoor Air Quality **IAQ** 477ppm (IAQ 0-10 VDC Input)
			Indoor Air Quality Source **IAQSrc** Local Input
			Outdoor Air Quality Input **OAQ** 477ppm (OAQ 0-10vdc Input)
			Outdoor Air Quality Source **OAQSrc** Local Input
			Purge Command Source **PurgeCmdSrc** RATemp
			Supply Air Humidity **SAH** 49%H (SAH 0-10 vdcInput)
			Mixed Air Temperature **MAT** 70 F
			Building Static Pressure **BLDGPres** .095"/w
			Duct Static Pressure **DctPrs** 1.50"/w (DuctPres 0-5vdc input)
	Unit	Unit Name **Name** RTUxxxx (14 character max)	
		Unit Model Number **Model#** RTUxxxxx (14 character max)	
		Unit Serial Number **Serial#** DEFAULT_SERIAL (14 character max)	
		Model Name **ModelName**	
		Unit Status **Unit-S** Idle	
		Unit Enable **UnitEn** Enable	
		Hardware Reset **HdwrReset** No	
		Reset Lockouts **ResetLO** Off	

Table 4: SE USB display menu guide (continued)

Menu/Submenu		Default settings and conditions for parameter display
Commission	**Standard**	Occupancy Mode **OccMode** External
		Thermostat Only Control Enabled **Tstat-Only** Yes (T-Stat Input Only)
		Cooling Mode Enabled For Operation **Clg-En** Yes (Cooling Enabled/Disabled)
		Number of Cooling Stages Installed **#ClgStgs** 1 (Cooling Enabled/Disabled)
		Heating Mode Enabled For Operation **Htg-En** Yes (Heating Enabled/Disabled)
		Number of Heating Stages Installed **#HtgStgs** 0
		Economizer Enabled For Operation **Econ-En** Yes (Permit Free Cooling operation)
		Economizer Minimum Position Setpoint **Econ-MinPos** 20% (OccEconoMinPos)
		Economizer Damper Minimum Position Low Speed Fan **LowSpeedFan-MinPos** 25% (AI-IN 0-10vdc Input)
		Continuous Fan Operation in Occupied Mode **FanOnOcc** Yes (CV ConstantFanOccupied Mode)
		SAT Limit for Cooling Enable **SATCoolLimit-En** Yes (Enable SAT Limit)
		SAT Limit for Cooling Setpoint **SATCoolLimit-Sp** 50 F (SAT Limit SetPt)
		OAT Cooling Cutout Enabled **ClgOATCutout-En** Yes (LowAmbComp LO)
		OAT Cooling Cutout **ClgOATCutout** 45 F (LoAmbCompLO StPt)
	Options	Fan Control Type **FanCtl-Type** Single Speed (ID Blower Type)
		Exhaust Type **ExFType** None (Power Exh Fan mode selection)
		Number of Refrig Systems Installed **#RefrigSys** 4 (#Refrig Circuits)
		Low Ambient Enabled **LowAmb-En** Yes
		Lead/Lag Equalize Cooling Stage Runtime Enabled **LeadLag-En** No (EqualCompRuntime)
		Hot Gas Bypass Present **HGP-Inst** No (Hot Gas Bypass Installed)
		Heating Mode Enabled For Operation **Htg-En** Yes (Heating Enabled/Disabled)
		Heating Control Type **Htg-Type** Staged (Heating Control Method)
		SAT Air Temp Limit for Heating Enabled **SATHtgLimit-En** Yes (SA HtgLimitEnabled)
		SAT Air Temp Limit For Heating Setpoint **SATHtgLimit-Sp** 140 F (SA HtgLimitSetPt)
		Outdoor Air Temp Heating Cutout Setpoint **HtgOATCutout-Sp** 75 F (HtgOAT CO SetPt)
		Air Proving Switch Setup **APSSetup** None (Air Proving Switch Operation)
		Dirty Filter Switch Installed **DFSINst**
		Demand Ventilation Mode of Operation **DVent-Mode** Disabled (Dmand Vent mode select)
		Hot Gas Reheat Enabled **HGR-En** No
		Morning Warmup Enabled **MornW-En** No (VavMornWrmupEnable)
		Number of Heat Pump Stages Installed **#HtPumpStgs** 0 (# of Heat Pumps)
		Low Ambient Fan Pre-run Time For Cooling **LowAmbFanPre-runCool** 60 Sec
		PID Tuning Reset **PIDTunRst** False
		Low Ambient Start **LowAmbStart** No
		Single Zone VAV Enabled **SZVAVEn** No
	Network Setup	FC Comm Mode **FcBusMode** Wired (FC Bus Comm Mode)
		Address 4 (FCBusBACnetNetworkAddress)
		Device OID **DeviceId** 1
		Baud Rate **BaudRate** Auto (FC BUS baud rate in use)
		Device Name **DevName** UCBApp (FCBusBACnetNtwrkName)
		BACnet Encoding Type **EncodeType** ANSI X3.4 (US-ASCII)

Table 4: SE USB display menu guide (continued)

Menu/Submenu		Default settings and conditions for parameter display
Controller	**Network**	Device Name **DevName** UCBApp (FC Bus BACnet network name)
		BAS Communication **BASCom** BACnet (Comm Sub-board operation)
		Address 4 (FC BUS BACnet network address)
		Time Zone **TimeZone** Central
		Description **Descript**
		Communication Status **Comm-S** Waiting For Poll (FC Bus comm status)
		FC Comm Mode **FcBusMode** Wired (FC Bus Comm Mode)
		Operating Baud Rate **OprBaudRate** Auto (FC BUS baud rate to be used)
		Baud Rate **BaudRate** Auto (FC BUS baud rate in use)
		Device OID **Deviceid** 1 (Device OID)
		Language English
		Units IP (units of measure to be used)
		Number of Network Sensors Online **#NetSensors** 1
		Relearn System **Relearn** False
		BACnet Encoding Type **EncodeType** ISO 10646 (UCS-2)
	Firmware **Firm**	Firmware Status **Firm-S** Firmware Versions OK
		Firmware Version **FirmVer** 3.4.1.447
		Firmware Main Version **UCBMainVer** 3.4.1.447 (Firmware Revision)
		Application Version **UCBAppVer** 1223_2017.9.6.255 (Software App Rev)
		Hardware Version **UCBHardVer** 001 (Hardware Revision)
		Firmware Main Version **EconMainVer** 3.4.1.447 (Firmware Revision)
		Application Version **EconAppVer** 1223_2017.9.6.255 (Software App Rev)
		Hardware Version **EconHardVer** 001 (Hardware Revision)
		Firmware Main Version **4StgMainVer** 3.4.1.447 (Firmware Revision)
		Application Version **4StgAppVer** 1223_2017.9.6.255 (Software App Rev)
		Hardware Version **4StgHardVer** 001 (Hardware Revision)
		Firmware Main Version **FDDMMainVer** 3.4.1.447 (Firmware Revision)
		Application Version **FDDMAppVer** 1223_2017.9.6.255 (Software App Rev)
		Hardware Version **FDDMHardVer** 001 (Hardware Revision)
		Firmware Main Version **FDDSMainVer** 3.4.1.447 (Firmware Revision)
		Application Version **FDDSAppVer** 1223_2017.9.6.255 (Software App Rev)
		Hardware Version **FDDSHardVer** Not Present (Hardware Revision)

Table 4: SE USB display menu guide (continued)

Menu/Submenu			Default settings and conditions for parameter display
Controller (continued)	**Network Inputs**	Network Override Space Temperature **NetST**	(FC Bus Space Temp)
		Network Override Space Setpoint Offset **NetSSO**	(FC BusSpaceSetPtOffset)
		Network Override Zone Humidity **NetSH**	(FC BusSpaceHumidity)
		Network Occupancy Request **NetOcc**	Not Set (FC BusOccupncyStatus)
		Network Temporary Occupancy Request **NetTempOcc**	False (TempOccCommand)
		Network Override Indoor Air Quality **NetIAQ**	(FC Bus IAQ value)
		Network Override Fan Request **NetFanReq**	(FC BusFanOn reqst)
		Network Override Outdoor Air Temperature **NetOAT**	(FC Bus OA Temp)
		Network Override Outdoor Air Humidity **NetOAH**	(FC Bus OA Humidity)
		Network Override Outdoor Air Quality **NetOAQ**	(FC Bus OA Quality)
		Network Override Purge Command **NetPurge**	(FC BusPurge Comand)
		Direct Loadshed **DirLoadshd**	Yes/No (Direct Loadshed)
		Redline	Yes/No
	FDD	Unit Type **UnitType**	
		EER	
		Subcooling Goal **SubcoolGoal**	
		Refrigerant Type **RefrigType**	
		High Side Port Location **HiSidePortLoc**	
		Evaporator Coil Type **EvapCoil-Type**	
		Condenser Coil Type **CondCoil-Type**	
		Indoor Metering Device Type **InMeterDev-Type**	
		Outdoor Metering Device Type **OutMeterDev-Type**	
		Unit Capacity **UnitCap**	
		Fan Power **FanPower**	
		Super Heat Goal **SuperHeatGoal**	
		Altitude	
	Time	Time	
		Date	
		Time Zone	Central
		Daylight Savings Enable	
		Time Format	
	Description	Rooftop Controller Type **CntrlType**	CV
		Rooftop Equipment Type **EquipType**	RTU
Update	View version **View Ver**		3.4.1.447 Firmware OK
	Load firmware **LoadFirm**		No Package Present Error USB w/firmware must be present
	Backup		(BKP:Wait bCfg 0%
	Restore		>serialflash/BackupConfig
	Full clone		>serialflash/BackupConfig
	Partial clone		>serialflash/BackupConfig
	Factory default		Confirm

Table 4: SE USB display menu guide (continued)

Menu/Submenu				Default settings and conditions for parameter display
Update (continued)	**Time**	**Hour** 0 (0 through 23)		
		Minute 11(0 through 59)		
		Day 1 (1 through 31)		
		Month 1 (1 through 12)		
		Year 2000 (1900 through 2155)		
	Export Trend	**USB** Missing		
Details	Occupancy Status **OCC**	Occupancy Mode **OccMode** External		
		Occupancy Input **OCC** UnOccupied		
		Operational Occupancy **OprOcc** UnOccupied (Occupancy status)		
		Occupancy Input Source **OccSrc** Local Input		
		Temporary Occupancy Input **TempOcc** Disable		
		Temporary Occupancy Timeout **TempOccTimeout** 120		
		Off During Unoccupied **OffDurUnocc** No		
		Optimal Start Enabled **OptStrt-En** No		
		Early Start Period **EarlyStrtPeriod** 60min		
		Use Occupancy Schedule **UseOccSched** Yes		
		Pre Occupancy Purge Enable **PreOccPurgeEna**		
		Pre Occupancy Purge Time **PreOccPurge-Time** 60		
		Pre Occupancy Purge Upper SAT Setpoint **PreOccUp-SAT_SP** 90		
		Pre Occupancy Purge Lower SAT Setpoint **PreOccLow-SAT_SP** 45		
	Cooling **Clg**	**Setup**	Cooling Mode Enabled For Operation **Clg-En** Yes	
			Number of Cooling Stages Installed **#ClgStgs** 1	
			Number of Refrig Systems Installed **#RefrigSys** 4	
			CV Occupied Cooling Setpoint **ClgOcc-Sp** 72 F	
			CV Unoccupied Cooling Setpoint **ClgUnocc-Sp** 85 F	
			Compressor Stage 1 Enabled **C1-En** Yes (C1 24vacOutputEnabled)	
			Compressor Stage 2 Enabled **C2-En** Yes (C2 24vac output enabled)	
			Compressor Stage 3 Enabled **C3-En** Yes (C3 24vacOutputEnabled)	
			Compressor Stage 4 Enabled **C4-En** Yes (C4 24vacOutputEnabled)	
			Minimum Runtime for a Cooling Stage **MinRtCoolStg** 3min	
			Cooling Adaptive Tuning Enable **ClgAdapTunEn** Yes	
			Low Ambient Enabled **LowAmb-En** No	
			Low Ambient Cooling Stages 10 on 5 off Setpoint **LowAmb10On5OffSp** 45 F	
			Lead/Lag Equalize Cooling Stage Runtime **EnabledLeadLag-En** No	
			OAT Cooling Cutout Enabled **ClgOATCutout-En** Yes (LowAmbComp LO)	
			OAT Cooling Cutout **ClgOATCutout** 45 F (LoAmbCompLO StPt)	
			SAT Limit for Cooling Enable **SATCoolLimit-En** Yes (Enable SAT Limit)	
			SAT Limit for Cooling Setpoint **SATCoolLimit-Sp** 45 F	
			Hot Gas Bypass Present **HGP-Inst** No	
			Freeze Condition Setpoint **Freeze-Sp** 26.0 F	
			Pump Out Enable **PmpOut-En** Disable	
			Low Ambient Fan Pre-run Time For Cooling **LowAmbFanPrerun-Cool** 60sec	
			Cooling Manual Tuning **ClgManualTune** No	
			Low Ambient Start **LowAmbStart** No	

Table 4: SE USB display menu guide (continued)

Menu/Submenu				Default settings and conditions for parameter display
Details (continued)	Cooling **Clg** (continued)	**Setup** (continued)	4 Pipe Split Enable **4pipeEna**	No
		Service	**Unit**	Staged Cooling Command **StgClgCmd** 0%
				CV Operating Cooling Setpoint **OprCVClg-Sp** 72 F
				Cooling Status **Clg-S** Off-Idle
				Operational Outdoor Air Temperature **OprOAT** 73.0 F
				Operational Space Temperature **OprST** 73.0 F
				Return Air Temperature **RAT** 73 F (UCB RAT thermistor input)
				Econ Free Cooling Available **Econ-Free** No
				Supply Air Temperature **SAT** 60.7 F (UCB SAT thermistor input)
				Y1 - Thermostat **Y1-Tstat** Off (24vac input to Y1 term)
				Y2 - Thermostat **Y2-Tstat** Off (24vac input to Y2 term)
				Y3 - Thermostat **Y3-Tstat** Off (24vac input to Y3 term)
				Y4 - Thermostat **Y4-Tstat** Off (24vac input to Y4 term)
				Condenser Fan 1 **CN-Fan** Off (CN-Fan 24 VAC output)
				Condenser Fan 2 **CF2** Off (CF2 24 VAC output)
			Stage 1	Compressor Stage 1 Status **C1-S** Off - Idle
				Compressor Stage Command 1 **C1** Off (C1 24vac output status)
				Min On Time Remaining 1 **C1OnTmr** 180 Sec
				Anti-Short Cycle Delay Time Remaining **1C1ASCDTmr** 300 Sec
				Compressor Stage Accumulated Runtime 1 **C1RunTim** . 0 hr
				Efficiency Index 1 **C1-EI** ? %
				Capacity Index 1 **C1-CI** ? F
				Condensing Temperature over Ambient 1 **C1-CondTempOvrAmb**
				Evaporating Temperature Value Circuit 1 **C1-EvapTempValue**
				Cooling Circuit Test Status **ClgCktTestS-1**
				Superheat **C1-SuperHeat**
				Subcooling **C1-SubCool**
			Stage 2	Compressor Stage 2 Status **C2-S** Off - Idle
				Compressor Stage Command 2 **C2** Off (C2 24vac output status)
				Min On Time Remaining 2 **C2OnTmr** 180 sec
				Anti-Short Cycle Delay Time Remaining 2 **C2ASCDTmr** 300 sec
				Compressor Stage Accumulated Runtime 2 **C2RunTim** .0 hr
				Efficiency Index 2 **C2-EI** ? %
				Capacity Index 2 **C2-CI** ? F
				Condensing Temperature over Ambient 2 **C2-CondTempOvrAmb**
				Evaporating Temperature Value Circuit 2 **C2-EvapTempValue**
				Cooling Circuit Test Status **ClgCktTestS-1**
				Superheat **C1-SuperHeat**
				Subcooling **C1-SubCool**

Table 4: SE USB display menu guide (continued)

Menu/Submenu				Default settings and conditions for parameter display
Details (continued)	Cooling **Clg** (continued)	**Service (continued)**	**Stage 3**	Compressor Stage 3 Status **C3-S** Off - Idle
				Compressor Stage Command 3 **C3** Off (C3 24vac output status)
				Min On Time Remaining 3 **C3OnTmr** 180 sec
				Anti-Short Cycle Delay Time Remaining 3 **C3ASCDTmr** 300 sec
				Compressor Stage Accumulated Runtime 3 **C3RunTim** .0 hr
				Efficiency Index 3 **C3-EI** ? %
				Capacity Index 3 **C3-CI** ? F
				Condensing Temperature over Ambient 3 **C3-CondTempOvrAmb**
				Evaporating Temperature Value Circuit 3 **C3-EvapTempValue**
				Cooling Circuit Test Status **ClgCktTestS-1**
				Superheat **C1-SuperHeat**
				Subcooling **C1-SubCool**
			Stage 4	Compressor Stage 4 Status **C4-S** Off - Idle
				Compressor Stage Command 4 **C4** Off (C4 24vac output status)
				Min On Time Remaining 4 **C4OnTmr** 180 sec
				Anti-Short Cycle Delay Time Remaining 4 **C4ASCDTmr** (300 sec
				Compressor Stage Accumulated Runtime 4 **C4RunTim** (.0 hr
				Efficiency Index 4 **C4-EI** ? %
				Capacity Index 4 **C4-CI** ? F
				Condensing Temperature over Ambient 4 **C4-CondTempOvrAmb**
				Evaporating Temperature Value Circuit 4 **C4-EvapTempValue**
				Cooling Circuit Test Status **ClgCktTestS-1**
				Superheat **C1-SuperHeat**
				Subcooling **C1-SubCool**
		Sensors		Evaporator Coil Temp 1 **EC1** 42 F (EC1 thermistor input)
				Condenser Coil Temp 1 **CC1** 96 F (CC1 thermistor input)
				Suction Pressure 1 **SLP-1**
				Liquid Pressure 1 **LLP-1**
				Suction Temperature 1 **SLT-1**
				Liquid Temperature 1 **LLT-1**
				Evaporator Coil Temp 2 **EC2** 42 F (EC2 thermistor input)
				Condenser Coil Temp 2 **CC2** 96 F (CC2 thermistor input)
				Suction Pressure 2 **SLP-2**
				Liquid Pressure 2 **LLP-2**
				Suction Temperature 2 **SLT-2**
				Liquid Temperature 2 **LLT-2**
				Evaporator Coil Temp 3 **EC3** 42 F (EC3 thermistor input)
				Condenser Coil Temp 3 **CC3** 96 F (CC3 thermistor input)
				Suction Pressure 3 **SLP-3**
				Liquid Pressure 3 **LLP-3**
				Suction Temperature 3 **SLT-3**
				Liquid Temperature 3 **LLT-3**
				Evaporator Coil Temp 4 **EC4** 42 F (EC4 thermistor input)

Table 4: SE USB display menu guide (continued)

Menu/Submenu			Default settings and conditions for parameter display
Details (continued)	Cooling **Clg** (continued)	**Sensors** (continued)	Condenser Coil Temp 4 **CC4** 96 F (CC4 thermistor input)
			Suction Pressure 4 **SLP-4**
			Liquid Pressure 4 **LLP-4**
			Suction Temperature 4 **SLT-4**
			Liquid Temperature 4 **LLT-4**
		Safeties	High Pressure Limit 1 **HPS1** Normal (HPS1 24vac input status)
			High Pressure Lockout 1 **HPS1-LO** Normal (HiPress1 switch status)
			Low Pressure Limit 1 **LPS1** Normal (LPS1 24vac input status)
			Low Pressure Lockout 1 **LPS1-LO** Normal (LoPress1 switch status)
			Freeze Condition 1 **FS1** Normal (Freeze Protect1 status)
			Freeze Condition Lockout 1 **FS1-LO** Normal (Freeze Protect1 status)
			High Pressure Limit 2 **HPS2** Normal (HPS2 24vac input status)
			High Pressure Lockout 2 **HPS2-LO** Normal (HiPress2 switch status)
			Low Pressure Limit 2 **LPS2** Normal (LPS2 24vac input status)
			Low Pressure Lockout 2 **LPS2-LO** Normal (LoPress2 switch status)
			Freeze Condition 2 **FS2** Normal (Freeze Protect2 status)
			Freeze Condition Lockout 2 **FS2-LO** Normal (Freeze Protect2 status)
			High Pressure Limit 3 **HPS3** Normal (HPS3 24vac input status)
			High Pressure Lockout 3 **HPS3-LO** Normal (HiPress3 switch status)
			Low Pressure Limit 3 **LPS3** Normal (LPS3 34vac input status)
			Low Pressure Lockout 3 **LPS3-LO** Normal (LoPress3 switch status)
			Freeze Condition 3 **FS3** Normal (Freeze Protect3 status)
			Freeze Condition Lockout 3 **FS3-LO** Normal (Freeze Protect3 status)
			High Pressure Limit 4 **HPS4** Normal (HPS4 44vac input status)
			High Pressure Lockout 4 **HPS4-LO** Normal (HiPress4 switch status)
			Low Pressure Limit 4 **LPS4** Normal (LPS4 44vac input status)
			Low Pressure Lockout 4 **LPS4-LO** Normal (LoPress4 switch status)
			Freeze Condition 4 **FS4** Normal (Freeze Protect4 status)
			Freeze Condition Lockout 4 **FS4-LO** Normal (Freeze Protect4 status)
		Misc	Maximum Temperature / Humidity Setpoint Offset **MaxTempHumS-pOff** 3.0 F
			Temperature/Humidity Setpoint **TempHum-Sp** 50%H (*effectsOprClg-SP)
			Temperature/Humidity (Return) Control Enable **TempHumC-trl-En** No
			Operational Space Humidity **OprSH** 49.6 %H (Space Humidity in use)
			CV Occupied Cooling Setpoint **ClgOcc-Sp** 72 F
			CV Operating Cooling Setpoint **OprCVClg-Sp** 72 F
			Temperature/Humidity Value per Degree Offset **TempHumValPerDegOff** 5%H
	Heating **Htg**	**Setup**	Heating Mode Enabled For Operation **Htg-En** Yes
			Number of Heating Stages Installed **#HtgStgs** 1
			Heating Control Type **Htg-Type** Staged
			CV Occupied Heating Setpoint **CVHtgOcc-SP** 68 F
			CV Unoccupied Heating Setpoint **CVHtgUnocc-Sp** 60 F
			Heating Adaptive Tuning Enable **HtgAdapTunEn** Yes
			SAT Air Temp Limit for Heating Enabled **SATHtgLimit-En** Yes
			SAT Air Temp Limit For Heating Setpoint **SATHtgLimit-Sp** 135 F

Table 4: SE USB display menu guide (continued)

Menu/Submenu			Default settings and conditions for parameter display
Details (continued)	Heating **Htg** (continued)	**Setup** (continued)	Outdoor Air Temp Heating Cutout Setpoint **HtgOATCutout-Sp** 75 F
			Number of Gas Valves Installed **#GasVlvs** 0 (#HtPmpStgs = 0)
			Number of Limit Switches **#LimSwtchs** 1 (#HtPmpStgs = 0)
			Low Limit Enable **LL_Enable** Disable
			Low Limit Upper SAT Setpoint **LL_UpSAT_SP** 80 F
			Low Limit Lower SAT Setpoint **LL_LowSAT_SP** 80 F
			Heating Manual Tuning **HtgManualTune** No
		Service	Staged Heating Command **StgHtgCmd** 0%
			CV Operating Heating Setpoint **CVOprHtg-Sp** 68 F
			Heating Status **Htg-S** Off-Idle
			Operational Outdoor Air Temperature **OprOAT** 73.0 F
			Operational Space Temperature **OprST** 73.0 F
			Return Air Temperature **RAT** 70.4 F (UCB RAT thermistorInput)
			W1 - Thermostat **W1-Tstat** Off (24vac input to W1 term)
			W2 - Thermostat **W2-Tstat** Off (24vac input to W2 term)
			W3 - Thermostat **W3-Tstat** Off (24vac input to W3 term)
			G - Thermostat **G-Tstat** Off (24vac input to G term)
			Heating Stage 1 Status **H1-S** Off-Idle
			Heating Stage Command 1 **H1** Off (1st stage heat output status)
			Heating Stage 1 Min On Time Remaining **H1OnTmr** 0 Sec
			Heating Stage 1 Anti-Short Cycle Delay Time Remaining **H1ASCDTmr** 0 Sec
			Heating Stage 1 Accumulated Runtime **H1RunTim** . 0 hr
			Heating Stage Command 2 **H2** Off (2nd stage heating output status)
			Heating Stage 2 Status **H2-S** Off-Idle
			Heating Stage 2 Min On Time Remaining **H2OnTmr** 0 Sec
			Heating Stage 2 Anti-Short Cycle Delay Time Remaining **H2ASCDTmr** 0 Sec
			Heating Stage 2 Accumulated Runtime **H2RunTim** .0 hr
			Heating Stage Command 3 **H3** Off (3rd stage heating output status)
			Heating Stage 3 Status **H3-S** Off-Idle
			Heating Stage 3 Min On Time Remaining **H3OnTmr** 0 Sec
			Heating Stage 3 Anti-Short Cycle Delay Time Remaining **H3ASCDTmr** 0 Sec
			Heating Stage 3 Accumulated Runtime **H3RunTim** .0 hr
		Safeties	Heat Limit1 Switch **Limit** Normal (Limit 24vac input status)
			Heat Limit1 Switch Lockout **LimitLO** Normal (HeaT Limit status)
			Heat Limit2 Switch **Lim2** Normal (Limit 24vac input status)
			Heat Limit2 Switch Lockout **Lim2LO** Normal (Heat Limit status)
			Heat Limit3 Switch **Lim3** Normal (Limit 24vac input status)
			Heat Limit3 Switch Lockout **Lim3LO** Normal (Heat Limit status)
			Gas Valve1 Input **MV** No (MV pin 24vac input status)
			Gas Valve2 Input **GV2** Off (GV2 pin 24vac input status)
			Gas Valve3 Input **GV3** Off (GV3,4 pin 24vac input status)

Table 4: SE USB display menu guide (continued)

Menu/Submenu				Default settings and conditions for parameter display
Details (continued)	Heating **Htg** (continued)	Proportional **Prop**	**Setup**	Hydronic Heating Stage #1 Supply Air Setpoint **HydH1SA-Sp** 120 F
				Hydronic Heating Stage #2 Supply Air Setpoint **HydH2SA-Sp** 150 F
				Hydronic Heat SAT Tempering Enabled **SATTempHydHt-En** No
				Hydronic Heat SAT Tempering Setpoint **SATTempHydHt-Sp** 40
				Hydronic Heat Valve Reverse Acting **HydReverse** No (ModHt 2-10vdcAction)
			Service	CV Occupied Heating Setpoint **CVHtgOcc-SP** 68 F
				CV Unoccupied Heating Setpoint **CVHtgUnocc-Sp** 60 F
				CV Operating Heating Setpoint **CVOprHtg-Sp** 68 F
				VAV Operating Heating Setpoint **VAVOprHtg-Sp** 68F
				Operational Space Temperature **Opr ST** 73.0 F
				Supply Air Temperature **SAT** 60.7 F (S A Temp Thermistor input)
				W1 - Thermostat **W1-Tstat** Off (24vac input to W1 term)
				W2 - Thermostat **W2-Tstat** Off (24vac input to W2 term)
				Hydronic Heat Valve % Command **HWV** 0% (HWV VDC output)
				Hydronic Heat Valve Reverse Acting **HydReverse** No (ModHt 2-10vdcAction)
				Hot Water Freeze Stat **FSHW** Normal
	Indoor Fan **Fan**	**Setup**		Fan Control Type **FanCtl-Type** Single Speed (ID Blwr/Unit Op Mode)
				Continuous Fan Operation in Occupied Mode **FanOn Occ** Yes (CV Constant Fan in Occupied Mode)
				Fan On Delay for Heat **FanOnDlyHeat** 30sec
				Fan Off Delay for Heat **FanOffDlyHeat** 60sec
				Turn Off Continuous Fan Operation When Starting Heat **FanOffStartHeat** Yes
				Fan On Delay for Cool **FanOnDlyCool** 0sec
				Fan Off Delay for Cool **FanOffDlyCool** 30sec
				Occupied: No Heat or Cool % Command **Fan Only-% Cmd** 50% (CV IS fan only)
				Occupied: One Stage of Cool % Command **1ClgStg-% Cmd** 70% (CV IS 1 Stg Cool)
				Occupied: Two Stage of Cool % Command **2ClgStg-% Cmd** 80% (CV IS 2 Stg Cool)
				Occupied: Three Stage of Cool % Command **3ClgStg-% Cmdt** 90% (CV IS 3 Stg Cool)
				Occupied: Four Stage of Cool % Command **4ClgStg-% Cmd** 100% (CV IS 4 Stg Cool)
				Occupied: One Stage of Heat % Command **1HtgStg-%Cmd** 100%
				Occupied: Two Stage of Heat % Command **2HtgStg-%Cmd** 100%
				Occupied: Three Stage of Heat % Command **3HtgStg-%Cmd** 100%
				Low Ambient Fan Pre-run Time For Cooling **LowAmbFanPre-runCool** 60 sec
				Air Proving Switch Setup **APSSetup** None (Air Proving Switch Operation)
				Dirty Filter Switch **DFS** Normal (DFS 24vac input status)

Table 4: SE USB display menu guide (continued)

Menu/Submenu			Default settings and conditions for parameter display
Details (continued)	Indoor Fan **Fan** (continued)	**Service**	G - Thermostat **G-Tstat** Off (24vac input to G term)
			Fan Status **Fan-S** Off-Idle
			Fan Command **Fan** Off (FAN 24vac output status)
			Fan Accumulated Runtime **Fan-RT** .0 hr
			Operating Fan Request **OprFanReq** Off
			Fan Request Source **FanReqSrc** Local Input
			Air Proving Switch **APS** Off
			Fan Overload **FanOverload** Normal
			Fan VFD Fault **FanVFDFlt** Normal
	Economizer **Econ**	**Setup**	Economizer Enabled For Operation **Econ-En** Yes
			Economizer Minimum Position Setpoint **Econ-MinPos** 10%
			Econ Damper Minimum Position Low Speed Fan **LowSpeedFan-MinPos** 25%
			Low Ambient Economizer Minimum Position **LowAmb-MinPos** 0%v
			Low Ambient Economizer Setpoint **LowAmb-Sp** 0 F
			Free Cooling Selection **FreeClg-Sel** Auto (FreClgChngOvrMethod)
			Free Cooling Current Mode **FreeClg-Mode** Dry Bulb (ChngoverMode)
			All Compressors Off in Free Cooling **AllCompOff-Econ** No
			Economizer Outdoor Air Temp Enable Setpoint **EconOAT-SpEn** 55 F
			Economizer Outdoor Air Enthalpy Setpoint **EconOAEnth-Sp** 27 B/#
			Demand Ventilation Mode of Operation **DVent-Mode** Disabled
			Demand Ventilation Maximum Economizer Position **DVentMaxEconPos** 50%
			Demand Ventilation Indoor Air Quality Setpoint **DVentIAQ-Sp** 1000ppm
			Demand Ventilation Differential Setpoint **DVentDiff-Sp** 600ppm
			Indoor Air Quality Sensor Range **IAQRange** 2000ppm (w/Co2 sensor inst)
			Outdoor Air Quality Sensor Range **OAQRange** 2000ppm (w/Co2 sensor inst)
			Economizer Loading Enabled **EconLoad-En** No
			Fresh Air Intake Setpoint **MOAFlow-Sp** 10CFM
			Fresh Air Intake Max Sensor Range **MOA-Range** 10000CFM
			EconMech Setup **EconMechStp** Option B
			Economizer Fault Detection Enable **EconFltDetectEn** Disable
		Service	Cooling Status **Clg-S** Off-Idle
			Economizer Status **Econ-S** Disabled
			Econ Free Cooling Available **Econ-Free** No
			Economizer Damper % Command **Econ** 0% (ECON 2-10vdc output status)
			Supply Air Temperature **SAT** 60.7 F (UCB SAT thermistor input)
			Operational Outdoor Air Temperature **OprOAT** 73.0 F
			Outdoor Air Enthalpy **OA-Enth** 20 B/# (CalcOA enthalpyInput)
			Return Air Enthalpy **RA-Enth** 20B/#
			Operational Indoor Air Quality **OprIAQ** 477ppm
			Operational Outdoor Air Quality **OprOAQ** 990ppm
			Fresh Air Intake Value **Fr Air** 7940CFM
			Economizer Damper Position **EconDampPos** 38 (AI-IN 0-10vdc Input)
			FDD Economizer Alarm Delay **EconAlrmDly** 600sec
			FDD Economizer Damper Allowed Error **EconPosErr** 8%
			FDD Damper Min Position Tolerance **EconMinErr** 5%

Table 4: SE USB display menu guide (continued)

Menu/Submenu				Default settings and conditions for parameter display
Details (continued)	Demand Ventilation **Dvent**			Economizer Enabled For Operation **Econ-En** Yes
				Demand Ventilation Mode of Operation **DVent-Mode** Disabled
				Demand Ventilation Maximum Economizer Position **DVentMaxEconPos** 50%
				Demand Ventilation Indoor Air Quality Setpoint **DVentIAQ-Sp** 1000ppm
				Demand Ventilation Differential Setpoint **DVentDiff-Sp** 600ppm (Occ Diff IAQ/OAQ SetPt)
				Indoor Air Quality Sensor Range **IAQRange** 2000ppm (ppm@10vdcIAQ Output)
				Outdoor Air Quality Sensor Range **OAQRange** 2000ppm (ppm@10vdcOAQ Output)
				Operational Indoor Air Quality **OprIAQ** 477ppm (IAQ 0-10vdcInput in use)
				Operational Outdoor Air Quality **OprOAQ** 990ppm (OutdoorAirQuality in use)
				Economizer Damper Position **EconDampPos** 38 (AI-IN 0-10vdc Input)
	Air Monitor Station **AirMonStation**			Economizer Enabled For Operation **Econ-En** Yes
				Fresh Air Intake Enable **FrAir-En** Disable
				Fresh Air Intake Setpoint **MOAFlow-Sp** 10CFM
				Fresh Air Intake Max Sensor Range **MOA-Range** 10000CFM
				Fresh Air Intake Value **Fr Air** 7953CFM
				Economizer Damper Position **EconDampPos** 38 (AI-IN 0-10vdc Input)
				Fresh Air Range **Control** 40CFM
	Power Exhaust **PowerEx**	**Setup**		Exhaust Type **ExFType** None (PwrExFanModeSelection)
				Economizer Damper Position for Exhaust Fan to Turn On **EconDmpPosFanOn** 60%
				Economizer Damper Position for Exhaust Fan to Turn Off **EconDmpPosFanOff** 20%
				Exhaust Damper Position for Exhaust Fan to Turn On **ExDmpPosFanOn** 80%
				Exhaust Damper Position for Exhaust Fan to Turn Off **ExDmpPosFanOff** 20%
				Building Pressure Setpoint **Bldg-Sp** 100"/w
				Duct Static Pressure **DctPrs**
		Service		Exhaust Fan Status **ExF-S** Off
				Exhaust Fan Command **ExFan** Off (EX-FAN 24vacOutputStatus)
				Building Static Pressure **BldgPres** .164"/w (BldgPres 0-5vdc Input)
				Exhaust Damper % Command **EAD-O** 0% (EXVFD2-10vdcOutptStatus)
				Exhaust Fan VFD % Command **ExFanVFD** 0% (EX VFD2-10vdc Output)
				Exhaust Fan Accumulated Runtime **ExFan-RunTime** .0 hr (24vacOutputAccRunTime)
				Exhaust Fan VFD Fault **ExFanVFDFlt** Normal (VFD FLT24vacInput)

Table 4: SE USB display menu guide (continued)

Menu/Submenu			Default settings and conditions for parameter display
Details (continued)	**FanVFD**	**Setup**	Fan Control Type **FanCtl-Type** Single Speed (UnitOpMode)
			Duct Pressure Setpoint **DctPrs-Sp** 1.50"/w
			Duct Pressure Shutdown Setpoint **DctShutdownSp** 4.5"/w
			VAV Cooling Supply Air Temp Upper Setpoint **SATUp-Sp** 60 Fc
			VAV Cooling Supply Air Temp Lower Setpoint **SATLo-Sp** 55 F
			VAV Supply Air Temp Reset Setpoint **SATRst-Sp** 72 F
			VAV Unoccupied Cooling Setpoint **VAVClgUnocc-Sp** 85 F (FanCtl-Type = Variable Speed)
			Morning Warmup Enabled **MornW-En** No
			Morning Warmup/Return Air Temp Setpoint **MornWRAT-Sp** 71 F
			VAV Occupied Heating Enabled **HtgOcc-En** Yes
			VAV Occupied Heating Setpoint **VAVHtgOcc-SP** 85 F
			Unoccupied Heating Enabled **HtgUnocc-En** No
			VAV Unoccupied Heating Setpoint **VAVHtgUnocc-Sp** 60 F
			Morning Cooldown Enabled **MornC-En** No
			Morning Cooldown/Return Air Temp Setpoint **MornCRAT-Sp** 74F
			Optimal Start Enabled **OptStrt-En** No
			Early Start Period **EarlyStrtPeriod** 60min
			Use Occupancy Schedule **UseOccSched** Yes
			Low Pressure Limit 1 **LPS1** Normal (LPS1 24vac input status)
			Low Pressure Limit 2 LPS2 Normal (LPS2 24vac input status)
			Time
			Time
			COBP Occupied Heating Enabled **HtgOcc-En** Yes
		Service	Fan % Command **FanVFD** 0% (VFD 2-10 VDC output)
			Duct Static Pressure **DctPrs** 1.50"/w (DCT PRS 0-5vdcInput)
			Duct Pressure Setpoint **DctPrs-Sp** 1.5"/w
			VAV Operating Cooling Supply Air Temp Setpoint **OprVAVClg-Sp** 55 F
			Supply Air Temperature **SAT** 60.7 F (UCB SAT thermistor input)
			Staged Cooling Command **StgClgCmd** 0%
			Cooling Status **Clg-S** Yes
			Econ Free Cooling Available **Econ-Free** No
			Compressor Stage Command 1 **C1** Off (UCB C1 24 VAC output status)
			Compressor Stage Command 2 **C2** Off (Demand Vent Set Point)
			Compressor Stage Command 3 **C3** Off (4stg C3 24 VAC output status)
			Compressor Stage Command 4 **C4** Off (4stg C4 24 VAC output status)
			VAV Operating Heating Setpoint **VAVOprHtg-Sp** 68 F
			Staged Heating Command **StgHtgCmd** 0%
			Operational Space Temperature **OprST** 73.0 F
			Heating Status **Htg-S** Off-Idle
			Heating Stage Command 1 **H1** Off (CV IS 1 Stg Heat)
			Heating Stage Command 2 **H2** Off (CV IS 2 Stg Heat)
			Heating Stage Command 3 **H3** Off (CV IS 3 Stg Heat)
			VAV Box Heat Command **VAV Box** Off

Table 4: SE USB display menu guide (continued)

Menu/Submenu			Default settings and conditions for parameter display
Details (continued)	Single Zone VAV **SZVAV**	**Setup**	SZ VAV Enabled **SZVAVEn** No
			SZ VAV Minimum Fan Speed **SZVAVMinFanSpd** 66%
			SZ VAV Occupied Cooling Setpoint **SZVAVClgOcc-Sp** 72 F
			SZ VAV Unoccupied Cooling Setpoint **SZVAVClgUnocc-Sp** 85 F
			VAV Occupied Heating Setpoint **VAVHtgOcc-SP** 68 F
			VAV Unoccupied Heating Setpoint **VAVHtgUnocc-Sp** 60 F
			DAT Max Heating SP **DATMaxHtgSP** 105F
			DAT Satisfied SP **DATSATSP** 70F
			DAT Cooling Min SP **DATClgMinSP** 54F
		Service	SZ VAV Operating Cooling Setpoint **OprSZVAV-Clg-Sp** 72 F
			SZ VAV Cooling Load **SZVAVClgLd** 0%
			SZ VAV Heating Load **SZVAVHtgLd**
			VAV Operating Cooling Supply Air Temp Setpoint **OprVAVClg-Sp** 60 F
			Operational Space Temperature **OprST** 73.0 F
			Supply Air Temperature **SAT** 60.7 F (SAT thermistor input)
			Fan % Command **FanVFD** 0% (VFD 2-10vdc output status)
			Economizer Damper % Command **Econ** 0% (ECON 2-10 VDC output status)
			Compressor Stage Command 1 **C1** Off (1st Cool 24 VAC output)
			Compressor Stage Command 2 **C2** Off (2nd+ Cool 24 VAC output)
			Compressor Stage Command 3 **C3** Off (3rd+ Cool 24 VAC output)
			Compressor Stage Command 4 **C4** Off (4th+ Cool 24 VAC output)
	Hot Gas Reheat **HGR**	**Setup**	Hot Gas Reheat Enabled For Operation **HGR-En** No
			Hot Gas Reheat Alternate Operation Enabled **HGRAlt-En** No
			Hot Gas Reheat Alternate Operation Writeable **HGRAltWrite** No
			Hot Gas Reheat Humidity Setpoint **HGRHum-Sp** 60degF
			HGR Enabled for Unoccupied Operation **HGRUnocc-En** Yes
			HGR Unoccupied Humidity Setpoint **HGRUnoc-cHum-SP** 70degF
			HGR Humidity Setpoint Differential **HGR-Diff** 3%
			Aux Mode **Mode**
		Service	Staged Cooling Command **StgClgCmd** 0%
			CV Operating Cooling Setpoint **OprCVClg-Sp** 72 F
			Operational Space Temperature **OprST** 73.0 F
			Hot Gas Reheat Humidity Setpoint **HGRHum-Sp** 60F
			Operational Space Humidity **OprSH** 49.6 %H
			Hot Gas Reheat Status **HGR-S** Off-Disabled
			Hot Gas Reheat Command **HGR** Off
			Compressor Stage Command 1 **C1** Off (C1 24vacOutputStatus)
			Compressor Stage Command 2 **C2** Off (UCB C1 24 VAC output status)
			Compressor Stage Command 3 **C3** Off (C3 24vacOutputStatus)
			Compressor Stage Command 4 **C4** Off (4stg C4 24 VAC output status)
			Space Humidity RAH Input **RAH** (49.6 %H) (R A Humidity 0-10 VDC input)

Table 4: SE USB display menu guide (continued)

Menu/Submenu		Default settings and conditions for parameter display
Details (continued)	Heat Pump	Number of Heat Pump Stages Installed **#HtPumpStgs** 0
		Test Defrost Enable **TestDefrost-Enable** No
		Compressor Delay Enable **CompDelay-Enable** No
		Defrost Curve Selection **DefrostCur-veSel** Curve 1
		Reversing Valve **RevVlv** Off
		Auxiliary Heat **AuxHtg** Off
		Mode Cooling
	ERV-En	ERV Enabled **ERV-En** No (Econ&PwrExIntrgrationW/ERV)
		ERV Unoccupied Fan Enabled **ERVUnoccFan-En** (ERV Unoccupied Fan Enabled)
		Fan Control Type **FanCtl-Type** Single Speed (UnitOpMode)
		Fan Command **Fan** Off (UCB FAN 24 VAC output status)
		Econ Free Cooling Available **Econ-Free** No (FreeCooling available)
		Exhaust Fan Command **ExFan** Off (EX-Fan 24 VAC output)
	T24Load Shed	Load Shed Rate Limit **LoadShedRateLim** .066
		Load Shed Adjust **LoadShedAdjust** 4.0 F
		Load Shed Active **LoadShedEnable** No
Self Test	**Start** Begins the Self Test Sequence	
	Pause Causes the sequence to hold any outputs ON for 10 minutes	
	Cancel Stops the Self Test Sequencer and returns the SEC to normal operation	
	Test Status Displays current state of the Self Test Sequencer	
	Reset Erases the previous Self Test results and prepares the Self Test Sequencer for another test run	
View Results	**Fan Result** Pass-Fail (APS On Early or APS Off)	
	C1 Result Pass-Fail-Warning	
	C2 Result Pass-Fail-Warning	
	C3 Result Pass-Fail-Warning	
	C4 Result Pass-Fail-Warning	
	H1 Result Pass-Fail-Warning	
	H2 Result Pass-Fail-Warning	
	H3 Result Pass-Fail-Warning	
	Econ Result Pass-Fail (damper)	
	Exhaust Result **ExhResult** Warning-Pass (BSP not dropped)	
Trend View	Status	Unit Status
		Fan Status
		Cooling Status
		Heating Status
		Economizer Status
		Hot Gas Reheat Status
		Operational Occupancy
		Operational Space Temperature
		Supply Air Temperature
		Mixed Air Temperature

Table 4: SE USB display menu guide (continued)

Menu/Submenu				Default settings and conditions for parameter display
Trend View (continued)	Status (continued)	Operational Outdoor Air Temperature		
		Return Air Temperature		
		Outdoor Air Enthalpy		
	Cooling	Status	Cooling Status	
			Supply Air Temperature	
			VAV Operating Cooling Supply Air Temp Setpoint	
			CV Operating Cooling Setpoint	
		Stage 1	Y1 - Thermostat	
			Compressor Stage 1 Status	
			Compressor Stage Command 1	
		Stage 2	Y2 - Thermostat	
			Compressor Stage 2 Status	
			Compressor Stage Command 2	
		Stage 3	Y3 - Thermostat	
			Compressor Stage 3 Status	
			Compressor Stage Command 3	
		Stage 4	Y4 - Thermostat	
			Compressor Stage 4 Status	
			Compressor Stage Command 4	
	Heating	Status	Heating Status	
			Supply Air Temperature	
			VAV Operating Heating Setpoint	
			CV Operating Heating Setpoint	
		Stage 1	W1 - Thermostat	
			Heating Stage Command 1	
			Heating Stage 1 Enabled	
		Stage 2	W2 - Thermostat	
			Heating Stage Command 2	
			Heating Stage 2 Status	
		Stage 3	W3 - Thermostat	
			Heating Stage Command 3	
			Heating Stage 3 Status	
	Fan	Indoor Fan	G - Thermostat	
			Fan Status	
			Fan Command	
			Fan % Command	
			Air Proving Switch	
		Exhaust Fan	Exhaust Fan Command	
			Exhaust Fan VFD % Command	
		Condenser Fans	Condenser Fan 1	
			Condenser Fan 2	
	Sensors	Space Temperature Input		
		Supply Air Temperature		

Table 4: SE USB display menu guide (continued)

Menu/Submenu				Default settings and conditions for parameter display
Trend View (continued)	Sensors (continued)	Mixed Air Temperature		
		Supply Air Humidity		
		Operational Space Temperature		
		Operational Indoor Air Quality		
		Operational Space Humidity		
		Operational Outdoor Air Temperature		
		Operational Outdoor Air Quality		
	Economizer	Economizer Damper % Command		
		Econ Free Cooling Available		
		Economizer Status		
		Return Air Enthalpy		
		Building Pressure Setpoint		
		Building Static Pressure		
	Misc	Heat Pump	Reversing Valve	
		Hot Gas Reheat	Hot Gas Reheat Command	
			Hot Gas Reheat Status	
			Hot Gas Reheat Humidity Setpoint	
		Demand Ventilation	Fresh Air Intake Setpoint	
			Fresh Air Intake Value	
	Fault	Misc	X-OUT	
			Dirty Filter Switch	
		Heating Stage 1	Heat Limit1 Switch	
			Heat Limit1 Switch Lockout	
		Heating Stage 2	Heat Limit2 Switch	
			Heat Limit2 Switch Lockout	
		Heating Stage 3	Heat Limit3 Switch	
			Heat Limit3 Switch Lockout	
		Cooling Stage 1	High Pressure Limit	
			High Pressure Lockout	
			Low Pressure Limit	
			Low Pressure Lockout	
			Freeze Condition	
			Freeze Condition Lockout	
			Evaporator Coil Temp	
			Condenser Coil Temp	
		Cooling Stage 2	High Pressure Limit	
			High Pressure Lockout	
			Low Pressure Limit	
			Low Pressure Lockout	
			Freeze Condition	
			Freeze Condition Lockout	
			Evaporator Coil Temp	
			Condenser Coil Temp	

Table 4: SE USB display menu guide (continued)

Menu/Submenu			Default settings and conditions for parameter display
Trend View (continued)	Fault (continued)	Cooling Stage 3	High Pressure Limit
			High Pressure Lockout
			Low Pressure Limit
			Low Pressure Lockout
			Freeze Condition
			Freeze Condition Lockout
			Evaporator Coil Temp
			Condenser Coil Temp
		Cooling Stage 4	High Pressure Limit
			High Pressure Lockout
			Low Pressure Limit
			Low Pressure Lockout
			Freeze Condition
			Freeze Condition Lockout
			Evaporator Coil Temp
			Condenser Coil Temp
	Diagnostics	Cooling Stage 1	Suction Pressure
			Liquid Pressure
			Suction Temperature
			Liquid Temperature
			Superheat
			Subcooling
			Condensing Temperature over Ambient
			Efficiency Index
			Capacity Index
		Cooling Stage 2	Suction Pressure
			Liquid Pressure
			Suction Temperature
			Liquid Temperature
			Superheat
			Subcooling
			Condensing Temperature over Ambient
			Efficiency Index
			Capacity Index
		Cooling Stage 3	Suction Pressure
			Liquid Pressure
			Suction Temperature
			Liquid Temperature
			Superheat
			Subcooling
			Condensing Temperature over Ambient
			Efficiency Index
			Capacity Index

Table 4: SE USB display menu guide (continued)

Menu/Submenu			Default settings and conditions for parameter display
Trend View (continued)	Diagnostics (continued)	Cooling Stage 4	Suction Pressure
			Liquid Pressure
			Suction Temperature
			Liquid Temperature
			Superheat
			Subcooling
			Condensing Temperature over Ambient
			Efficiency Index
			Capacity Index
Set Schedule	Occupancy Schedule		

LIT-12011998-UTB-B-0119
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