UM-ILINQA

Daikin *iLINQ* User Manual

This user manual provides information regarding hardware specifications, wiring and installation requirements, application sequence of operation, and troubleshooting to aide in the successful implementation of the Daikin *iLINQ* controller.

⚠ WARNING

ONLY PERSONNEL THAT HAVE BEEN TRAINED TO INSTALL, ADJUST, SERVICE OR REPAIR (HEREINAFTER, "SERVICE") THE EQUIPMENT SPECIFIED IN THIS MANUAL SHOULD SERVICE THE EQUIPMENT. THE MANUFACTURER WILL NOT BE RESPONSIBLE FOR ANY INJURY OR PROPERTY DAMAGE ARISING FROM IMPROPER SERVICE OR SERVICE PROCEDURES. IF YOU SERVICE THIS UNIT, YOU ASSUME RESPONSIBILITY FOR ANY INJURY OR PROPERTY DAMAGE WHICH MAY RESULT. IN ADDITION, IN JURISDICTIONS THAT REQUIRE ONE OR MORE LICENSES TO SERVICE THE EQUIPMENT SPECIFIED IN THIS MANUAL, ONLY LICENSED PERSONNEL SHOULD SERVICE THE EQUIPMENT. IMPROPER INSTALLATION, ADJUSTMENT, SERVICING OR REPAIR OF THE EQUIPMENT SPECIFIED IN THIS MANUAL, OR ATTEMPTING TO INSTALL, ADJUST, SERVICE OR REPAIR THE EQUIPMENT SPECIFIED IN THIS MANUAL WITHOUT PROPER TRAINING MAY RESULT IN PRODUCT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

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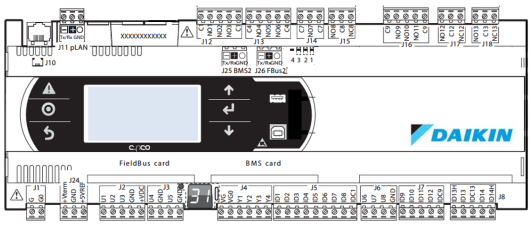
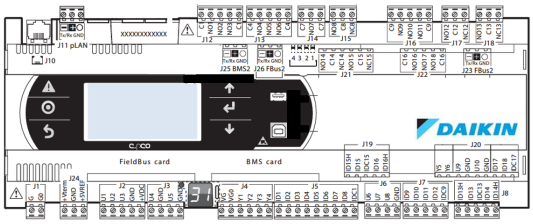
1 Introduction

1.1 Associated Parts and Optional Sensors

The following table lists parts associated with units that utilize DDC controls.

Part Number	Name	Picture	DESCRIPTION
0130M00579	DDC Controller (Medium)		DDC Controller 8AI, 14DI, 4AO, 13DO, LCD Display, *BACnet* Enabled
0130M00580	DDC Controller (Large)		DDC Controller 10AI, 18DI, 6AO, 18DO, LCD Display, *BACnet* Enabled
0130M00581	MHGRH Expansion Module		DDC Controller expansion module for control of the modulating hot gas reheat (MHGRH) valve
0130M00584	*LonWorks* Communication Card		Communication card allowing connection of the DDC Controller to a *LonWorks* network
0130L00225	Space CO2 Sensor		Sensor installed on wall to monitor space CO2 level. A CO2 sensor is required for demand control ventilation. Sensor output range 0-10Vdc, 0-2000ppm.

Part Number	Name	Picture	DESCRIPTION
0130L00220	Duct CO2 Sensor		Sensor installed in return air duct to monitor space CO2 level. A CO2 sensor is required for demand control ventilation. Sensor output range 0-10Vdc, 0-2000ppm.
0130L00222	Duct Temperature Sensor 4"		Sensor installed in return air or supply air duct to monitor temperature. When installed in the return air duct, this sensor can be used in place of the wall mounted temperature sensor. Sensor type is 10KΩ Type III Thermistor.
0130L00228	Duct Temperature Sensor 8"		Sensor installed in return air or supply air duct to monitor temperature. When installed in the return air duct, this sensor can be used in place of the wall mounted temperature sensor. Sensor type is 10KΩ Type III Thermistor.
0130L00221	Duct Temperature and Humidity Sensor		Sensor installed in return air duct to monitor space temperature and humidity level. This sensor can be used in place of the wall mounted temperature and humidity sensor. Temperature sensor type 10KΩ Type III Thermistor. Humidity sensor range 0-10Vdc, 0-100%RH.

Part Number	Name	Picture	DESCRIPTION
0130L00227	Outdoor Air Temperature Sensor		Sensor installed to monitor outdoor air temperature. Senor type 10KΩ Type III Thermistor.
0130L00223	Outdoor Air Temperature and Humidity Sensor		Sensor installed to monitor outdoor temperature and humidity levels. This sensor can be used in place of the outdoor temperature sensor when humidity must also be monitored. Temperature sensor type 10KΩ Type III Thermistor. Humidity sensor range 0-10Vdc, 0-100%RH.
0130L00226	Space Temperature Sensor		Sensor installed on wall to monitor space temperature. This sensor also provides local setpoint adjustment and a temporary occupancy override button. Sensor type 10KΩ Type III Thermistor.

Part Number	Name	Picture	DESCRIPTION
0130L00224	Space Temperature and Humidity Sensor		Sensor installed on wall to monitor space temperature and humidity levels. This sensor can be used in place of the wall mounted temperature sensor when humidity must also be monitored. This sensor also provides local setpoint adjustment and a temporary occupancy override button. Temperature sensor type 10KΩ Type III Thermistor. Humidity sensor range 0-10Vdc, 0-100%RH.

1.2 Application Overview

The DDC Controller application is designed to provide control for single zone light commercial (3 – 25 Ton) packaged rooftop units with support for the following features.

- Single speed, two speed, and variable (5) speed blower configurations
- Blower proving switch software interlock
- 1 or 2 stages of heating with PID control load calculation
- Gas, electric stages, electric with SCR control, and heat pump heating configurations
- 1 or 2 stages of cooling with PID control load calculation
- 1, 2 or 4 compressors with pressure switch feedback and alarms
- Lead / lag compressor priority rotation based on runtime
- Independent defrost of condenser coils
- Demand defrost interval calculation
- Staged auxiliary electric heat during defrost or when heat pump heating is locked out
- Dehumidification using Modulating Hot Gas Reheat (MHGRH)
- Low suction pressure freeze protection on units with MHGRH dehumidification
- Low ambient condenser fan control on units with MHGRH dehumidification
- California Title 24 certified economizer control
- Demand control ventilation
- Exhaust fan enable
- Dirty filter alarm
- Emergency shutdown interlock and alarm
- Remote start/stop
- Load shedding
- Local time scheduling, including weekly and holiday events
- Automatic daylight savings time adjustment
- Optimal start / optimal stop
- Onboard trend log storage can be exported to .csv file for analysis
- Live trend logs viewable via web interface
- Selectable TSTAT mode allowing for connection to standard TSTAT, bypassing some of the DDC control logic
- BACnet™ MS/TP or *BACnet* IP communication
- LonWorks™ communication with optional field installed module
- Web interface for commissioning or monitoring through any web browser
- Onboard LCD display for local commissioning or monitoring

2 Controller Hardware

In this document, examples for basic device and sensor wiring are shown with respect to the DDC controller. For specific unit wiring details, the unit wiring diagram must be referenced. **Use 18 to 22 AWG twisted pair or shielded cable for all sensor installations.**

2.1 Specifications and Components

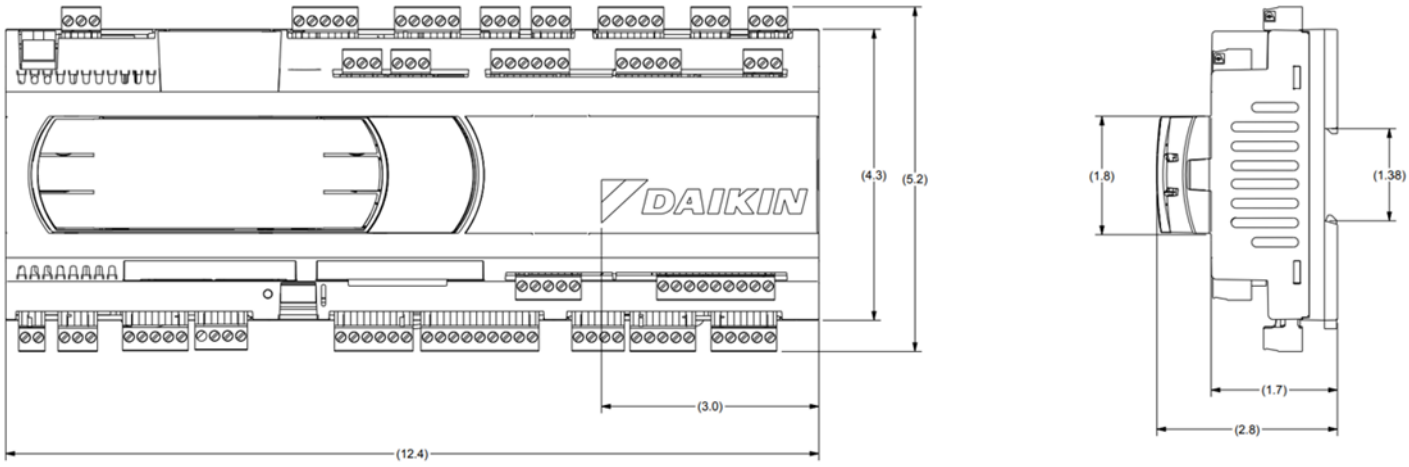
The Daikin *iLINQ* Light Commercial RTU application is designed specifically to function with the controller hardware described in this section. The sensors listed have been factory tested and proven to be compatible with the controller hardware. Other sensors which meet the same specifications will work, but have not been factory tested.

2.1.1 Main Controller (Medium 0130M00579, Large 0130M00580)

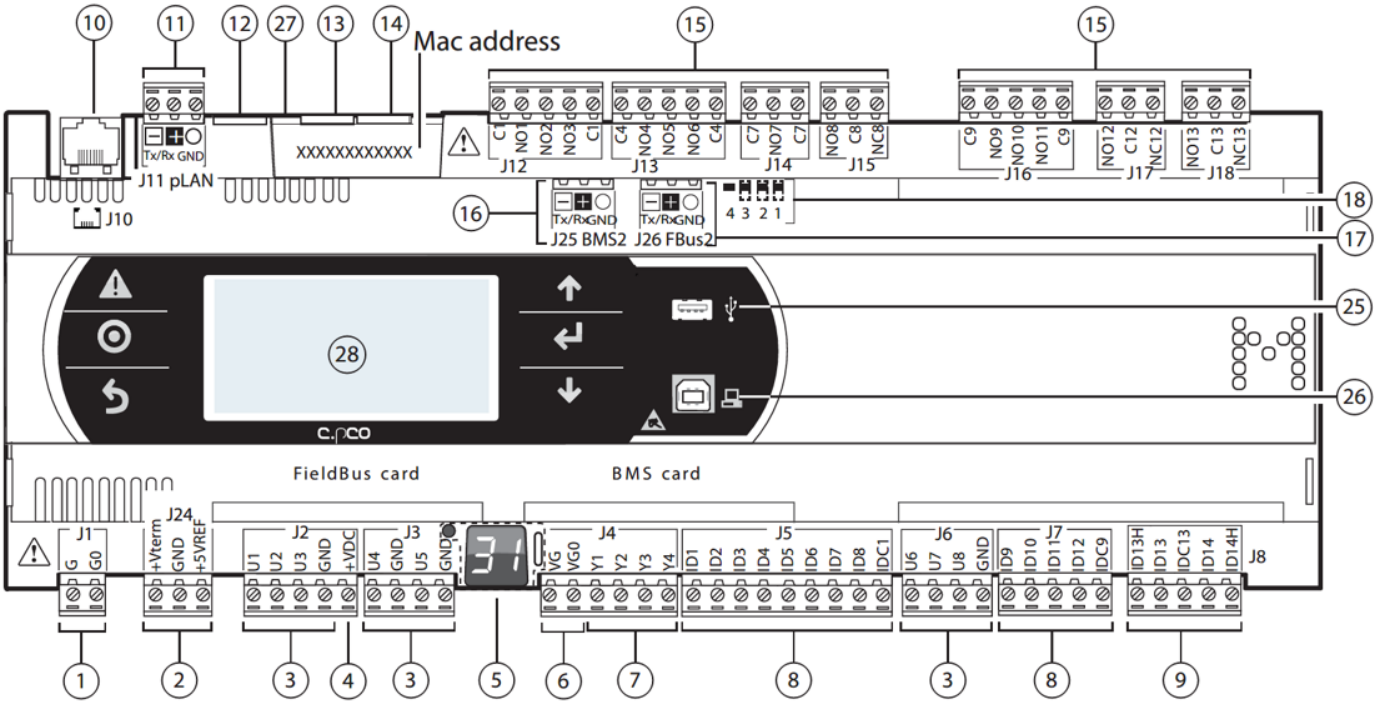
The Main Controller provides for the physical inputs and outputs required to monitor the system status and control the equipment in the unit. The operating system, application program, trend logs, time schedules, alarm logs, system clock, and other functions are stored in the controller's memory and executed by the controller's CPU. The two available controllers are differentiated by the number of physical inputs and outputs. All other specifications, including physical dimensions are the same. The large version of the controller is used on units with modulating hot gas reheat dehumidification systems which require additional inputs and outputs.

- **Supply Voltage Input:** Use dedicated class 2 transformer
  - 24VAC (+10/-15%), 45 VA power consumption
- **Installation:** Fitted on DIN rail
- **Temperature Inputs:** Type III thermistor, 10K Ω @ 77°F
- **Voltage Inputs:** 0 – 10Vdc, Input Precision ±0.3% Full Scale
- **Optically Isolated Digital Inputs:** 24VAC (+10/-15%) 50/60HZ, Absorbed Current: 5mA
- **Optically Isolated Analog Outputs:** 0 – 10Vdc
  - **External Power Supply:** 24VAC (+10/-15%)
  - **Precision:** ±2% Full Scale
  - **Resolution:** 8 Bit
  - **Maximum Load:** 10mA
- **Digital Outputs:** 8A/250VAC Resistive Load
- **USB Type "B" Port:** Programming, Setup, and Advanced Diagnostics
- **USB Type "A" Port:** Transferring files
- **Two 10/100 MBPS Ethernet Ports:**
  - Auto Crossover, *BACnet* IP Communication Protocol, Web Interface
- **BMS Port:** RS485 Slave, 3-PIN Connector
  - *BACnet* MS/TP Communication Protocol
- **BMS Port:** Unpopulated for field installation of optional *LonWorks* communication card
- **LCD Terminal:** 132x64 pixel with backlit 6 button keypad for system status/configurations
- **BTL Certification:** *BACnet* Building Controller (B-BC)
  - **Data link layer options:** *BACnet* IP, MS/TP
- **Analog Inputs:** (8) Medium, (10) Large
- **Digital Inputs:** (14) Medium, (18) Large
- **Analog Outputs:** (4) Medium, (6) Large

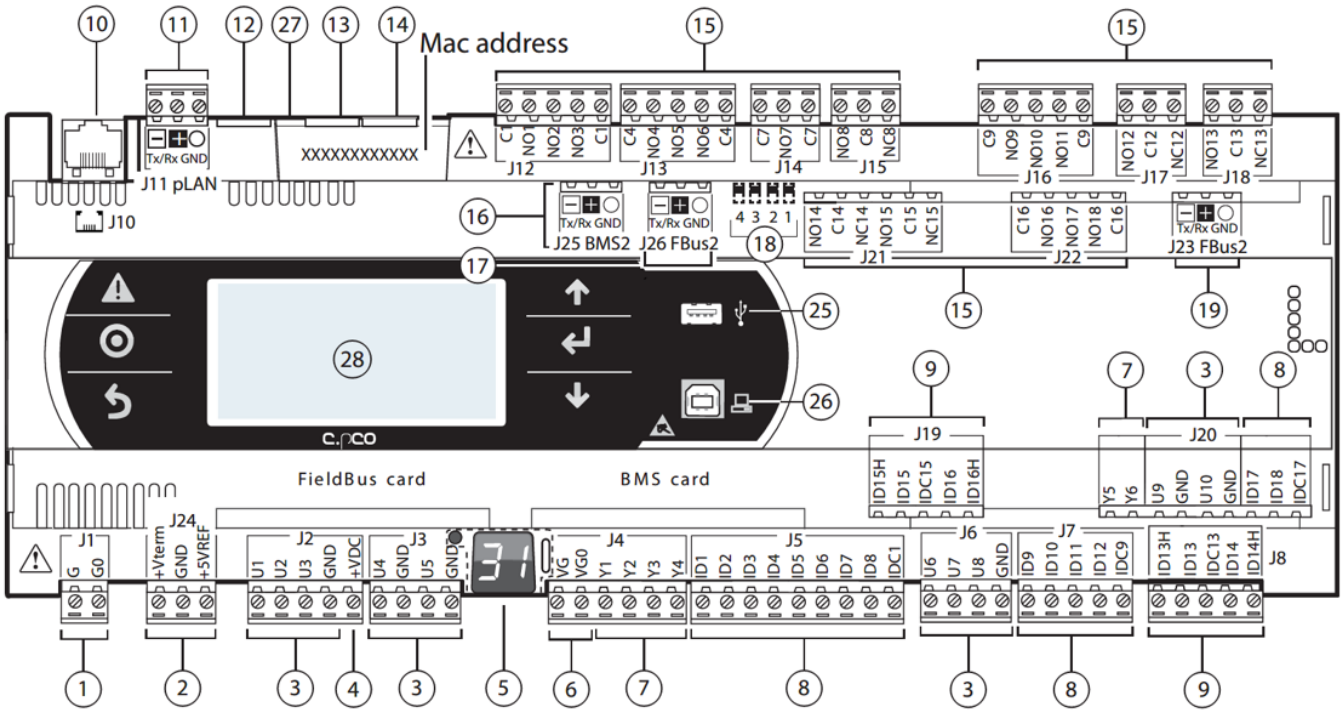
- **Digital Outputs:** (13) Medium, (18) Large
- **Physical Dimensions (inches):**



- **IO Layout Medium (0130M00579):**



- **IO Layout Large (0130M00580):**



- **IO Layout Reference Table:**

REF	DESCRIPTION	REF	DESCRIPTION
1	Power Connector [G(+), G0(-)]	13	Ethernet Port 1
2	+VTERM: Terminal Power Supply +5VREF: 5VDC Probe Power Supply	14	Ethernet Port 2
3	Analog Inputs	15	Relay Outputs
4	+VDC: 24VDC Power For Active Probes	16	BMS Port
5	pLAN Address LED	17	Fieldbus Port
6	24VAC Power Input For Analog Outputs	18	Fieldbus/BMS Jumpers
7	Analog Outputs	19	Fieldbus Port
8	Digital Inputs	25	USB Host Port
9	Digital Inputs	26	USB Device Port
10	pLAN Connection For Room Terminal	27	Earth Ground Connection
11	pLAN Connection For Room Terminal	28	Display and Keypad
12	Reserved		

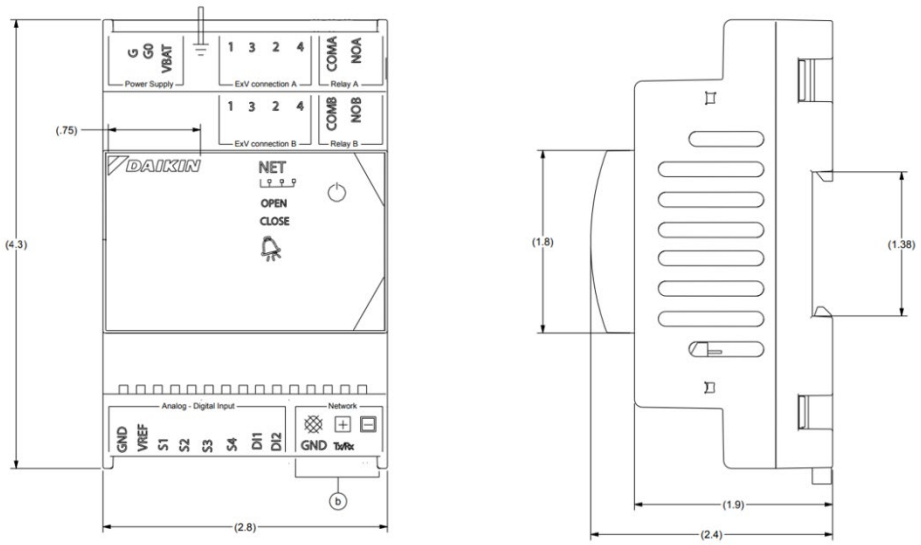
2.1.2 Modulating Hot Gas Reheat (MHGRH) Expansion Module (0130M00581)

The Modulating Hot Gas Reheat Expansion Module provides for the modulating valve driver output, reheat coil purge valve control output and system suction pressure inputs which are required for dehumidification operation.

- **Supply Voltage Input:** Use dedicated class 2 transformer
  - 24VAC (+10/-15%), 35 VA power consumption
- **Installation:** Fitted on DIN rail
- **Bi-Polar Step Motor Connection:** 4-Wire Connection

- **Step Count:** 6386 Full Scale; 7500 Initialization
- **Nominal Step Rate:** 200 Steps/Second
- **Moving Current:** 160mA

- **Digital Input Connection:** Activated From Potential Free Contact
  - **Closing Current:** 5mA
- **Sensor Connections:** S1 and S3
  - **Ratiometric Pressure Sensor Input:** 0-5Vdc
  - **Resolution:** 0.1%FS
- **Sensor Connections:** S2 and S4
  - **Thermistor Type:** Type III, 10K Ω @ 77°F
- **Relay Output:** Normally Open Contact
  - **Resistive Load:** 5A/250VAC
  - **Inductive Load:** 2A/250VAC
- **Power To Active Sensors:** (VREF) +5Vdc ±2%
- **RS485 Serial Connection:** Communication To Main Controller
- **LED Indicators:** Located On Front Cover
  - **Net:** On=Connection Made; Off=No Connection; Flashing=Communication Error
  - **Open:** On=Valve Opening; Flashing=First Configuration
  - **Close:** On=Valve Closing; Flashing=First Configuration
  - **Alarm:** On=Valve Driver Alarm Active
  - **Power:** On=Driver Powered; Off=Driver Not Powered; Flashing=Wrong Power Supply
- **Physical Dimensions (inches)**:



- **IO Layout:**

TERMINAL	DESCRIPTION	TERMINAL	DESCRIPTION
G, G0	Power Supply	S1	Probe 1 (Pressure)
VBAT	Emergency Power Supply	S2	Probe 2 (Temperature)
Ground	Functional Earth	S3	Probe 3 (Pressure)
1,3,2,4	Stepper Motor Driver	S4	Probe 4 (Temperature)
COM, NO	Relay Output	DI1, DI2	Digital Inputs
GND	Signal Ground	GND	RS485 Shield Ground
VREF	Power Supply To Active Probes	TX+/RX-	RS485 Modbus

2.1.3 *LonWorks* Communication Card (0130M00584)

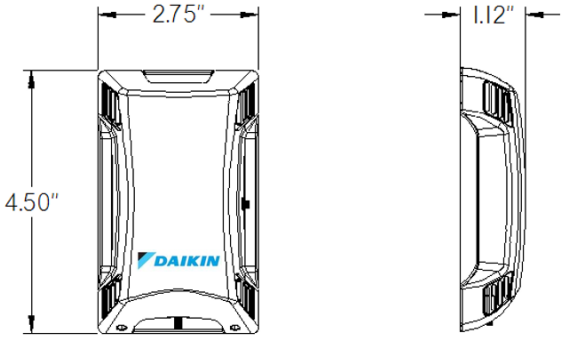
The optional *LonWorks* Communication Card can be field installed to expand the communication capability of the main controller. The blank cover marked "BMS Card" on the main controller is removed, and the *LonWorks* Communication Card is inserted to provide a BAS system access to monitor the unit via *LonWorks* communication protocol when the onboard *BACnet* communication is not preferred.

Note: The green *LonWorks* Connector is located below the right side of the display.

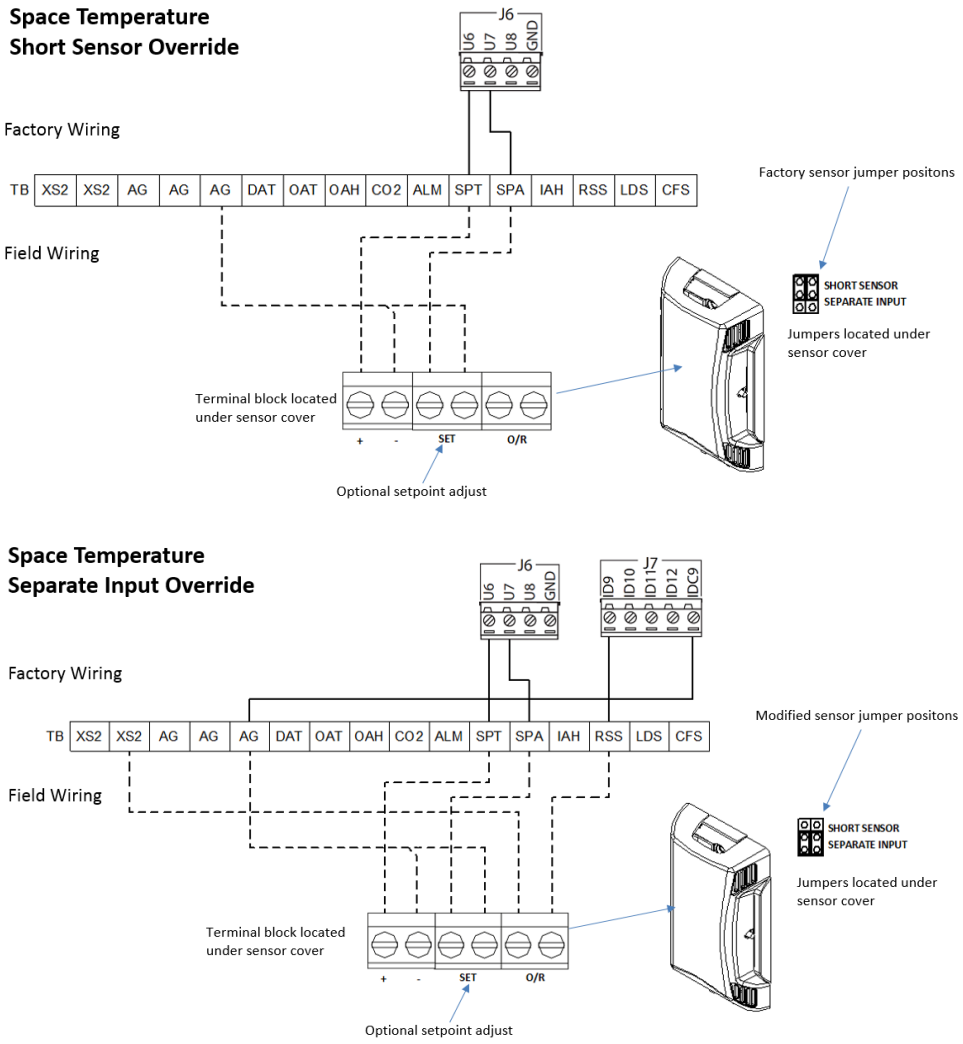
2.1.4 Space Temperature Sensor (0130L00226)

The Space Temperature Sensor should be installed on the wall in the space served by the roof top unit to provide feedback of space temperature conditions to the controller.

- **Sensor Element:** Type III thermistor, 10K Ω @ 77°F
- **Accuracy:** ±0.36°F Between 32°F and 158°F
- **Resistive Setpoint Adjust Range:** 10K Ω – 15K Ω
- **Operating Range:** 35°F – 122°F; 10%RH – 95%RH Non Condensing
- **Storage Range:** -40°F – 149°F; 10%RH – 95%RH Non Condensing
- **Housing Material:** ABS Plastic (White); UL94V-HB Approved
- **Physical Dimensions (inches):**



- **Wiring Example:** No wiring for the override is required if jumper is left in “Short Sensor” position. If jumper is moved to “Separate Input”, the O/R terminals must be wired to the Remote Start Stop digital input for the occupancy override button to be functional.



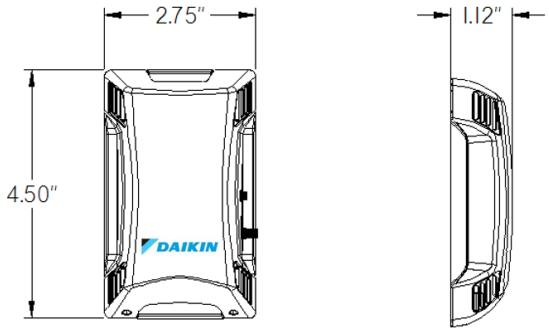
- **Installation Location:**
  - Suitable for either drywall or junction box mounting on an interior wall
  - Install approximately 4 feet above finished floor
  - Avoid heat sources such as radiators or direct sunlight
  - Avoid installing near sources of air drafts such as HVAC supply vents

2.1.5 Space Temperature / Humidity Sensor (0130L00224)

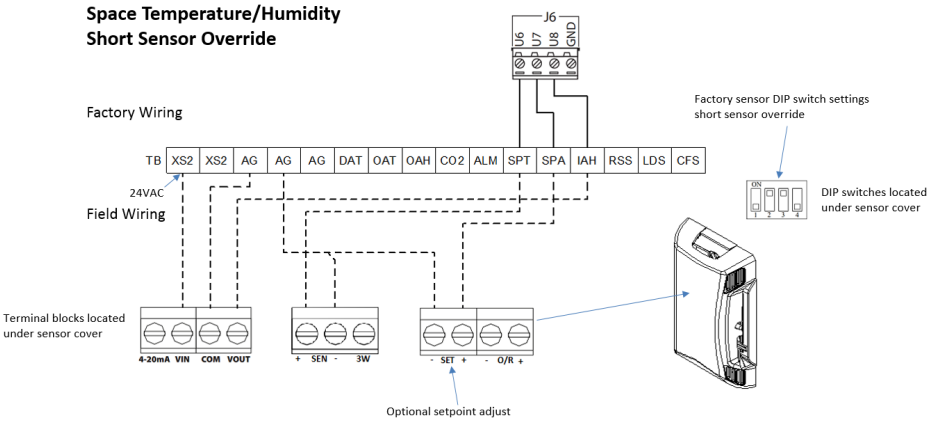
The combination Space Temperature and Humidity Sensor should be installed on the wall in the space served by the roof top unit to provide feedback of space temperature and relative humidity conditions to the controller.

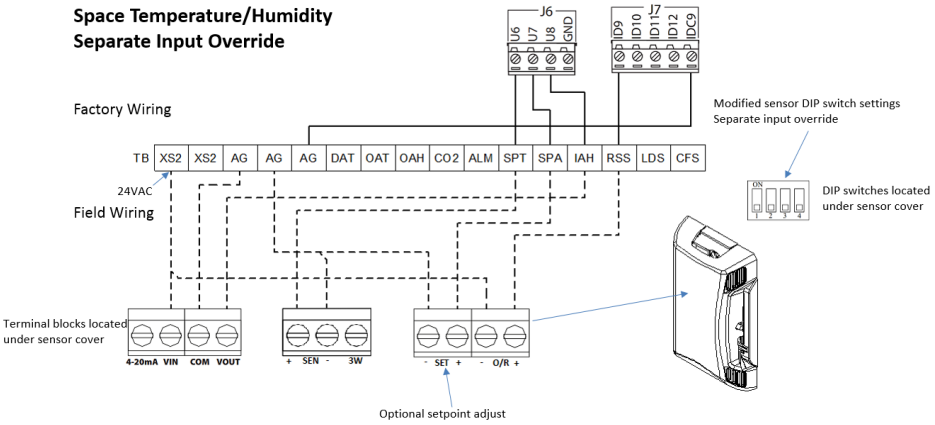
- **Supply Voltage:** 18-28 VAC; 18-40VDC
- **Supply Current:** 8mA at Max Voltage Output
- **Temperature Sensor Element:** Type III thermistor, 10K Ω @ 77°F
- **Temperature Sensor Accuracy:** ±0.36°F Between 32°F and 158°F
- **Resistive Setpoint Adjust Range:** 10K Ω – 15K Ω

- **Humidity Sensor Type:** Capacitive
- **Humidity Sensor Measurement Range:** 0-100%RH; Output 0-10Vdc
- **Humidity Sensor Accuracy:** ±3% From 10%RH to 95%RH @ 77°F
- **Operating Range:** -40°F – 140°F; 0%RH – 100%RH Non Condensing
- **Housing Material:** ABS Plastic (White); UL94V-HB Approved
- **Physical Dimensions (inches):**



- **Wiring Example:** No wiring for the override is required if SW2 is in "Override Short Sensor" position. If SW2 is moved to "Separate Input", the O/R terminals must be wired to the Remote Start Stop digital input for the occupancy override button to be functional. SW1 must be set to 0-10VDC for the humidity sensor to provide a correct reading at the controller.



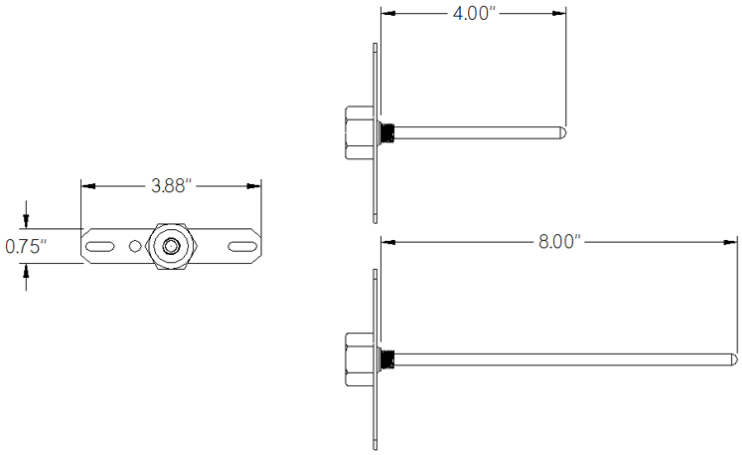


- **Installation Location:**
    - Suitable for either drywall or junction box mounting on an interior wall
    - Install approximately 4 feet above finished floor
    - Avoid heat sources such as radiators or direct sunlight
    - Avoid installing near sources of air drafts such as HVAC supply vents

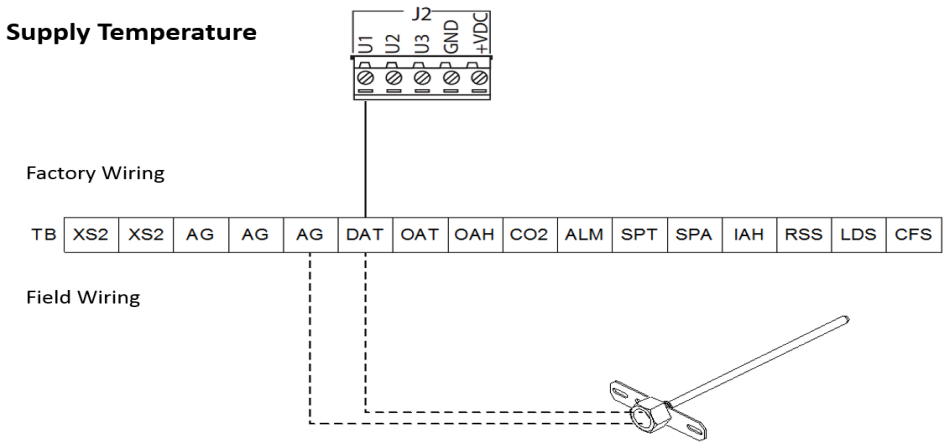
2.1.6 Duct Temperature Sensor (0130L00222, 0130L00228)

The Duct Temperature Sensor should be installed in the supply or return air duct to provide feedback of supply air or space temperature conditions to the controller.

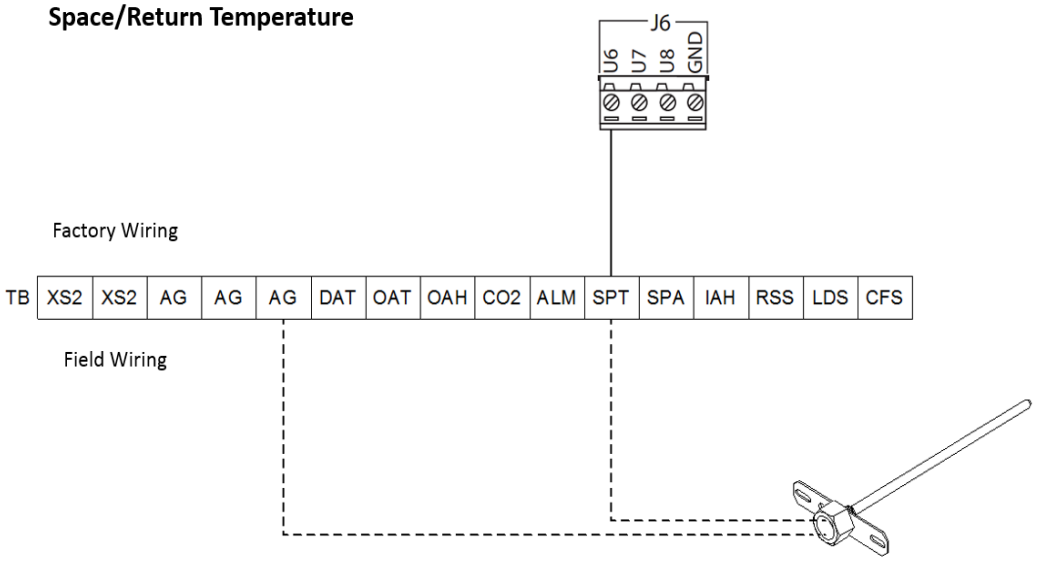
- **Probe Length:** 0130L00222 (4”); 0130L00228 (8”)
- **Sensor Element:** Type III thermistor, 10K Ω @ 77°F
- **Accuracy:** ±0.36°F Between 32°F and 158°F
- **Operating Range:** -40°F – 239°F; 10%RH – 95%RH Non Condensing
- **Storage Range:** -40°F – 185°F; 10%RH – 95%RH Non Condensing
- **Probe Material:** 304 Stainless Steel
- **Flange Material:** Galvanized Steel
- **Physical Dimensions (inches):**



- **Wiring Example:**



Space/Return Temperature



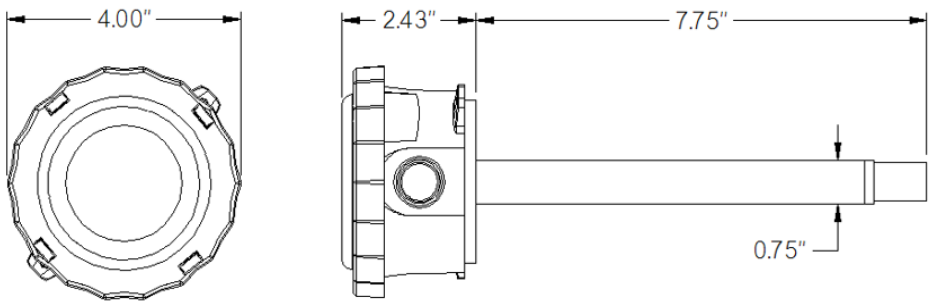
- **Installation Location:**

A Duct Temperature Sensor installed in the supply air duct should be located approximately 10 feet downstream of the unit for best performance. A Duct Temperature Sensor installed in the return air duct can be used to sense space temperature and replace the need for a wall mounted Space Temperature Sensor.

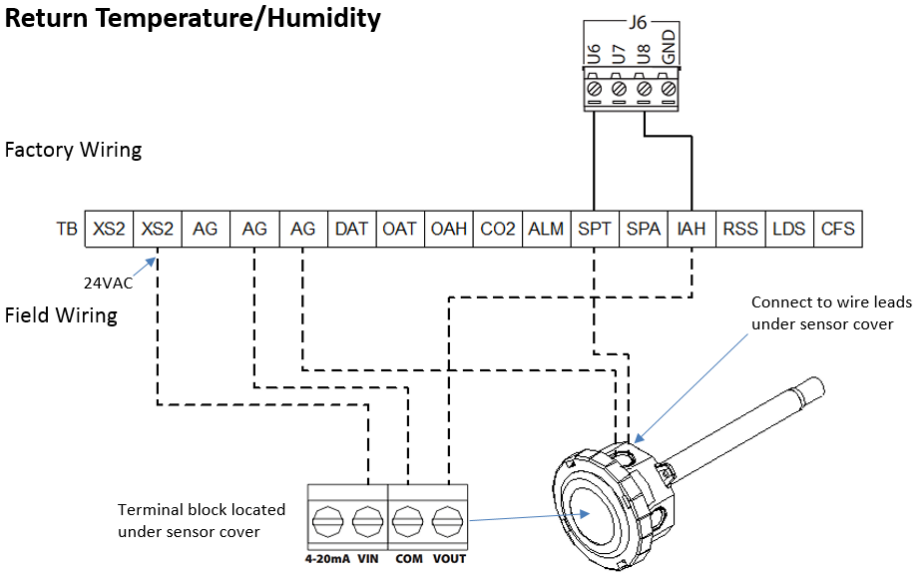
2.1.7 Return Air Temperature / Humidity Sensor (0130L00221)

The combination Return Air Temperature and Humidity Sensor should be installed in the return air duct of the roof top unit to provide feedback of space temperature and relative humidity conditions to the controller.

- **Supply Voltage:** 18-28 VAC; 18-40VDC
- **Supply Current:** 8mA at Max Voltage Output
- **Temperature Sensor Element:** Type III thermistor, 10K Ω @ 77°F
- **Temperature Sensor Accuracy:** ±0.36°F Between 32°F and 158°F
- **Humidity Sensor Type:** Capacitive
- **Humidity Sensor Measurement Range:** 0-100%RH; Output 0-10Vdc
- **Humidity Sensor Accuracy:** ±3% From 10%RH to 95%RH @ 77°F
- **Operating Range:** -40°F – 140°F; 0%RH – 100%RH Non Condensing
- **Physical Dimensions (inches):**



- **Wiring Example:**



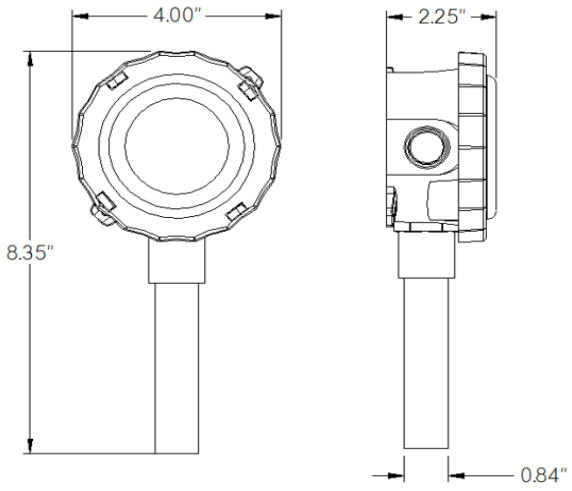
- **Installation Location:**

A sensor installed in the return air duct can be used to replace the wall mounted Space Temperature and Humidity Sensor.

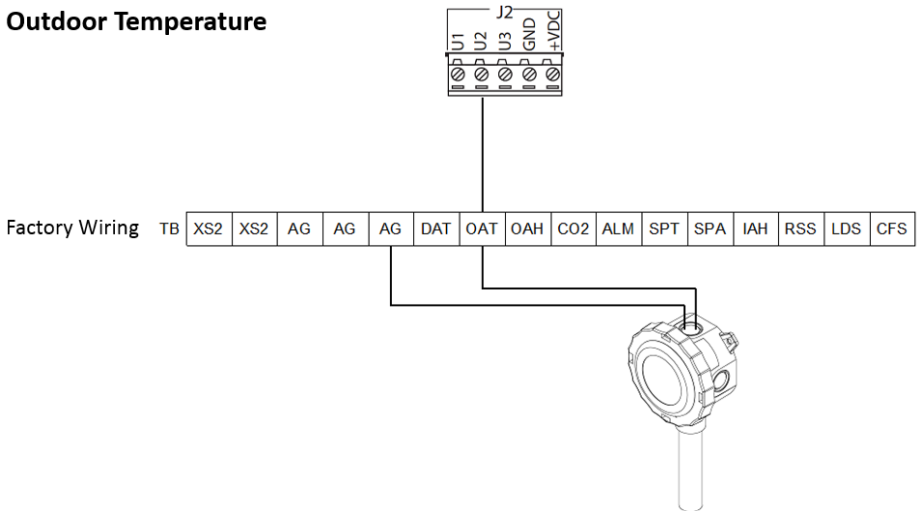
2.1.8 Outdoor Air Temperature Sensor (0130L00227)

The Outdoor Air Temperature Sensor should be installed near the outdoor air intake to the condenser fans on the roof top unit to provide feedback of ambient temperature conditions to the controller.

- **Sensor Element:** Type III thermistor, 10K Ω @ 77°F
- **Accuracy:** ±0.36°F Between 32°F and 158°F
- **Operating Range:** -22°F – 158°F
- **Storage Range:** -22°F – 158°F
- **Physical Dimensions (inches):**



- **Wiring Example:**



- **Installation Location:**

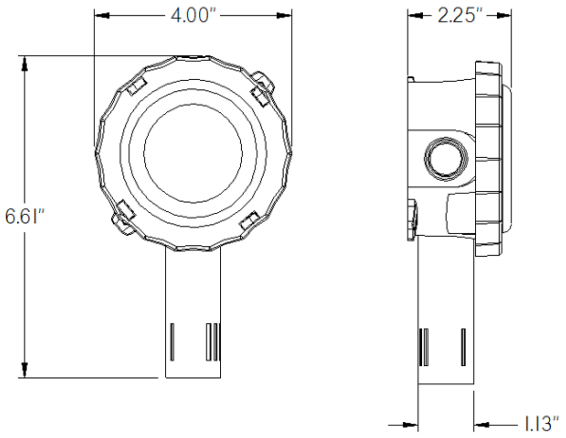
The outdoor air sensor is factory installed near the outdoor air intake of the condenser fans. If desired, the sensor can be relocated to a north facing exterior wall of the building or under the economizer outdoor air intake hood on the unit. The best location for an outdoor air sensor is one that avoids direct sunlight and contamination from other air sources.

2.1.9 Outdoor Air Temperature / Humidity Sensor (0130L00223)

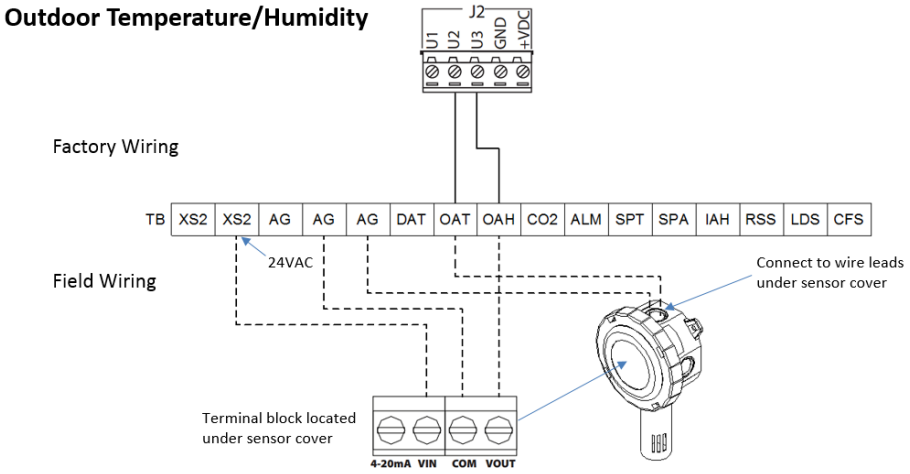
The combination Outdoor Air Temperature and Humidity Sensor should be installed near the outdoor air intake to the condenser fans on the roof top unit to provide feedback of ambient temperature and relative humidity conditions to the controller. This sensor should replace the Outdoor Air Temperature Sensor when enthalpy based economizer control is required.

- **Supply Voltage:** 18-28 VAC; 18-40VDC
- **Supply Current:** 8mA at Max Voltage Output
- **Temperature Sensor Element:** Type III thermistor, 10K Ω @ 77°F
- **Temperature Sensor Accuracy:** ±0.36°F Between 32°F and 158°F
- **Humidity Sensor Type:** Capacitive
- **Humidity Sensor Measurement Range:** 0-100%RH; Output 0-10Vdc
- **Humidity Sensor Accuracy:** ±3% From 10%RH to 95%RH @ 77°F
- **Operating Range:** -40°F – 140°F; 0%RH – 100%RH Non Condensing

- **Physical Dimensions (inches):**



- **Wiring Example:**



- **Installation Location:**

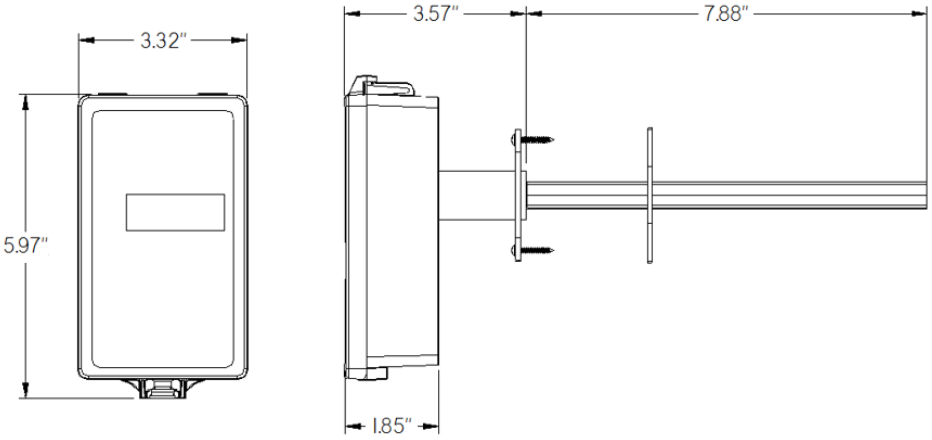
The outdoor air temperature sensor is factory installed near the outdoor air intake of the condenser fans. If desired, the factory installed sensor can be replaced with the combination temperature and humidity sensor in the same location or relocated to a north facing exterior wall of the building or under the economizer outdoor air intake hood on the unit. The best location for an outdoor air sensor is one that avoids direct sunlight and contamination from other air sources.

2.1.10 Duct CO_2 Sensor (0130L00220)

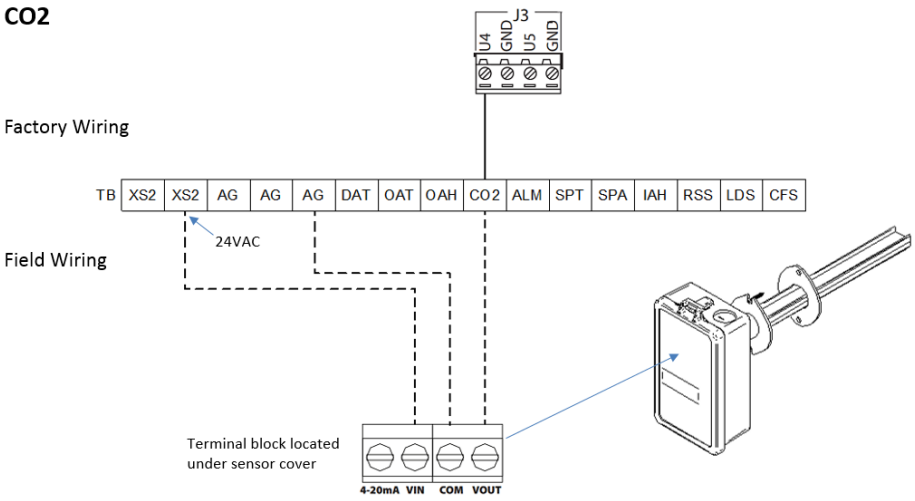
The Duct CO_2 Sensor should be installed in the return air duct of the roof top unit to provide feedback of the space CO_2 value to the controller. A sensor installed in the return air duct can be used to replace the wall mounted Space CO_2 Sensor if necessary. A CO_2 sensor is required for demand control ventilation operation of the economizer damper.

- **Supply Voltage:** 24VAC ±20%/50/60Hz (Half Wave Rectified)
- **Power Consumption:** 3VA @ 24 VAC
- **Sensing Method:** Single Beam Infrared Sensing Technology (NDIR); Diffusion
- **Measurement Range:** 0-2000 PPM; Output Signal 0-10Vdc
- **Accuracy:** ±40 PPM, ±3% Of Reading (@ 59-95°F, 20-70%RH and 14.7 psi)

- **Housing Material:** ABS Plastic (Black); UL94V-5V Approved
- **Physical Dimensions (inches):**



- **Wiring Example:**



- **Installation Location:**

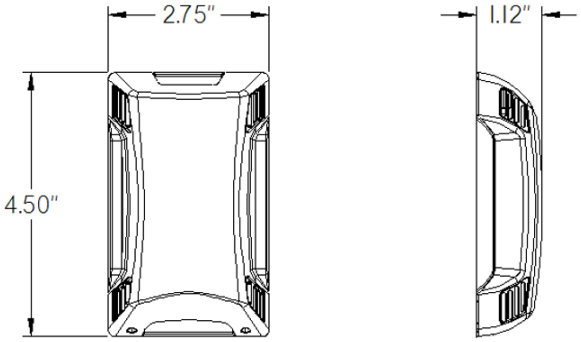
The duct CO_2 sensor should be installed in the return air duct of the roof top unit.

2.1.11 Space CO_2 Sensor (0130L00225)

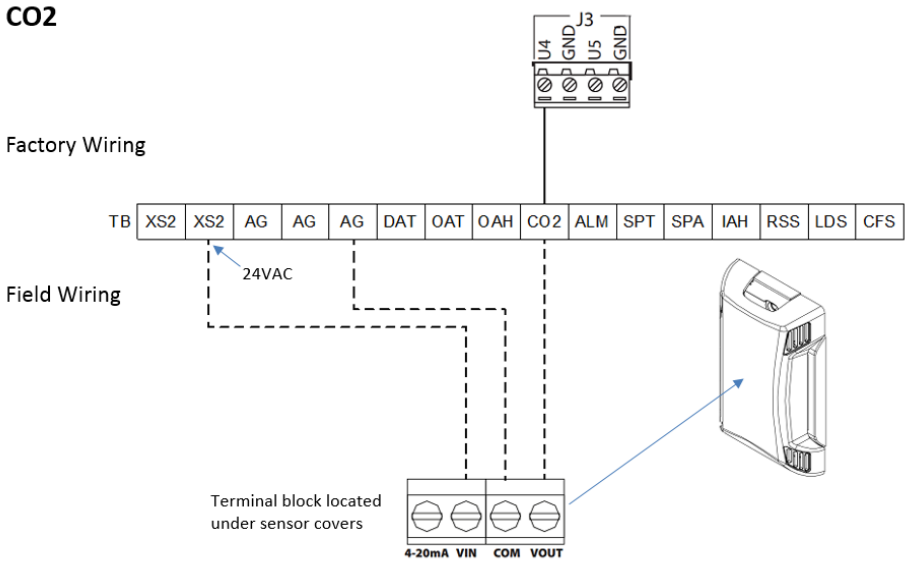
The Space CO_2 Sensor should be installed on the wall in the space served by the roof top unit to provide feedback of the space CO_2 value to the controller. A CO_2 sensor is required for demand control ventilation operation of the economizer damper.

- **Supply Voltage:** 24VAC ±20%/50/60Hz (Half Wave Rectified)
- **Power Consumption:** 3VA @ 24 VAC
- **Sensing Method:** Single Beam Infrared Sensing Technology (NDIR); Diffusion
- **Measurement Range:** 0-2000 PPM; Output Signal 0-10Vdc
- **Accuracy:** ±40 PPM, ±3% Of Reading (@ 59-95°F, 20-70%RH and 14.7 psi)
- **Housing Material:** ABS Plastic (White); UL94V-5V Approved

- **Physical Dimensions (inches):**



- **Wiring Example:**

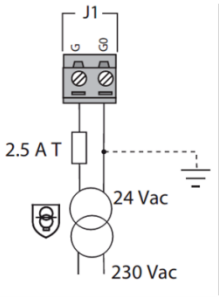


- **Installation Location:**
  - Suitable for either drywall or junction box mounting on an interior wall
  - Install approximately 4 feet above finished floor
  - Avoid installing near sources of air drafts such as HVAC supply vents
  - Install in common area served by the unit rather than confined spaces such as an individual's office

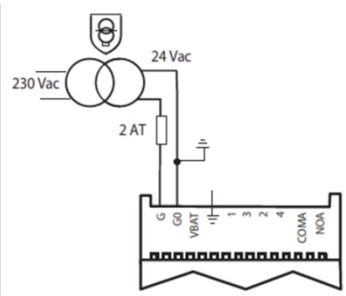
2.2 Wiring Details

2.2.1 Controller Power

Use a class II safety isolation transformer with short-circuit and overload protection. The transformer secondary, wired to G0, must be connected to earth ground. Using a supply voltage other than specified can seriously damage the controller. It is recommended that the controller power supply be separate from the power supply to other electrical devices such as contactors.



DDC Controller

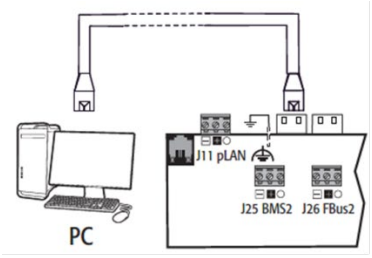


Hot Gas Reheat Expansion Module

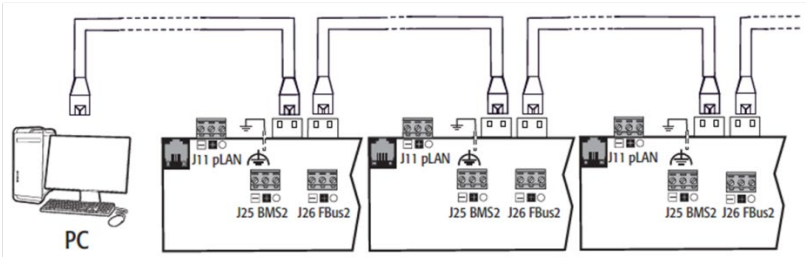
2.2.2 Ethernet Network

The Daikin *iLINQ* controller is capable of communicating over an Ethernet network providing access to the onboard web interface and for *BACnet* IP communication. Examples include a direct connection between the controller and a PC, or the controller residing on a local building intranet to be accessed by a PC on the same network. The two Ethernet ports on the controller are internally connected and can be used to connect multiple controllers, allowing access to several controllers from a PC without the need for multiple network drops to a network switch.

- Use CAT-5 STP shielded cables.
- Make the earth ground connection using the male spade near the Ethernet connectors.
- The maximum length of an Ethernet connection is 328 ft. between consecutive devices.
- Each controller must be assigned a unique IP address.



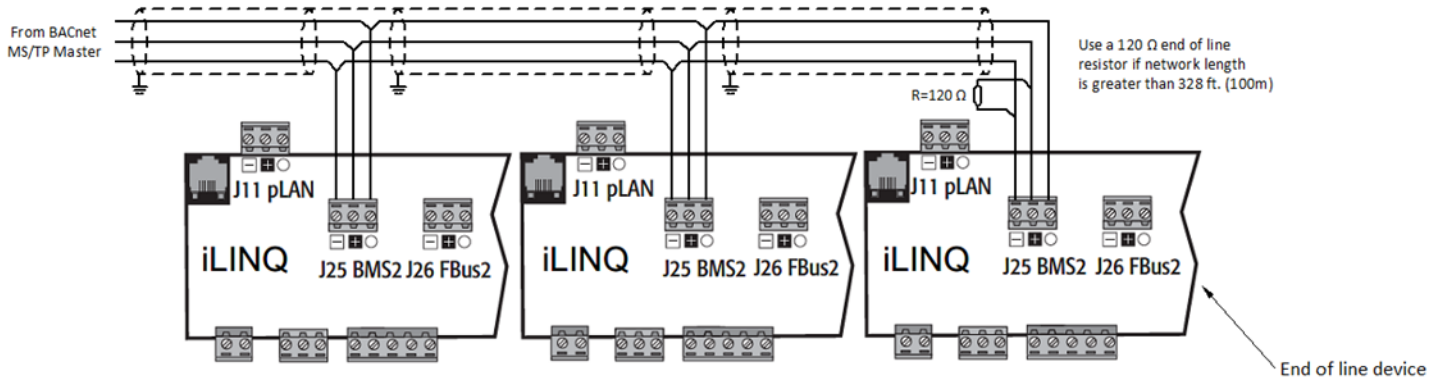
The controllers can be connected to a network switch or PC individually as shown to the left, or multiple controllers can be connected together utilizing the second Ethernet connection as shown below.



2.2.3 *BACnet* MS/TP Communication

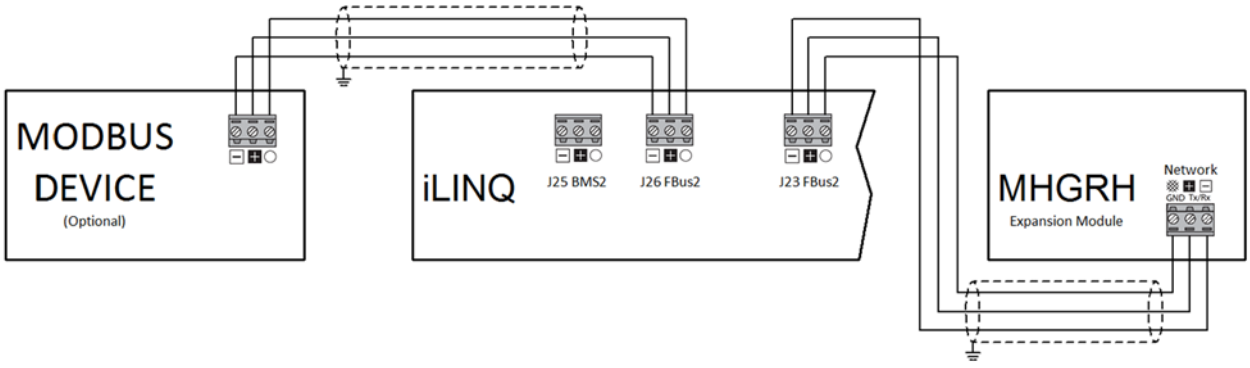
Terminal J25 BMS2 optically isolated serial port is reserved for *BACnet* MS/TP communication for connection to a building automation system. Use a 3-wire shielded cable connected as shown. If the network segment is more than 328 ft. (100 m) long, a 120 Ω ¼ W terminating resistor should be used at the first and last device on the network segment. The shield on each cable should be grounded on one end, and the shields of cables between controllers should be tied together. The maximum recommended length of an MS/TP segment is 4000 ft. with AWG 18 cable.

BACnet MS/TP Wiring



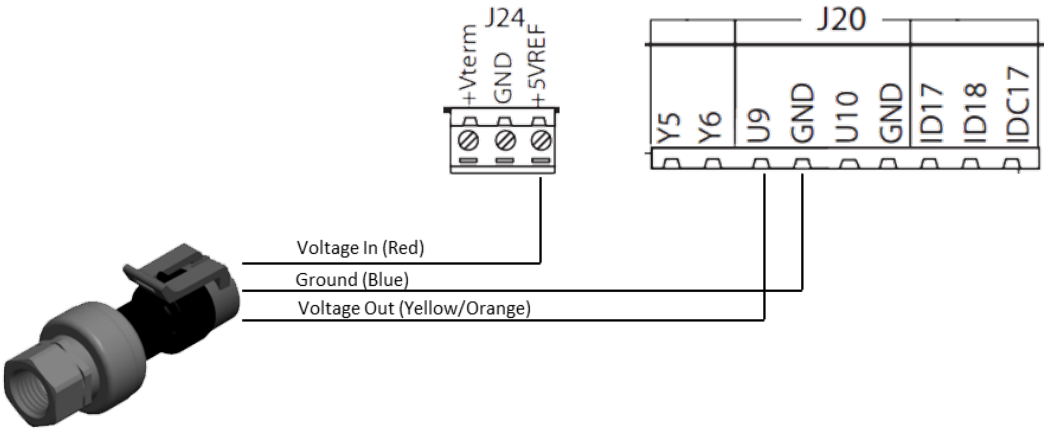
2.2.4 Internal RS485 Communication

Terminal J26 and terminal J23 FBus2 non-isolated serial ports are reserved for internal unit communication between controller modules, sensors or other communicating devices. Use a 2-wire shielded twisted pair cable to protect against electromagnetic interference. If the network segment length is less than 6.5 ft., a shield is not required. If the network segment length is greater than 328 ft. long, a 120 Ω ¼ W terminating resistor should be used at the first and last device on the network segment. The shield on each cable should be grounded on one end, and the shields of cables between controllers should be tied together.



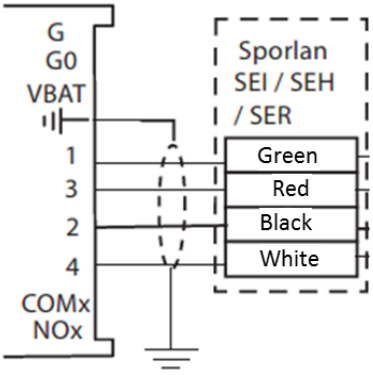
2.2.5 Pressure Transducer

Ratiometric pressure transducers (0-5Vdc) are used for modulating hot gas reheat dehumidification and low ambient control applications. The pressure transducers are factory installed in the discharge and suction refrigerant lines near the compressor when required. The sensors are powered directly from the controller using the +5VREF on terminal J24.



2.2.6 Modulating Hot Gas Reheat Valve

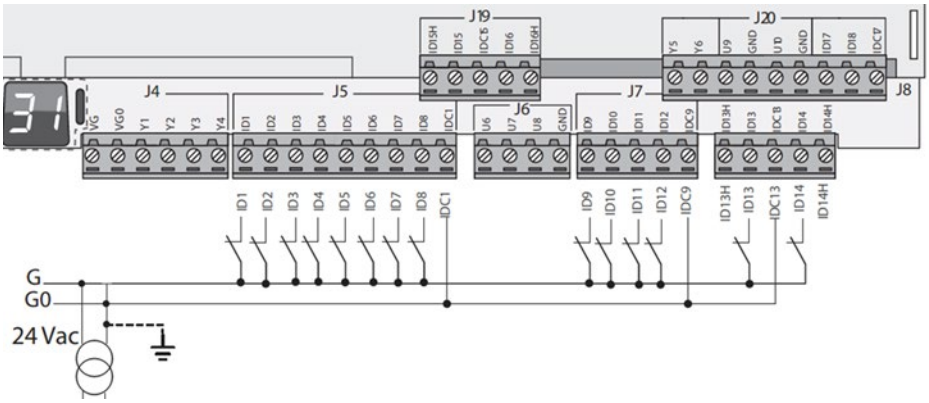
The hot gas reheat modulating valve used for dehumidification control is a bi-polar stepper valve requiring a 4-wire connection. Wiring connections and controller parameter settings are specific for the factory installed valves.



2.3 Physical Inputs/Outputs

2.3.1 Binary Inputs

Binary inputs are active when 24VAC is sensed at the associated controller terminal and are inactive when 0VAC is sensed at the terminal.



LABEL	NAME	LCD DISPLAY	DESCRIPTION
ID1	Emergency Shutdown	Emergency Shutdown	24VAC on the input indicates normal operation to the controller. When voltage is removed, the controller disables all controlled equipment. This input is typically used for connection of a phase monitor, smoke detectors, or remote fire alarm system shutdown contacts.
ID2*	Blower Proving Switch	Blower Proving Sw	In DDC control mode, 24VAC on the input indicates that the main blower is operating. 0VAC at the input indicates that the main blower is not running.
	"G"	G	In TSTAT control mode, 24VAC on the input indicates that the TSTAT is calling for the blower to operate.
ID3	Compressor Pressure Switch 1	Comp 1 Pres Switch	24VAC on the input indicates that compressor suction and discharge pressures are in normal operating ranges. 0VAC on the input indicates that suction pressure is too low or that discharge pressure is too high.
ID4	Compressor Pressure Switch 2	Comp 2 Pres Switch	On units with at least 2 compressors, 24VAC on the input indicates that compressor suction and discharge pressures are in normal operating ranges. 0VAC on the input indicates that suction pressure is too low or that discharge pressure is too high.
ID5	Compressor Pressure Switch 3	Comp 3 Pres Switch	On units with 4 compressors, 24VAC on the input indicates that compressor suction and discharge pressures are in normal operating ranges. 0VAC on the input indicates that suction pressure is too low or that discharge pressure is too high.
ID6	Compressor Pressure Switch 4	Comp 4 Pres Switch	On units with 4 compressors, 24VAC on the input indicates that compressor suction and discharge pressures are in normal operating ranges. 0VAC on the input indicates that suction pressure is too low or that discharge pressure is too high.
ID7	Defrost Switch 1	Defrost Switch C1	On heat pump units, 24VAC on the input indicates that frost could accumulate on the condenser coil and the defrost interval timer should be initiated. 0VAC at the input indicates that defrost is not required.
ID8	Defrost Switch 2	Defrost Switch C2	On heat pump units, 24VAC on the input indicates that frost could accumulate on the condenser coil and the defrost interval timer should be initiated. 0VAC at the input indicates that defrost is not required.
ID9*	Remote Start Stop	Remote Start Stop	In DDC control mode, 24VAC on the input indicates that a remote source is calling for the unit to be occupied.
	"Y1"	Y1	In TSTAT control mode, 24VAC on the input indicates that the TSTAT is calling for cooling stage 1 to operate.
ID10*	Load Shedding	Load Shedding	In DDC control mode, 24VAC on the input indicates that the active space cooling, heating and dehumidification setpoints should be offset by a user adjustable amount to reduce mechanical cooling/heating energy consumption.
	"Y2"	Y2	In TSTAT control mode, 24VAC on the input indicates that the TSTAT is calling for cooling stage 2 to operate.
ID11*	Dirty Filter Switch	Filter Switch	In DDC control mode, 24VAC at the input indicates that the filters are dirty. 0VAC at the input indicates that the filters are clean.
	"W1"	W1	In TSTAT control mode, 24VAC on the input indicates that the TSTAT is calling for heat stage 1 to operate.

LABEL	NAME	LCD DISPLAY	DESCRIPTION
ID12*	Digital Input 12	DI12	Not Used
	"W2"	W2	In TSTAT control mode, 24VAC on the input indicates that the TSTAT is calling for heat stage 2 to operate.
ID13*	Furnace Board Feedback 1	Furnace Brd Fbk 1	In units with gas heat, 24VAC at the input indicates that the integrated ignition control board is calling for the blower to operate. 0VAC at the input indicates that the furnace board is not calling for the blower to operate.
	"O"	O	In TSTAT control mode, 24VAC on the input indicates that the TSTAT is calling for a heat pump unit to operate in cooling mode. 0VAC on the input indicates that the TSTAT is calling for a heat pump unit to operate in heating mode.
ID14	Furnace Board Feedback 2	Furnace Brd Fbk 2	In units with gas heat, 24VAC at the input indicates that the integrated ignition control board is calling for the blower to operate. 0VAC at the input indicates that the furnace board is not calling for the blower to operate.
* When the controller is configured to operate in TSTAT control mode, some inputs are used for alternate monitoring functions.			

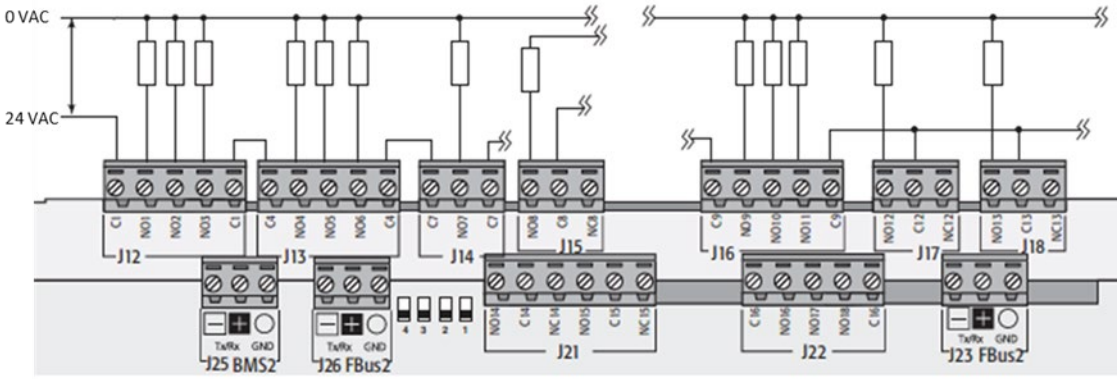
2.3.2 Analog Inputs

Wiring details for the sensors associated with the analog inputs are provided in the Specifications and Components section of this document. The inputs are configured for the sensor types and ranges listed in the table below.

LABEL	NAME	LCD DISPLAY	DESCRIPTION
U1	Supply Air Temperature	Supply Temp	(10KΩ Type III Thermistor) Installed downstream of the evaporator coil, this sensor provides feedback about the air being supplied to the space and is required for proper unit operation.
U2	Outdoor Air Temperature	Outdoor Temp	(10KΩ Type III Thermistor) This sensor provides feedback about the outdoor ambient conditions used for various unit lockouts and economizer enable calculations and is required for proper unit operation.
U3	Outdoor Air Humidity	Outdr Air Hum	(0 – 10 Vdc; 0 – 100 %RH) This optional sensor provides feedback about the outdoor ambient conditions used for economizer enthalpy calculations.
U4	Space CO_2	Space CO_2	(0 – 10 Vdc; 0 – 2000 ppm) This optional sensor provides feedback about space occupancy conditions used for demand control ventilation.
U5	Economizer Feedback	Econ Feedback	(2 – 10 Vdc; 0 – 100 % open) This feedback signal from the economizer damper actuator is used to verify proper economizer operation.
U6	Space/Return Air Temperature	Space Temp	(10KΩ Type III Thermistor) Installed in the space or return air duct, this sensor provides feedback about space temperature conditions and is required for unit operation.
U7	Space Temperature Setpoint Adjust	Setpoint Adj	(10KΩ – 15KΩ Resistive) Wired from optional slide adjust feature on space temperature sensors, this input allows the occupants to offset space temperature setpoints by a configurable amount.
U8	Space/Return Air Humidity	Space Hum	(0 – 10 Vdc; 0 – 100 %RH) Installed in the space or return air duct, this sensor provides feedback about conditions in the space and is required on units with dehumidification or differential enthalpy economizer control.
U9*	System 1 Head Pressure	Head Pres 1	(0.5 – 4.5 Vdc; 0 – 630 psi) Installed in the discharge line of compressor 1, this pressure sensor provides feedback of compressor operation to the controller.
U10*	System 2 Head Pressure	Head Pres 2	(0.5 – 4.5 Vdc; 0 – 630 psi) Installed in the discharge line of compressor 2, this pressure sensor provides feedback of compressor operation to the controller.
S1**	System 1 Suction Pressure	Suctn Pres 1	(0.5 – 4.5 Vdc; 0 – 200 psi) Installed in the suction line of compressor 1, this pressure sensor provides feedback of compressor operation to the controller.
S3**	System 2 Suction Pressure	Suctn Pres 2	(0.5 – 4.5 Vdc; 0 – 200 psi) Installed in the suction line of compressor 2, this pressure sensor provides feedback of compressor operation to the controller.
* U9 and U10 are only present on controllers with expansion IO			
** S1 and S2 are only present on units with the hot gas reheat expansion module			

2.3.3 Relay Outputs

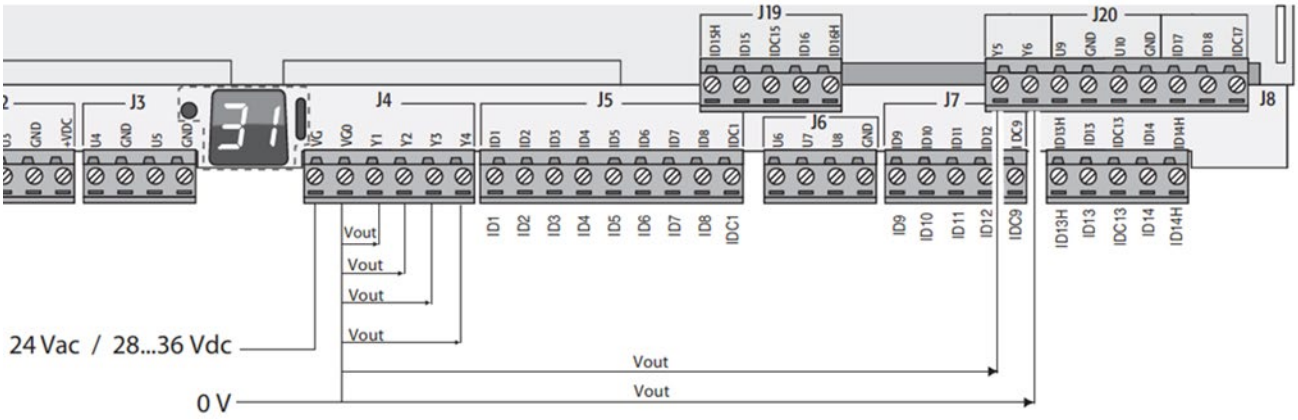
The controller features digital outputs with electromechanical relays. For ease of installation, the common terminals of some of the relays have been grouped together. Relay outputs 8, 12 and 13 feature both normally open and normally closed contacts. All other relay outputs are normally open contacts. 24VAC is wired to the common terminal of each relay output and that 24VAC is passed through to the load connected to the output terminal when the output is commanded on.



LABEL	NAME	LCD DISPLAY	DESCRIPTION
NO1	Heat Stage 1	Heating Stage 1	This relay is used to enable SCR electric heat, stage 1 of electric heat, auxiliary heat, or the furnace control board depending on unit configuration.
NO2	Heat Stage 2	Heating Stage 2	This relay is used to enable stage 2 of electric heat, auxiliary heat, or high stage gas valve depending on unit configuration.
NO3	Blower Stage 1	Blower Stage 1	This relay is used to enable the blower to run or to command a two speed blower to operate at low speed.
NO4	Blower Stage 2	Blower Stage 2	This relay is used to enable a two speed blower to operate at high speed. When changing speeds, both outputs are commanded off for 2 seconds before the associated output for the new speed command is energized. This is to prevent motor damage due to both low and high speed motor windings being commanded on simultaneously.
NO5	Reversing Valve(s) 1	Reversing Valve 1	In heat pump units, this relay is used to energize the reversing valve(s) during cooling or defrost operation.
NO6	Reversing Valve(s) 2	Reversing Valve 2	In heat pump units, this relay is used to energize the reversing valve(s) during cooling or defrost operation.
NO7	Compressor 1	Compressor 1	This relay is used to enable compressor 1.
NO8	Compressor 2 / Stage 2	Compressor 2	This relay is used to enable compressor 2 on units with more than 1 compressor, or stage 2 of compressor 1 on units with a single 2 stage compressor.
NO9	Condenser Fan(s) Enable 1	Condenser Fan 1	This relay is used to enable the condenser fan(s) associated with compressor 1. On units with 4 compressors, it is used to enable the condenser fan(s) associated with compressors 1 and 2.
NO10	Condenser Fan(s) Enable 2	Condenser Fan 2	This relay is used to enable the condenser fan(s) associated with compressor 2. On units with 4 compressors, it is used to enable the condenser fan(s) associated with compressors 3 and 4.
NO11	Exhaust Fan Enable	Exhaust Fan	This relay is used to enable an exhaust fan when the economizer is open beyond the position required for minimum ventilation requirements.
NO12	Compressor 3	Compressor 3	This relay is used to enable compressor 3.
NO13	Compressor 4	Compressor 4	This relay is used to enable compressor 4.
NOA*	Purge Valve	Purge Valve	This relay is used to energize the reheat coil purge valve during dehumidification.
* NOA is only present on units with the hot gas reheat expansion module			

2.3.4 Analog Outputs

Analog outputs are optically isolated and provide 0 -10Vdc control signals. The outputs are externally powered at the VG and VG0 terminals by the same power supply providing power to the main controller.



LABEL	NAME	LCD DISPLAY	DESCRIPTION
Y1	Economizer Damper	Econ Position	(2 – 10 Vdc; 0 – 100 % open) This output is used to control the economizer damper.
Y2	Blower Speed	Blower Speed	(0 – 10 Vdc; 0 – 100 %) This output is used to control the blower speed on units with variable speed blowers.
Y3	SCR Heat	SCR Heat Output	(1 – 9 Vdc; 0 – 100 %) This output is used to control the SCR electric heat on units with SCR heat installed.
Y4	Alarm	Alarm Output	(0Vdc = normal, 10Vdc = alarm) This output is used to indicate unit alarm status to an external low voltage relay.
Y5*	Low Ambient 1	N/A	(0Vdc = off, 10Vdc = on) This output is used to cycle the condenser fans on/off during low ambient conditions on units with modulating hot gas reheat dehumidification.
Y6*	Low Ambient 2	N/A	(0Vdc = off, 10Vdc = on) This output is used to cycle the condenser fans on/off during low ambient conditions on units with modulating hot gas reheat dehumidification.
ExVA**	Reheat Valve	Reheat Valve Pos	(Stepper Motor) This output is used to control the three-way modulating hot gas reheat valve.
* Y5 and Y6 are only present on controllers with expansion IO			
** ExVA is only present on units with the hot gas reheat expansion module			

3 Unit Occupancy

3.1 Time Schedule User Settings

NAME	LCD DISPLAY	DESCRIPTION	DEFAULT	RANGE
Schedule Source	Schedule Src	Select from Onboard, Remote, Force Occupied, and Force Unoccupied to set the preferred source for determining unit occupancy status.	Onboard	N/A
Push Button Override Duration	Push Btn Ovr	When the push button override on the space sensor is pressed while the time schedule is unoccupied, the unit schedule will go to occupied for this length of time.	0.0 h	0.0-8.0 h
Maximum Optimal Start Time	Max Opt Start	This is the maximum amount of time that the unit is allowed to start prior to the scheduled occupied time.	0.0 min	0.0-240.0 min
Maximum Optimal Stop Time	Max Opt Stop	This is the maximum amount of time prior to the end of the scheduled occupied time that mechanical cooling and heating are locked out.	0.0 min	0.0-240.0 min
Occupied Start Delay	Occ Start Dly	At the scheduled occupied time, the unit delays for this time before setting the Schedule Mode to Occupied and allowing equipment to start. This allows for the creation of a staggered system start-up on units with the same time schedule or after a loss of power.	0.0 s	0.0-600.0 s

3.2 Schedule Source and Schedule Mode

The user defined Schedule Source determines how the unit Schedule Mode is calculated. The Schedule Source parameter options are described in the table below.

NAME	DESCRIPTION
Onboard	Scheduled occupancy is determined by the internal time schedule
Remote	Scheduled occupancy is set by the Remote Start Stop digital input
Force Occupied	Scheduled occupancy is forced to Occupied
Force Unoccupied	Scheduled occupancy is forced to Unoccupied

The Schedule Mode describes the current state of unit occupancy and each Schedule Mode is described in the following table.

NAME	DESCRIPTION
Unoccupied	The unit is not scheduled to be occupied. Unoccupied temperature and humidity setpoints are used to determine HVAC Mode.
Occupied	The unit is scheduled to be occupied. Occupied temperature and humidity setpoints are used to determine HVAC Mode.
Push Button Override	The unit is not scheduled to be occupied, but an override has requested temporary occupancy. Occupied temperature and humidity setpoints are used to determine HVAC Mode.
Holiday Unoccupied	The weekly schedule is occupied, but the holiday schedule is calling for the unit to be unoccupied. Unoccupied temperature and humidity setpoints are used to determine HVAC Mode.
Holiday Occupied	The weekly schedule is unoccupied, but the holiday schedule is calling for the unit to be occupied. Occupied temperature and humidity setpoints are used to determine HVAC Mode.
Force Unoccupied	The unit schedule is ignored and the unit is set to unoccupied. Unoccupied temperature and humidity setpoints are used to determine HVAC Mode.
Force Occupied	The unit schedule is ignored and the unit is set to occupied. Occupied temperature and humidity setpoints are used to determine HVAC Mode.
TSTAT	The unit schedule is ignored. Commands come from TSTAT.
Optimized Start	The unit is started early so that the space temperature reaches setpoint at the scheduled occupancy time. Occupied temperature and humidity setpoints are used to determine HVAC Mode.
Optimized Stop	Mechanical cooling and heating are locked out prior to the end of scheduled occupancy.

3.2.1 Internal Time Schedule

If the Schedule Source is set to Onboard, the internal controller time schedule settings are used to determine the Schedule Mode. Each day of the week has four Schedule Events that are user configurable. The Schedule Events are composed of a Start Time and an End Time for occupancy. Examples of Schedule Event configurations are shown in the table below.

Monday Schedule			
EVENT	**START TIME**	**END TIME**	**DESCRIPTION**
Event 1	7:00 AM	6:00 PM	Occupied From 7:00 AM to 6:00 PM;
Event 2	12:00 AM	12:00 AM	
Event 3	12:00 AM	12:00 AM	
Event 4	12:00 AM	12:00 AM	
Tuesday Schedule			
EVENT	**START TIME**	**END TIME**	**DESCRIPTION**
Event 1	7:00 AM	11:00 AM	Occupied from 7:00AM to 11:00AM, unoccupied from 11:00AM to 5:00PM, and then occupied from 5:00PM to 7:00PM
Event 2	5:00 PM	7:00 PM	
Event 3	12:00 AM	12:00 AM	
Event 4	12:00 AM	12:00 AM	
Wednesday Schedule			
EVENT	**START TIME**	**END TIME**	**DESCRIPTION**
Event 1	12:00 AM	12:00 AM	Unoccupied all day
Event 2	12:00 AM	12:00 AM	
Event 3	12:00 AM	12:00 AM	
Event 4	12:00 AM	12:00 AM	
Thursday Schedule			
EVENT	**START TIME**	**END TIME**	**DESCRIPTION**
Event 1	12:00 AM	11:59 PM	Occupied all day
Event 2	12:00 AM	12:00 AM	
Event 3	12:00 AM	12:00 AM	
Event 4	12:00 AM	12:00 AM	

If a Schedule Event is entered which results in the End Time occurring prior to the Start Time, the controller automatically adjusts the End Time to be 11:59 PM so that the Schedule Event is valid.

To set a Holiday Schedule, Holiday Events must be configured and the dates that are to follow the Holiday Events must be selected. There are four Holiday Events, and 14 dates can be configured as holidays. Examples of holiday configurations are shown in the table below.

Holiday Events			
EVENT	**START TIME**	**END TIME**	**DESCRIPTION**
Event 1	7:00 AM	6:00 PM	Occupied from 7:00 AM to 6:00 PM
Event 2	5:00 PM	7:00 PM	Occupied from 5:00 PM to 7:00 PM
Event 3	12:00 AM	12:00 AM	Unoccupied all day
Event 4	12:00 AM	11:59 PM	Occupied all day

Holiday Schedule							
HOLIDAY	**MONTH**	**DAY**	**EVENT 1**	**EVENT 2**	**EVENT 3**	**EVENT 4**	**DESCRIPTION**
Event 1	01	01	Yes	No	No	No	Occupied 7:00AM - 6:00PM
Event 2	02	12	No	Yes	No	No	Occupied 5:00PM - 7:00PM
Event 3	03	14	No	No	Yes	No	Unoccupied all day
Event 4	04	03	No	No	No	Yes	Occupied all day
Event 5	05	30	Yes	Yes	No	No	Occupied 7:00AM - 7:00PM
Event 6	06	20	Yes	No	Yes	No	Occupied 7:00AM - 6:00PM
Event 7	07	04	Yes	No	No	Yes	Occupied all day
Event 8	08	12	No	Yes	Yes	No	Occupied 5:00PM - 7:00PM
Event 9	09	04	No	Yes	No	Yes	Occupied all day
Event 10	10	23	No	No	Yes	Yes	Occupied all day
Event 11	11	30	No	No	No	No	Unoccupied all day
Event 12	12	25	No	No	No	No	Unoccupied all day
Event 13	00	00	No	No	No	No	No holiday
Event 14	00	00	No	No	No	No	No holiday

3.2.2 Remote Start Stop Digital Input

If the Schedule Source is set to remote, then the Remote Start Stop input is used to determine the Schedule Mode. When 24VAC is present at the input the Schedule Mode is set to Occupied. When 0VAC is present at the input the Schedule Mode is set to unoccupied.

3.2.3 Force Occupied and Force Unoccupied

If the Schedule Source is set to Force Occupied the Schedule Mode is equal to Force Occupied. If the Schedule Source is set to Force Unoccupied the Schedule Mode is equal to Force Unoccupied.

3.2.4 Push Button Override

When the Schedule Mode is Unoccupied, Holiday Unoccupied, or Force Unoccupied the Schedule Mode can be temporarily overridden by pushing the override button on the space temperature sensor, or momentarily energizing the Remote Start Stop input to the controller. When the controller receives an override request, the Schedule Mode is set equal to Pushbutton Override for the length of time defined by the Push Button Override Duration setting. If the Push Button Override Duration setting is equal to 0, all override requests are ignored and the unit remains in one of the unoccupied schedule modes.

3.3 Optimized Start

The optimized start function will start the unit prior to the scheduled occupancy time in order to ensure that the Space Temperature is close to the Space Cooling Setpoint or Space Heating Setpoint at the scheduled occupancy time. This is intended to reduce energy consumption by removing the need to set the time schedule to be occupied at a fixed time prior to actual expected occupancy. During optimized start operation, cooling and heating equipment is staged to maintain the Space Cooling Setpoint or Space Heating Setpoint. The Economizer Damper is commanded closed unless the HVAC Mode is equal to Economizer Cooling.

The Maximum Optimized Start Time should be set to a value equal to the typical fixed start-ahead time that would be scheduled for the space. For example: If the building manager would normally set the time schedule to be occupied 2 hours prior to expected occupancy to ensure comfort of the arriving occupants, then the Maximum Optimized Start Time should be set to 120 minutes. The optimized start function can be disabled by setting the Maximum Optimized Start Time equal to 0. When the Maximum Optimized Start Time is set to a value greater than 0, the Schedule Mode will change to Occupied before the scheduled occupied time by the calculated Start Ahead Time. The calculation considers the current Space Temperature, Space Cooling Setpoint, Space Heating Setpoint, and the Outdoor Air Temperature.

3.3.1 In Cooling Mode

The amount of time that the unit should be started prior to the scheduled occupancy time is determined by calculating how far the current Space Temperature is above the Space Cooling Setpoint and multiplying by the amount of time that it is expected for the unit to reduce the Space Temperature by 1°F at the current Outdoor Air Temperature. If the Space Temperature is less than the Space Cooling Setpoint, the unit will start at the scheduled occupancy time.

3.3.2 In Heating Mode

The amount of time that the unit should be started prior to the scheduled occupancy time is determined by calculating how far the current Space Temperature is below the Space Heating Setpoint and multiplying by the amount of time that

it is expected for the unit to increase the Space Temperature by 1°F at the current Outdoor Air Temperature. If the Space Temperature is greater than the Space Heating Setpoint, the unit will start at the scheduled occupancy time.

3.4 Optimized Stop

The optimized stop function will lock out Cooling, Heating and Dehumidification Modes prior to the scheduled unoccupied time in order to reduce energy consumption. The amount of time is calculated so that the Space Temperature remains in a comfortable range until the scheduled unoccupied time. During this time, the unit will operate in either Vent Mode or Off Mode based on unit configuration. The Maximum Optimized Stop Time is the earliest that the equipment will be allowed to stop. The optimized stop function can be disabled by setting the Maximum Optimized Stop Time equal to 0. When the Maximum Optimized Stop Time is set to a value greater than 0, Cooling, Heating and Dehumidification Modes will be locked out before the scheduled unoccupied time by the calculated Stop Ahead Time. The calculation considers the current Space Temperature, Space Cooling Setpoint, Space Heating Setpoint and the Outdoor Air Temperature.

3.4.1 In Cooling Mode

The amount of time that cooling and dehumidification should be stopped prior to the scheduled unoccupied time is determined by calculating how far the current Space Temperature is below the Space Cooling Setpoint and multiplying by the amount of time that it is expected for the Space Temperature to increase by 1°F at the current Outdoor Air Temperature. If the Space Temperature is greater than the Space Cooling Setpoint, the unit will continue to operate normally until the scheduled unoccupied time.

3.4.2 In Heating Mode

The amount of time that heating should be stopped prior to the scheduled unoccupied time is determined by calculating how far the current Space Temperature is above the Space Heating Setpoint and multiplying by the amount of time that it is expected for the Space Temperature to decrease by 1°F at the current Outdoor Air Temperature. If the Space Temperature is less than the Space Heating Setpoint, the unit will continue to operate normally until the scheduled unoccupied time.

4 HVAC Modes

The unit can operate in the following modes:

NAME	DESCRIPTION
Off	All controlled equipment is commanded off.
Ventilation	Blower is operating to provide ventilation, but cooling and heating equipment is commanded off.
Cooling	Blower is commanded to run and compressors are commanded as required to maintain Space Temperature at the Active Cooling Setpoint.
Economizer Cooling	Blower is commanded to run and the economizer is used as the first stage of cooling prior to utilizing compressors to maintain Space Temperature at the Active Cooling Setpoint.
Heating	Blower is commanded to run and heating equipment is commanded as required to maintain Space Temperature at the Active Heating Setpoint.
Dehumidification	Blower is commanded to run. The modulating hot gas reheat valve and compressors are commanded as required to maintain Space Temperature at the Active Cooling Setpoint while simultaneously reducing Space Humidity.
Forced Override	The operator has forced the unit to operate in a particular mode for testing purposes.

The unit transitions between HVAC Modes to satisfy space cooling, heating and dehumidification demands.

4.1 Off Mode

When space conditions and unit configuration indicate to the controller that no ventilation, cooling, or heating is necessary, the unit enters Off Mode and all controlled equipment is commanded off. Following a power cycle, the unit initially goes to Off Mode for 30 seconds to allow controller programs and connected sensors to establish proper operation before transitioning to other modes of operation as needed.

4.1.1 Off Mode Enable

The unit is in Off Mode when any of the following conditions are true:

- The Schedule Mode is Unoccupied, Holiday Unoccupied, or Force Unoccupied and there is no demand for heating, cooling, or dehumidification.
- The Schedule Mode is Occupied, Pushbutton Override, Holiday Occupied, Force Occupied, Optimized Start, or Optimized Stop, the Blower Cycling configuration is set to Yes, and there is no demand for heating, cooling, or dehumidification.
- The Emergency Shutdown Alarm is active.

4.1.2 Off Mode Unit Operation

When the unit is in Off Mode, the controller first checks if the Emergency Shutdown Alarm is active. If there is an Emergency Shutdown Alarm, then all of the unit compressors, heating stages, blower, economizer damper, and condenser fans are immediately commanded off.

If the Emergency Shutdown Alarm is not active, the controller performs the following actions:

- Once the Compressor Minimum Run Time is satisfied, any operating compressors and condenser fans are commanded off.
- After the Heat Minimum Run Time is satisfied, any operating heat stages are commanded off.
- The blower is commanded off 60 seconds after all compressors and heat stages are commanded off.

- On units that have gas heat, Furnace Board Feedback 1 and Furnace Board Feedback 2 inputs must be false before the blower is commanded off. This ensures safe operation of the gas heat exchangers.
- The Economizer Damper is commanded to 0%.
- If the unit is a heat pump, the reversing valves remain in their current position.

4.2 Ventilation Mode

When the space is occupied and ventilation is required, but there is no need for cooling or heating, the unit operates in Ventilation Mode. The blower is commanded to run, but all cooling and heating equipment is commanded off.

4.2.1 Ventilation Mode Enable

The unit is in Ventilation Mode when all of the following conditions are true:

- The Schedule Mode is Occupied, Push Button Override, Holiday Occupied, or Force Occupied.
- The Emergency Shutdown input does not indicate an alarm condition.
- The Blower Cycling configuration is set to No.
- There is no demand for cooling, heating, or dehumidification.

4.2.2 Compressor Operation

When the unit is operating in Ventilation Mode, all compressors and their associated condenser fans are commanded off. If a compressor was running at the time the unit entered Ventilation Mode, the Compressor Minimum Run Time must be met before the compressors and condenser fans are commanded off.

If the unit is a heat pump, the reversing valves remain in their current position. If the unit is entering Ventilation Mode from Cooling Mode, the reversing valves remain energized. If the unit is entering Ventilation Mode from Heating Mode, the reversing valves remain de-energized.

4.2.3 Heating Operation

When the unit is operating in Ventilation Mode, heat stages are commanded off. If a heat stage was commanded on at the time the unit entered Ventilation Mode, the Heat Minimum Run Time must be met before the heat stage is commanded off.

4.2.4 Blower Control

On units with a one speed blower, the Blower Stage 1 output is commanded on any time the unit is operating in Ventilation Mode. The Blower Stage 2 output is commanded off.

On units with a two speed blower the Blower Stage 1 output is used to command the blower to operate at low speed and the Blower Stage 2 output is used to command the blower to operate at high speed. When operating in Ventilation Mode, Blower Stage 1 is commanded on and Blower Stage 2 is commanded off.

On units with a variable speed blower, the Blower Stage 1 output is commanded on to enable the motor. The Blower Speed output is commanded to operate at the configured Vent Speed setting.

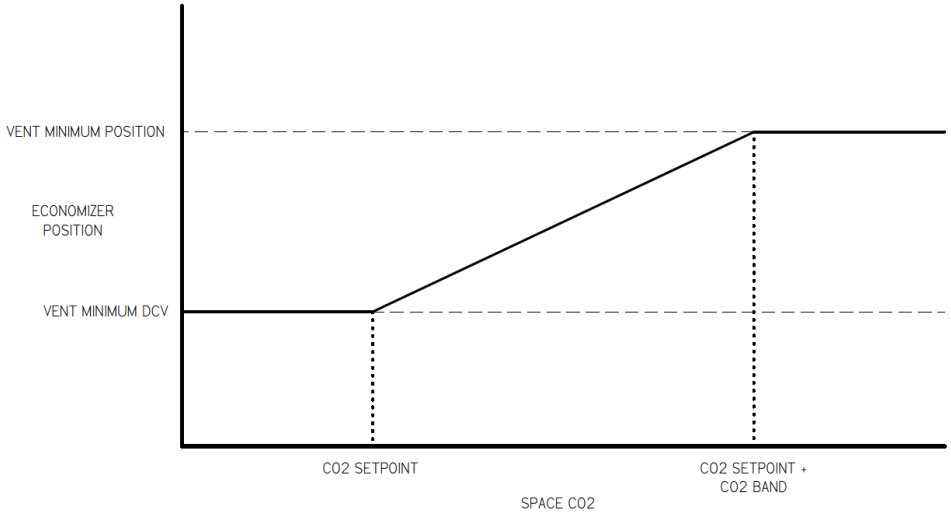
4.2.5 Economizer Control

On units with no economizer installed, the economizer damper is commanded closed. When the Economizer configuration is set to Economizer Installed, the economizer damper is commanded to the Vent Minimum Position

setting when the unit is running in Ventilation Mode. The Vent Minimum Position should be set to a value which provides the space design outdoor airflow when the unit blower is operating at low speed, or the Vent Speed setting if configured for a variable speed blower.

On units that have a Space CO_2 sensor installed and the Economizer configuration parameter is set to Economizer With CO_2 Control, Demand Control Ventilation (DCV) is used to reduce the quantity of outdoor air brought into the building through the economizer damper from the scheduled design minimum. A Space CO_2 value below the CO_2 Setpoint indicates that there are fewer occupants in the space, and that a reduced quantity of outdoor air is required to maintain good indoor air quality. The Vent Minimum DCV setting should be set to a value which provides the quantity of outdoor air required for makeup air that is exhausted from the space when the unit blower is operating at low speed, or the Vent Speed setting if configured for a variable speed blower. This value must be less than the Vent Minimum Position setting.

When the Space CO_2 is below the CO_2 Setpoint, the economizer damper is commanded to the Vent Minimum DCV setting. As Space CO_2 rises above the CO_2 Setpoint, the economizer damper is opened proportionally between the Vent Minimum DCV setting and the Vent Minimum Position setting. When Space CO_2 is above the CO_2 setpoint by more than the CO_2 Band, the economizer damper is commanded to the Vent Minimum Position setting.



4.3 Cooling Mode

When space conditions indicate to the controller that cooling is required, and the outdoor conditions or unit configurations do not allow economizer cooling, the unit operates in Cooling Mode. The blower is commanded to run, and cooling equipment is commanded as needed.

4.3.1 Cooling Mode Lockout

Cooling Mode is locked out when the Outdoor Air Temperature is below the Outdoor Cooling Lockout setting by more than 0.5°F, or Optimized Stop is enabled. The unit is allowed to enter Cooling Mode once the Outdoor Air Temperature is greater than the Outdoor Cooling Lockout by more than 0.5°F and Optimized Stop is not enabled.

4.3.2 Active Cooling Setpoint Calculation

When the unit is occupied, the Active Cooling Setpoint is determined as follows:

Space Cooling Setpoint + Space Setpoint Adjust + (Load Shed Offset * Load Shedding = On)

When the unit is unoccupied, the Active Cooling Setpoint is determined as follows:

Space Cooling Setpoint + Unoccupied Cooling Offset + (Load Shed Offset * Load Shedding = On)

The Space Cooling Setpoint and the Space Heating Setpoint must always maintain a minimum differential to minimize how often the unit may switch between heating and cooling modes.

Minimum Space Setpoint Differential = ½ Cooling Band + ½ Heating Band

If the Space Cooling Setpoint is modified to a value that does not satisfy this requirement, then the Space Heating Setpoint is automatically adjusted so that this requirement is met. If the Space Heating Setpoint is modified to a value that does not satisfy this requirement, then the Space Cooling Setpoint is automatically adjusted so that this requirement is met.

4.3.3 Cooling Mode Enable

The unit enters Cooling Mode when all of the following conditions are satisfied:

- Space Temperature is above the Active Cooling Setpoint.
- Cooling Mode is not locked out.
- The Emergency Shutdown input does not indicate an alarm condition.
- The Space Temperature sensor input is reading a valid value.
- The Supply Air Temperature sensor input is reading a valid value.
- Economizer Cooling Mode is not enabled.
- Dehumidification Mode is not enabled.

The unit leaves Cooling Mode when any of following conditions are met:

- Space Temperature is below the Active Cooling Setpoint by more than ½ of the Cooling Band.
- Cooling Mode is locked out.
- The Emergency Shutdown Alarm is active.
- The Space Temperature sensor input is reading an invalid value.
- The Supply Air Temperature sensor is reading an invalid value.
- Economizer Cooling Mode is enabled.
- Dehumidification Mode is enabled.

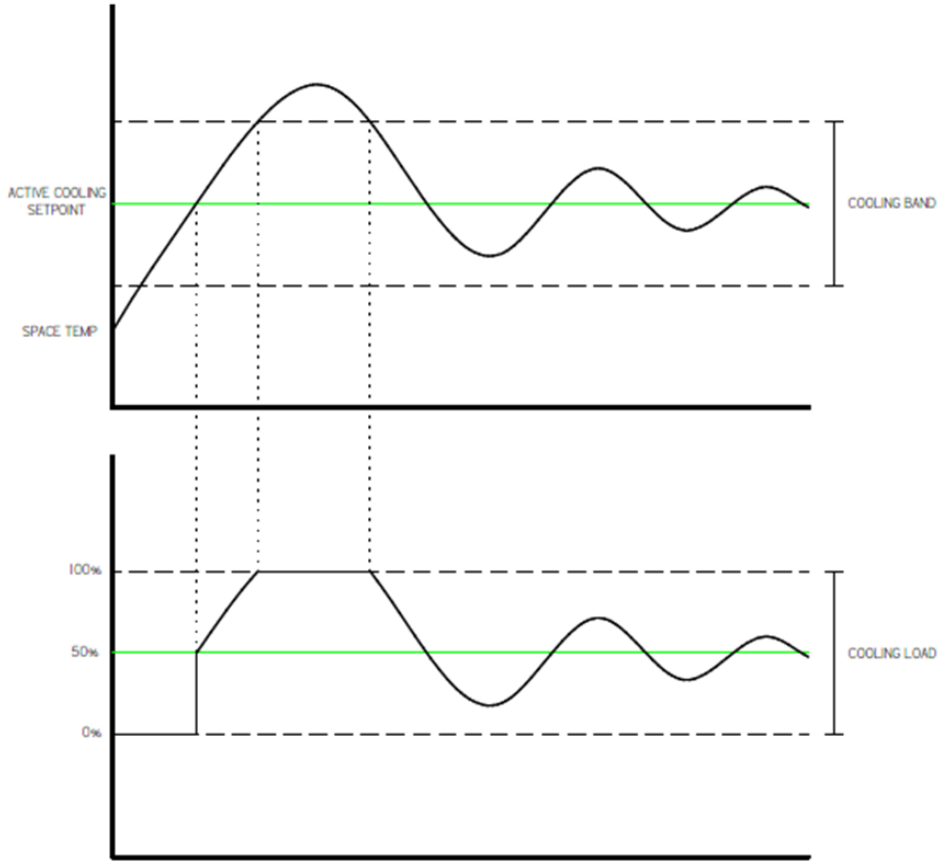
4.3.4 Cooling Load Calculation

The Cooling Load is a calculated value which represents the amount of cooling required to maintain the Space Temperature at the Active Cooling Setpoint. A value of 0% indicates that no cooling is required, and a value of 100% indicates that the full cooling capacity of the unit is required. As the Space Temperature rises above the Active Cooling Setpoint, the Cooling Load increases. As the Space Temperature falls below the Active Cooling Setpoint, the Cooling Load decreases. When the Space Temperature is above the Active Cooling Setpoint by more than ½ of the Cooling Band, the Cooling Load is 100%. When the Space Temperature is below the Active Cooling Setpoint by more than ½ of the Cooling Band, the Cooling Load is 0%.

The controller also considers the amount of time that the Space Temperature has been above or below the Active Cooling Setpoint. When the Space Temperature remains above the Active Cooling Setpoint, the Cooling Load is gradually increased to indicate that additional cooling capacity is necessary to bring the Space Temperature closer to the Active

Cooling Setpoint. When the Space Temperature remains below the Active Cooling Setpoint, the Cooling Load is gradually decreased to indicate that less cooling capacity is necessary to bring the Space Temperature closer to the Active Cooling Setpoint.

Setting the Cooling Band to a smaller value causes the unit to respond more quickly to changes in space conditions, but could also cause excessive cycling of equipment. Setting the Cooling Band to a larger value causes the unit to respond more slowly to changes in space conditions which will cycle the equipment less often. However, this allows the Space Temperature to increase further above and below the Active Cooling Setpoint before staging equipment on and off.



A secondary control function is used to limit the Cooling Load to prevent freezing the evaporator coil. As the Supply Air Temperature decreases to the Supply Air Cooling Low Limit setting, the Cooling Load is limited proportionally. When the Supply Air Temperature is 5°F above the Supply Air Cooling Low Limit, the Cooling Load is allowed to be as high as 100%. When the Supply Air Temperature is equal to the Supply Air Cooling Low Limit, the Cooling Load is not allowed to be more than 0%.

4.3.5 Cooling Stage Calculation

The Cooling Stage is determined by the Cooling Load and the Number of Cooling Stages as described in the tables below.

Number of Cooling Stages = 1	
Cooling Load	Cooling Stage
0 → 25	0
25 → 49	0
50 → 75	1
75 → 100	1
100	1
100 → 75	1
75 → 50	1
50 → 26	1
25 → 1	1
0	0

Number of Cooling Stages = 2	
Cooling Load	Cooling Stage
0 → 25	0
25 → 49	0
50 → 75	1
75 → 99	1
100	2
100 → 75	2
75 → 51	2
50 → 25	1
25 → 1	1
0	0

4.3.6 Compressor Control

Compressors are commanded based on the Number of Compressors configured, the lead / lag priority, and the current Cooling Stage as described in the table below. If the Blower Proving Switch indicates an alarm condition, all compressors are commanded off.

User configurable Compressor Minimum Run Time and Compressor Minimum Off Time settings are used to prevent short cycling. Once a compressor has been commanded to run, it will continue to be commanded until the Compressor Minimum Run Time has been met even if the staging logic determines that the compressor is no longer required. Once a compressor has been commanded off, it will remain off until the Compressor Minimum Off Time has been met even if the staging logic determines that the compressor is required.

Number of Compressors	Lead Compressor	Cooling Stage	Compressor 1 Command	Compressor 2 / Stage 2 Command	Compressor 3 Command	Compressor 4 Command
1	N/A	0	Off	Off	N/A	N/A
1	N/A	1	On	Off	N/A	N/A
1	N/A	2	On	On	N/A	N/A
2	1	0	Off	Off	N/A	N/A
2	1	1	On	Off	N/A	N/A
2	1	2	On	On	N/A	N/A
2	2	0	Off	Off	N/A	N/A
2	2	1	Off	On	N/A	N/A
2	2	2	On	On	N/A	N/A
4	1&2	0	Off	Off	Off	Off
4	1&2	1	On	On	Off	Off
4	1&2	2	On	On	On	On
4	3&4	0	Off	Off	Off	Off
4	3&4	1	Off	Off	On	On
4	3&4	2	On	On	On	On

Each compressor has a pressure switch input monitored by the controller. If a Compressor Pressure Switch Alarm is active, the associated compressor is commanded off until the alarm is no longer active. When a unit is configured for one compressor with two stages of cooling, the compressor pressure switch input for compressor 2 is ignored and the output for compressor 2 is used to command the second stage of cooling on compressor 1.

4.3.7 Condenser Fan Control

Condenser Fan Enable 1 output is used to enable the condenser fan(s) associated with Compressor 1, or on units with 4 compressors, the condenser fans associated with Compressor 1 and Compressor 2. Condenser Fan Enable 2 output is used to enable the condenser fan(s) associated with Compressor 2, or on units with 4 compressors, the condenser fans associated with Compressor 3 and Compressor 4. When any compressor is commanded on, the associated Condenser Fan Enable output is commanded on.

4.3.8 Reversing Valve Control

Reversing Valve 1 output is used to energize the reversing valve associated with Compressor 1, or on units with 4 compressors, the reversing valves associated with Compressor 1 and Compressor 2. Reversing Valve 2 output is used to energize the reversing valve associated with Compressor 2, or on units with 4 compressors, the reversing valves associated with Compressor 3 and Compressor 4. On heat pump units, when the unit is in Cooling Mode, the reversing valve(s) are energized. Once energized, the reversing valve(s) remain energized until the unit enters Heating Mode. On units with only 1 compressor, Reversing Valve 2 output is not used and is always de-energized. On any unit that is not a heat pump, the reversing valve outputs are de-energized.

4.3.9 Blower Control

One Speed Blower:

The Blower Stage 1 output is commanded on any time the unit is operating in Cooling Mode. The Blower Stage 2 output is commanded off.

Two Speed Blower:

The blower is commanded based on the cooling stage. During Cooling Mode Stage 0 or Cooling Mode Stage 1, the Blower Stage 1 output is commanded on and Blower Stage 2 output is commanded off so that the blower operates at low speed. During Cooling Mode Stage 2, the Blower Stage 1 output is commanded off and Blower Stage 2 output is commanded on so that the blower operates at high speed.

Variable Speed Blower:

The blower is commanded based on the cooling stage and the configured blower speed settings. During Cooling Mode Stage 1, the Blower Stage 1 output is commanded on, and the Blower Speed is set to the configured Cooling Low Speed setting. During Cooling Mode Stage 2, the Blower Stage 1 output is commanded on and the Blower Speed is set to the configured Cooling High Speed setting. The Blower Stage 2 output is commanded off when the unit is configured to have a variable speed blower.

4.3.10 Economizer Control

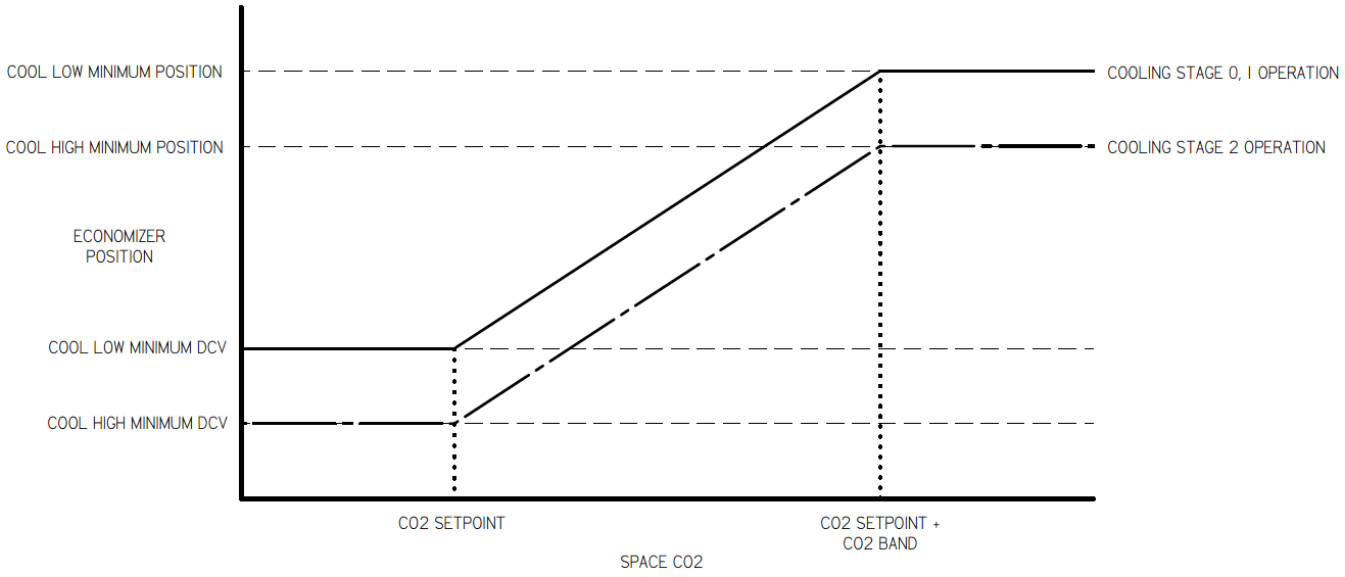
On units with no economizer installed, or if the Schedule Mode is Unoccupied, Holiday Unoccupied, or Force Unoccupied, the economizer damper is commanded closed. When the Economizer configuration is set to Economizer Installed, the economizer is commanded to the Cooling Low Minimum Position setting when the unit is operating in Cooling Mode Stage 0 or Cooling Mode Stage 1. The economizer is commanded to the Cooling High Minimum Position setting when the unit is operating in Cooling Mode Stage 2. The Cooling Low Minimum Position should be set to a value which provides the space design outdoor airflow when the unit blower is operating at low speed, or the Cooling Low Speed setting if configured for a variable speed blower. The Cooling High Minimum Position should be set to a value

which provides the space design outdoor airflow when the unit blower is operating at high speed, or the Cooling High Speed setting if configured for a variable speed blower.

Blower Type	Blower Stage 1 Command	Blower Stage 2 Command	Blower Speed	Economizer Damper Position
One Speed	On	Off	N/A	Cooling Low Minimum Position
Two Speed	On	Off	N/A	Cooling Low Minimum Position
Two Speed	Off	On	N/A	Cooling High Minimum Position
Variable	On	Off	Cooling Low Speed	Cooling Low Minimum Position
Variable	On	Off	Cooling High Speed	Cooling High Minimum Position

On units that have a Space CO_2 sensor installed and the Economizer configuration parameter is set to Economizer With CO_2 Control, Demand Control Ventilation (DCV) is used to reduce the quantity of outdoor air brought into the building through the economizer damper from the scheduled design minimum. A Space CO_2 value below the CO_2 Setpoint indicates that there are fewer occupants in the space, and that a reduced quantity of outdoor air is required to maintain good indoor air quality. The Cooling Low Minimum DCV setting should be set to a value which provides the quantity of outdoor air required for makeup air that is exhausted from the space when the unit blower is operating at low speed, or the Cooling Low Speed setting if configured for a variable speed blower. The Cooling High Minimum DCV setting should be set to a value which provides the quantity of outdoor air required for makeup air that is exhausted from the space when the unit blower is operating at high speed, or the Cooling High Speed setting if configured for a variable speed blower. These values must be less than the Cooling Low Minimum Position and Cooling High Minimum Position settings respectively.

When the Space CO_2 is below the CO_2 Setpoint, the economizer damper is commanded to the Cooling Low Minimum DCV or Cooling High Minimum DCV setting depending on the Cooling Stage as described above. As Space CO_2 rises above the CO_2 Setpoint, the economizer damper is opened proportionally between the Cooling Low Minimum DCV or Cooling High Minimum DCV setting and the Cooling Low Minimum Position or Cooling High Minimum Position setting. When Space CO_2 is above the CO_2 setpoint by more than the CO_2 Band, the economizer damper is commanded to the Cooling Low Minimum Position or Cooling High Minimum Position setting.



4.4 Economizer Cooling Mode

When space conditions indicate to the controller that cooling is required, and the outdoor conditions and unit configurations allow for economizer cooling, the unit operates in Economizer Cooling Mode. The blower is commanded to run, the economizer damper is modulated open, and cooling equipment is commanded as needed.

4.4.1 Economizer Enable

Economizer Enable is true when the conditions are favorable to use outdoor air for the first stage of cooling. Economizer cooling is enabled differently depending on the Economizer Enable Source configuration setting.

NAME	DESCRIPTION
None	Economizer Enable is false.
Fixed Dry Bulb	Economizer Enable is true when the Outdoor Air Temperature is below the Fixed Dry Bulb Setpoint by more than 1.0°F. Economizer Enable is false when the Outdoor Air Temperature is above the Fixed Dry Bulb Setpoint by more than 1.0°F.
Differential Dry Bulb	Economizer Enable is true when the Outdoor Air Temperature is below the Space/Return Air Temperature by more than the Differential Dry Bulb Setpoint. Economizer Enable is false when the Outdoor Air Temperature is above the Space/Return Air Temperature.
Fixed Enthalpy	Economizer Enable is true when the Outdoor Air Enthalpy is below the Fixed Enthalpy Setpoint by more than 0.5 Btu/lb and the Outdoor Air Temperature is below the Fixed Dry Bulb Setpoint by more than 1.0°F. Economizer Enable is false when the Outdoor Air Enthalpy is above the Fixed Enthalpy Setpoint by more than 0.5 Btu/lb or the Outdoor Air Temperature is above the Fixed Dry Bulb Setpoint by more than 1.0°F.
Differential Enthalpy	Economizer Enable is true when the Outdoor Air Enthalpy is below the Space/Return Air Enthalpy by more than the Differential Enthalpy Setpoint and the Outdoor Air Temperature is below the Fixed Dry Bulb Setpoint by more than 1.0°F. Economizer Enable is false when the Outdoor Air Enthalpy is above the Space/Return Air Enthalpy or the Outdoor Air Temperature is above the Fixed Dry Bulb Setpoint by more than 1.0°F.

4.4.2 Economizer Cooling Mode Enable

The unit enters Economizer Cooling Mode when all of the following conditions are satisfied:

- Space Temperature is above the Active Cooling Setpoint.
- Cooling Mode is not locked out.
- The Emergency Shutdown input does not indicate an alarm condition.
- The Space Temperature sensor input is reading a valid value.
- The Supply Air Temperature sensor input is reading a valid value.
- Economizer Enable is true.
- Dehumidification Mode is not enabled.
- Economizer configuration is set to Economizer Installed.

The unit leaves Economizer Cooling Mode when any of following conditions are met:

- Space Temperature is below the Active Cooling Setpoint by more than ½ of the Cooling Band.
- Cooling Mode is locked out.
- The Emergency Shutdown Alarm is active.
- The Space Temperature sensor input is reading an invalid value.
- The Supply Air Temperature sensor is reading an invalid value.
- Economizer configuration is set to None.
- Economizer Enable is false.
- Dehumidification Mode is enabled.

4.4.3 Cooling Load Calculation

The Cooling Load is calculated as described in the Cooling Mode sequence of operation.

4.4.4 Cooling Stage Calculation

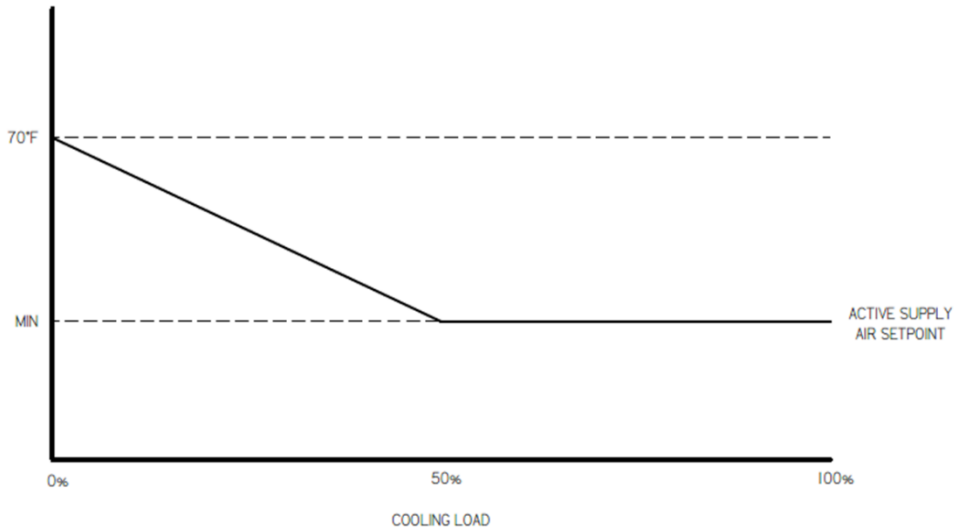
The Cooling Stage is determined by the Cooling Load and the Number of Cooling Stages as described in the tables below.

Number of Cooling Stages = 1	
Cooling Load	Cooling Stage
0 → 25	0
25 → 50	0
50 → 75	0
75 → 99	0
100	1
100 → 75	1
75 → 50	1
50 → 26	1
25 → 0	0
0	0

Number of Cooling Stages = 2	
Cooling Load	Cooling Stage
0 → 25	0
25 → 50	0
50 → 74	0
75 → 99	1
100	2
100 → 76	2
75 → 51	1
50 → 25	0
25 → 0	0
0	0

4.4.5 Supply Air Temperature Setpoint Calculation

During Economizer Cooling Mode, the Active Supply Air Temperature Setpoint is calculated to match the cooling demands of the space. When the Cooling Load is 0%, the Active Supply Air Cooling Setpoint is set equal to 70°F to provide neutral air temperature to the space. The Active Supply Air Cooling Setpoint is reduced proportionally as Cooling Load increases until the Active Supply Air Cooling Setpoint is equal to the Supply Cooling Low Limit when Cooling Load equals 50%. While Cooling Load is above 50%, the Active Supply Air Cooling Setpoint is equal to the Supply Air Cooling Minimum Setpoint.



4.4.6 Blower Control

One Speed Blower:

The Blower Stage 1 output is commanded on any time the unit is operating in Cooling Mode. The Blower Stage 2 output is commanded off.

Two Speed Blower:

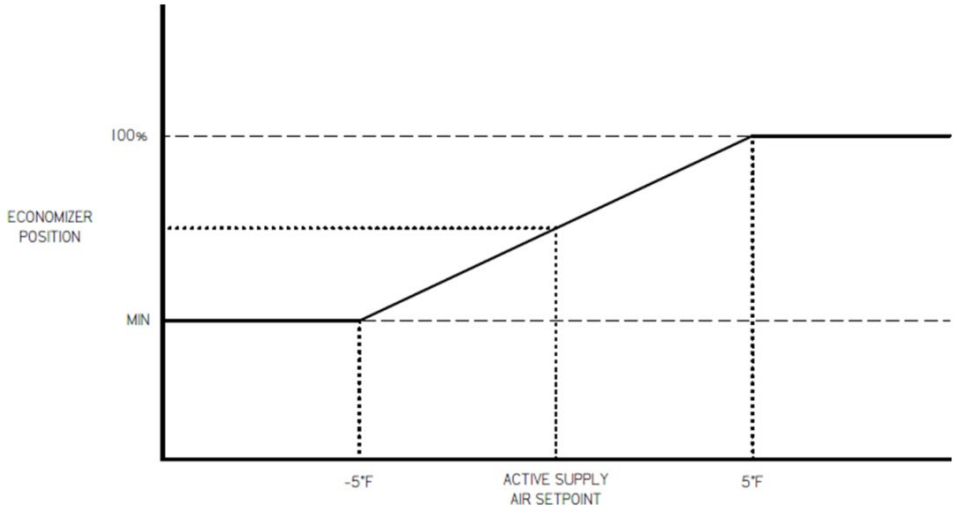
The blower is commanded based on the Cooling Load. The Blower Stage 1 output is commanded on and Blower Stage 2 output is commanded off so that the blower operates at low speed until the Cooling Load rises above 50%. Once the Cooling Load rises above 50%, the Blower Stage 1 output is commanded off and Blower Stage 2 output is commanded on so that the blower operates at high speed. The blower continues to be commanded at high speed until the Cooling Load falls to 0%, then the blower is commanded to run at low speed.

Variable Speed Blower:

The blower is commanded based on the Cooling Load and the configured blower speed settings. The Blower Stage 1 output is commanded on, and the Blower Speed is set to the configured Cooling Low Speed setting until the Cooling Load rises above 50%. Once the Cooling Load rises above 50%, the Blower Speed is set to the configured Cooling High Speed setting. The blower continues to be commanded at the configured Cooling High Speed setting until the Cooling Load falls to 0%, then the Blower Speed is set to the configured Cooling Low Speed setting.

4.4.7 Economizer Control

When the unit is operating in Economizer Cooling Mode, the economizer damper is modulated between the Cooling Low Minimum Position setting and 100% open to maintain Supply Air Temperature at the Active Supply Air Temperature Setpoint. The damper is commanded open as the Supply Air Temperature rises above the Active Supply Air Temperature Setpoint and is commanded closed as the Supply Air Temperature falls below the Active Supply Air Temperature Setpoint. During Economizer Cooling Mode operation Demand Control ventilation is not used to reduce the quantity of outdoor air because it is more efficient to provide a quantity of outdoor air that is greater than the scheduled design minimum.



4.4.8 Exhaust Fan Control

Powered exhaust may be necessary to maintain proper building pressure when the unit is operating in Economizer Cooling Mode. When the Exhaust Fan Installed configuration parameter is set to yes and the economizer damper is open to a value greater than the configured mode minimum position, the Exhaust Fan Enable output is commanded on. When the Exhaust Fan Installed configuration parameter is set to no or the economizer damper is commanded to the configured mode minimum position, the Exhaust Fan output is commanded off.

4.4.9 Compressor Control

Refer to the compressor control sequence of operation in the Cooling Mode section of this document.

4.5 Heating Mode

When space conditions indicate to the controller that heating is required, and the unit is configured for heating, the unit operates in Heating Mode. The blower is commanded to run, and heating equipment is commanded as needed.

4.5.1 Heating Mode Lockout

Heating Mode is locked out if the Number of Heating Stages is set to 0 or if the Outdoor Air Temperature is above the Outdoor Heating Lockout setting by more than 0.5°F, or Optimized Stop is enabled. The unit is allowed to enter Heating Mode once the Outdoor Air Temperature is less than the Outdoor Heating Lockout by more than 0.5°F and Optimized Stop is not enabled.

4.5.2 Heat Pump Heating Lockout

If the unit is configured as a Heat Pump, the use of heat pump heating is locked out when the Outdoor Air Temperature is below the Outdoor Heat Pump Heating Lockout setting by more than 0.5°F, or Optimized Stop is enabled. The unit is allowed to use heat pump heating once the Outdoor Air Temperature is greater than the Outdoor Heat Pump Heating Lockout by more than 0.5°F and Optimized Stop is not enabled. When the use of heat pump heating is locked out, auxiliary electric heat is used to meet space heating demands.

4.5.3 Active Heating Setpoint Calculation

When the unit is occupied, the Active Heating Setpoint is determined as follows:

Active Heating Setpoint = Space Heating Setpoint + Space Setpoint Adjust - (Load Shed Offset * Load Shed = On)

When the unit is unoccupied, the Active Heating Setpoint is determined as follows:

Active Heating Setpoint = Space Heating Setpoint - Unoccupied Heating Offset - (Load Shed Offset * Load Shed = On)

The Space Cooling Setpoint and the Space Heating Setpoint must always maintain a minimum differential to minimize how often the unit may switch between heating and cooling modes.

Minimum Space Setpoint Differential = ½ Cooling Band + ½ Heating Band

If the Space Cooling Setpoint is modified to a value that does not satisfy this requirement, then the Space Heating Setpoint is automatically adjusted so that this requirement is met. If the Space Heating Setpoint is modified to a value that does not satisfy this requirement, then the Space Cooling Setpoint is automatically adjusted so that this requirement is met.

4.5.4 Heating Mode Enable

The unit enters Heating Mode when all of the following conditions are satisfied:

- Space Temperature is below the Active Heating Setpoint.
- Heating Mode is not locked out.
- The Emergency Shutdown input does not indicate an alarm condition.
- The Space Temperature sensor input is reading a valid value.

- The Supply Air Temperature sensor input is reading a valid value.

The unit leaves Heating Mode when any of the following conditions are met:

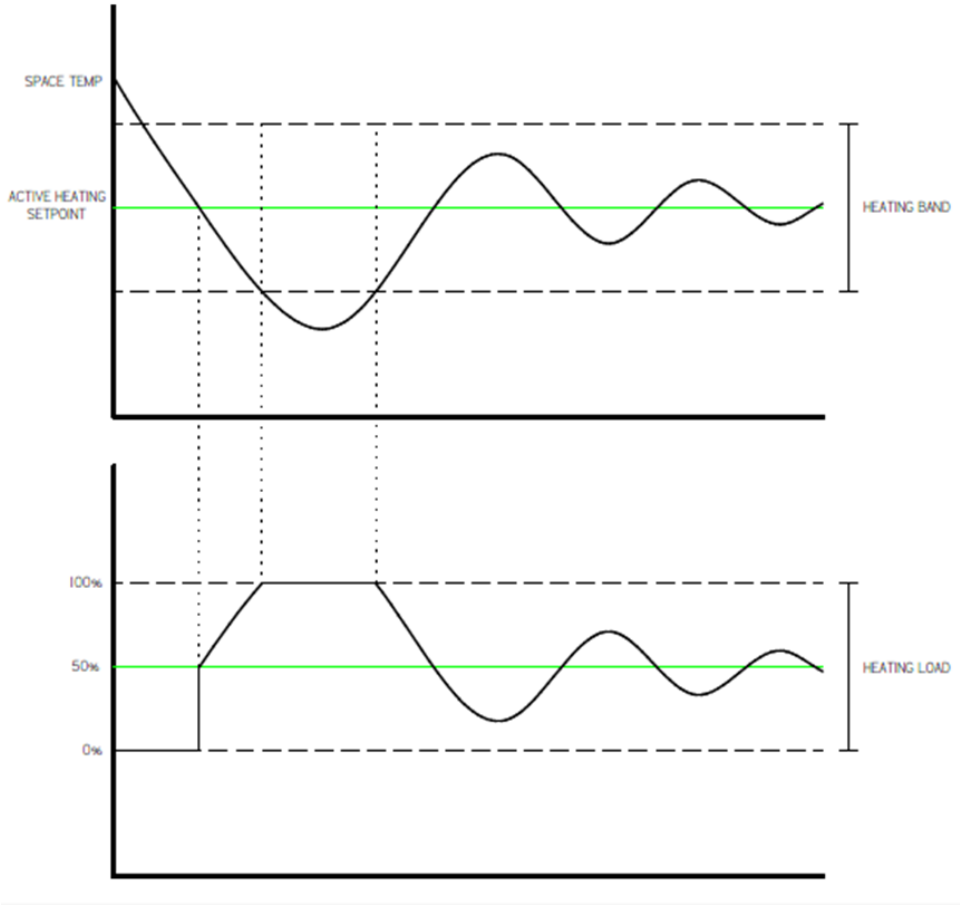
- Space Temperature is above the Active Heating Setpoint by more than ½ of the Heating Band.
- Heating Mode is locked out.
- The Emergency Shutdown Alarm is active.
- The Space Temperature sensor input is reading an invalid value.
- The Supply Air Temperature sensor is reading an invalid value.

4.5.5 Heating Load Calculation

The Heating Load is a calculated value which represents the amount of heating required to maintain the Space Temperature at the Active Heating Setpoint. A value of 0% indicates that no heating is required, and a value of 100% indicates that the full heating capacity of the unit is required. As the Space Temperature falls below the Active Heating Setpoint, the Heating Load increases. As the Space Temperature rises above the Active Heating Setpoint, the Heating Load decreases. When the Space Temperature is below the Active Heating Setpoint by more than ½ of the Heating Band, the Heating Load is 100%. When the Space Temperature is above the Active Heating Setpoint by more than ½ of the Heating Band, the Heating Load is 0%.

The controller also considers the amount of time that the Space Temperature has been above or below the Active Heating Setpoint. When the Space Temperature remains below the Active Heating Setpoint, the Heating Load is gradually increased to indicate that additional heating capacity is necessary to bring the Space Temperature closer to the Active Heating Setpoint. When the Space Temperature remains above the Active Heating Setpoint, the Heating Load is gradually decreased to indicate that less heating capacity is necessary to bring the Space Temperature closer to the Active Heating Setpoint.

Setting the Heating Band to a smaller value causes the unit to respond more quickly to changes in space conditions, but could also cause excessive cycling of equipment. Setting the Heating Band to a larger value causes the unit to respond more slowly to changes in space conditions which will cycle the equipment less often. However, this allows the Space Temperature to increase further above and below the Active Heating Setpoint before staging equipment on and off.



A secondary control function is used to limit the Heating Load to prevent damage to the heat exchanger. As the Supply Air Temperature increases to the Supply Air Heating High Limit setting, the Heating Load is limited proportionally. When the Supply Air Temperature is 5°F below the Supply Air Heating High Limit, the Heating Load is allowed to be as high as 100%. When the Supply Air Temperature is equal to the Supply Air Heating High Limit, the Heating Load is not allowed to be more than 0%.

4.5.6 Heating Stage Calculation

The Heating Stage is determined by the Heating Load and the Number of Heating Stages as described in the tables below. If the SCR Heat unit configuration is set to yes, the Heating Stage calculation is not used.

Number of Heating Stages = 1	
Heating Load	**Heating Stage**
0 → 25	0
25 → 49	0
50 → 75	1
75 → 100	1
100	1
100 → 75	1
75 → 50	1
50 → 26	1
25 → 1	1
0	0

Number of Heating Stages = 2	
Heating Load	**Heating Stage**
0 → 25	0
25 → 49	0
50 → 75	1
75 → 99	1
100	2
100 → 75	2
75 → 51	2
50 → 25	1
25 → 1	1
0	0

Exception: On heat pump units with 1 compressor and 2 stages of heat pump heating, when the Outdoor Air Temperature is below 37°F the Heating Stage is equal to 2 any time there is a need for heating. Stage 1 heating is locked out. When the Outdoor Air Temperature is above 40°F the normal staging sequence is followed. This improves the overall efficiency of the units when the outdoor conditions can cause diminished part-load compressor efficiency.

4.5.7 Electric Heat Stages Control

If the Unit Type is configured as A/C With Electric Heat and the SCR Heat configuration is set to no, the Heat Stage 1 and Heat Stage 2 outputs are used to command up to two stages of electric heat. Both outputs are immediately commanded off if the Blower Proving Switch input is false.

User configurable Heat Minimum Run Time and Heat Minimum Off Time settings are used to prevent short cycling. Once a heating stage has been commanded to run, it will continue to be commanded until the Heat Minimum Run Time has been met even if the staging logic determines that the heating stage is no longer required. Once a heating stage has been commanded off, it will remain off until the Heat Minimum Off Time has been met even if the staging logic determines that the heating stage is required.

Heat Stage 1 and Heat Stage 2 are commanded according to the following table.

Heating Stage	Heat Stage 1 Command	Heat Stage 2 Command
0	Off	Off
1	On	Off
2	On	On

4.5.8 SCR Electric Heat Control

If the Unit Type is configured as A/C With Electric Heat and the SCR Heat configuration is set to yes, the Heat Stage 1 output is used to enable the electric heat. The SCR Heat output is used to send a 0-100% (0-10Vdc) signal to the SCR controller which will modulate the heat provided. The Heat Stage 1 output is commanded on when the unit is in Heating Mode. The SCR Heat analog output is commanded to a value equal to the Heating Load. If the Blower Proving Switch input is false, the Heat Stage 1 output is commanded off and the SCR Heat output is commanded to 0%.

4.5.9 Gas Heat Stages Control

If the Unit Type is configured as A/C with Gas Heat, the Heat Stage 1 output is used to enable the furnace control board. The furnace control board verifies necessary safety devices, opens the gas valve to low heat, ignites the furnace, and commands the ventilation fan to run. The Heat Stage 2 output is used to command the gas valve to open to the high heat position. On units with two separate gas heat exchangers, the Heat Stage 1 output is used to enable both furnace control boards simultaneously, and Heat Stage 2 output is used to command both gas valves to the high heat position. Both outputs are immediately commanded off if the Blower Proving Switch input is false.

User configurable Heat Minimum Run Time and Heat Minimum Off Time settings are used to prevent short cycling of heating stages. Once a heating stage has been commanded to run, it will continue to be commanded on until the Heat Minimum Run Time has been met even if the staging logic determines that the heating stage is no longer required. Once a heating stage has been commanded off, it will remain off until the Heat Minimum Off Time has been met even if the staging logic determines that the heating stage is required.

Heat Stage 1 and Heat Stage 2 are commanded according to the following table.

Heating Stage	Heat Stage 1 Command	Heat Stage 2 Command
0	Off	Off
1	On	Off
2	On	On

4.5.10 Heat Pump Heating Control

If the Unit Type is configured as Heat Pump, then the compressors are commanded based on the Number of Compressors configured, the lead / lag priority, and the current Heating Stage as described in the table below. Any electric heat stages installed are used for auxiliary heating. If the Blower Proving Switch input is false, all of the heat stages are commanded off.

User configurable Compressor Minimum Run Time and Compressor Minimum Off Time settings are used to prevent short cycling. Once a compressor has been commanded to run, it will continue to be commanded on until the Compressor Minimum Run Time has been met even if the staging logic determines that the heating stage is no longer required. Once a compressor has been commanded off, it will remain off until the Compressor Minimum Off Time has been met even if the staging logic determines that the heating stage is required.

Number of Compressors	Lead Compressor	Heating Stage	Compressor 1 Command	Compressor 2 / Stage 2 Command	Compressor 3 Command	Compressor 4 Command
1	N/A	0	Off	Off	N/A	N/A
1	N/A	1	On	Off	N/A	N/A
1	N/A	2	On	On	N/A	N/A
2	1	0	Off	Off	N/A	N/A
2	1	1	On	Off	N/A	N/A
2	1	2	On	On	N/A	N/A
2	2	0	Off	Off	N/A	N/A
2	2	1	Off	On	N/A	N/A
2	2	2	On	On	N/A	N/A
4	1&2	0	Off	Off	Off	Off
4	1&2	1	On	On	Off	Off
4	1&2	2	On	On	On	On
4	3&4	0	Off	Off	Off	Off
4	3&4	1	Off	Off	On	On
4	3&4	2	On	On	On	On

Each compressor has a pressure switch input monitored by the controller. If a Compressor Pressure Switch Alarm is active, the associated compressor is commanded off until the alarm is no longer active. When a unit is configured for one compressor with two stages of cooling, the compressor pressure switch input for compressor 2 is ignored and the output for compressor 2 is used to command the second stage of heating on compressor 1.

4.5.11 Condenser Fan Control

Condenser Fan Enable 1 output is used to enable the condenser fan(s) associated with Compressor 1, or on units with 4 compressors, the condenser fans associated with Compressor 1 and Compressor 2. Condenser Fan Enable 2 output is used to enable the condenser fan(s) associated with Compressor 2, or on units with 4 compressors, the condenser fans associated with Compressor 3 and Compressor 4. When any compressor is commanded on for heat pump heating, the associated Condenser Fan Enable output is commanded on.

4.5.12 Reversing Valve Control

Reversing Valve 1 output is used to energize the reversing valve associated with Compressor 1, or on units with 4 compressors, the reversing valves associated with Compressor 1 and Compressor 2. Reversing Valve 2 output is used to energize the reversing valve associated with Compressor 2, or on units with 4 compressors, the reversing valves associated with Compressor 3 and Compressor 4. On heat pump units, when the unit is in Heating Mode, the reversing valve(s) are de-energized. Once de-energized, the reversing valve(s) remain de-energized until the unit enters Cooling Mode. On units with only 1 compressor, Reversing Valve 2 output is not used and is always de-energized. On any unit that is not a heat pump, the reversing valve outputs are de-energized.

4.5.13 Auxiliary Heating Stage Control

If the Number of Auxiliary Heating Stages is set to a value greater than 0, Heat Stage 1 and Heat Stage 2 outputs are commanded on to provide additional heating when heat pump heating cannot meet the space heating requirements. The configured auxiliary heating stages are commanded on when the Space Temperature falls below the Active Heating Setpoint by more than the Auxiliary Heat Offset. The auxiliary heat stages continue to be commanded on until the Heating Load is less than 100%.

When the use of heat pump heating is locked out, the compressors will not be used for heating and the unit will use any installed auxiliary electric heating stages as described in the Electric Heat Stages Control sequence of operation.

4.5.14 Defrost Interval Time Calculation

The defrost interval time can be determined in two ways depending on user configuration. If Auto Defrost is set to No, then the defrost interval time is equal to the user defined Defrost Timer value. If Auto Defrost is set to Yes, then the defrost interval time is calculated to achieve optimum defrost cycle efficiency.

The Defrost Timer value can be set as low as 2 for testing, but if the value remains less than 30 for longer than 30 minutes, the value is reset to 30 to prevent excessive cycling of the unit.

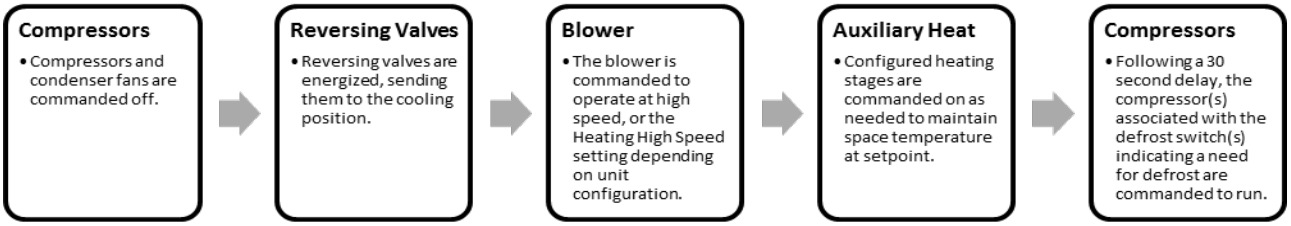
4.5.15 Defrost Enable

A closed contact at the Defrost Switch 1 input indicates a need for defrost on condenser coil 1. On units with 1 or 2 compressors, condenser coil 1 serves compressor 1. On units with 4 compressors, condenser coil 1 serves compressors 1 and 2. A closed contact at the Defrost Switch 2 input indicates a need for defrost on condenser coil 2. On units with 1 or 2 compressors, condenser coil 2 serves compressor 2. On units with 4 compressors, condenser coil 2 serves compressors 3 and 4.

Defrost can only be enabled if the Unit Type is configured as Heat Pump and the unit is operating in Heating Mode. When the Defrost Switch 1 or Defrost Switch 2 inputs indicate a need for defrost for longer than the defrost interval time, the defrost cycle is initiated.

4.5.16 Defrost Operation

When the defrost cycle is initiated, the following actions are taken by the controller.



4.5.17 Defrost Mode Disable

When the Defrost Switch 1 contact is open, the compressors associated with condenser coil 1 are commanded off. When Defrost Switch 2 contact is open, the compressors associated with condenser coil 2 are commanded off. Defrost is disabled when the unit leaves Heating Mode, if both defrost switch contacts are open, or if the defrost cycle has been enabled for longer than 10 minutes.

Once the defrost cycle is completed and compressors have been commanded off, the reversing valves are de-energized, and the unit resumes normal Heating Mode operation following a 30 second delay to allow the reversing valves to change position. Auxiliary heat also resumes normal operation and is commanded off once the Heating Load is less than 100%.

If the unit leaves Heating Mode prior to completion of the defrost cycle, and one or more of the defrost switches still indicate a need for defrost, when the unit re-enters Heating Mode the defrost cycle will immediately be continued.

4.5.18 Blower Control

One Speed Blower:

The Blower Stage 1 output is commanded on any time the unit is operating in Heating Mode. The Blower Stage 2 output is commanded off.

Two Speed Blower:

The Blower Stage 1 output is used to command the blower to operate at low speed and the Blower Stage 2 output is used to command the blower to operate at high speed. The blower is commanded based on the heating stage and the configuration settings as described in the table below.

Unit Type	Heating Stage	SCR Heat Command	Blower Stage 1 Command	Blower Stage 2 Command
A/C With Electric Heat	0	N/A	Off	On
A/C With Electric Heat	1	N/A	Off	On
A/C With Electric Heat	2	N/A	Off	On
A/C With Electric Heat	N/A	0 → 50	On	Off
A/C With Electric Heat	N/A	51 → 100	Off	On
A/C With Electric Heat	N/A	100 → 41	Off	On
A/C With Electric Heat	N/A	40 → 0	On	Off
A/C With Gas Heat	0	N/A	Off	On
A/C With Gas Heat	1	N/A	Off	On
A/C With Gas Heat	2	N/A	Off	On
Heat Pump	0	N/A	On	Off

Unit Type	Heating Stage	SCR Heat Command	Blower Stage 1 Command	Blower Stage 2 Command
Heat Pump	1	N/A	On	Off
Heat Pump	2	N/A	Off	On
Heat Pump	Aux Heat	N/A	Off	On
Defrost Cycle	Aux Heat	N/A	Off	On

Variable Speed Blower:

The Blower Stage 1 output is used to enable the blower to operate and the Blower Speed output is used to command the blower to run at the configured speed. The Blower Stage 2 output is commanded off. The blower is commanded based on the heating stage and the configuration settings as described in the table below.

Unit Type	Heating Stage	SCR Heat Command	Blower Stage 1 Command	Blower Speed
A/C With Electric Heat	0	N/A	On	Heating Low Speed
A/C With Electric Heat	1	N/A	On	Heating Low Speed
A/C With Electric Heat	2	N/A	On	Heating High Speed
A/C With Electric Heat	N/A	0 → 50	On	Heating Low Speed
A/C With Electric Heat	N/A	51 → 100	On	Heating High Speed
A/C With Electric Heat	N/A	100 → 41	On	Heating High Speed
A/C With Electric Heat	N/A	40 → 0	On	Heating Low Speed
A/C With Gas Heat	0	N/A	On	Heating Low Speed
A/C With Gas Heat	1	N/A	On	Heating Low Speed
A/C With Gas Heat	2	N/A	On	Heating High Speed
Heat Pump	0	N/A	On	Heating Low Speed
Heat Pump	1	N/A	On	Heating Low Speed
Heat Pump	2	N/A	On	Heating High Speed
Heat Pump	Aux Heat	N/A	On	Heating High Speed
Defrost Cycle	Aux Heat	N/A	On	Heating High Speed

If the Unit Type is set equal to A/C With Gas Heat, and the blower was not already commanded on prior to the unit entering Heating Mode, the blower is not commanded on until either Furnace Board Feedback 1 or Furnace Board Feedback 2 inputs indicate that a furnace has been successfully ignited. This 45 second delay is to prevent introducing cold air into the space during furnace startup on units with the Blower Cycling configuration set to true. On a transition from Heating Mode to Off Mode, the blower continues to be commanded on until the Furnace Board Feedback 1 and Furnace Board Feedback 2 inputs indicate that it is ok to turn off the blower. This 150 second delay allows the remaining heat to be dissipated from the heat exchanger.

4.5.19 Economizer Control

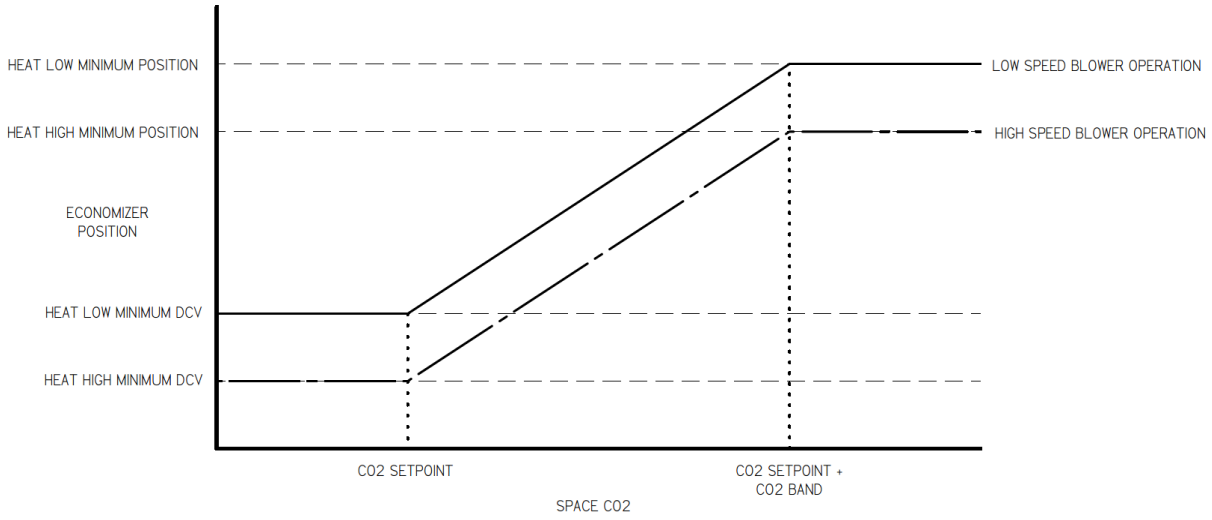
On units with no economizer installed, or if the Schedule Mode is Unoccupied, Holiday Unoccupied, or Force Unoccupied, the economizer damper is commanded closed. When the Economizer configuration is set to Economizer Installed, the economizer is commanded to the Heating Low Minimum Position setting when the blower is commanded to run at low speed or if the Blower Type configuration is set to One Speed. The economizer is commanded to the Heating High Minimum Position setting when the blower is commanded to run at high speed. The Heating Low Minimum Position should be set to a value which provides the space design outdoor airflow when the unit blower is operating at low speed, or the Heating Low Speed setting if configured for a variable speed blower. The Heating High

Minimum Position should be set to a value which provides the space design outdoor airflow when the unit blower is operating at high speed, or the Heating High Speed setting if configured for a variable speed blower.

Blower Type	Blower Stage 1 Command	Blower Stage 2 Command	Blower Speed	Economizer Damper Position
One Speed	On	Off	N/A	Heating Low Minimum Position
Two Speed	On	Off	N/A	Heating Low Minimum Position
Two Speed	Off	On	N/A	Heating High Minimum Position
Variable	On	Off	Heating Low Speed	Heating Low Minimum Position
Variable	On	Off	Heating High Speed	Heating High Minimum Position

On units that have a Space CO_2 sensor installed and the Economizer configuration parameter is set to Economizer with CO_2 Control, Demand Control Ventilation (DCV) is used to reduce the quantity of outdoor air brought into the building through the economizer damper from the scheduled design minimum. A Space CO_2 value below the CO_2 Setpoint indicates that there are fewer occupants in the space, and that a reduced quantity of outdoor air is required to maintain good indoor air quality. The Heating Low Minimum DCV setting should be set to a value which provides the quantity of outdoor air required for makeup air that is exhausted from the space when the unit blower is operating at low speed, or the Heating Low Speed setting if configured for a variable speed blower. The Heating High Minimum DCV setting should be set to a value which provides the quantity of outdoor air required for makeup air that is exhausted from the space when the unit blower is operating at high speed, or the Heating High Speed setting if configured for a variable speed blower. These values must be less than the Heating Low Minimum Position and Heating High Minimum Position settings respectively.

When the Space CO_2 is below the CO_2 Setpoint, the economizer damper is commanded to the Heating Low Minimum DCV or Heating High Minimum DCV setting depending on the blower speed as described above. As Space CO_2 rises above the CO_2 Setpoint, the economizer damper is opened proportionally between the Heating Low Minimum DCV or Heating High Minimum DCV setting and the Heating Low Minimum Position or Heating High Minimum Position setting. When Space CO_2 is above the CO_2 setpoint by more than the CO_2 Band, the economizer damper is commanded to the Heating Low Minimum Position or Heating High Minimum Position setting.



4.6 Dehumidification Mode

4.6.1 Dehumidification Mode Lockout

Dehumidification Mode is locked out if the Hot Gas Reheat configuration parameter is set to no, or if any of the following conditions are true.

- The Cooling Load is 100%. The lockout is not removed until Cooling Load is less than 50%.
- The Outdoor Air Temperature is below 40°F. Lockout is not removed until Outdoor Air Temperature is above 45°F.
- The Outdoor Air Temperature is above 100°F. The lockout is not removed until the Outdoor Air Temperature is below 95°F.
- The Space Temperature is below the Active Heating Setpoint plus ½ of the Heating Band. Lockout is not removed until Space Temperature is above the Active Heating Setpoint by more than the Heating Band.
- The Outdoor Air Temperature is below 60°F and Circuit 1 Head Pressure Sensor Missing Alarm is active. Lockout is not removed until Outdoor Air Temperature is above 65°F.
- Optimized Stop is enabled.
- The Electronic Valve Driver (EVD) Module Communication Offline Alarm is active.
- The Outdoor Air Temperature Sensor Missing Alarm is active.
- The Supply Air Temperature Sensor Missing Alarm is active.
- The Compressor 1 Pressure Switch Alarm is active.
- The Circuit 1 Low Suction Pressure Alarm is active.
- The Circuit 1 Suction Pressure Sensor Missing Alarm is active.
- The Space Humidity Sensor Missing Alarm is active.

4.6.2 Active Humidity Setpoint Calculation

When the unit is occupied, the Active Humidity Setpoint is determined as follows:

Space Humidity Setpoint + (Load Shed Offset * Load Shedding = On)

When the unit is unoccupied, the Active Humidity Setpoint is determined as follows:

Space Humidity Setpoint + Unoccupied Humidity Offset + (Load Shed Offset * Load Shedding = On)

4.6.3 Dehumidification Mode Enable

The unit enters Dehumidification Mode when all of the following conditions are satisfied:

- The Space Humidity is above the Active Humidity Setpoint by more than ½ of the Space Humidity Band.
- Dehumidification Mode is not locked out.
- The Emergency Shutdown input does not indicate an alarm condition.
- The Space Temperature sensor input is reading a valid value.
- Dehumidification Mode has been inactive for longer than the Dehumidification Minimum Run Time setting.

The unit leaves Dehumidification Mode when any of the following conditions are met:

- The Space Humidity is below the Active Humidity Setpoint by more than ½ of the Space Humidity Band and Dehumidification Mode has been active for longer than the Dehumidification Minimum Run Time setting.

- Dehumidification Mode is locked out.
- The Emergency Shutdown Alarm is active.
- The Space Temperature sensor input is reading an invalid value.

4.6.4 Supply Air Temperature Setpoint Calculation

During Dehumidification Mode, the Active Supply Air Temperature Setpoint is calculated to match the cooling demands of the space and is offset based on System 1 Suction Pressure to prevent freezing of the evaporator coil and to ensure proper compressor operation.

4.6.5 Dehumidification Stage Calculation

When the unit initially enters Dehumidification Mode, the Dehumidification Stage is set to 1. The Dehumidification Stage is set to 2 when all of the following conditions are satisfied. This provides additional dehumidification and cooling capacity as required to satisfy space conditions.

- The reheat valve is commanded to a position less than 80% open and the Suction Pressure SAT Offset is equal to 0°F for more than 1 minute.
- The Space Humidity is greater than the Active Humidity Setpoint by more than ½ of the Humidity Band, or the Cooling Load is greater than 75%.
- The Outdoor Air Temperature is above 65°F.

The Dehumidification Stage is set to 1 when any of the following conditions are true. This prevents the space from being over cooled while allowing the unit to operate at partial capacity for longer periods of time, and also prevents the unit from operating compressors outside of desirable pressure ranges.

- The Suction Pressure SAT Offset is equal to 5°F for more than 5 minutes.
- The Supply Air Temperature remains below the Active Supply Air Temperature Setpoint by more than 5°F for more than 5 minutes.
- The Space Humidity is less than the Active Humidity Setpoint and the Cooling Load is less than 50%.
- The Outdoor Air Temperature is less than 60°F and stage 2 cooling is not required.

4.6.6 Compressor Control

Compressors are commanded based on the Number of Compressors configured, and the current Dehumidification Stage as described in the table below. If the Blower Proving Switch indicates an alarm condition, all compressors are commanded off.

User configurable Compressor Minimum Run Time and Compressor Minimum Off Time settings are used to prevent short cycling. Once a compressor has been commanded to run, it will continue to be commanded until the Compressor Minimum Run Time has been met even if the staging logic determines that the compressor is no longer required. Once a compressor has been commanded off, it will remain off until the Compressor Minimum Off Time has been met even if the staging logic determines that the compressor is required.

The hot gas reheat circuit is part of refrigerant circuit 1. During Dehumidification Mode, compressor lead/lag priority rotation is disabled. On units with 2 compressors, compressor 1 is utilized for stage 1 dehumidification and compressor 2 is utilized for stage 2 dehumidification. On units with 4 compressors, the compressor pair of compressor 1 and compressor 2 is used for stage 1 dehumidification and the compressor pair of compressor 3 and compressor 4 is used for stage 2 dehumidification.

Number of Compressors	Lead Compressor	Dehumidification Stage	Compressor 1 Command	Compressor 2 / Stage 2 Command	Compressor 3 Command	Compressor 4 Command
1	N/A	1	On	Off	N/A	N/A
1	N/A	2	On	On	N/A	N/A
2	N/A	1	On	Off	N/A	N/A
2	N/A	2	On	On	N/A	N/A
4	N/A	1	On	On	Off	Off
4	N/A	2	On	On	On	On

Each compressor has a pressure switch input monitored by the controller. If a Compressor Pressure Switch Alarm is active, the associated compressor is commanded off until the alarm is no longer active. When a unit is configured for one compressor with two stages of cooling, the compressor pressure switch input for compressor 2 is ignored and the output for compressor 2 is used to command the second stage of cooling on compressor 1.

When the unit leaves dehumidification mode, compressor 1 continues to be commanded to run until after the reheat valve has been commanded fully closed.

4.6.7 Purge Valve Control

The reheat coil purge valve is open when de-energized, and closes when energized. When the unit enters Dehumidification Mode, and after compressor 1 has been commanded on, the purge valve is energized. When the unit leaves Dehumidification Mode, or compressor 1 has been commanded off for any reason, the purge valve is de-energized after the reheat valve is fully closed.

4.6.8 Reheat Valve Control

After the reheat coil purge valve has been energized and compressor 1 is commanded to run, the reheat valve is controlled to maintain Supply Air Temperature at the Active Supply Air Temperature Setpoint. A value of 0% indicates that the valve is closed to the reheat coil, and a value of 100% indicates that the valve is fully open to the reheat coil. The valve is modulated open as the Supply Air Temperature falls below the Active Supply Air Temperature Setpoint and is modulated closed as the Supply Air Temperature rises above the Active Supply Air Temperature Setpoint. The minimum valve open position during Dehumidification Mode is 20% open.

When the unit leaves Dehumidification Mode, or if compressor 1 is commanded off for any reason, the reheat valve is commanded closed.

4.6.9 Unit Freeze Protection

Units with the modulating hot gas reheat option are equipped to provide evaporator coil freeze protection based on suction pressure sensor readings. If compressor 1 is commanded on, and the System 1 Suction Pressure is below 75 psig for more than 2 minutes, compressor 1 is commanded off. When System 1 Suction Pressure has increased above 155 psig, or the Circuit 1 Suction Pressure Sensor Missing Alarm is active, then the unit returns to normal operation.

If the Number of Suction Pressure Sensors configuration is set to 2, compressor 2 is commanded on, and the System 2 Suction Pressure is below 75 psig for more than 2 minutes, compressor 2 is commanded off. When System 2 Suction Pressure has increased above 155 psig, or the Circuit 2 Suction Pressure Sensor Missing Alarm is active, then the unit returns to normal operation.

The blower continues to operate according to the current mode of operation.

4.6.10 Low Ambient Control of Condenser Fans

Units with the modulating hot gas reheat option can control up to two condenser fan system outputs based on system head pressure readings. These outputs are analog 0-10Vdc outputs that are used to control discrete solid state relays. An output less than 2Vdc is considered an off command, and an output greater than 9Vdc is considered an on command.

Low Ambient 1 output is operated based on System 1 Head Pressure. If the Circuit 1 Head Pressure Sensor Missing Alarm is active, Low Ambient 1 output is commanded on for fail safe operation. When the System 1 Head Pressure falls below setpoint, and Low Ambient 1 output has been commanded on for more than 10 seconds, the Low Ambient 1 output is commanded off. When the System 1 Head Pressure reading rises above setpoint, and the Low Ambient 1 output has been commanded off for more than 10 seconds, the Low Ambient 1 output is commanded on.

Low Ambient 2 output is operated based on System 2 Head Pressure. If the Circuit 2 Head Pressure Sensor Missing Alarm is active, Low Ambient 2 output is commanded on for fail safe operation. When the System 2 Head Pressure reading falls below setpoint, and the Low Ambient 2 output has been commanded on for more than 10 seconds, the Low Ambient 2 output is commanded off. When the System 2 Head Pressure reading rises above setpoint, and the Low Ambient 2 output has been commanded off for more than 10 seconds, the Low Ambient 2 output is commanded on.

4.6.11 Blower Control

One Speed Blower:

The Blower Stage 1 output is commanded on any time the unit is operating in Dehumidification Mode. The Blower Stage 2 output is commanded off.

Two Speed Blower:

The blower is commanded based on the cooling stage. When no cooling is required or only 1 stage of cooling is required during Dehumidification Mode, the Blower Stage 1 output is commanded on and Blower Stage 2 output is commanded off so that the blower operates at low speed. When 2 stages of cooling are required during Dehumidification Mode, the Blower Stage 1 output is commanded off and Blower Stage 2 output is commanded on so that the blower operates at high speed.

Variable Speed Blower:

The blower is commanded based on the cooling stage and the configured blower speed settings. When no cooling is required or only 1 stage of cooling is required during Dehumidification Mode, the Blower Stage 1 output is commanded on and the Blower Speed is set to the configured Cooling Low Speed setting. When 2 stages of cooling are required during Dehumidification Mode, the Blower Stage 1 output is commanded on and the Blower Speed is set to the configured Cooling High Speed setting. The Blower Stage 2 output is commanded off when the unit is configured to have a variable speed blower.

4.6.12 Economizer Control

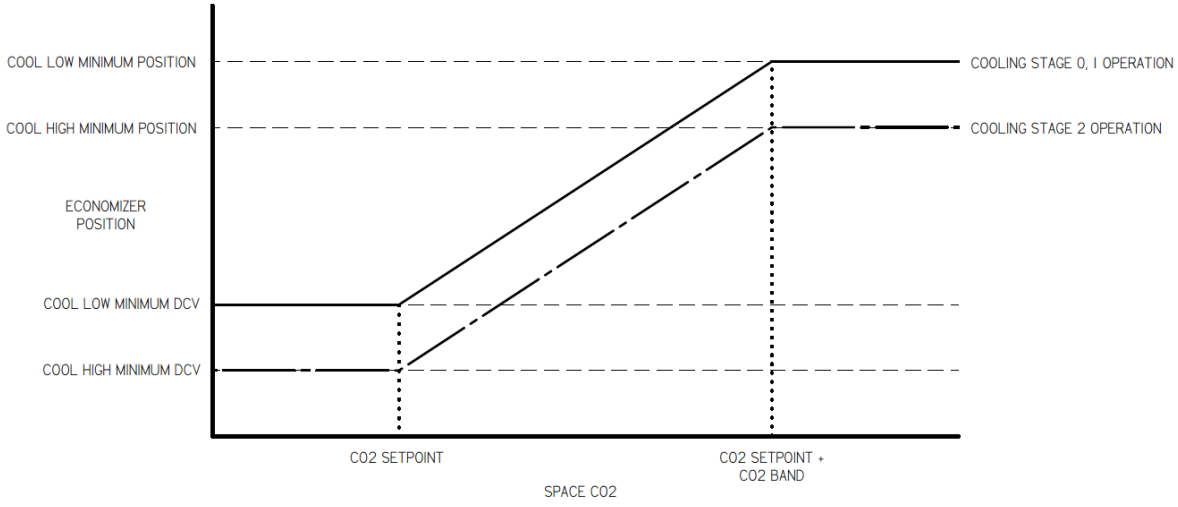
On units with no economizer installed, or if the Schedule Mode is Unoccupied, Holiday Unoccupied, or Force Unoccupied, the economizer damper is commanded closed. When the Economizer configuration is set to Economizer Installed, the economizer is commanded to the Cooling Low Minimum Position setting when the blower is commanded to run at low speed or if the Blower Type configuration is set to One Speed. The economizer is commanded to the Cooling High Minimum Position setting when the blower is commanded to run at high speed. The Cooling Low Minimum

Position should be set to a value which provides the space design outdoor airflow when the unit blower is operating at low speed, or the Cooling Low Speed setting if configured for a variable speed blower. The Cooling High Minimum Position should be set to a value which provides the space design outdoor airflow when the unit blower is operating at high speed, or the Cooling High Speed setting if configured for a variable speed blower.

Blower Type	Blower Stage 1 Command	Blower Stage 2 Command	Blower Speed	Economizer Damper Position
One Speed	On	Off	N/A	Cooling Low Minimum Position
Two Speed	On	Off	N/A	Cooling Low Minimum Position
Two Speed	Off	On	N/A	Cooling High Minimum Position
Variable	On	Off	Cooling Low Speed	Cooling Low Minimum Position
Variable	On	Off	Cooling High Speed	Cooling High Minimum Position

On units that have a Space CO_2 sensor installed and the Economizer configuration parameter is set to Economizer with CO_2 Control, Demand Control Ventilation (DCV) is used to reduce the quantity of outdoor air brought into the building through the economizer damper from the scheduled design minimum. A Space CO_2 value below the CO_2 Setpoint indicates that there are fewer occupants in the space, and that a reduced quantity of outdoor air is required to maintain good indoor air quality. The Cooling Low Minimum DCV setting should be set to a value which provides the quantity of outdoor air required for makeup air that is exhausted from the space when the unit blower is operating at low speed, or the Cooling Low Speed setting if configured for a variable speed blower. The Cooling High Minimum DCV setting should be set to a value which provides the quantity of outdoor air required for makeup air that is exhausted from the space when the unit blower is operating at high speed, or the Cooling High Speed setting if configured for a variable speed blower. These values must be less than the Cooling Low Minimum Position and Cooling High Minimum Position settings respectively.

When the Space CO_2 is below the CO_2 Setpoint, the economizer damper is commanded to the Cooling Low Minimum DCV or Cooling High Minimum DCV setting depending on the blower speed as described above. As Space CO_2 rises above the CO_2 Setpoint, the economizer damper is opened proportionally between the Cooling Low Minimum DCV or Cooling High Minimum DCV setting and the Cooling Low Minimum Position or Cooling High Minimum Position setting. When Space CO_2 is above the CO_2 setpoint by more than the CO_2 Band, the economizer damper is commanded to the Cooling Low Minimum Position or Cooling High Minimum Position setting.



4.7 Force Mode

The unit operation can be manually forced through the onboard menu or from the web interface by setting Force Mode Enable to true. Force Mode allows the user to select from a set of predefined modes. Depending on the Force Mode selected, the controller commands the necessary outputs based on the unit configuration.

Name	Description
Off	All controlled equipment is commanded off.
Vent	Blower is command on.
Low Cooling	The unit is operated in first stage cooling.
High Cooling	The unit is operated in second stage cooling
Low Heating	The unit is operated in first stage heating.
High Heating	The unit is operated in second stage heating.
Dehumidification	The unit is operated in first stage dehumidification.

Force Mode is intended to be used for short time periods for start-up or test/balance procedures. If the unit has been in a Force Mode for longer than 30 minutes without any changes being made to any of the Force Mode settings, the unit returns to normal operation.

4.7.1 Force Mode Enable

The unit enters the selected Force Mode when Force Mode Enable is set to true and the Emergency Shutdown Alarm is not active. All other alarms and time delays are ignored when Force Mode is enabled.

4.7.2 Force Off Mode

In Force Off Mode, all controller outputs are commanded off. SCR Heat, Blower Speed, Economizer Damper, and Hot Gas Reheat Valve are all commanded to 0%.

4.7.3 Force Vent Mode

In Force Vent Mode, all heat stages, compressors, reversing valves, and condenser fans are commanded off. The blower is commanded based on the Fan Type unit configuration setting.

Fan Type	Name	Blower Stage 1	Blower Stage 2	Blower Speed
0	One Speed	On	Off	0%
1	Two Speed	On*	Off*	0%
2	Variable	On	Off	User Defined

* If the user defined Force Mode Blower Speed is set equal to 100, Blower Stage 1 is commanded off and Blower Stage 2 is commanded on. Otherwise, Blower Stage 1 is commanded on and Blower Stage 2 is commanded off to simulate normal Vent Mode blower operation.

The Economizer Damper is commanded to the user defined Force Mode Economizer Damper Position setting. The SCR Heat and Hot Gas Reheat Valve are commanded to 0%.

The Exhaust Fan is commanded on when the Economizer Damper is commanded open more than the configured Vent Minimum Position.

4.7.4 Force Low Cooling Mode

In Force Low Cooling Mode, all heat stages are commanded off. If the unit is configured as a heat pump, the reversing valves are energized. The compressors are commanded based on the number of compressors and the number of cooling stages configured. During Force Mode, Lead / Lag priority rotation logic is ignored. Condenser Fan Enable 1 output is commanded on and Condenser Fan Enable 2 Output is commanded off.

Compressors	Cooling Stages	Compressor 1	Compressor 2 / Stage 2	Compressor 3	Compressor 4
1	1	On	Off	Off	Off
1	2	On	Off	Off	Off
2	2	On	Off	Off	Off
4	2	On	On	Off	Off

The blower is commanded based on the Fan Type unit configuration setting.

Fan Type	Name	Blower Stage 1	Blower Stage 2	Blower Speed
0	One Speed	On	Off	0%
1	Two Speed	On	Off	0%
2	Variable	On	Off	Cooling Low Fan Speed

The Economizer Damper is commanded to the configured Cooling Low Minimum Position. The SCR Heat and Hot Gas Reheat Valve are commanded to 0%.

4.7.5 Force High Cooling Mode

In Force High Cooling Mode, all heat stages are commanded off. If the unit is configured as a heat pump, the reversing valves are energized. The compressors are commanded based on the number of compressors and the number of cooling stages configured. During Force Mode, Lead / Lag priority rotation logic is ignored. The Condenser Fan Enable 1 output and Condenser Fan Enable 2 Output are commanded on.

Compressors	Cooling Stages	Compressor 1	Compressor 2 / Stage 2	Compressor 3	Compressor 4
1	1	On	Off	Off	Off
1	2	On	On	Off	Off
2	2	On	On	Off	Off
4	2	On	On	On	On

The blower is commanded based on the Fan Type unit configuration setting.

Fan Type	Name	Blower Stage 1	Blower Stage 2	Blower Speed
0	One Speed	On	Off	0%
1	Two Speed	Off	On	0%
2	Variable	On	Off	Cooling High Fan Speed

The Economizer Damper is commanded to the configured Cooling High Minimum Position. The SCR Heat and Hot Gas Reheat Valve are commanded to 0%.

4.7.6 Force Low Heating Mode

If the unit is configured as a heat pump, the reversing valves are de-energized and the auxiliary heat stages are commanded off. The compressors are commanded based on the number of compressors and the number of cooling stages configured. During Force Mode, Lead / Lag priority rotation logic is ignored. Condenser Fan Enable 1 output is commanded on and Condenser Fan Enable 2 Output is commanded off.

Compressors	Heating Stages	Compressor 1	Compressor 2 / Stage 2	Compressor 3	Compressor 4
1	1	On	Off	Off	Off
1	2	On	Off	Off	Off
2	2	On	Off	Off	Off
4	2	On	On	Off	Off

If the unit is not a heat pump, the heating stages and SCR heat output are commanded to first stage heating based on unit configurations.

SCR Heat Installed	Heating Stages	Heat Stage 1	Heat Stage 2	SCR Heat
No	0	Off	Off	0%
No	1	On	Off	0%
No	2	On	Off	0%
Yes	N/A	Off	Off	50%

The blower is commanded based on the Fan Type unit configuration setting.

Fan Type	Name	Blower Stage 1	Blower Stage 2	Blower Speed
0	One Speed	On	Off	0%
1	Two Speed	Off	On	0%
2	Variable	On	Off	Heating Low Fan Speed

The Economizer Damper is commanded to the configured Heating Low Minimum Position. The Purge Valve and Hot Gas Reheat Valve are commanded closed.

4.7.7 Force High Heating Mode

If the unit is configured as a heat pump, the reversing valves are de-energized and the auxiliary heat stages are commanded off. The compressors are commanded based on the number of compressors and the number of cooling stages configured. During Force Mode, Lead / Lag priority rotation logic is ignored. Condenser Fan Enable 1 output and Condenser Fan Enable 2 Output are commanded On.

Compressors	Heating Stages	Compressor 1	Compressor 2 / Stage 2	Compressor 3	Compressor 4
1	1	On	Off	Off	Off
1	2	On	On	Off	Off
2	2	On	On	Off	Off
4	2	On	On	On	On

If the unit is not a heat pump, the heating stages and SCR heat output are commanded to first stage heating based on unit configurations.

SCR Heat Installed	Heating Stages	Heat Stage 1	Heat Stage 2	SCR Heat
No	0	Off	Off	0%
No	1	On	Off	0%
No	2	On	On	0%
Yes	N/A	Off	Off	100%

The blower is commanded based on the Fan Type unit configuration setting.

Fan Type	Name	Blower Stage 1	Blower Stage 2	Blower Speed
0	One Speed	On	Off	0%
1	Two Speed	Off	On	0%
2	Variable	On	Off	Heating High Fan Speed

The Economizer Damper is commanded to the configured Heating High Minimum Position. The Purge Valve and Hot Gas Reheat Valve are commanded closed.

4.7.8 Force Dehumidification Mode

In Force Dehumidification Mode, all heat stages are commanded off and SCR heat is commanded to 0%. The compressors are commanded based on the number of compressors. During Force Mode, Lead / Lag priority rotation logic is ignored. Condenser Fan Enable 1 output is commanded on and Condenser Fan Enable 2 Output is commanded off.

Compressors	Compressor 1	Compressor 2 / Stage 2	Compressor 3	Compressor 4
1	On	Off	Off	Off
2	On	Off	Off	Off
4	On	On	Off	Off

The blower is commanded based on the Fan Type unit configuration setting.

Fan Type	Name	Blower Stage 1	Blower Stage 2	Blower Speed
0	One Speed	On	Off	0%
1	Two Speed	On	Off	0%
2	Variable	On	Off	Cooling Low Fan Speed

The Reheat Purge Valve is energized, and the Modulating Hot Gas Reheat Valve is commanded to the user defined Force Mode Reheat Valve position. The Economizer Damper is commanded to the configured Cooling Low Minimum Position.

5 DCV Minimum Economizer Position Settings

On units that have a Space CO_2 sensor installed and the Economizer configuration parameter is set to Economizer With CO_2 Control, Demand Control Ventilation (DCV) is used to reduce the quantity of outdoor air brought into the building through the economizer damper from the scheduled design minimum. A Space CO_2 value below the CO_2 Setpoint indicates that there are fewer occupants in the space, and that a reduced quantity of outdoor air is needed to maintain good indoor air quality. To produce this result, the DCV Minimum Economizer Position settings must be set to values that are less than the corresponding Minimum Economizer Position settings.

- Vent Minimum DCV < Vent Minimum Position
- Cooling Low Minimum DCV < Cooling Low Minimum Position
- Cooling High Minimum DCV < Cooling High Minimum Position
- Heating Low Minimum DCV < Heating Low Minimum Position
- Heating High Minimum DCV < Heating High Minimum Position

If an invalid economizer position setting is entered, the program automatically adjusts the DCV Minimum Economizer setting to a value equal to the corresponding Minimum Economizer Position setting.

6 Alarms

6.1 Unit Alarms

Unit alarms are generated to alert the user about potential problems and to help guide in troubleshooting unit operation.

Blower Off Alarm:

The Blower Off Alarm is activated if the blower proving switch does not provide a signal that the blower is running within 60 seconds of the blower being commanded to operate. If the blower proving switch indicates that the blower is running and the Blower Proving Switch input becomes de-energized, the alarm is activated without delay. The alarm is de-activated when the blower is no longer commanded, or when the blower proving switch indicates that the blower is running. There is a 10 second delay before the alarm is de-activated. The Blower Off Alarm is disabled when the Control Mode is set to TSTAT instead of DDC.

When the Blower Off Alarm is active, all heating and cooling is disabled.

Emergency Shutdown Alarm:

The Emergency Shutdown Alarm is activated when 24VAC is not present at the Emergency Shutdown input on the controller. The alarm is de-activated when 24VAC has been present at the controller input for more than 10 seconds.

When the Emergency Shutdown Alarm is active, all outputs are commanded off.

Compressor Pressure Switch Alarms:

Each compressor has an associated pressure switch alarm. The Compressor Pressure Switch Alarm is activated without delay if 24VAC is not present at the controller input prior to starting the compressor. When the compressor is initially commanded to operate, the Compressor Pressure Switch Alarm is delayed for 2 minutes to allow the refrigerant circuit to stabilize without false alarms. After the start up time, the alarm is activated without delay. The alarm is de-activated when the 24VAC has been present at the pressure switch input for more than 10 seconds.

If the alarm is generated 5 times within a 4 hour time period, the alarm must be manually reset by an operator.

When a Compressor Pressure Switch Alarm is active, the associated compressor is commanded off.

Dirty Filter Alarm:

The Dirty Filter Alarm can be activated in two ways. The alarm is activated when 24VAC is present on the Dirty Filter Switch input at the controller and is de-activated when 24VAC is not present at the input. If the Dirty Filter Timer is configured with a value greater than 0, the alarm will also be activated when the Filter Run Time exceeds the Dirty Filter Timer setting. The alarm is de-activated when the Filter Run Time is reset to 0 by the user.

High Supply Air Temperature Alarm:

The High Supply Air Temperature Alarm is activated when the Supply Air Temperature rises above the Supply High Alarm Limit. The alarm is de-activated when the Supply Air Temperature falls below the Supply Heating High Limit.

Low Supply Air Temperature Alarm:

The Low Supply Air Temperature Alarm is activated when the Supply Air Temperature falls below the Supply Low Alarm Limit. The alarm is de-activated when the Supply Air Temperature rises above the Supply Cooling Low Limit.

High Space Humidity Alarm:

The High Space Humidity Alarm is activated when the Space Humidity rises above the Space Humidity Setpoint by more than the Space Humidity Alarm Offset for longer than the Space Humidity Alarm Delay setting. The alarm is de-activated when the Space Humidity falls below the Space Humidity Setpoint.

Mechanical Cooling Alarm:

The Mechanical Cooling Alarm is activated if the Supply Air Temperature is not reduced by more than the Mechanical Cooling Alarm Offset within the Mechanical Failure Alarm Delay when one or more compressors have been commanded to run. The alarm is de-activated once the Supply Air Temperature drops by an amount equal to the Mechanical Cooling Alarm Offset, or if compressors are no longer commanded to run.

Mechanical Heating Alarm:

The Mechanical Heating Alarm is activated if the Supply Air Temperature is not increased by more than the Mechanical Heating Alarm Offset within the Mechanical Failure Alarm Delay when one or more heating stages have been commanded to run. The alarm is de-activated once the Supply Air Temperature increases by an amount equal to the Mechanical Heating Alarm Offset, or if heating stages are no longer commanded to run.

Space Temperature Alarm:

The Space Temperature Alarm is activated if the Space Temperature falls below the Active Heating Setpoint or rises above the Active Cooling Setpoint by more than the Space Temperature Alarm Offset value for longer than the Space Temperature Alarm Delay. The alarm is de-activated when the Space Temperature is above the Active Heating Setpoint and is below the Active Cooling Setpoint

High CO_2 Alarm:

The High CO_2 Alarm is activated when the Space CO_2 is above the CO_2 Setpoint by more than CO_2 Alarm Offset for longer than the CO_2 Alarm Delay. The alarm is de-activated when the Space CO_2 falls below the CO_2 setpoint.

Gas Furnace Board 1 Alarm:

The Gas Furnace Board 1 Alarm indicates that the Furnace Board Feedback 1 input at the controller is not receiving the expected signal from the furnace board on units that have the Unit Type configuration as A/C With Gas Heat. The alarm is activated if 24VAC is not present on the Furnace Board Feedback 1 input at the controller after Heat Stage 1 has been commanded to operate for longer than 1 minute, or if 24VAC is present on the Furnace Board Feedback 1 input after Heat Stage 1 has been commanded off for longer than 3 minutes. The alarm is de-activated when the feedback signal matches the expected state.

Gas Furnace Board 2 Alarm:

The Gas Furnace Board 2 Alarm indicates that the Furnace Board Feedback 2 input at the controller is not receiving the expected signal from the furnace board on units that have the Unit Type configuration as A/C With Gas Heat, and the Number Of Furnaces is set equal to 2. The alarm is activated if 24VAC is not present on the Furnace Board Feedback 2 input at the controller after Heat Stage 1 has been commanded to operate for longer than 1 minute, or if 24VAC is

present on the Furnace Board Feedback 2 input after Heat Stage 1 has been commanded off for longer than 3 minutes. The alarm is de-activated when the feedback signal matches the expected state.

Defrost Cycle Incomplete Alarm:

The Defrost Cycle Incomplete Alarm is activated if the Unit Type configuration is set as Heat Pump, Defrost Switch 1 or Defrost Switch 2 indicate the presence of frost on the coils, and the previous defrost cycle was not completed before the maximum allowed defrost time (10 minutes) elapsed. This alarm is de-activated when the defrost switches no longer indicate the presence of frost on the coils, or the previous defrost cycle was successfully completed in less than 10 minutes.

Circuit 1 Low Suction Pressure Alarm:

The Circuit 1 Low Suction Pressure Alarm is activated if Hot Gas Reheat is installed, compressor 1 is commanded on, the Circuit 1 Suction Pressure Sensor Missing Alarm is not active, and the System 1 Suction Pressure drops below 75 PSI for more than 2 minutes. This alarm is de-activated when the System 1 Suction Pressure rises above 155psi.

Circuit 1 Suction Pressure Sensor Missing Alarm:

The Circuit 1 Suction Pressure Sensor Missing Alarm is activated if Hot Gas Reheat is installed and the controller detects an invalid sensor value. The alarm is de-activated once a valid reading is detected.

When the Circuit 1 Suction Pressure Sensor Missing Alarm is active, Dehumidification Mode is locked out.

Circuit 2 Low Suction Pressure Alarm:

The Circuit 2 Low Suction Pressure Alarm is activated if Hot Gas Reheat is installed, the Number Of Suction Pressure Sensors is set to 2, compressor 2 is commanded on, the Circuit 2 Suction Pressure Sensor Missing Alarm is not active, and the System 2 Suction Pressure drops below 75 PSI for more than 2 minutes. This alarm is de-activated when the System 2 Suction Pressure rises above 155psi.

Circuit 2 Suction Pressure Sensor Missing Alarm:

The Circuit 2 Suction Pressure Sensor Missing Alarm is activated if Hot Gas Reheat is installed, the Number Of Suction Pressure Sensors is set to 2, and the controller detects an invalid sensor value. The alarm is de-activated once a valid reading is detected.

Circuit 1 Head Pressure Sensor Missing Alarm:

The Circuit 1 Head Pressure Sensor Missing Alarm is activated if Hot Gas Reheat is installed and the controller detects an invalid sensor value. The alarm is de-activated once a valid reading is detected.

When the Circuit 1 Head Pressure Sensor Missing Alarm is active, the low ambient cycling of condenser fans associated with circuit 1 is disabled.

Circuit 2 Head Pressure Sensor Missing Alarm:

The Circuit 2 Head Pressure Sensor Missing Alarm is activated if Hot Gas Reheat is installed, Number Of Compressors is set to a value greater than 1, and the controller detects an invalid sensor value. The alarm is de-activated once a valid reading is detected.

When the Circuit 2 Head Pressure Sensor Missing Alarm is active, the low ambient cycling of the condenser fans associated with circuit 2 is disabled.

EVD Communication Offline Alarm:

The EVD Communication Offline Alarm is activated if Hot Gas Reheat is installed and the Hot Gas Reheat Expansion Module is not communicating with the Main Controller. The alarm is de-activated when the module communication is restored.

When the EVD Communication Offline Alarm is active, Dehumidification Mode is locked out.

6.2 Economizer Fault Detection and Diagnostics Faulty Alarms

California Energy Commission (CEC) Building Energy Efficiency Standard Title 24 Part 6 requires the detection of the following faults related to economizer operation. Where applicable, each of the alarms in this section list which economizer fault category that they represent.

A. Air Temperature Sensor Failure/Fault
B. Not Economizing When It Should
C. Economizing When It Should Not
D. Damper Not Modulating
E. Excess Outdoor Air

Space Temperature Sensor Missing Alarm:

The Space Temperature Sensor Missing Alarm is activated when the unit is configured to have the sensor wired to the on-board controller, and the controller does not detect that a sensor is installed or if the Space Temperature value is less than -200 or greater than 200. The alarm is de-activated once a valid reading on the Space Temperature input is received. This alarm is ignored if the control source is set to TSTAT and the selected Economizer Enable is not set to Differential Drybulb or Differential Enthalpy.

Economizer FDD Fault Category: A

When the Space Temperature Sensor Missing Alarm is active, all outputs are commanded off.

Supply Air Temperature Sensor Missing Alarm:

The Supply Air Temperature Sensor Missing Alarm is activated when the controller does not detect that a sensor is installed. The alarm is de-activated once a valid reading on the Supply Air Temperature input is received.

Economizer FDD Fault Category: A, B

When the Supply Air Temperature Sensor Missing Alarm is active, all outputs are commanded off.

Outdoor Air Temperature Sensor Missing Alarm:

The Outdoor Air Temperature Sensor Missing Alarm is activated when the unit is configured to have the sensor wired to the on-board controller, and the controller does not detect that a sensor is installed or if the Outdoor Air Temperature value is less than -200 or greater than 200. The alarm is de-activated once a valid reading on the Outdoor Air Temperature input is received.

Economizer FDD Fault Category: A, B

When the Outdoor Air Temperature Sensor Missing Alarm is active, the Outdoor Air Temperature value is removed from the Cooling Lockout, Heating Lockout, and Heat Pump Heating Lockout calculations and Economizer Enable is set to false.

Outdoor Air Humidity Sensor Missing Alarm:

The Outdoor Air Humidity Sensor Missing Alarm is activated when the Economizer Enable is set to Fixed Enthalpy or Differential Enthalpy and the controller detects an invalid sensor value. The alarm is de-activated once a valid reading is detected.

Economizer FDD Fault Category: A

When the Outdoor Air Humidity Sensor Missing Alarm is active the Economizer Enable uses either Fixed Drybulb or Differential Drybulb as the enable source until the alarm is de-activated.

Space Humidity Sensor Missing Alarm:

The Space Humidity Sensor Missing Alarm is activated when the Economizer Enable is set to Differential Enthalpy or if Hot Gas Reheat is installed and the controller detects an invalid sensor value. The alarm is de-activated once a valid reading is detected.

Economizer FDD Fault Category: A

When the Space Humidity Sensor Missing Alarm is active the Economizer Enable uses Differential Drybulb as the enable source until the alarm is de-activated.

CO_2 Sensor Missing Alarm:

The CO_2 Sensor Missing Alarm is activated when the Economizer configuration is set equal to Economizer With CO_2 Control and the controller detects an invalid sensor value. The alarm is de-activated once a valid reading is detected.

Economizer FDD Fault Category: E

When the CO_2 Sensor Missing Alarm is active, demand control ventilation functions cannot be used for economizer damper control.

Economizer Feedback Missing Alarm:

The Economizer Feedback Missing Alarm is activated when the Economizer configuration is set equal to Economizer Installed or Economizer With CO_2 Control, but no voltage is present at the Economizer Feedback input. This indicates that the actuator is not properly wired, the actuator is not installed, the wire harness is broken, or the actuator is failed. The alarm is de-activated when the controller input detects a voltage signal from the actuator.

Economizer FDD Fault Category: B, C, D

Economizer Supply Air Temperature High Alarm:

The Economizer Supply Air Temperature High Alarm is activated when the unit is operating in Economizer Cooling Mode with no compressors, the economizer damper is commanded more than 90% open, and the Supply Air Temperature is not within 15°F of the Outdoor Air Temperature for longer than 10 minutes.

Economizer FDD Fault Category: B, D

Economizer Damper Open Alarm:

The Economizer Damper Open Alarm is activated when the Economizer Feedback signal is greater than the Economizer Position command by more than 10% for longer than 150 seconds. The alarm is de-activated once the Economizer Feedback signal is within acceptable range. This alarm is disabled when the Economizer Feedback Missing Alarm is active.

Economizer FDD Fault Category: C, D, E

Economizer Damper Closed Alarm:

The Economizer Damper Closed Alarm is activated when the Economizer Feedback signal is less than the Economizer Position command by more than 10% for longer than 150 seconds. The alarm is de-activated once the Economizer Feedback signal is within acceptable range. This alarm is disabled when the Economizer Feedback Missing Alarm is active.

Economizer FDD Fault Category: B, D

6.3 Modbus Enabled Blower Motor Alarms

The Modbus enabled blower motor alarms are only available on units that have applicable blower motors installed. These alarms are only displayed, and logged for troubleshooting or motor evaluation purposes. No specific action is taken by the DDC Controller based on the status of these alarms.

Unit Models DRX180 – DRX300

Name	Description
Blower Motor Phase Failure	Phase failure (3-Phase devices) or line under voltage (single-Phase devices).
Blower Motor Blocked	Motor prevented from rotating.
Blower Motor Mains Undervolt	Line voltage under voltage.
Blower Motor Mains Overvolt	Line voltage overvoltage.
Blower Motor DC-Link Overvolt	DC-link over voltage.
Blower Motor DC-Link Undervolt	DC-link under voltage.
Blower Motor Superheat	Motor overheating.
Blower Motor IC Superheat	Inside electronics overheating.
Blower Motor Out Stage Superheat	Output stage overheating.
Blower Motor Hall Sensor Error	Hall sensor error.
Blower Motor Communication Error	Communication error between master controller and slave controller.
Blower Motor Generic Error	General error is set for every error.
Blower Motor Out Stage High Temp	Output stage temperature high.
Blower Motor IC High Temp	Temperature inside electronics high.
Blower Motor High Temp	Motor temperature high.
Blower Motor DC-Link Volt Low	DC-link voltage low.
Blower Motor Limit Mains Power	Power limiter in action.
Blower Motor Limit Mains Current	Current limitation in action.
Blower Motor Brake Mode	Braking mode: set in the case of external drive in opposite direction at high speed.
Blower Motor Cable Break	Cable break at analog input or PWM input for the analog set value input.
Blower Motor Ice Protection	Ice protection mode in action.
Blower Motor Heating Motor Stop	Motor stopped due to overheating.
Blower Motor Speed Under Limit	Actual speed is lower than run monitoring speed limit.
Blower Motor DC-Voltage High	DC-link voltage high.
Blower Motor Supply Voltage High	Line voltage high.
Blower Motor Line Impedance High	Line impedance too high (DC-link voltage unstable).

Unit Models DRX036 – DRX150

Name	Description
Blower Motor Analog Control Signal Missing	The 0-10Vdc speed control signal is missing at the blower motor.
Blower Motor Digital Control Signal Missing	The 24VAC speed tap selection signal is missing at the blower motor.
Blower Motor Over Temperature	An over temperature alarm has been indicated by the blower motor.
Blower Motor MCU Fault	An MCU fault alarm has been indicated by the blower motor.
Blower Motor Hall Effect Sensor Fault	A hall effect sensor failure has been detected by the blower motor.
Blower Motor Hardware Failure	A generic hardware failure has been indicated by the blower motor.
Blower Motor IPM FO Hardware Fault	An IPM FO hardware protection fault has been indicated by the blower motor.
Blower Motor Locked Rotor Fault	A locked rotor fault has been indicated by the blower motor.

7 Trend Logging

7.1 Trend Logging User Settings

NAME	LCD DISPLAY	DESCRIPTION	DEFAULT	RANGE
Log Export				
Sample Time	Sample Time	Time interval between log samples.	2.0 min	0.1-60.0 min
Memory Type	Memory Type	Select from Internal Flash Memory and USB.	Internal	N/A
Confirm	Confirm	When this setting is set to Yes, the trend log in the controller is exported to a *.csv file in the selected memory type.	No	N/A

7.2 Trend Log Values

The application logs 72 predetermined variables at the user defined Sample Time. The controller is capable of storing 4MB of trend log data. When the available trend log storage space is full, the oldest trend data values are replaced by each new value recorded. To calculate the length of time of trend log data that can be stored locally on the controller, the following equation can be used.

Days Of Trend Log Storage = 24,105 * (Sample Time / 1,440)

At the default Sample Time of 2 minutes, the controller will retain 33 days of trend log data.

The following table lists the variables which are recorded in the trend log.

ITEM	NAME	DESCRIPTION
1	ActiveCoolingSP	Active Space Temperature Cooling Setpoint
2	ActiveHeatingSP	Active Space Temperature Heating Setpoint
3	ActiveHumiditySP	Active Space Humidity Setpoint
4	ActiveSATSP	Active Supply Air Temperature setpoint
5	AlarmDO	Alarm Digital Output (FALSE = No active alarms, TRUE = 1 or more active alarms)
6	BlowerProvingSw	Blower Proving Switch Status (FALSE = Off, TRUE = On)
7	BlowerSpeed	Blower Speed Command (FALSE = Off, TRUE = On)
8	BlowerStage1	Blower Stage 1 Command (FALSE = Off, TRUE = On)
9	BlowerStage2	Blower Stage 2 Command (FALSE = Off, TRUE = On)
10	C1RunTime	Compressor 1 Calculated Runtime
11	C2RunTime	Compressor 2 Calculated Runtime
12	C3RunTime	Compressor 3 Calculated Runtime
13	C4RunTime	Compressor 4 Calculated Runtime
14	CO_2	Space CO_2
15	CompPresSw1	Compressor 1 Pressure Switch Status (FALSE = Alarm condition, TRUE = Normal condition)
16	CompPresSw2	Compressor 2 Pressure Switch Status (FALSE = Alarm condition, TRUE = Normal condition)
17	CompPresSw3	Compressor 3 Pressure Switch Status (FALSE = Alarm condition, TRUE = Normal condition)
18	CompPresSw4	Compressor 4 Pressure Switch Status (FALSE = Alarm condition, TRUE = Normal condition)
19	Compressor1	Compressor 1 Command (FALSE = Off, TRUE = On)
20	Compressor2	Compressor 2 Command (FALSE = Off, TRUE = On)
21	Compressor3	Compressor 3 Command (FALSE = Off, TRUE = On)
22	Compressor4	Compressor 4 Command (FALSE = Off, TRUE = On)
23	CondFan1	Condenser Fan 1 Relay Output Status (FALSE = Off, TRUE = On)
24	CondFan2	Condenser Fan 2 Relay Output Status (FALSE = Off, TRUE = On)
25	CoolingLockout	Cooling Mode Lockout (FALSE = Unit can enter Cool Mode, TRUE = Unit cannot enter Cool Mode)
26	CoolingStage	Current Cooling Stage
27	DefrostEnabled	Defrost Enabled (FALSE = Unit not defrosting, TRUE = Defrost cycle is active)
28	DefrostSwitch1	Defrost Switch status for circuit 1 (FALSE = Defrost not needed, TRUE = Defrost needed)
29	DefrostSwitch2	Defrost Switch status for circuit 2 (FALSE = Defrost not needed, TRUE = Defrost needed)
30	DehumLockout	Dehumidification Lockout (FALSE = Unit can dehumidify, TRUE = Unit cannot dehumidify)
31	DehumStage	Current Dehumidification Stage
32	DirtyFilterSw	Dirty Filter Switch Status (FALSE = Filters clean, TRUE = Filters dirty)

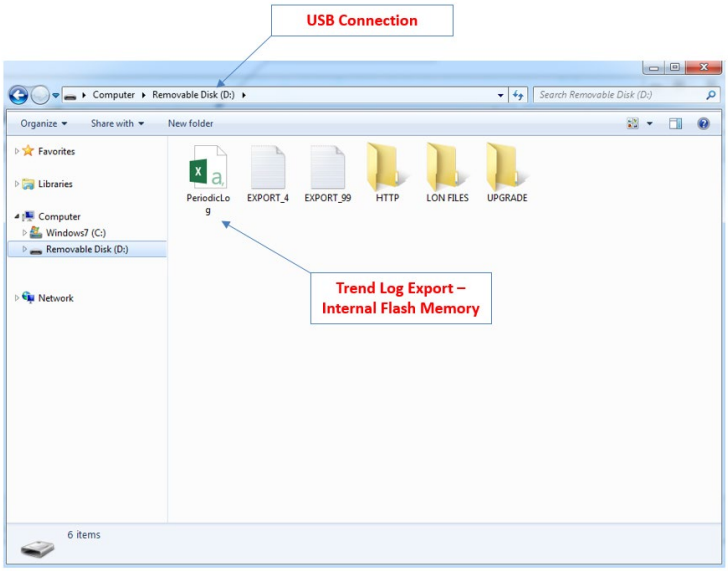
ITEM	NAME	DESCRIPTION
33	EconDamperPosSet	Economizer Damper Position Command
34	EconomizerEnable	Economizer Enable Status (FALSE = Free cooling not available, TRUE = Free cooling available)
35	EconomizerFeedback	Economizer Damper Position Feedback
36	EffCoolingLoad	Effective Cooling Load
37	EffHeatingLoad	Effective Heating Load
38	EmergencyShutdown	Emergency Shutdown Status (FALSE = Emergency shutdown alarm active, TRUE = Normal operation)
39	ExhaustFanEna	Exhaust Fan Command (FALSE = Off, TRUE = On)
40	FilterRunTime	Filters Calculated Runtime
41	HeadPres1	Head Pressure for circuit 1
42	HeadPres2	Head Pressure for circuit 2
43	HeatingStage	Current Heating Stage
44	HeatLockout	Heating Lockout (FALSE = Unit can enter Heat Mode, TRUE = Unit cannot enter Heat Mode)
45	HeatPumpHeatLockout	Heat Pump Heating Lockout (FALSE = Unit can use heat pump heating, TRUE = Unit cannot use heat pump heating)
46	HeatStage1	Heat Stage 1 Command (FALSE = Off, TRUE = On)
47	HeatStage2	Heat Stage 2 Command (FALSE = Off, TRUE = On)
48	HVACMode	0 = Off, 1 = Vent, 2 = Cooling, 3 = Econ Cooling, 4 = Heating, 5 = Dehumidification, 6 = Force
49	IICFeedback1	IIC Furnace Board 1 Feedback (FALSE = No call for blower, TRUE = Call for blower)
50	IICFeedback2	IIC Furnace Board 2 Feedback (FALSE = No call for blower, TRUE = Call for blower)
51	LeadCompressor	0 = Compressor 1, 1 = Compressor 2, 2 = Compressors 1&2, 3 = Compressors 3&4
52	LoadShedding	Load Shedding Input Status (FALSE = No call for load shedding, TRUE = Call for load shedding)
53	LowAmbient1	Low Ambient Condenser Fan Control 10V = On 0V = Off
54	LowAmbient2	Low Ambient Condenser Fan Control 10V = On 0V = Off
55	OutdoorAirHum	Outdoor Air Humidity
56	OutdoorAirTemp	Outdoor Air Temperature
57	OutdoorEnthalpy	Outdoor Enthalpy
58	ReheatPurgeValve	Purge Valve Status (FALSE = Open, TRUE = Closed)
59	ReheatValvePos	Reheat Valve position feedback from EVD module
60	ReheatValvePosSet	Reheat Valve position command
61	RemoteStartStop	Remote Occupancy Input Status (FALSE = Off, TRUE = On)
62	RevValve1	Reversing Valve 1 Command (FALSE = Heating/Not Used, TRUE = Cooling)
63	RevValve2	Reversing Valve 2 Command (FALSE = Heating/Not Used, TRUE = Cooling)
64	ScheduleMode	0 = Unoccupied, 1 = Occupied, 2 = Push Button Override, 3 = Holiday Unoccupied, 4 = Holiday Occupied, 5 = Force Unoccupied, 6 = Force Occupied, 7 = TSTAT, 8 = Optimized Start, 9 = Optimized Stop
65	SCRHeat	SCR Heat Command
66	SlideAdjustConv	Setpoint adjust request from space temperature sensor
67	SpaceEnthalpy	Space Enthalpy
68	SpaceHumidity	Space Humidity
69	SpaceTemp	Space Temperature
70	SuctionPres1	Suction Pressure for circuit 1
71	SuctionPres2	Suction Pressure for circuit 2
72	SupplyAirTemp	Supply Air Temperature

7.3 Exporting Trend Logs

The trend logs can be exported for analysis and long term storage using the Settings → Export / Reset menu in the web interface or onboard display. The trend log file can be exported directly to a USB drive inserted into the port located under the front panel of the controller, or can be exported to internal memory on the controller. The trend log data is exported as a *.csv file named PeriodicLog.csv and a full log file will be approximately 10MB in size. Allow up to 5 minutes for a full export of the trend log data.

Note: Any USB connection between the controller and a PC must be unplugged prior to performing a trend log export to internal memory.

A trend log file that has been exported to internal controller memory can be copied to a PC by direct connection with a USB cable. When exporting, any previously exported PeriodicLog.csv file is overwritten by the new file.



The PeriodicLog.csv file separates each trend variable into its own column. The time stamp at which each log entry was recorded is populated in the first column of the file. If the controller reboots for any reason, a log entry is recorded when the controller restarts and the event column is populated with “Boot”.

PeriodicLog.csv

Controller Reboot

	A	B	C	D	E	F
1	TIME	EVENT	OutdoorAirTemp	OutdoorAirHum	CO2	SpaceTemp
2	2019-04-17T08:26:10-05:00	Boot	59.9724	54.93	0	66.786888
3	2019-04-17T08:28:10-05:00		59.9752	54.89	0	66.783488
4	2019-04-17T08:30:10-05:00		59.9724	54.89	0	66.783488
5	2019-04-17T08:32:10-05:00		59.9724	54.88	0	66.783488
6	2019-04-17T08:33:38-05:00	Boot	59.9752	54.825	0	66.783488
7	2019-04-17T08:35:38-05:00		59.969544	54.89	0	66.783488
8	2019-04-17T08:37:38-05:00		59.969544	54.88	0	66.783488
9	2019-04-17T08:39:38-05:00		59.969544	54.87	0	66.783488
10	2019-04-17T08:40:41-05:00	Boot	59.966688	54.925	0	66.769856
11	2019-04-17T08:42:41-05:00		59.966688	54.885	0	66.783488
12	2019-04-17T08:44:41-05:00		59.969544	54.895	0	66.783488

Timestamp

7.4 View Live Trend Data

Live trend data can be viewed in the web interface for short term live analysis. After the page has been refreshed or navigated from, the live trend data is deleted. Refer to the User Interface section of this document for additional information.

7.5 View Historical Trend Data

Historical trend data can be viewed in the web interface to quickly view and compare available trend log data. Refer to the User Interface section of this document for additional information.

8 TSTAT Mode Unit Operation

When the Control Mode setting is configured as TSTAT control, the space temperature control staging logic in the DDC application is replaced with “G”, “Y1”, “Y2”, “W1”, “W2”, and “O” inputs from a traditional thermostat. The features and functions of the DDC application listed below are disabled to allow for more traditional TSTAT control.

- The internal controller time schedule is ignored and the Schedule Mode variable is set to TSTAT.
- The internal space cooling and heating user adjustable setpoints are ignored.
- The space temperature sensor alarms are disabled.
- The blower off alarm is disabled.
- Dehumidification mode is locked out.
- Remote occupancy input functionality is disabled.
- Load shedding input functionality is disabled.
- The dirty filter switch input functionality is disabled.

Other features and functions of the controller are still functional when TSAT control is selected.

- All sensor readings are still displayed, and trend log values are still collected.
- The secondary Supply Air Temperature low limit control is still used to prevent coil freezing.
- Outdoor Air Temperature heating and cooling lockouts are still calculated.
- The Emergency Shutdown input on the controller remains functional and will turn the unit off when the input is de-energized.
- On Heat Pump units, Defrost Mode is enabled in the same way that it is enabled during DDC control using Defrost Switch 1 and Defrost Switch 2 inputs.

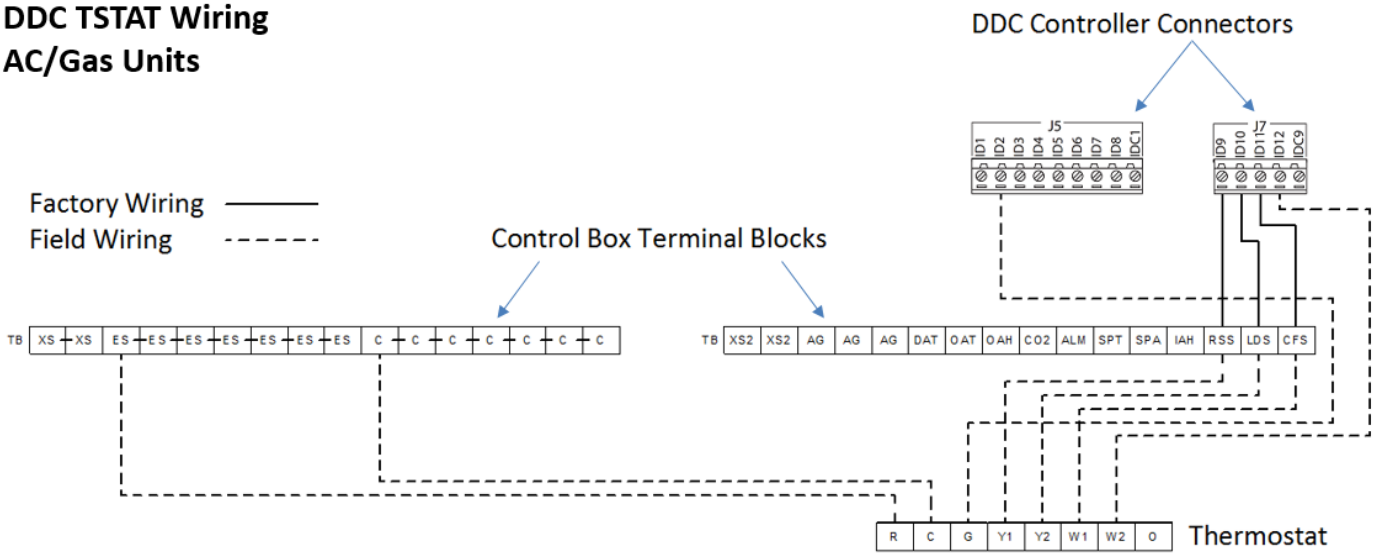
8.1 TSTAT Wiring

In order to utilize TSTAT Mode, the DDC controller factory wiring must be modified and field wiring must be added.

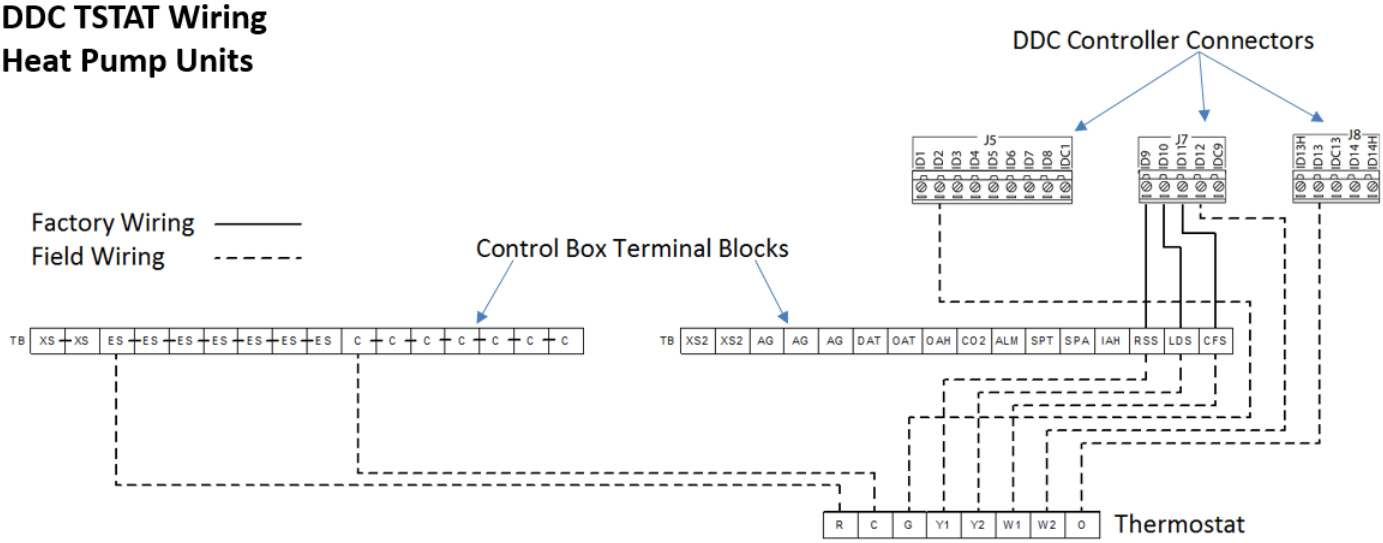
The wiring modification steps are as follows:

1. Turn off the unit’s supply power.
2. Remove the existing wire from J5-ID2 on the DDC controller, cut the wire below the stripping, and add a wire nut to the end of the wire.
3. Wire the thermostat to the controller/terminal blocks according to the appropriate DDC TSTAT wiring diagram.
4. Turn on the unit’s supply power.

DDC TSTAT Wiring
AC/Gas Units



DDC TSTAT Wiring
Heat Pump Units



8.2 TSTAT HVAC Mode Operation Tables

AC Electric Heat and AC Gas Heat; 2 Stage Cooling/Heating

G	Y1	Y2	W1	W2	O	Economizer Enable	HVAC Mode	Economizer Position	Cooling Stage	Heating Stage
Off	Off	Off	Off	Off	---	---	Off	Closed	0	0
On	Off	Off	Off	Off	---	---	Vent	Mode Minimum	0	0
On	On	Off	Off	Off	---	Off	Cooling	Mode Minimum	1	0
On	On	On	Off	Off	---	Off	Cooling	Mode Minimum	2	0
On	On	Off	Off	Off	---	On	Economizer Cooling	Modulating**	0	0
On	On	On	Off	Off	---	On	Economizer Cooling	Modulating**	1*	0
On	On	On	Off	Off	---	On	Economizer Cooling	Modulating**	2*	0
On	Off	Off	On	Off	---	---	Heating	Mode Minimum	0	1***
On	Off	Off	On	On	---	---	Heating	Mode Minimum	0	2***

*When the unit receives a call for Y2 from the TSTAT, and the Economizer Damper is 100% open stage 2 cooling is commanded after a 5 minute delay. The unit stages down as the Supply Air Temperature approaches the Supply Air Temperature Cooling Minimum Setpoint to prevent coil freezing.

**The SAT Setpoint is 55°F when Cool Stage is 0. When Cool Stage is greater than 0, SAT Setpoint is equal to the SAT Cooling Minimum Setpoint.

***If the unit is configured for SCR Electric Heat, stage 1 heating is equal to 50% SCR output and stage 2 heating is equal to 100% SCR output.

Heat Pump; 2 Stage Cooling/Heating

G	Y1	Y2	W1	W2	O	Economizer Enable	HVAC Mode	Economizer Position	Cooling Stage	Heating Stage
Off	Off	Off	Off	Off	---	---	Off	Closed	0	0
On	Off	Off	Off	Off	---	---	Vent	Mode Minimum	0	0
On	On	Off	Off	Off	On	Off	Cooling	Mode Minimum	1	0
On	On	On	Off	Off	On	Off	Cooling	Cool High Min	2	0
On	On	Off	Off	Off	On	On	Economizer Cooling	Modulating**	0	0
On	On	On	Off	Off	On	On	Economizer Cooling	Modulating**	1*	0
On	On	On	Off	Off	On	On	Economizer Cooling	Modulating**	2*	0
On	On	Off	Off	Off	Off	---	Heating	Mode Minimum	0	1***
On	On	On	Off	Off	Off	---	Heating	Mode Minimum	0	2***
On	Off	Off	On	Off	Off	---	Heating	Mode Minimum	0	1 (Auxiliary)
On	Off	Off	On	On	Off	---	Heating	Mode Minimum	0	2 (Auxiliary)
On	On	On	On	Off	Off	---	Heating	Mode Minimum	0	2 + Aux Stage 1
On	On	On	On	On	Off	---	Heating	Mode Minimum	0	2 + Aux Stage 2

*When the unit receives a call for Y2 from the TSTAT, and the Economizer Damper is 100% open stage 2 cooling is commanded after a 5 minute delay. The unit stages down as the Supply Air Temperature approaches the Supply Air Temperature Cooling Minimum Setpoint to prevent coil freezing.

**The SAT Setpoint is 55°F when Cool Stage is 0. When Cool Stage is greater than 0, SAT Setpoint is equal to the SAT Cooling Minimum Setpoint.

***If the Heat Pump Heating Lockout is true, the auxiliary heat stages are used for stage 1 and stage 2 heating.

AC Electric Heat and AC Gas Heat; 1 Stage Cooling/Heating

G	Y1	Y2	W1	W2	O	Economizer Enable	HVAC Mode	Economizer Position	Cooling Stage	Heating Stage
Off	Off	---	Off	---	---	---	Off	Closed	0	0
On	Off	---	Off	---	---	---	Vent	Mode Minimum	0	0
On	On	---	Off	---	---	Off	Cooling	Mode Minimum	1	0
On	On	---	Off	---	---	On	Economizer Cooling	Modulating**	0*	0
On	On	---	Off	---	---	On	Economizer Cooling	Modulating**	1*	0
On	Off	---	On	---	---	---	Heating	Mode Minimum	0	1***
*When the unit receives a call for Y1 from the TSTAT, and the Economizer Damper is 100% open stage 1 cooling is commanded after a 5 minute delay. The unit stages down as the Supply Air Temperature approaches the Supply Air Temperature Cooling Minimum Setpoint to prevent coil freezing.										
**The SAT Setpoint is 55°F when Cool Stage is 0. When Cool Stage is greater than 0, SAT Setpoint is equal to the SAT Cooling Minimum Setpoint.										
***If the unit is configured for SCR Electric Heat, stage 1 heating is equal to 50% SCR output and stage 2 heating is equal to 100% SCR output.										

Heat Pump; 1 Stage Cooling/Heating

G	Y1	Y2	W1	W2	O	Economizer Enable	HVAC Mode	Economizer Position	Cooling Stage	Heating Stage
Off	Off	---	Off	---	---	---	Off	Closed	0	0
On	Off	---	Off	---	---	---	Vent	Mode Minimum	0	0
On	On	---	Off	---	On	Off	Cooling	Mode Minimum	1	0
On	On	---	Off	---	On	On	Economizer Cooling	Modulating**	0*	0
On	On	---	Off	---	On	On	Economizer Cooling	Modulating**	1*	0
On	On	---	Off	---	Off	---	Heating	Mode Minimum	0	1***
On	Off	---	On	---	Off	---	Heating	Mode Minimum	0	1 (Auxiliary)
On	On	---	On	---	Off	---	Heating	Mode Minimum	0	1 + Aux Stage 1
*When the unit receives a call for Y1 from the TSTAT, and the Economizer Damper is 100% open stage 1 cooling is commanded after a 5 minute delay. The unit stages down as the Supply Air Temperature approaches the Supply Air Temperature Cooling Minimum Setpoint to prevent coil freezing.										
**The SAT Setpoint is 55°F when Cool Stage is 0. When Cool Stage is greater than 0, SAT Setpoint is equal to the SAT Cooling Minimum Setpoint.										
***If the Heat Pump Heating Lockout is true, the auxiliary heat stages are used for stage 1 and stage 2 heating.										

9 Equipment Run Time and Lead/Lag Priority Calculations

9.1 Compressor Run Time

Individual compressor run times are calculated based on the compressor command state and the status of the compressor pressure switch feedback to the controller. These values are stored for use in lead lag priority rotation and can be reset to 0 by the user by setting the associated Compressor Run Time Reset value to True from the onboard LCD display or web interface. The reset function may be helpful following the replacement of one or more compressors.

9.2 Filter Run Time

Filter Run Time is calculated based on the blower command and the status of the Blower Proving Switch feedback to the controller. This value is stored for use in determining the Dirty Filter Alarm and can be reset to 0 by setting the Filter Run Time Reset value to True from the onboard LCD display or web interface. The reset function is used following the replacement of filters to reset the Dirty Filter Alarm status. Filter Run Time is only accumulated if the value of the Dirty Filter Timer setting is greater than 0 to prevent unwanted Dirty Filter Alarms. By setting the Filter Timer setting to a value of -1 or 0, the Dirty Filter Alarm is only activated when the Dirty Filter Switch input is active.

9.3 Unit Run Time

Unit Run Time is calculated based on the blower command and the status of the Blower Proving Switch feedback to the controller. This value is stored for display and monitoring only. A systems integrator may use this value available from the *BACnet* communication interface to determine unit operating priority when multiple units serve the same space. The value can be reset to 0 by the user by setting the Unit Run Time Reset value to True from the onboard LCD display or web interface.

9.4 Compressor Lead/Lag Priority Rotation

When the Lead Lag configuration setting is set to True, the Lead Compressor is rotated as needed to equalize compressor run times within defined parameters. Equalizing compressor run times prevents the overuse of one compressor and underuse of another compressor during partial load conditions which could cause premature equipment failure. The Lead Compressor is only recalculated when all of the compressors are commanded off or when all of the compressors are commanded on to prevent a rotation swap during partial load cooling operation.

On units with 1 compressor, the Lead Compressor value is always set to Compressor 1.

On units with 2 compressors, the lead compressor designation is swapped when the calculated run time of the lead compressor is greater than the run time of the lag compressor by more than the Lead Lag Differential setting.

On units with 4 compressors, the lead compressor pair designation is swapped when the calculated average run time of the lead compressors is greater than the average run time of the lag compressors by more than the Lead Lag Differential setting.

If the Lead Lag configuration setting is False, the Lead Compressor value is set to Compressor 1 or the compressor pair of Compressor 1 and Compressor 2 depending on the number of configured compressors.

10 User Interface Navigation and Operation

10.1 Password Administration

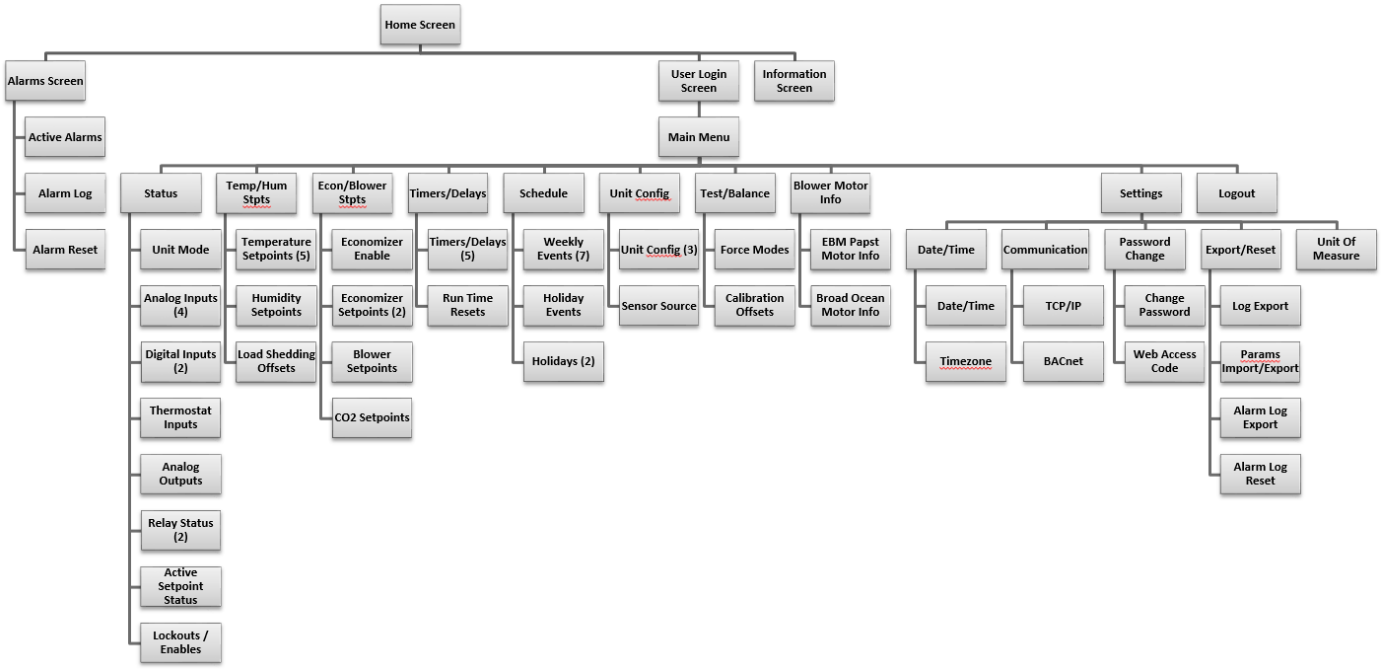
The two user access levels defined in the DDC controller are User and Service. Password settings are modified by navigating to the Settings menu and selecting the Password Change screen. User level access grants permission to view the unit status and to modify user setpoints. The default User password is 0000. Service level access grants all of the permissions of the User level access plus permission to modify unit configurations, delete alarm logs, and import/export configuration parameters from backup files. The default Service level password is 1954. A detailed list of access permissions is provided in the table below.

Controller Menu Item	User Level Access		Service Level Access	
	Read	Write	Read	Write
Unit Status Overview	X		X	
Controller General Information	X		X	
Detailed Unit Status: Calculated Values, Inputs, Outputs	X		X	
Temperature Setpoints	X	X	X	X
Humidity Setpoints	X	X	X	X
Economizer Enable Setpoints	X	X	X	X
Economizer Damper Minimum Position Setpoints	X		X	X
Blower Speed Settings	X		X	X
Space CO_2 Setpoints	X	X	X	X
Equipment Time Delay Settings	X	X	X	X
Alarm Time Delay Settings	X	X	X	X
Time Schedule	X	X	X	X
Unit Configuration Settings	X		X	X
Force Modes	X		X	X
Sensor Calibration Offsets	X		X	X
Controller Date and Time Settings	X	X	X	X
Controller Communication Settings	X		X	X
User Level Access Password Change	X	X	X	X
Service Level Password Change	X		X	X
Trend Log Export	X	X	X	X
Unit Parameters Import and Export	X		X	X
Alarm Log Export	X	X	X	X
Alarm Log Reset	X		X	X
View and Acknowledge Alarms	X	X	X	X
Preferred Unit of Measure	X	X	X	X

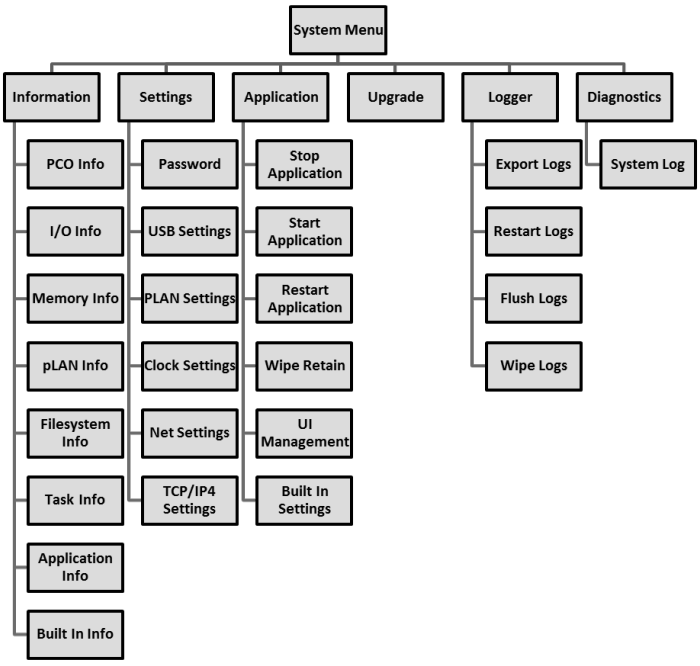
10.2 Onboard Display

10.2.1 Menu Navigation Chart

The menu navigation structure is organized to allow for efficient access to view unit status and make configuration changes.

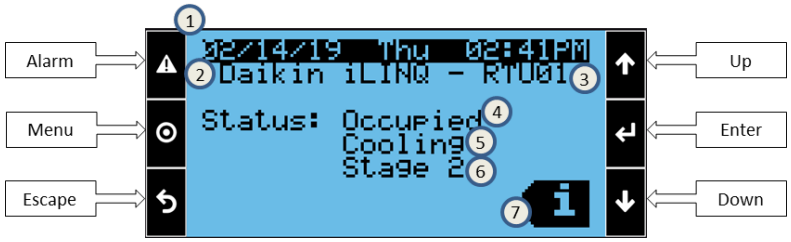


The system menu for advanced diagnostics is available from any screen by special keystroke and password.



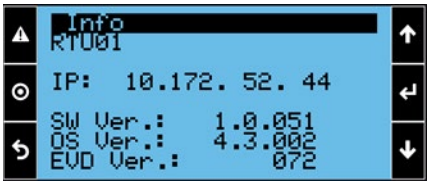
10.2.2 Home Screen

The home screen provides basic unit operation status and allows for navigation to other system screens for additional information. After five minutes of inactivity on any display screen, the display returns to the Home Screen and the current user is logged out.



Item	Description or Function
Alarm	Press to view any active alarms.
Menu	Press to navigate to the main menu screen.
Escape	Press to return to the previous screen.
Up	Press to scroll through menu screens, or modify selected values.
Enter	Press to select a highlighted option or accept a modified value.
Down	Press to scroll through menu screens, or modify selected values.
1	The current date, day, and time are displayed.
2	The controller name is displayed. This cannot be modified.
3	The unit name is displayed. The name can be modified from the info screen.
4	The current Schedule Mode status is displayed.
5	The current HVAC Mode status is displayed.
6	The current mode stage status is displayed.
7	Press ENTER to view the general information screen.

10.2.3 Information Screen

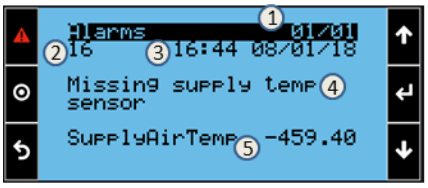


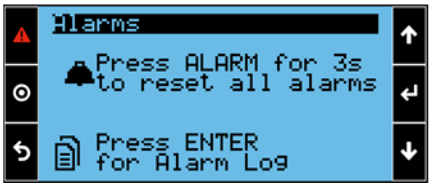
Pressing the ENTER button while on the main screen displays the information screen. Pressing ENTER while viewing the first information screen selects the RTU number which can be modified using the UP and DOWN buttons. The new unit name will be displayed on the main screen. Scroll through the information screens by pressing the UP and DOWN buttons. A list of controller information displayed is given in the table below.

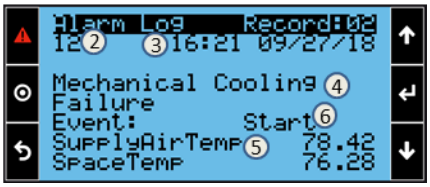
Name	Description
Unit Name	The unit number can be modified by the user and is displayed as RTU##.
IP: ###.###.###.###	The current IP address of the controller.
SW Ver.: #.#.#	The software application version currently loaded in the controller.
OS Ver.: #.#.#	The operating system version currently running in the controller.
EVD Ver.: ###	The firmware version of the reheat valve control module, if it is installed.
Board Type:	Board manufacturer model name.
Board Size:	Board manufacturer size code.
Core:	Core chipset manufacturer source code.
Board Temp.:	Current board temperature.
Ret Mem Writes:	Number of writes that have been made to retained memory.
Main Task:	The main task last cycle time.
Current Time:	The current date and time of the controller.
Power Off Time:	The date and time of the previous power loss.
Length Last Time Off:	The length in days, hours, minutes of the previous power loss.

10.2.4 Alarm Screen

The ALARM button icon is illuminated red when there is an active alarm. The alarm menu allows the user to scroll through the active alarms, reset any alarms that may require a manual reset, and view alarm log entries.







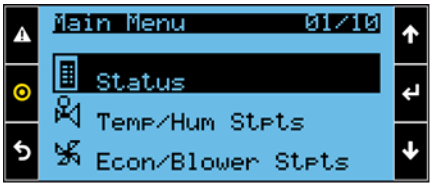
Item	Description or Function
1	The selected alarm number / total number of active alarms are displayed here.
2	The alarm code for the currently selected alarm is displayed.
3	The time and date for the alarm event is displayed.
4	A description for the currently selected alarm is displayed.
5	Up to two related values are recorded when an alarm becomes active.
6	The alarm log records start and stop events for each alarm.

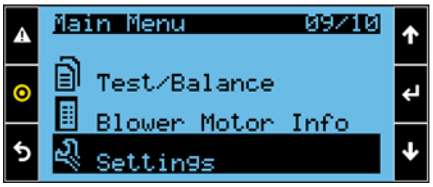
10.2.5 User Login Screen

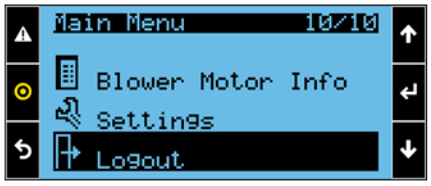
Pressing the MENU button displays the login screen. Use the UP and DOWN buttons to change the value of each digit in the password, pressing ENTER once the digit has been set to the correct value. If a password is entered incorrectly, an error message is displayed.

10.2.6 Main Menu

After successfully logging in, the main menu is displayed. Items in the main menu can be selected by using the UP and DOWN buttons to highlight the desired item and pressing ENTER.



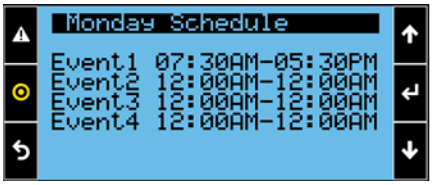


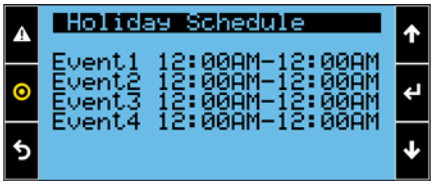


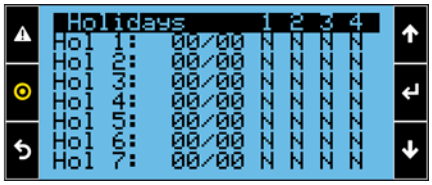
Name	Description
Status	Display the current status of physical inputs/outputs and calculated values. Scroll through the multiple system status screens using the UP and DOWN buttons.
Temp/Hum Stpts	Display the current value of system temperature and humidity setpoints. Scroll through the temperature and humidity setpoints screens using the UP and DOWN buttons. Pressing the ENTER button on a screen selects the first setpoint value displayed. The setpoint value can be modified using the UP and DOWN buttons, and pressing ENTER again selects the next setpoint.
Econ/Blower Stpts	Display the current value of system economizer, CO_2 and blower speed setpoints. Scroll through the setpoints screens using the UP and DOWN buttons. Pressing the ENTER button on a screen selects the first setpoint value displayed. The setpoint value can be modified using the UP and DOWN buttons, and pressing ENTER again selects the next setpoint.
Timers/Delays	Display the current value of system timing and delay settings. Scroll through the setting screens using the UP and DOWN buttons. Pressing the ENTER button on a screen selects the first setting value displayed. The setting value can be modified using the UP and DOWN buttons, and pressing ENTER again selects the next setting.
Schedule	Display the current value of weekly and holiday time schedule settings. Scroll through the schedule screens using the UP and DOWN buttons. Pressing the ENTER button on a screen selects the first setting value displayed. The setting value can be modified using the UP and DOWN buttons, and pressing ENTER again selects the next setting.
Unit Config	Display the current value of unit configuration settings. Scroll through the setting screens using the UP and DOWN buttons. Pressing the ENTER button on a screen selects the first setting value displayed. The setting value can be modified using the UP and DOWN buttons, and pressing ENTER again selects the next setting.
Test/Balance	The test and balance menu is used to force the unit into a selected mode of operation for testing, and to configure sensor calibration offset values. Scroll through the setting screens using the UP and DOWN buttons. Pressing the ENTER button on a screen selects the first setting value displayed. The setting value can be modified using the UP and DOWN buttons, and pressing ENTER again selects the next setting.
Blower Motor Info	Some units are provided with blower motors which are capable of communicating additional information to the controller. When a compatible motor is detected by the controller, the available motor information is displayed when this menu option is selected.
Settings	Select the settings option to enter the controller settings sub menu.
Logout	Selecting the logout option displays the current user access level. Pressing ENTER a second time logs out the current user and returns to the main screen.

10.2.7 Schedule Menu

When the schedule option is selected from the main menu, the weekly and holiday schedule events can be viewed or modified. Press the UP and DOWN buttons to scroll through schedule event screens for each day of the week, holiday events, and holiday date configurations.





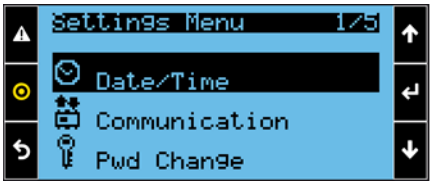


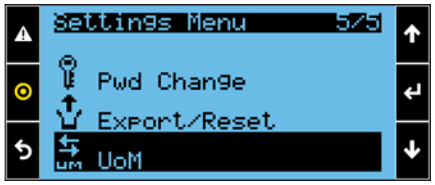
Pressing the ENTER button on a weekday or holiday event screen selects the Event1 Start Hour. The UP and DOWN buttons can be used to modify the value. Pressing ENTER accepts the new value and selects the Event1 Start Minute. The UP and DOWN buttons can be used to modify the value. Pressing ENTER accepts the new value and selects the Event1 AM/PM designation. Use the UP or DOWN button to toggle the value and press ENTER to accept. This process is repeated for the start and stop time settings for the four events. Additional information on time schedule settings is provided in the unit occupancy section of the user manual.

Pressing the ENTER button on the holidays screen selects the first Holiday Month setting. The UP and DOWN buttons can be used to modify the value. Pressing ENTER accepts the new value and selects the first Holiday Day setting. The UP and DOWN buttons can be used to modify the value. Pressing ENTER accepts the new value and selects the holiday event selection. Use the UP or DOWN button to toggle the value and press ENTER to accept. This process is repeated for each holiday. Additional information on time schedule settings is provided in the unit occupancy section of the user manual.

10.2.8 Settings Menu

Items in the settings menu can be selected by using the UP and DOWN buttons to highlight the desired item and pressing ENTER.

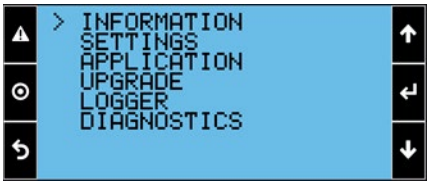




Name	Description
Date/Time	Modify the date, time, and timezone settings.
Communication	Modify the controller TCP/IP settings and *BACnet* communication settings.
Password Change	When logged in as User, the User password can be viewed and modified. When logged in as Service, the User and Service passwords can be viewed and modified. The Web Access Code used to activate the web interface functionality is displayed here.
Export/Reset	Export trend log data, import parameter settings from saved files, export current parameter settings to file, export alarm log data, clear alarm log data.
UoM	Toggle the displayed units of measurement (UoM) for the onboard HMI and the web interface between USA and SI.

10.2.9 System Menu

The system menu provides access to more detailed information about controller operation and troubleshooting actions. The items in this menu are not intended for common use but may be referenced by technical support. The system menu is accessed by simultaneously pressing the ALARM and ENTER buttons on the keypad and holding them for 3 seconds. Items in the system menu can be selected by using the UP and DOWN buttons to highlight the desired item and pressing ENTER.



System Menu		Item	Description
Information	PCO Info	BT	Bootloader Version
		OS	Operating System Version
		SVN REV	Operating System Version
		MAC	Ethernet card MAC address, also shown on the label above the Ethernet port
		S/N	Hardware unique ID
		tERA	Code for activating the tERA service
	I/O Info	1 FW HW	HW and SW version of IO chip
		2 FW HW	HW and SW version of IO chip
		3 FW HW	HW and SW version of IO chip
		4 FW HW	HW and SW version of IO chip
	Memory Info	Used RAM	Used RAM (nominal RAM 16 MB)
		Free RAM	Free RAM (nominal RAM 16 MB)
	pLAN Info	pLAN Address	Display pLAN address and terminals assigned
		ENTER	Graphic view of the pLAN network
	Filesystem Info	nand: 0	Volume 0 comprises 32MB, and cannot be accessed directly. Location of application
		nand: 1	Volume 1 comprises 96MB and is available to the user via USB
		msd: 0	Flash drive recognition on host port
		mmc: 0	Flash drive recognition on host port
	Task Info	Active Tasks	Display the number of currently active tasks

System Menu		Item	Description
		Scroll	Use Up and DOWN buttons to scroll through individual task information
	Application Info	Used Memory	Information on the application program, used for diagnostics
		Cycle Time	Application program cycle time, depending on the complexity
	Built In Info	Built-in Type	Type of built-in display if featured
		FW Release	Software version of built-in display if featured
Settings	Password	Insert New	Password to prevent access to all pages of the System Menu, except for PCO information
		Update	Confirm update of password
	USB Settings	Pen Drive	Enable/disable the Host/Device USB ports. Only use one port at a time, host or device
		PC Connection	Enable/disable the c.pCO controller as a serial port for c.suite
		pCO Disk	Enable/disable the c.pCO controller as a storage device
		Status	Connection status: Not connected, Wait, Ready
	PLAN Settings	pCO Address	Address of the c.pCO controller that the terminal is currently connected to
		Release Term	Release command
		Acquire Term	Acquire command
		Update Config	Confirm update
	Clock Settings	Date	Date setting
		Time	Time setting
		DST	Daylight Saving Time information
		Update	Confirm update
		Clock Sync	Synchronization setting: manual, via tERA, via NTP
		Update Config	Confirm update
		Time Zone	Display the time zone
	Net Settings	mDNS	Enable/disable multicast DNS
	TCP/IPv4 Settings	DHCP	Static/dynamic address
		IP	IP address
		MASK	Net mask
		Gateway	Gateway
		DNS	DNS
		Name	Host name, only changeable from c.suite
		Update Config	Update settings
Application	Stop Application	Stop Application	To stop execution of the application program
	Start Application	Start Application	To start execution of the application program
	Restart Application	Restart Application	Corresponds to STOP + START
	Wipe Retain	Wipe Retain	The "Retain" variables return to the default values
	Wipe NVRAM	Wipe NVRAM	Clear clock or RAM buffer memory: this stores the values of parameters that change often
	UI Management	Active UI	Activate the set of screens, 'I' of 'N'
		Active Trans	Active translation 'I' of 'N'
		Program	Press Prg to load the next set of screens
		Enter	Press Enter to load the next application language
	Built In Settings	Built In Settings	Terminal settings: brightness, buzzer
		Backlight Val	Backlighting intensity set after backlight idle time
		Backlight Time	Time (s) before setting Backlight Idle Value. Function disabled of equal to 0
		Buzzer	Buzzer status
		Auto Off	Built-in terminal auto backlighting off
		Confirm	Confirm update
Upgrade	xxx.ap1	xxx.ap1	With the USB flash drive plugged into the host USB port: .ap1 file contained in the Upgrade directory on the drive. With the USB flash drive not plugged in: .ap1 file in the NAND1 partition.
Logger	Export Logs	Export Logs	Export the logger files
	Restart Logs	Restart Logs	For periodical logs activated/terminated by variable, start logging again
	Flush Logs	Flush Logs	Save the logs to memory. Logs: max 32, max 4 MB in binary format
	Wipe Logs	Wipe Logs	Delete all the data and restart logging from the beginning
Diagnostics	System Log	System Log	Export the system log for diagnostics as a .zip file

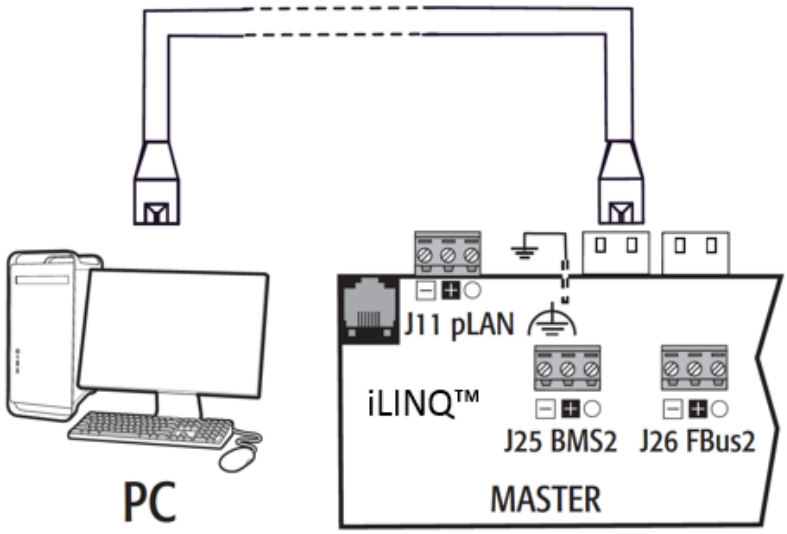
10.3 Web Interface

The Daikin *iLINQ* controller is capable of communicating over an Ethernet network providing access to the onboard web interface. Examples include a direct connection between the controller and a PC, or the controller residing on a local building intranet to be accessed by a PC on the same network.

10.3.1 Requirements

To utilize the web interface, the following conditions must be met:

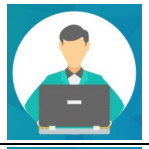
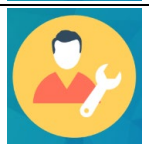
- The controller must have 24 VAC present on the J1 terminal.
- The controller and PC must be connected to the same Ethernet network and have unique IP addresses that are on the same network.
- The PC must have an internet browser installed. Google Chrome™ is preferred.



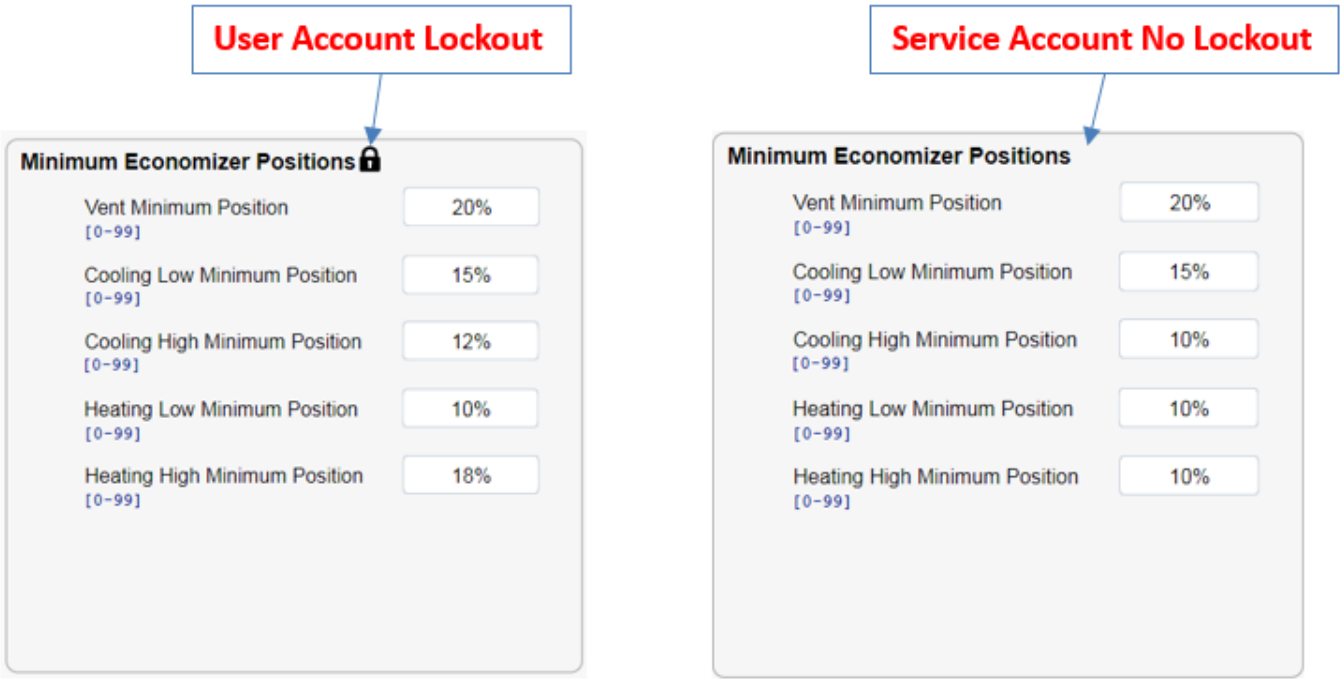
Controller Settings	Computer Settings	Successful Connection (Y/N)	Notes
IP: 192.168.1.16 NM: 255.255.255.0	IP: 192.168.1.16 NM: 255.255.255.0	No	IP addresses must be unique.
IP: 192.168.1.16 NM: 255.255.255.0	IP: 10.172.27.54 NM: 255.255.255.0	No	IP addresses must be on the same network.
IP: 192.168.1.16 NM: 255.255.255.0	IP: 192.168.1.25 NM: 255.255.255.0	Yes	

10.3.2 Account Access Levels

As previously stated in the password administration section of this document, there are two user access levels defined in the DDC controller. When using the web interface, the active account is denoted by an account specific icon displayed in the top right corner of the web interface.

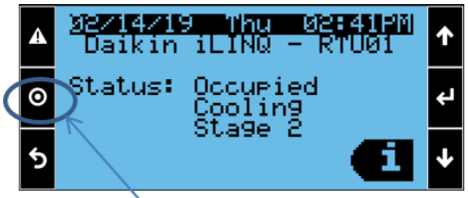
Account	Account Icon	Default Password
User		0000
Service		1954

The account permissions function as described in the password administration section of this document. When the User account is active, a lock symbol designates the variables that are locked from editing. When the service account is active, these variables are unlocked and can be edited.



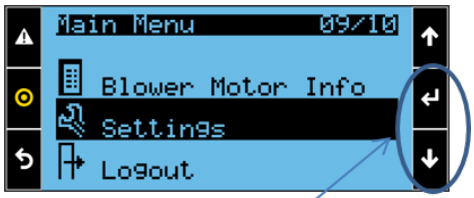
10.3.3 Web Access Code

Each controller is factory loaded with a unique web access code to prevent unauthorized access to the controller's web interface. The web access code must be entered before the controller's web interface can be used. To view the controller's web access code, navigate to the Settings/Pwd Change menu using the onboard LCD.

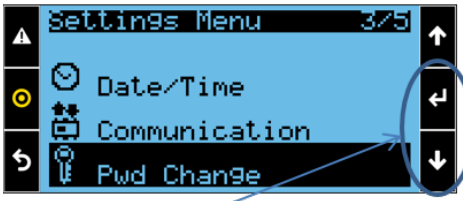


From the Unit Status screen, press the Menu button.

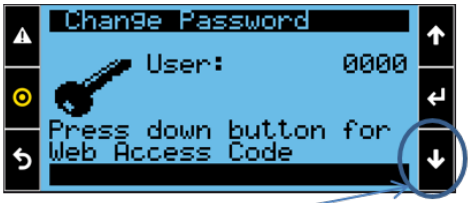
From the Login screen, use the Up/Down/Enter buttons to enter the User or Service password.



From the Main Menu, use the Down button to scroll to the Settings Menu and press the Enter button.



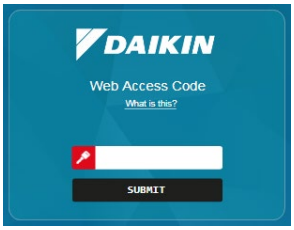
From the Settings Menu, use the Down button to scroll to the Pwd Change Menu and press the Enter button.



Press the Down button to navigate to the Web Access Code screen.

Use the Web Access Code displayed for initial web interface activation, or use the navigation buttons to generate a new code.

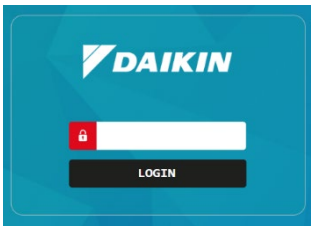
To access the web access code screen, enter the controllers IP address in the address bar of the internet browser. Enter the six character case-sensitive code into the entry field and press enter or click submit. The user will be prompted with an "Invalid Code!" message if the code entered does not match the controller's unique web access code. After successfully entering the web access code, the set password page of the web interface is displayed.



Click in the entry field for each account and type a four digit numeric password that will be used for access to the web interface and the onboard LCD display. After pressing enter or clicking the save button, the login screen is displayed.

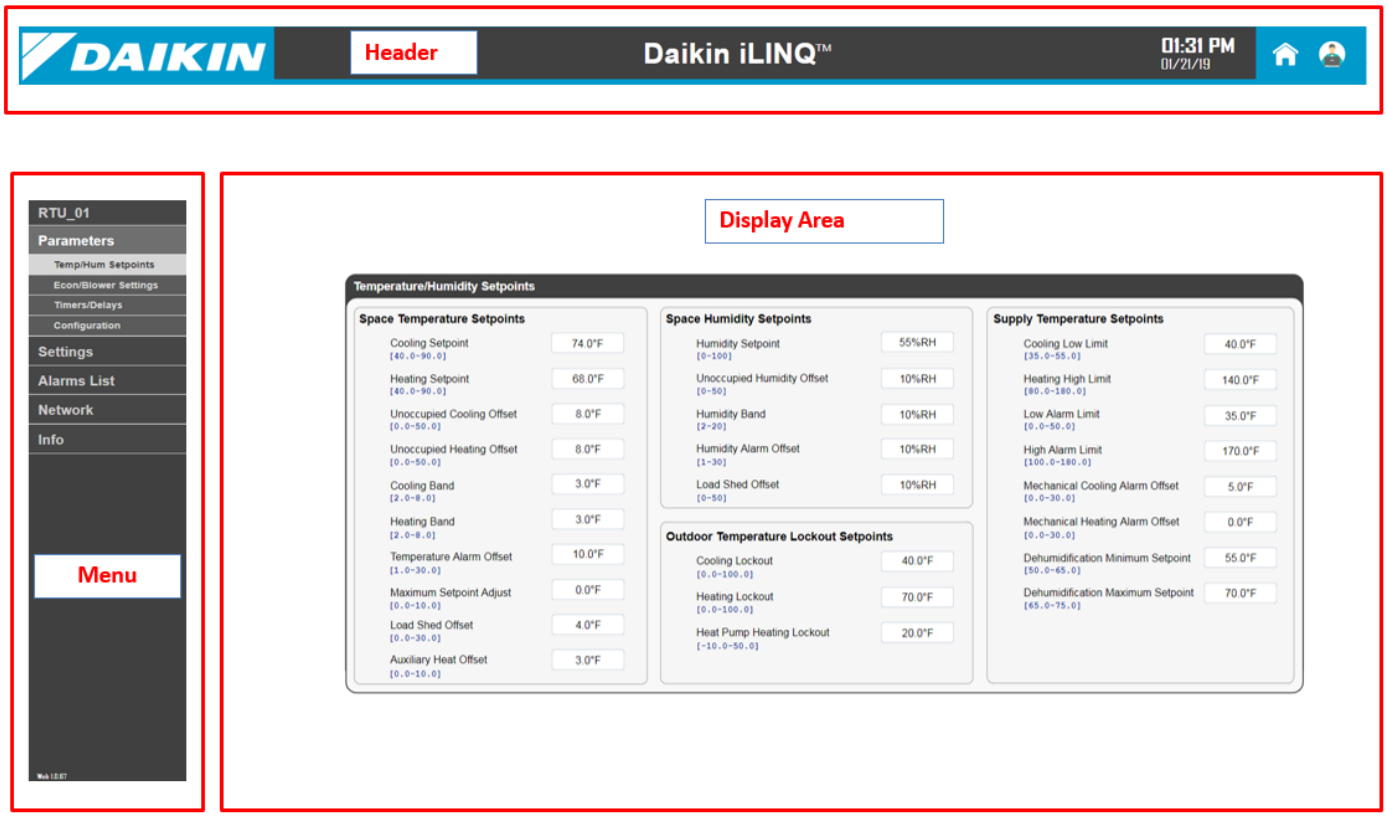
10.3.4 Login Screen

To access the login screen, enter the controllers IP address in the address bar of the internet browser. Enter the four digit password into the password field and press enter or click login. The user will be prompted with a “Wrong password!” message if the password entered does not match the controller’s account passwords. After successfully logging in, the home page of the web interface is displayed.



10.3.5 Web Interface Layout

The web interface layout consists of three areas, the menu, header, and display area.

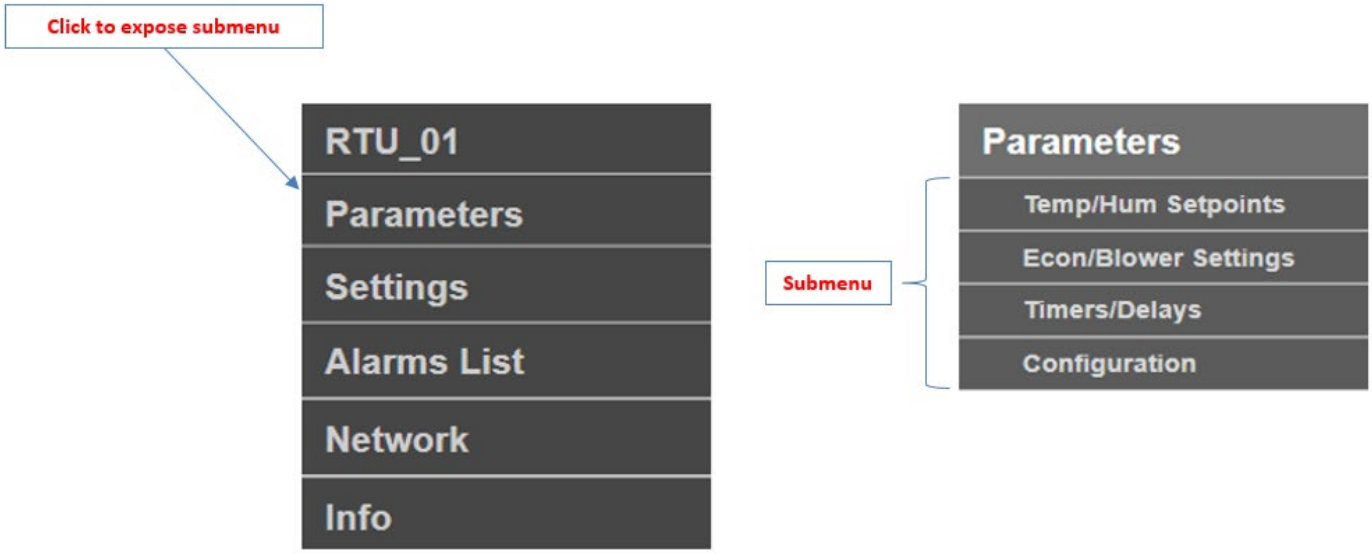


Display Area:

The display area contains information pertaining to the current selection from the menu. The display area defaults to the home screen and changes when a menu selection is made.

Menu:

The menu is the main source of navigation within the web interface. To make a selection from the menu, click one of the top layer options. Either a submenu will appear below the top layer selection, or the display area will update to the corresponding selection. If a submenu appears, click one of the options to navigate to the corresponding page.



Header:

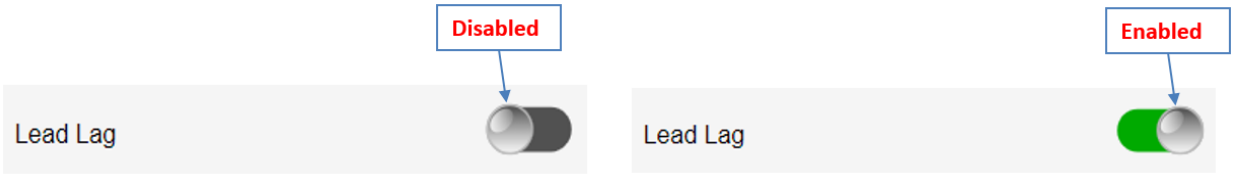
The header displays the date/time that is stored in the controller, a home page link, and a logout button. The home page can be accessed from any page of the web interface by clicking the home page link. To logout of the web interface, click the user icon and then click logout in the logout window.

10.3.6 Web Interface Operation

In order to control, monitor, and configure units via the web interface the user must interact with toggle switches, dropdown menus, increment/decrement buttons, and manual entry fields.

Toggle Switch:

Toggle switches allow the user to enable or disable a parameter. To enable or disable a parameter, click the circle portion of the toggle switch. Once clicked, the toggle switch will change states. When the toggle switch is positioned to the left, the parameter is disabled. When the toggle switch is positioned to the right, the parameter is enabled.

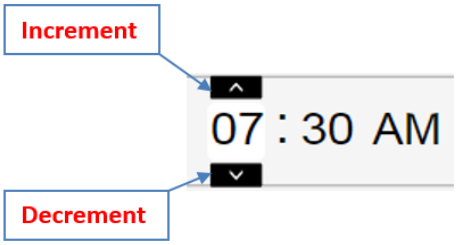


Dropdown Menu:

Dropdown menus allow the user to select from available preconfigured options of a parameter. To expand a dropdown menu, click the down arrow. Select an option from the dropdown menu list to update the value of the parameter.

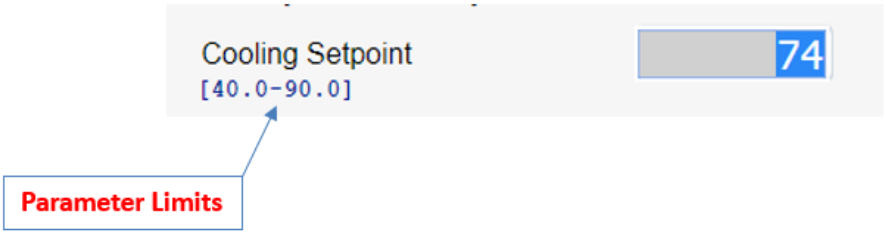
Increment/Decrement:

Increment/decrement controls are present for parameters that must be entered as a whole number. To adjust the parameter, click the up or down arrows until the target value is achieved. In addition, the value may be set manually by clicking the existing value, entering the target value in the internet browser dialog box, and pressing enter or clicking ok.



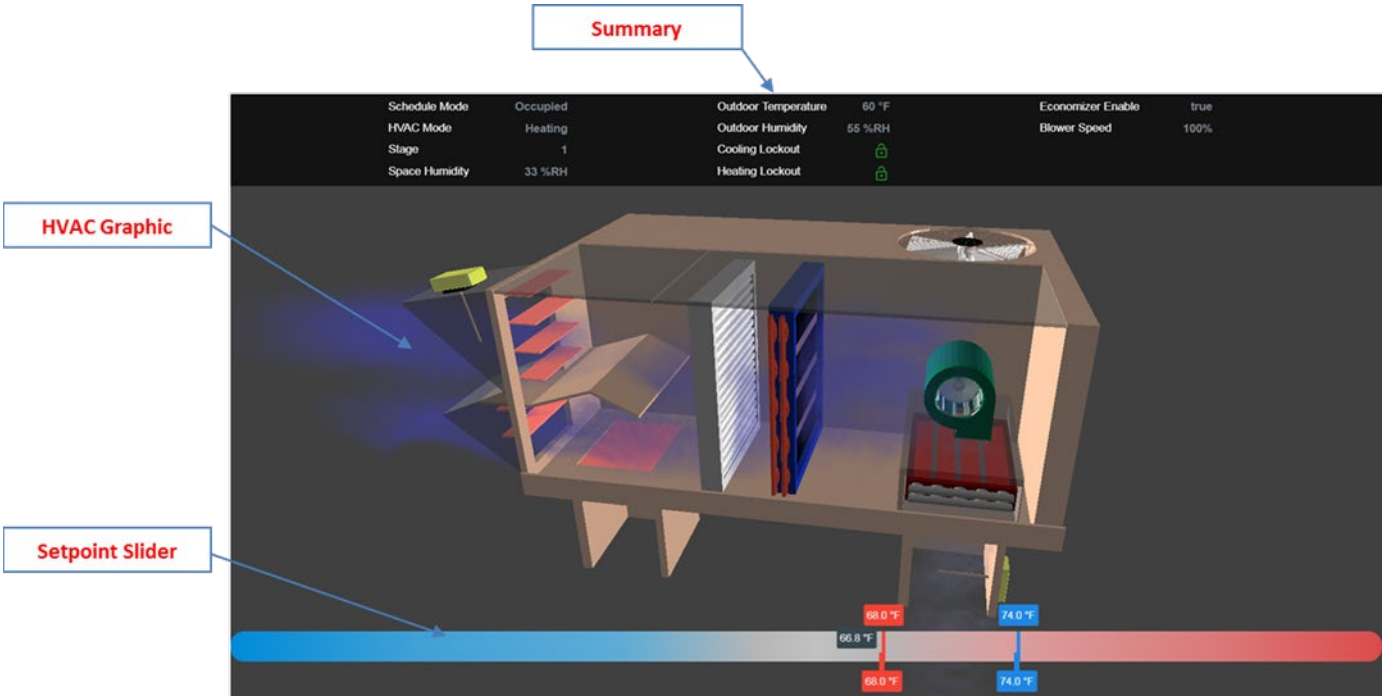
Manual Entry:

To change a parameter manually, click the current value of the parameter, type the desired value, and press enter. A warning message will appear if a value outside of the parameter's limits is entered.



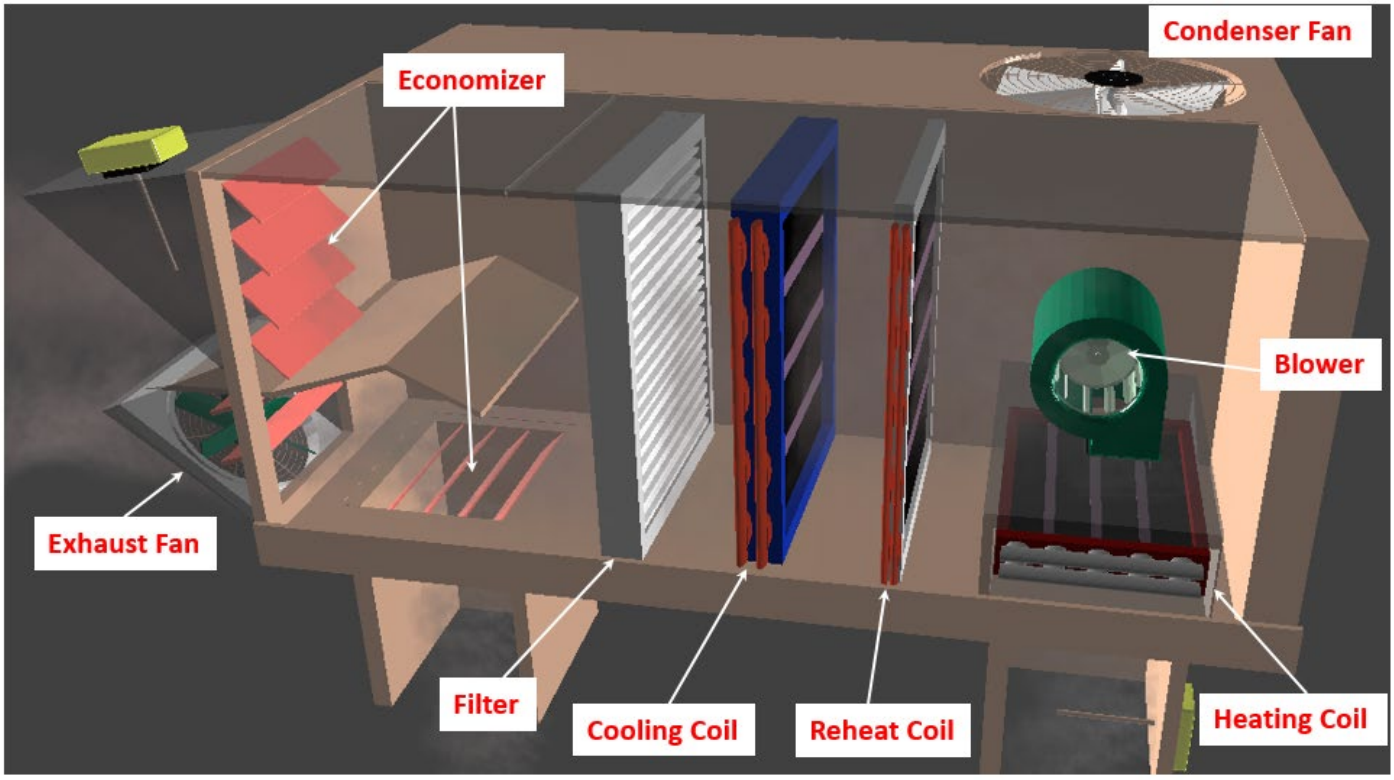
10.3.7 Home Page

After logging into the web interface, the first page to be displayed in the display area is the home page. The home page displays a live graphical representation of the HVAC unit, a summary of parameters, and an interactive space temperature setpoint slider.



10.3.8 HVAC Graphic

The HVAC graphic changes appearance based on the value of configuration parameters on the configuration page and current unit operation. For example, if unit is configured to have an economizer installed, the graphic will display a unit with an economizer. Otherwise, the graphic displays a unit without an economizer.



Blower:

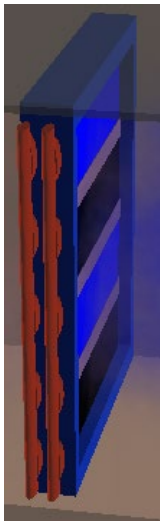
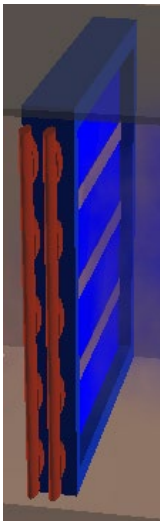
When the Blower Proving Switch Input is active, the blower wheel rotates. When the Blower Proving Switch Input is inactive, the blower wheel does not rotate. If the Blower Type is Variable, the blower wheel rotation speed varies with the Blower Speed value.

Condenser Fans:

If any condenser fans are commanded on, the condenser fan rotates. If the condenser fan(s) are commanded off, the condenser fan does not rotate.

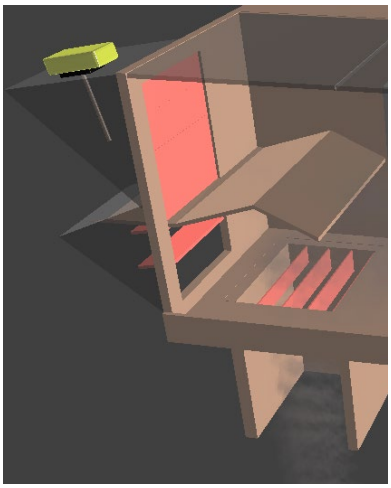
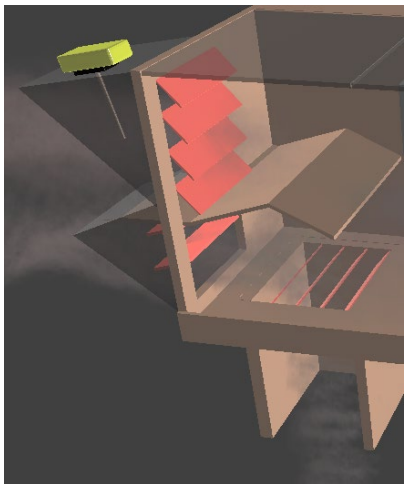
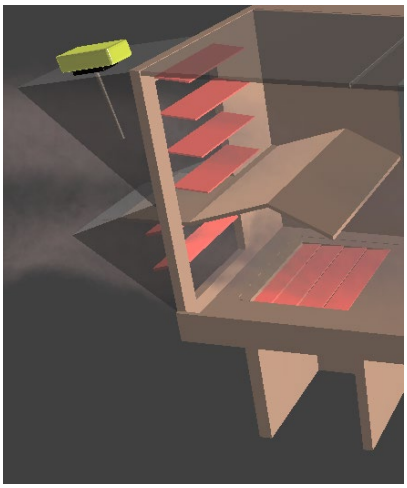
Cooling Coil:

The cooling coil animation displays the number of active cooling stages. Sections of the cooling coil illuminate as cooling stages are enabled to indicate the amount of cooling capacity being used by the unit.

Active Cooling Stages	0	1 of 2	1 of 1 or 2 of 2
Coil Animation			

Economizer:

The economizer animation displays the current economizer damper position as sensed by the Economizer Feedback Input. The economizer is visible if Economizer is set equal to something other than none on the configuration page.

Economizer Position	0%	50%	100%
Economizer Animation			

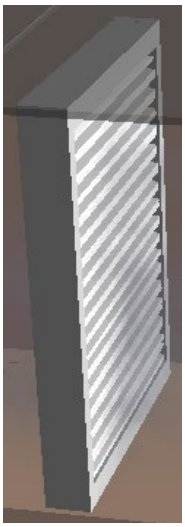
Exhaust Fan:

When the Exhaust Fan Enable Relay Output is active, the exhaust fan rotates. When the Exhaust Fan Enable Relay Output is not active, the exhaust fan does not rotate. The exhaust fan is displayed when the following configurations are selected:

- The Economizer configuration does not equal None
- The Exhaust Fan toggle switch is enabled

Filter:

The filter animation displays the status of the Dirty Filter Switch Input or the Dirty Filter Timer. If the Dirty Filter Switch Input is active or the Dirty Filter Timer expires, the filter will darken in appearance to indicate a dirty filter.

Filter Status	Clean	Dirty
Filter Animation		

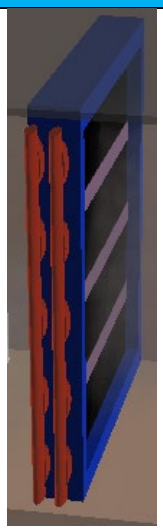
Heating Coil:

The heating coil animation displays the number of active electric or gas heating stages. Sections of the heating coil illuminate as heating stages are enabled to indicate the amount of heating capacity being used by the unit. If SCR Heat is installed and enabled on the configuration page, the heating coil illuminates proportionally, section by section, as the SCR Heat output increases.

Active Heating Stages	0	1 of 2	1 of 1 or 2 of 2
Coil Animation			

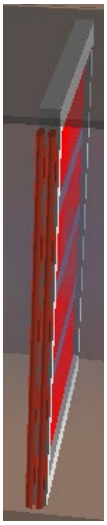
Heat Pump Heating Coil:

When Unit Type is set equal to Heat Pump on the configuration page, the cooling coil operates as the primary heat source for the unit. Sections of the cooling coil illuminate as heating stages are enabled to indicate the amount of heating capacity being used by the unit.

Active Heating Stages	0	1 of 2	1 of 1 or 2 of 2
Coil Animation			

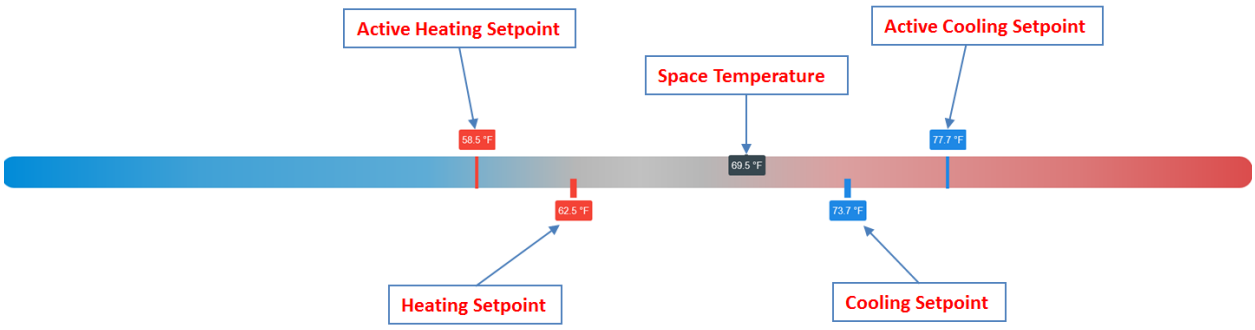
Reheat Coil:

The reheat coil animation indicates the position of the Modulating Hot Gas Reheat Valve Output. Sections of the reheat coil illuminate as the reheat valve opens to indicate the amount of reheat capacity being used by the unit.

Reheat Valve Position	Closed	0 < Valve Position < 25	25 < Valve Position < 50	50 < Valve Position < 75	75 < Valve Position < 100
Coil Animation					

Space Temperature Setpoint Slider:

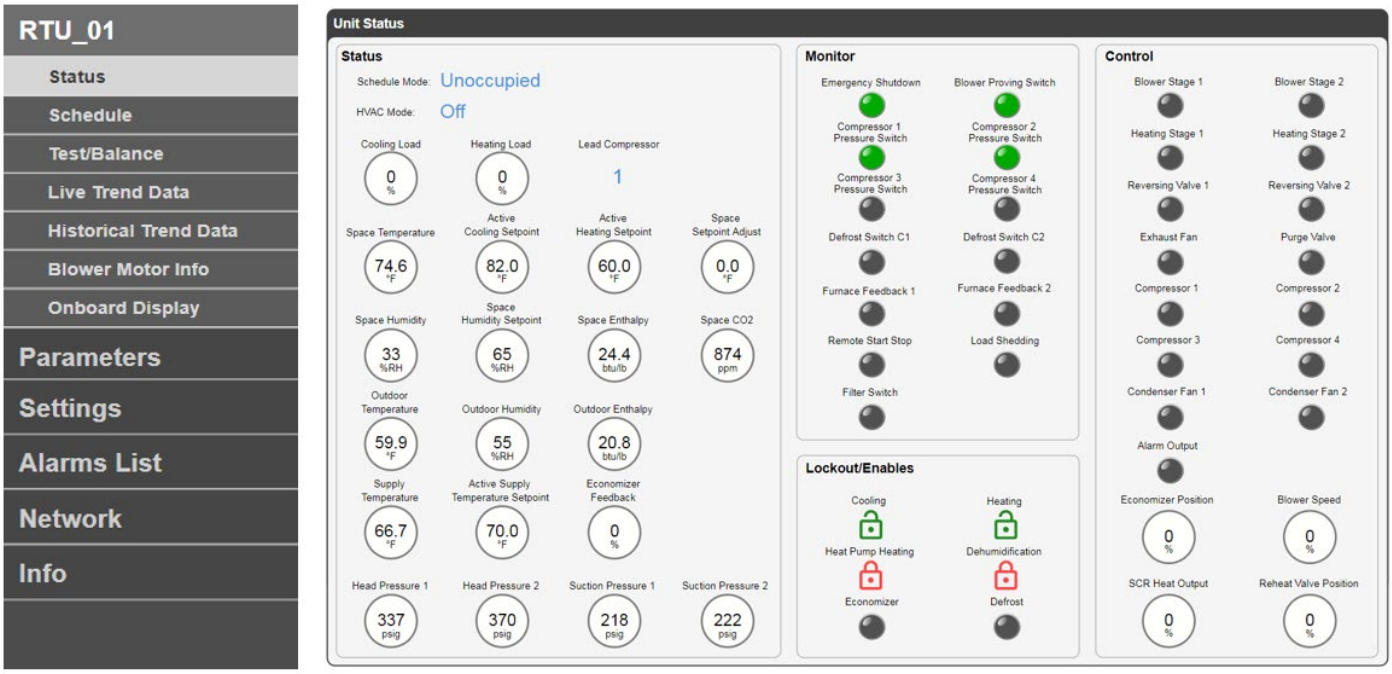
The space temperature setpoint slider is an interactive graphical representation of the current space temperature and space temperature setpoints. From left to right, the slider is scaled from 40-90°F. The space temperature setpoint slider allows the user to monitor the space temperature and adjust the cooling and heating setpoints. To adjust the Cooling Setpoint, click and hold the Cooling Setpoint and drag it in either direction to increase or decrease the value. As the user drags the value, the Cooling Setpoint is updated depending on its position on the temperature slider. Once the desired value is displayed, release the click to apply the new Cooling Setpoint. The same method should be followed for adjusting the heating setpoint. The active cooling and heating setpoints will automatically recalculate as needed.



10.3.9 Status Screen

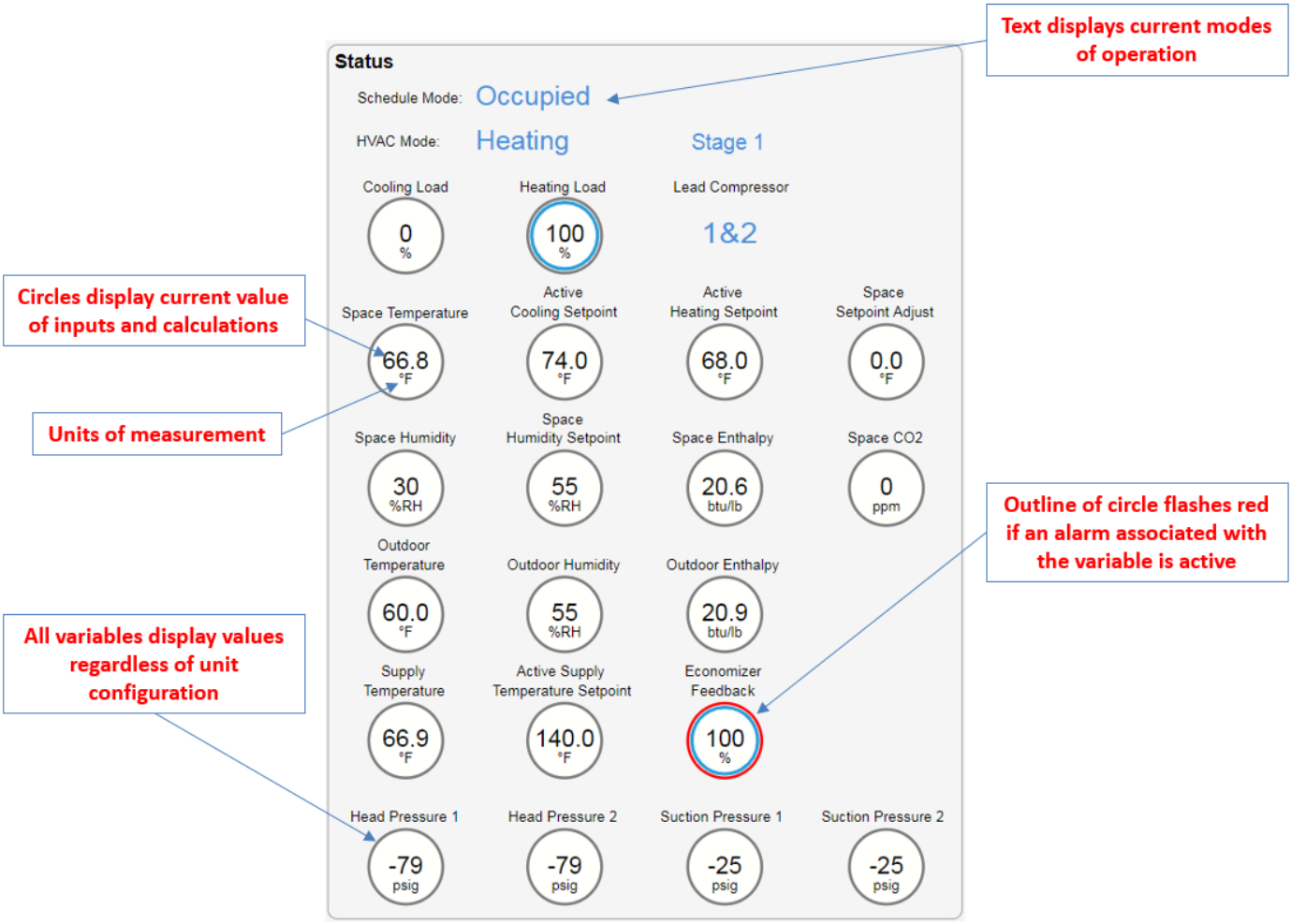
The status page is grouped into the following sections:

Section	Description
Status	Display the program calculated values, sensor input values, and current operating mode.
Monitor	Display the current value of binary switch inputs.
Lockout/Enables	Display the current value of HVAC mode software lockouts, and the enable status of defrost and economizer functions.
Control	Display the current value of the controller relay outputs, and analog 0-10Vdc outputs.



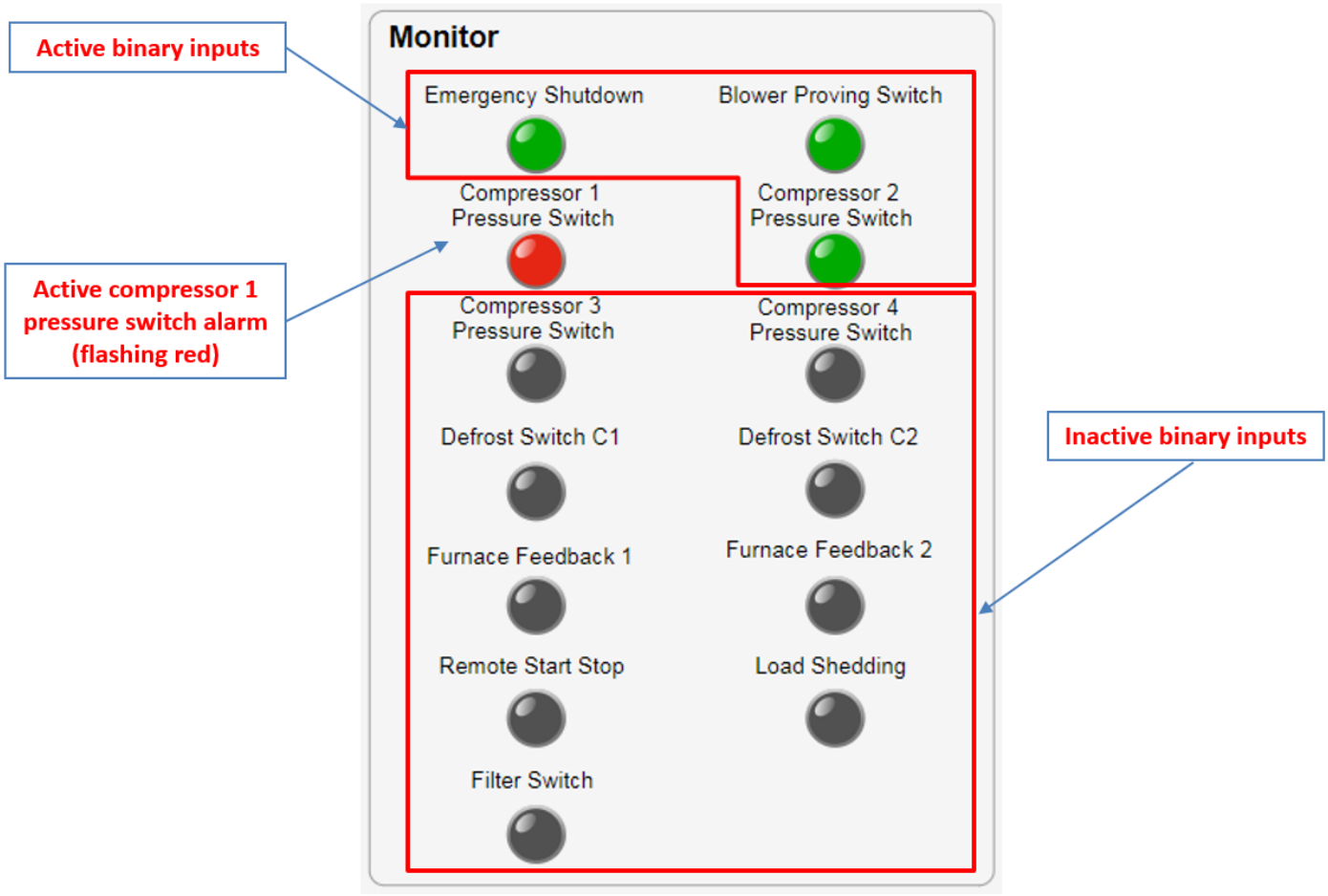
Status:

The status section displays the controllers calculated values, analog input values, and current modes of operation. The sensor values are displayed regardless of unit configuration type. For example, a unit that is not configured to use the suction pressure inputs will display a negative value. No alarm is generated, and unit operation is not affected because that sensor is not required.



Monitor:

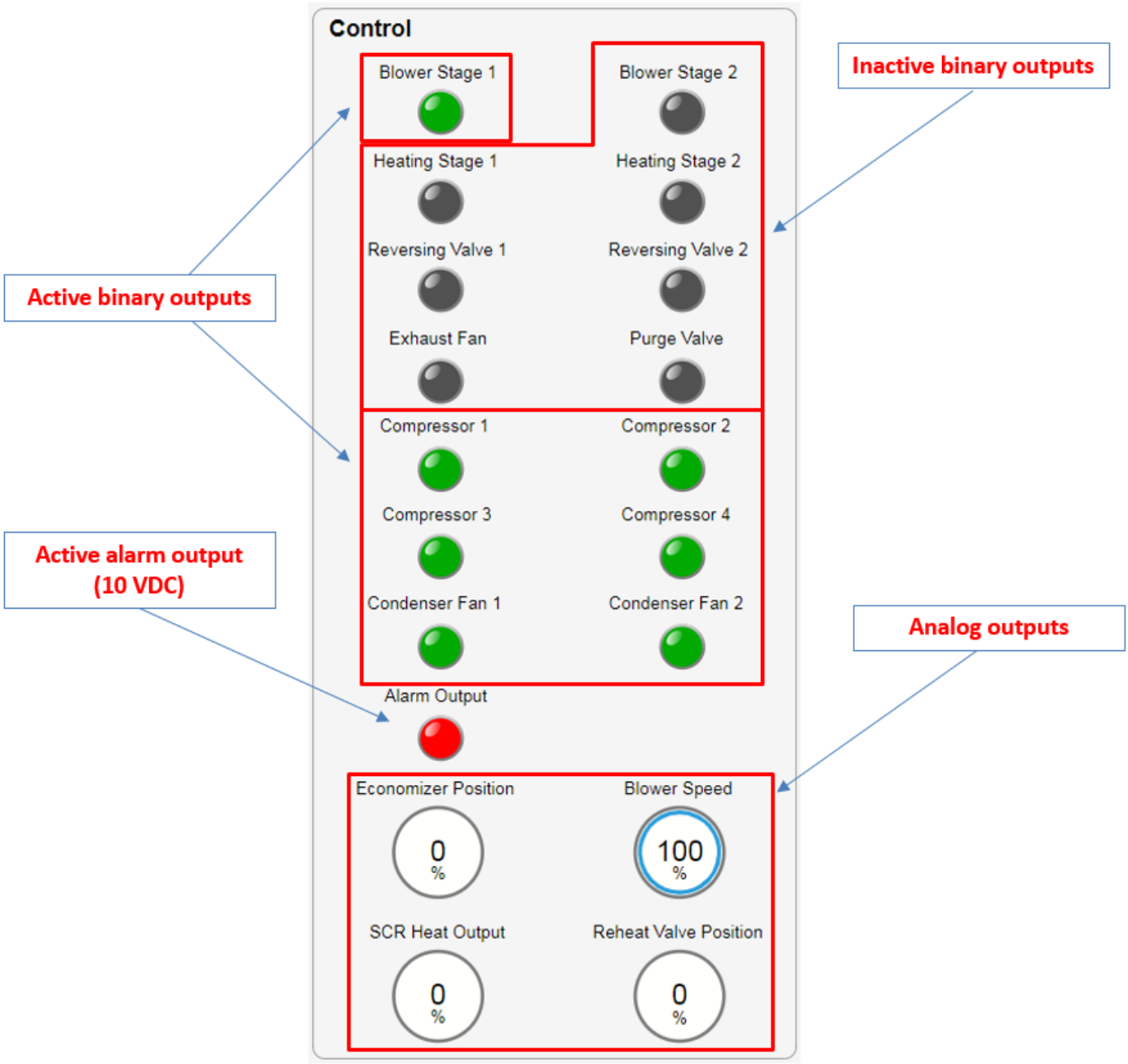
The monitor section displays the status of the controller's binary inputs. A solid greed LED indicates that the binary input is active. A solid grey LED indicates that the binary input is inactive. If an alarm associated with the binary input is active, the LED flashes red.



Control:

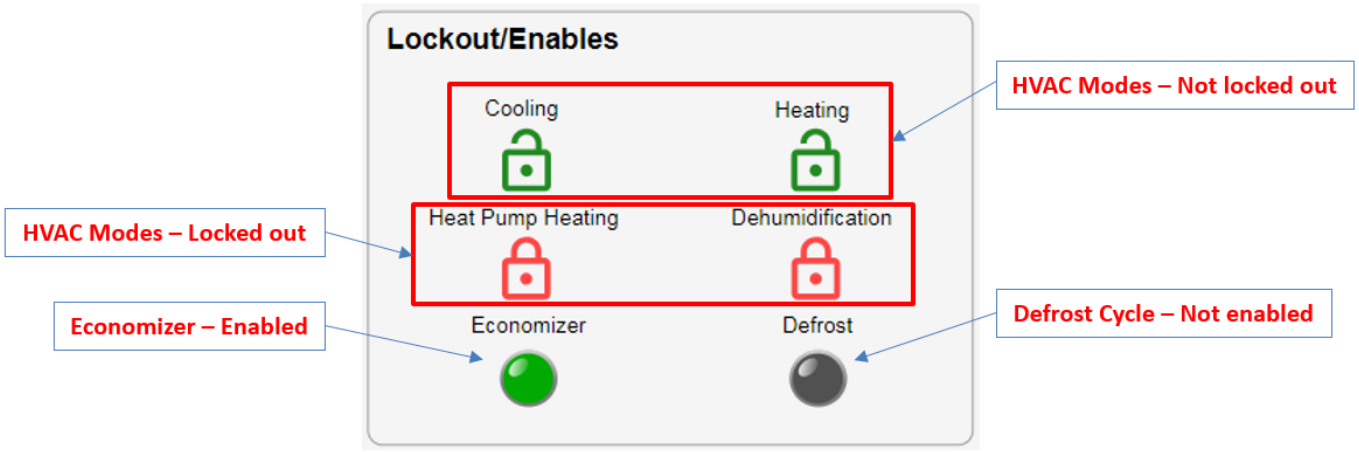
The control section displays the status of the controller's binary and analog outputs. A green LED indicates that the binary output is active. A grey LED indicates that the binary output is inactive.

The alarm output LED indicates the status of the alarm analog output. If the LED is red, the output is active. If the LED is grey, the output is inactive.



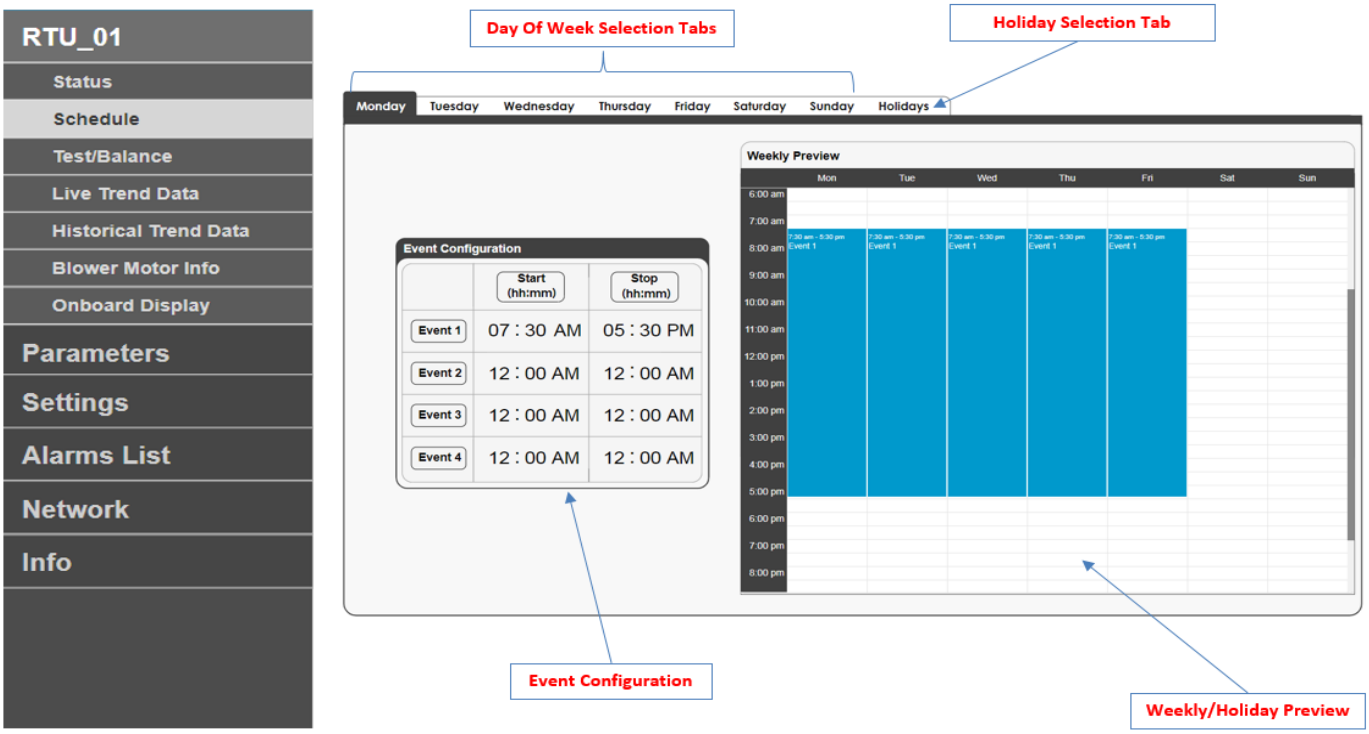
Lockout/Enables:

The lockout/enables section displays the status of the unit's HVAC lockouts and enables. If an HVAC mode is locked out, a red lock symbol is displayed. If an HVAC mode is not locked out, a green unlocked symbol is displayed. If the economizer or defrost cycle is enabled the corresponding LED turns green. If the economizer or defrost cycle is disabled the corresponding LED turns grey.



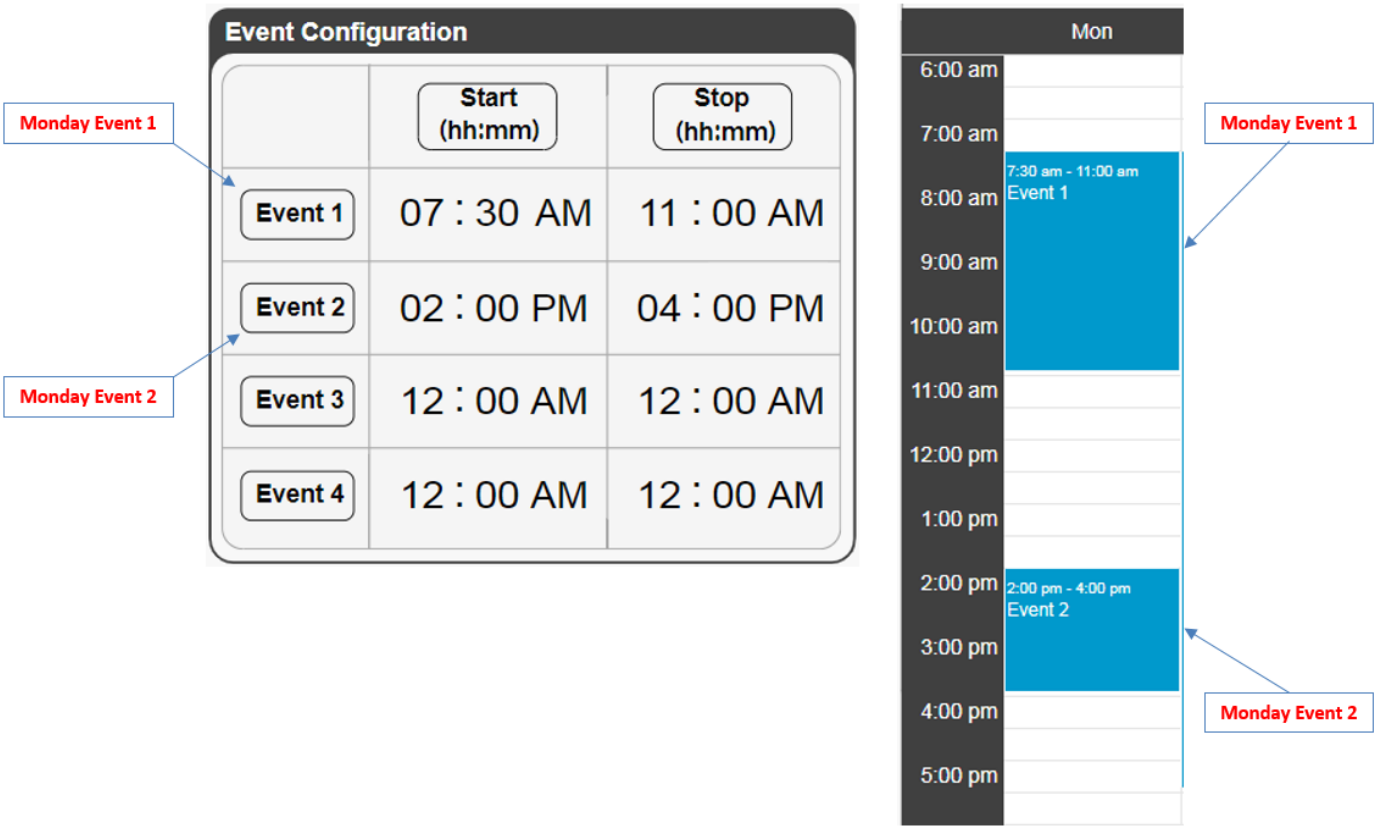
10.3.10 Schedule Screen

The schedule page allows the user to schedule the occupancy of the unit. Both the unit's weekly schedule and holiday event schedules can be modified from this page.



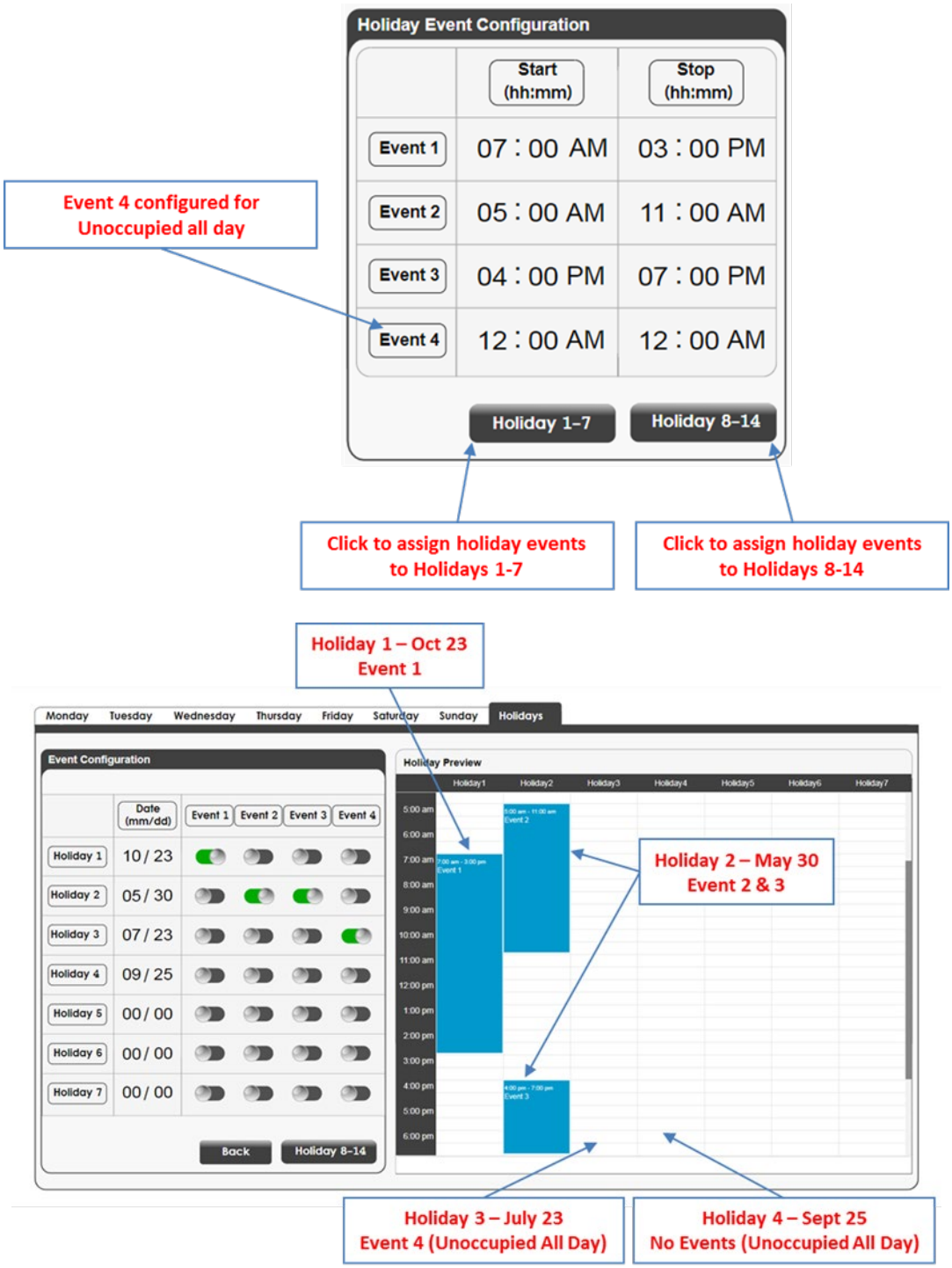
Weekly Schedule:

To modify the weekly schedule, select the tab for the desired day of the week. Each day of the week has four configurable events. Use the increment/decrement feature or manual entry to set the start and stop times for each event. The weekly preview window is a graphical representation of the current weekly schedule. The shaded area represents the time that the unit is scheduled to be occupied. The unshaded area represents the time that the unit is scheduled to be unoccupied. The weekly preview window updates each time an event is modified.



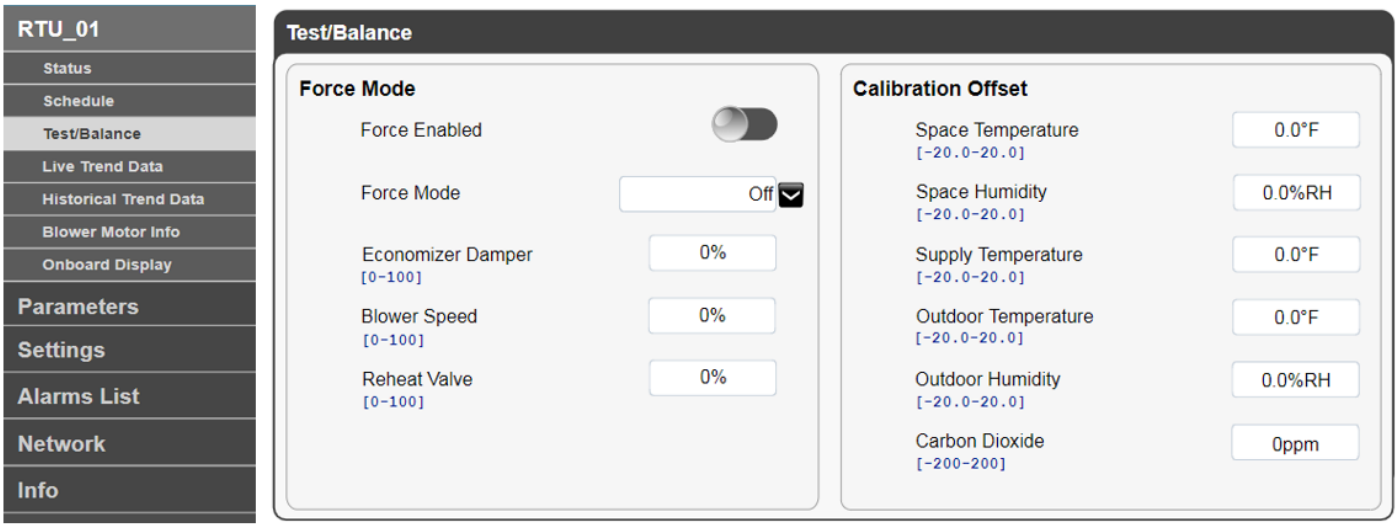
Holiday Schedule:

To modify the holiday schedule, select the holidays tab. There are four holiday events that can be applied to 14 independent holidays. First, set the start and stop time for each holiday event. Click the holidays 1-7 or 8-14 buttons to configure the holiday dates. Each holiday can be assigned up to four holiday events by enabling the event toggle switches that are on the same row as the holiday. The holiday preview window updates each time an event is enabled. If a date is assigned to a holiday and no event is enabled, the holiday is considered unoccupied all day.



10.3.11 Test/Balance Screen

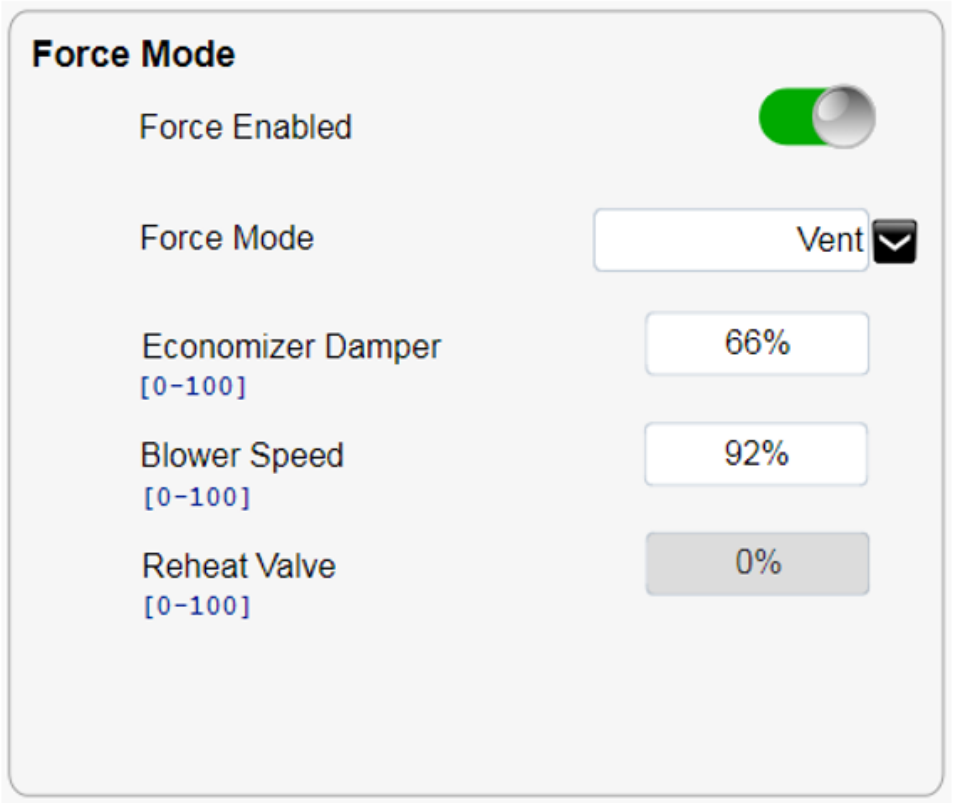
The Test/Balance page allows the user to force the unit into predefined HVAC Modes, force analog outputs, and add calibration offsets to analog inputs.



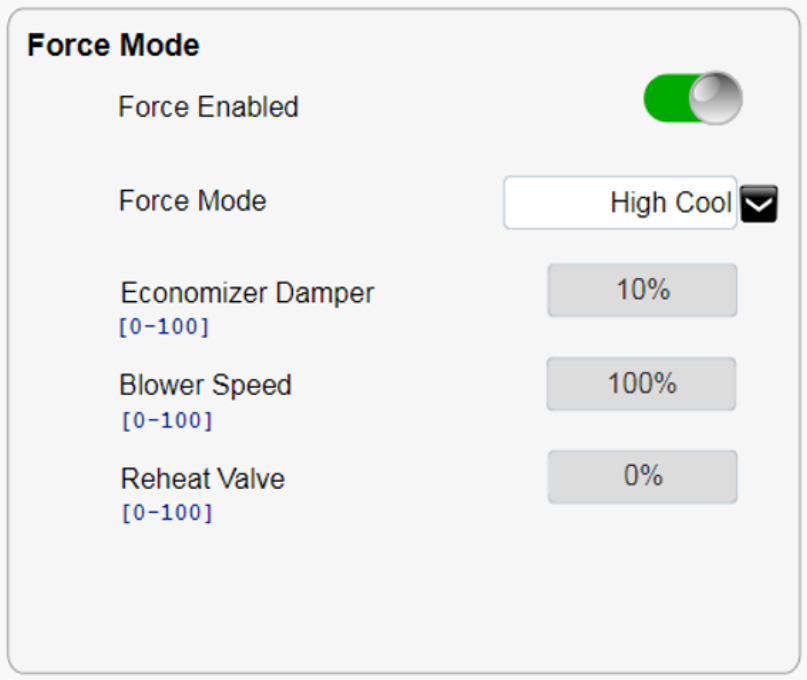
Force Mode:

Force Mode is intended to assist with unit start up and general troubleshooting. To enable Force Mode, click the Force Enabled toggle switch and select an HVAC Mode from the Force Mode dropdown menu. Once an HVAC Mode is selected, the controller energizes the corresponding mechanical equipment. Depending on the HVAC Mode selected, the end user will be able enter force mode settings for Blower Speed, Economizer Damper, and Reheat Valve. To disable Force Mode and return to normal unit operation, return the Force Mode toggle switch to its original position. If no change to the force mode settings page is made for 30 minutes, the unit will resume normal operation.

Selected Force Mode	User Adjustable Force Mode Settings
Off	All controller outputs are determined by program.
Vent	Blower Speed and Economizer Position are determined by user. Other controller outputs are determined by program.
Low Cool	All controller outputs are determined by program.
High Cool	All controller outputs are determined by program.
Low Heat	All controller outputs are determined by program.
High Heat	All controller outputs are determined by program.
Dehumidification	Reheat Valve position is determined by user. Other controller outputs are determined by program.



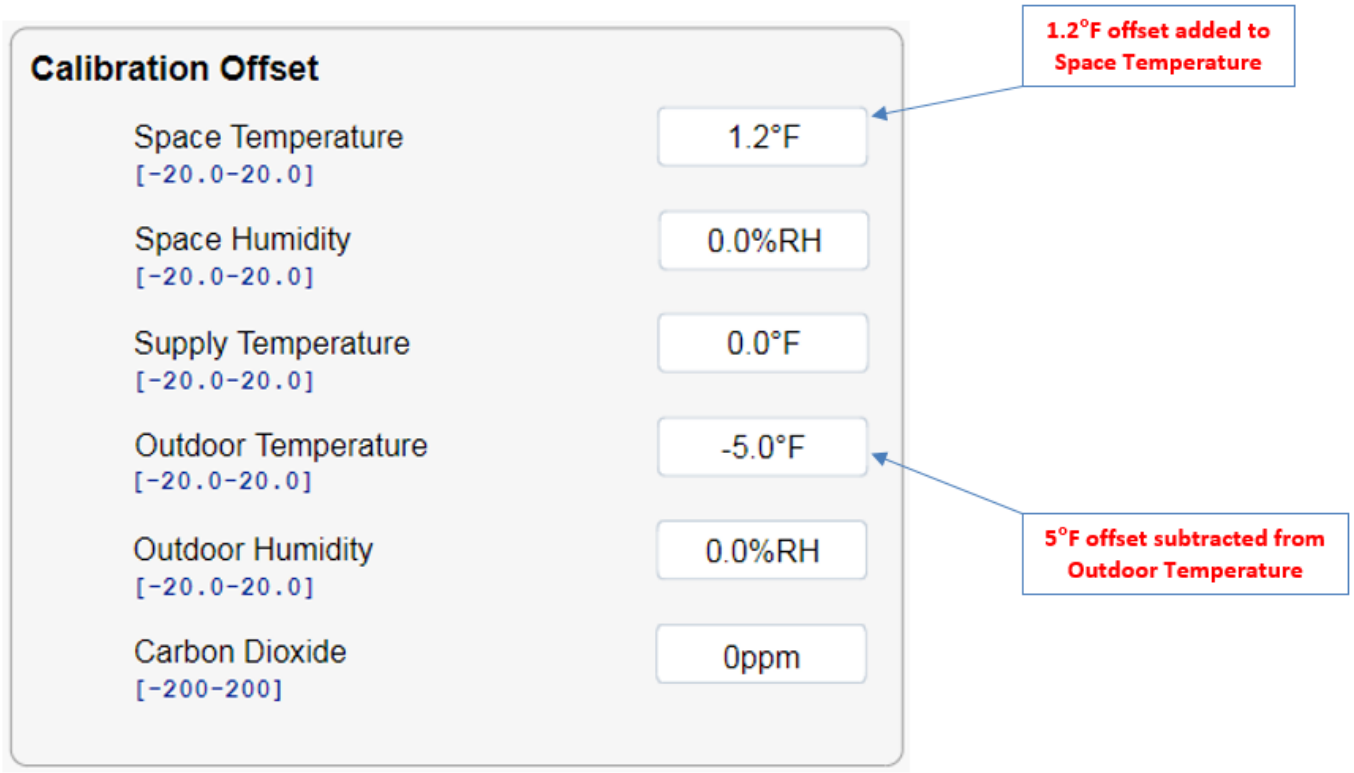
Forced Vent Mode
Economizer Damper – 66%
Blower Speed – 92%



Forced High Cool Mode
Economizer Damper – High Cool Minimum Position
Blower Speed – High Cool Speed

Calibration Offset:

The user may add a field calibration offset to analog inputs by manually entering a calibration offset value into the parameter field.

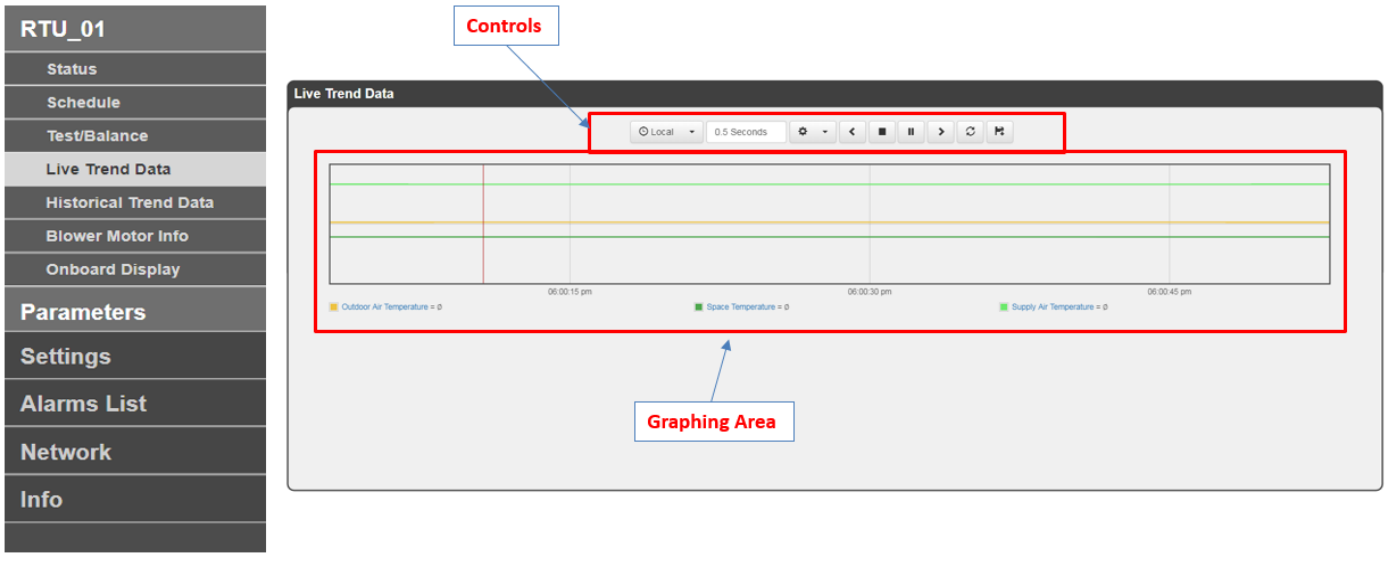


10.3.12 Live Trend Data Screen

The live trend data page allows the user to create, analyze, and export custom plots of live controller data. Once the user navigates to the live trend data page, the controller begins recording an internal live trend log of all variables in the variables dropdown list.

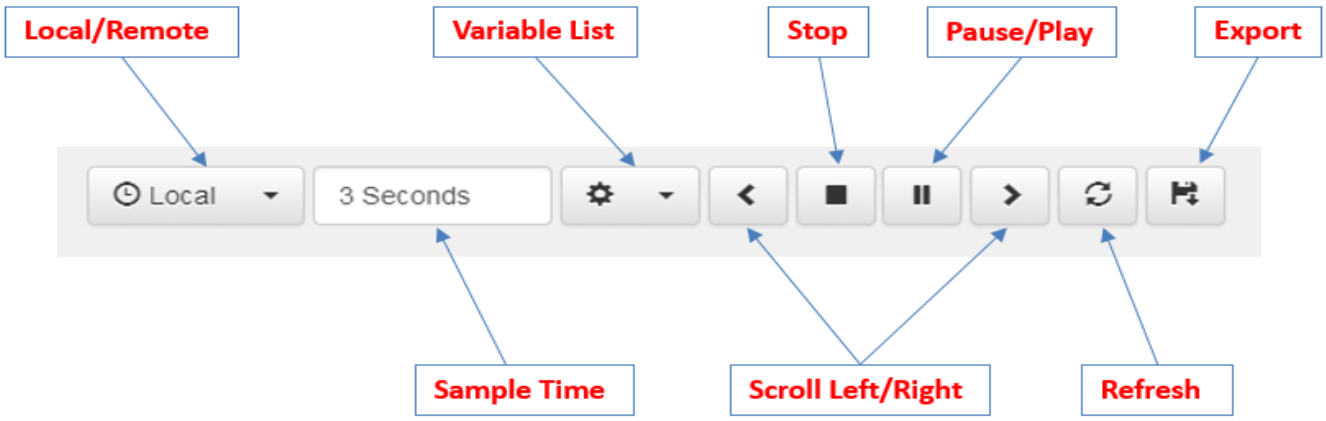
By default, the controller plots the following variables on the live trend data page:

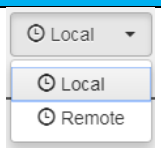
- Outdoor Air Temperature
- Space Temperature
- Supply Air Temperature
- Active Heating Setpoint
- Active Cooling Setpoint
- Effective Heating Load
- Effective Cooling Load



Live Trend Controls:

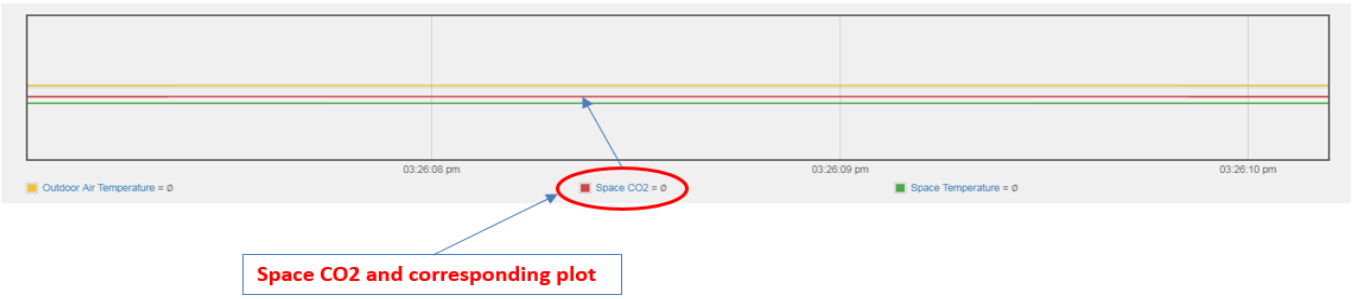
The live trend data controls allow the user to create custom live trend plots and export live trend logs.



Name	Image	Function
Local/Remote		The Local/Remote variable switches the graph's time axis between the PC's local timezone and the controller's remote timezone. The default selection is local.
Sample Time		The sample time is the time interval at which the controller records an entry to the live trend log. The sample time is user adjustable from 0.5-60 seconds. The time axis of the graphing area is automatically scaled based on the sample time.
Variables List		The variable list dropdown menu contains all variables available to add to the graphing area. To add or remove variables from the list, click the variable list dropdown button. The variables with a check next to them are currently being plotted in the graphing area. To remove a variable from the graphing area, click any active variable in the list and the check will disappear. To add a variable to the graphing area, click the variable and a check will appear next to the variable. Once all selections have been made, click ok. The new variable selection will be populated and the graph will begin to plot the new list of variables.
Scroll		The scroll buttons shift the graphing window to the left or right. This feature is most helpful when the zoom feature in the graphing window is used. To scroll, click the left or right scroll button until the graph shifts to the desired position.
Stop		The stop button stops the live trend log and the graphing operation. While stopped, user can still interact with the graph and export the live trend log. If the play button is clicked after clicking the stop button, a new live trend log and graph are started.
Pause/Resume		The pause button stops the graphing operation but the live trend log will continue in the background. While paused, the user can still interact with the graph and export the live trend log. To resume plotting the variables, click the resume button.
Refresh		The refresh button updates the graphing window to the current time and rescales the time axis to its default scale.
Export		Clicking the export button will save the current live trend log to the PC. To access the live trend log, navigate to the default download folder of the internet browser. The live trend log is saved to this location with the file name live_data.csv.

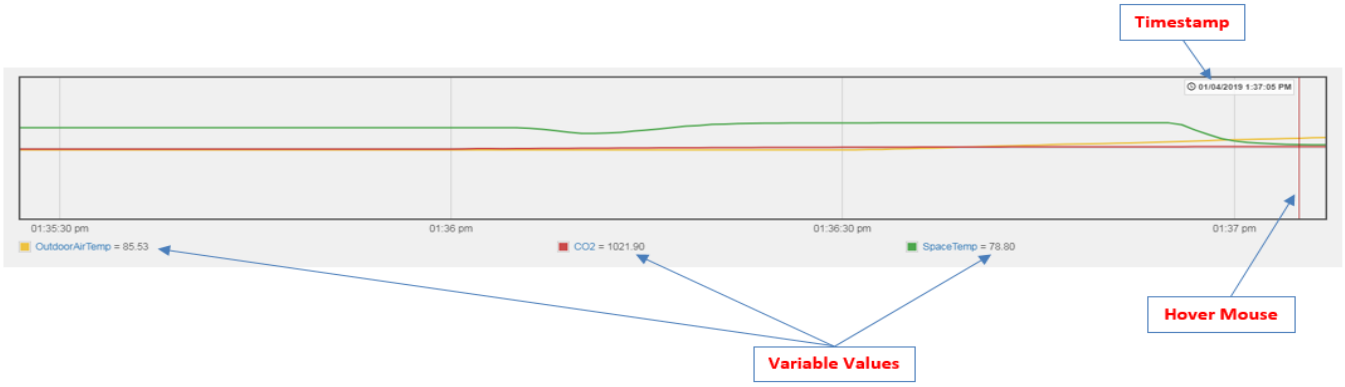
Live Trend Graphing Area:

Once the live trend controls are configured, the graphing area plots the selected variables. The selected variables, are listed below the graph and are assigned a color that corresponds to a plotted line in the graphing area.

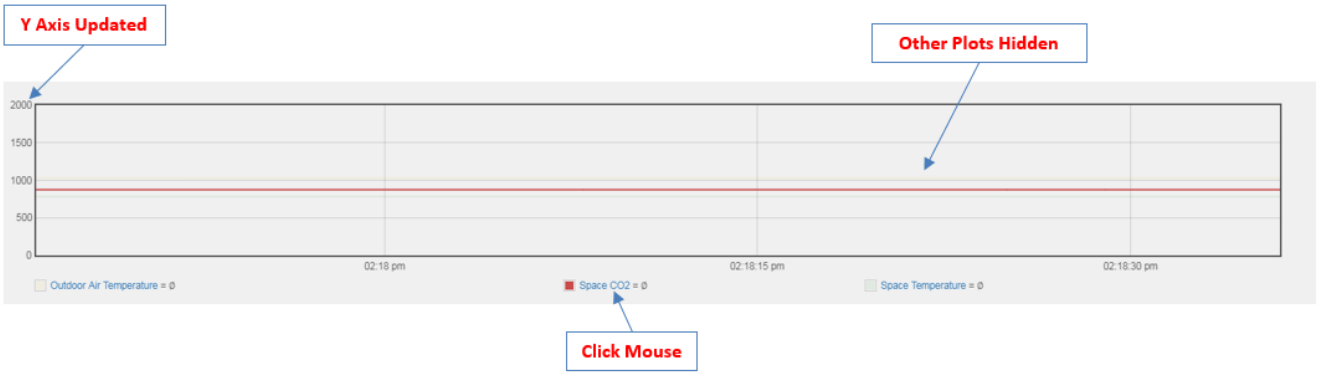


The graphing area plots all selected variables in a value vs. time arrangement. The y axis of the graph represents the value of the variable and the x axis represents time.

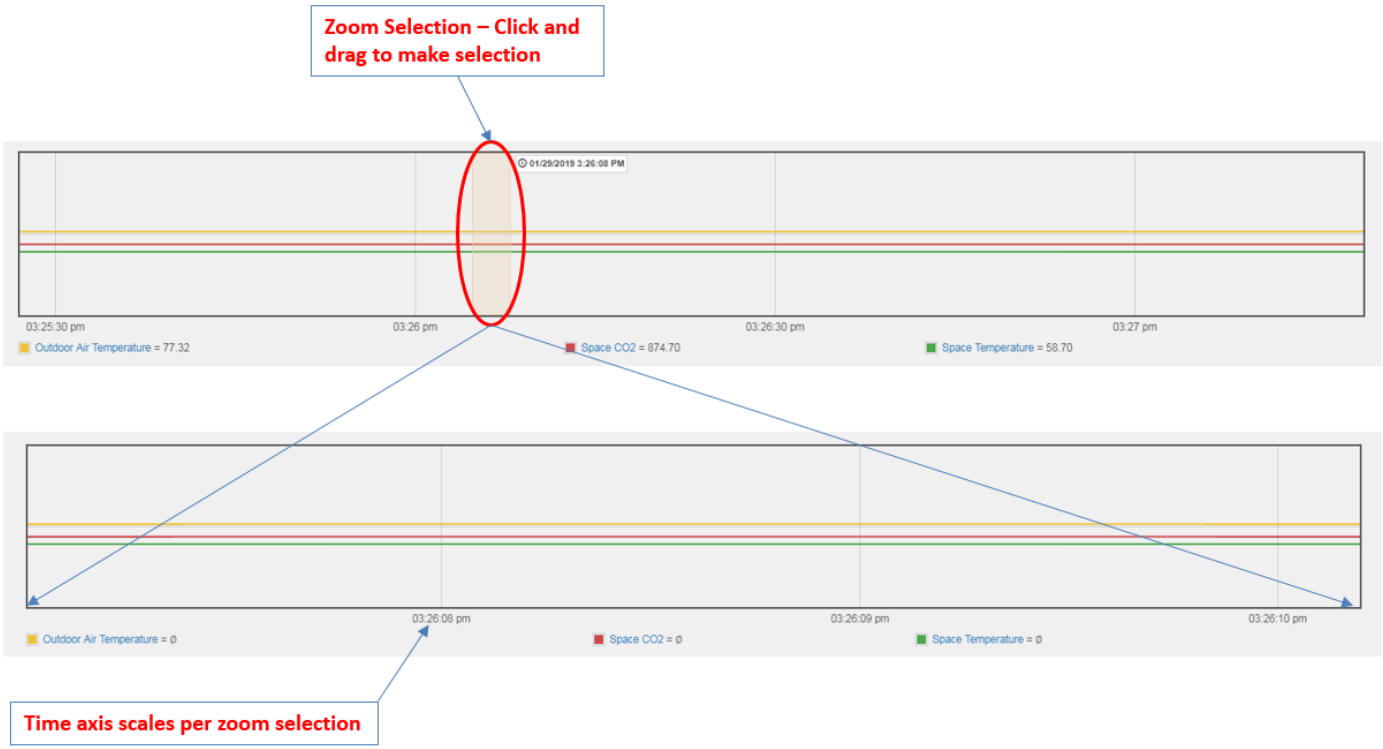
To view the values of the plotted variables at a specific time, hover the mouse over the graph and the value of the variable(s) corresponding to the time stamp will be populated in the list below the graph.



To examine a single variable, click the variable in the list of variables below the graph. All other variable plots will fade into the background while the selected variable plot remains visible. The y-axis will be scaled to the selected variable. Click the selected variable again to resume plotting all active variables.

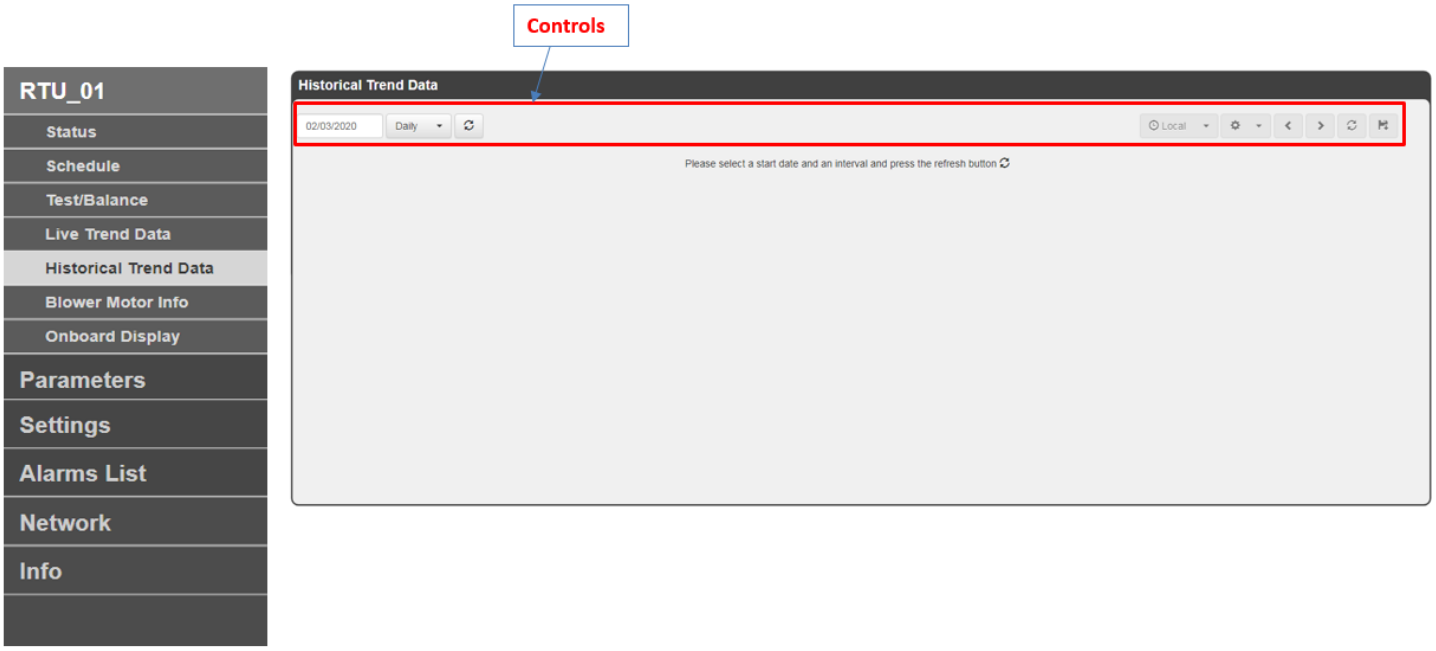


To zoom in on the graph, click and drag the cursor horizontally across a section of the graph. Once the graph is updated, use the scroll button controls to reposition the graph. Click the refresh button to update the graphing window to the current time.



10.3.13 Historical Trend Data Screen

The historical trend data page allows the user to create, analyze, and export custom plots of historical controller data. The majority of the historical trend data controls function exactly as they do on the live trend data control page.



Unlike the live trend data page, the historical trend data page does not automatically generate a plot. To generate a historical plot, click the start date selection dropdown menu to select the start date of the historical trend plot. Depending on the current sample time, the start date selected may have no recorded log records due to controller memory limitations.

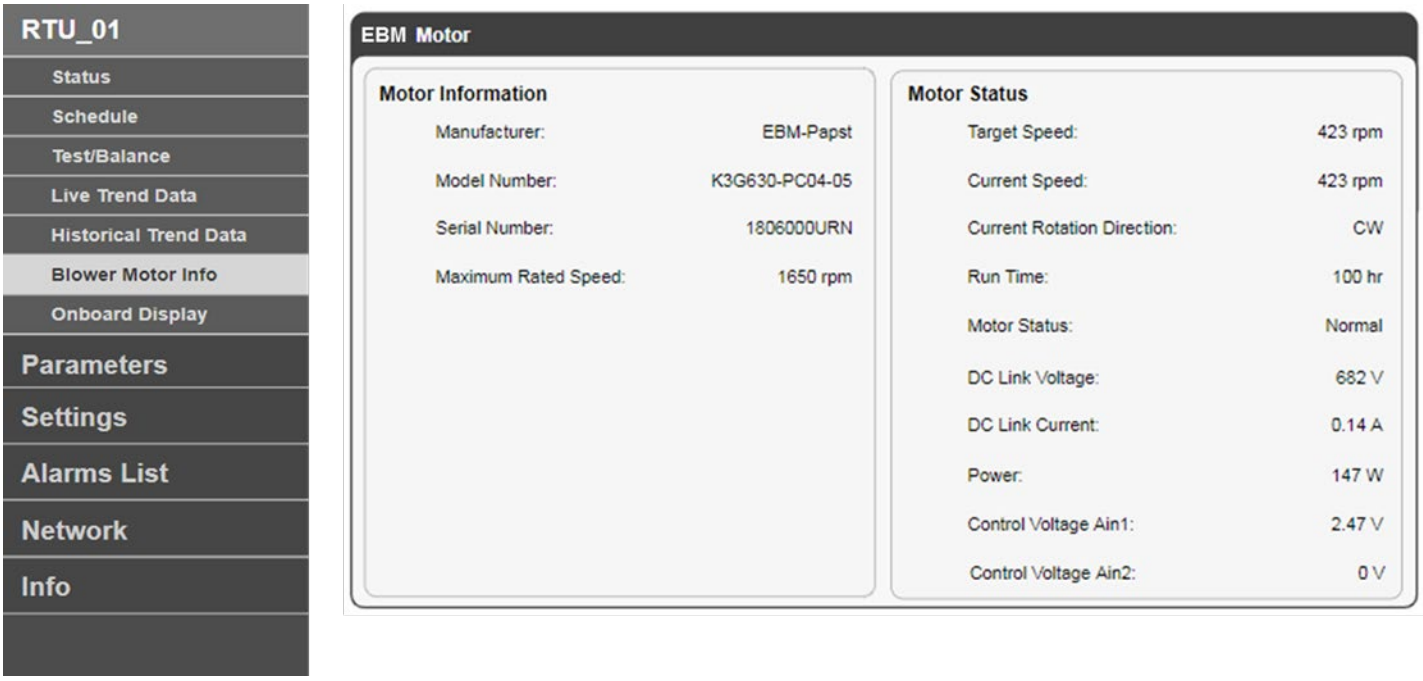
The sample length determines how long after the selected start date to stop the historical trend plot. For example, if weekly is selected, the historical trend plot will only display one week of data starting with the selected date.

The plot button generates the historical trend plot. Once a plot is generated, the remaining controls function as detailed in the live trend data controls section.

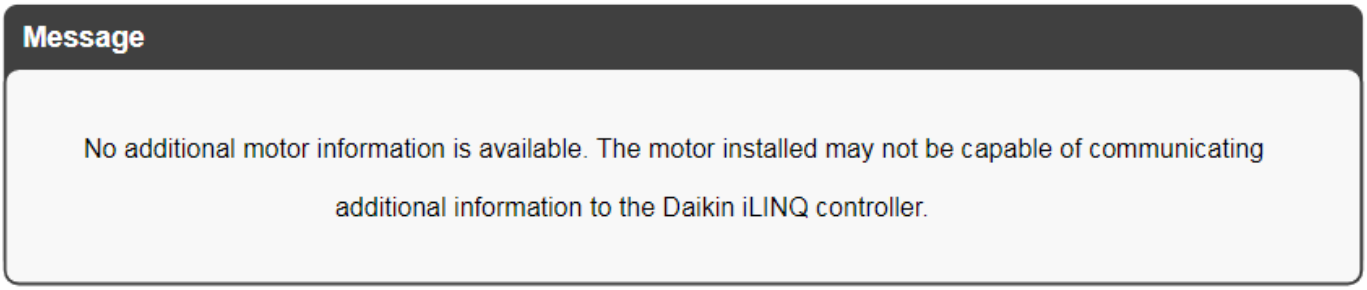
Clicking the export button will save the current historical trend log selection to the PC. To access the trend log, navigate to the default download folder of the internet browser. The trend log is saved to this location with the file name log.csv.

10.3.14 Blower Motor Info

The blower motor info page displays blower motor data if the blower motor installed is capable of communicating with the DDC controller.

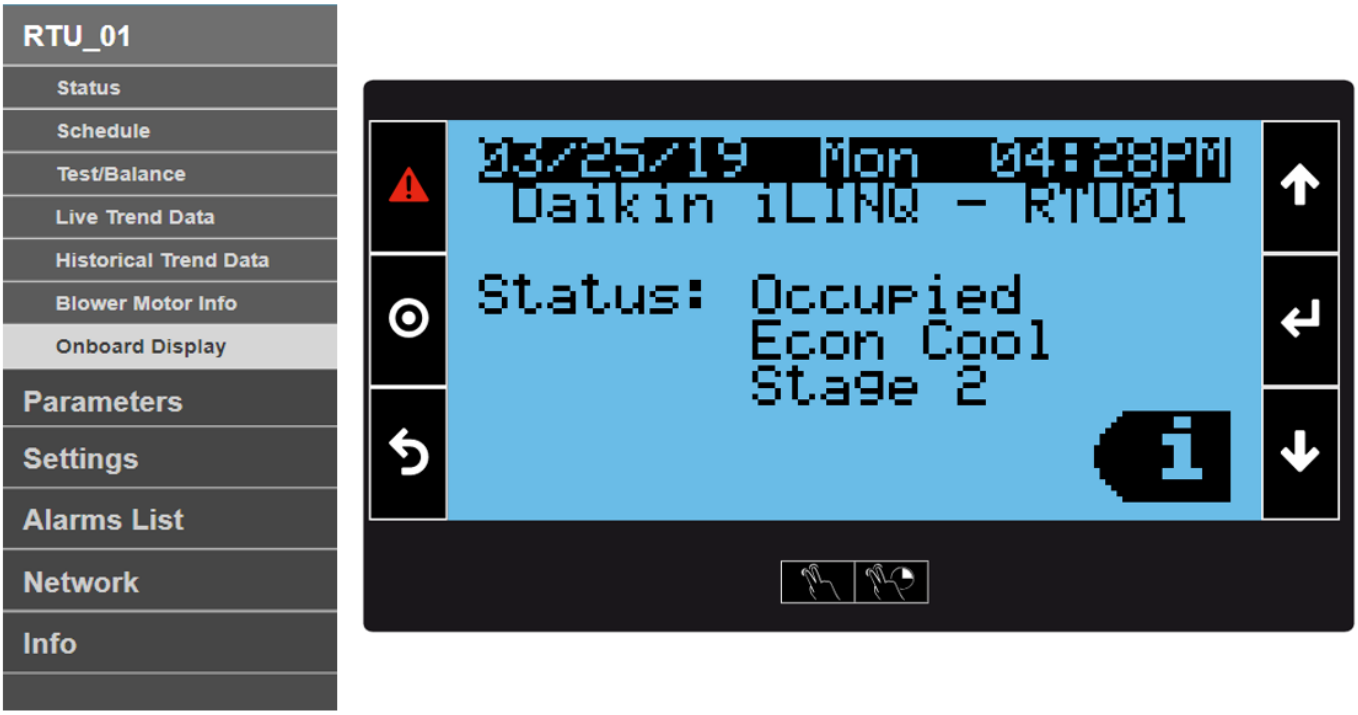


If the motor installed does not support communicating with the DDC controller the message below is displayed instead.



10.3.15 Onboard Display

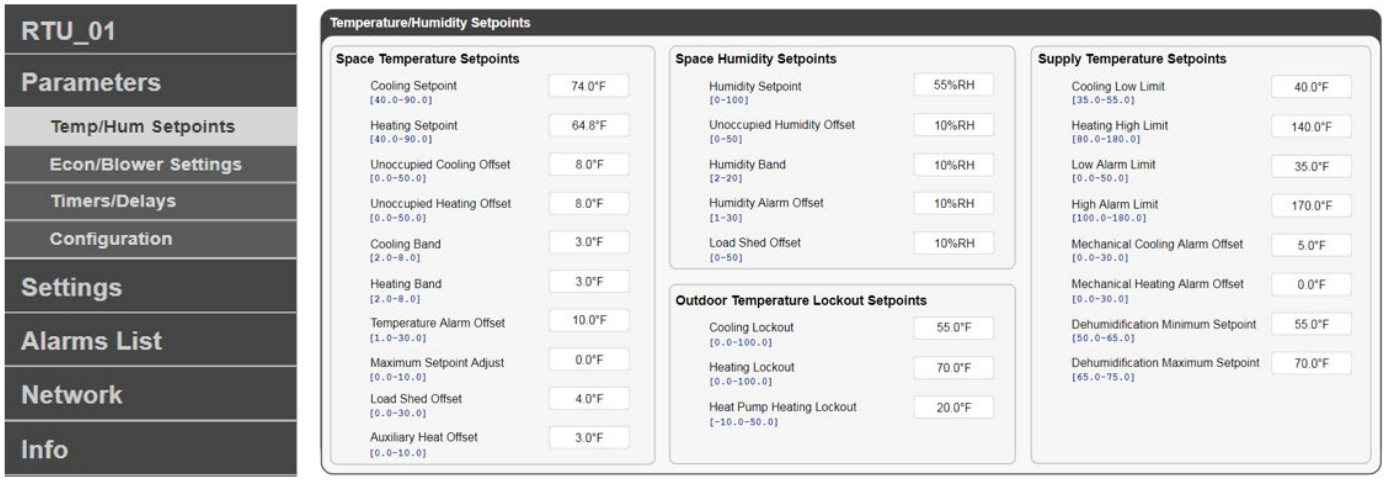
The onboard display is a real-time duplication of the controller's onboard HMI. As the operator navigates the onboard display at the controller, the web interface's onboard display page will duplicate, in real time, the operator's actions. Also, the controller's onboard HMI will duplicate the actions of the web interface onboard display.



To simulate a two button press, click the  icon followed by the two desired buttons on the onboard display. To simulate a two button press and hold, click the  icon followed by the two desired buttons on the onboard display.

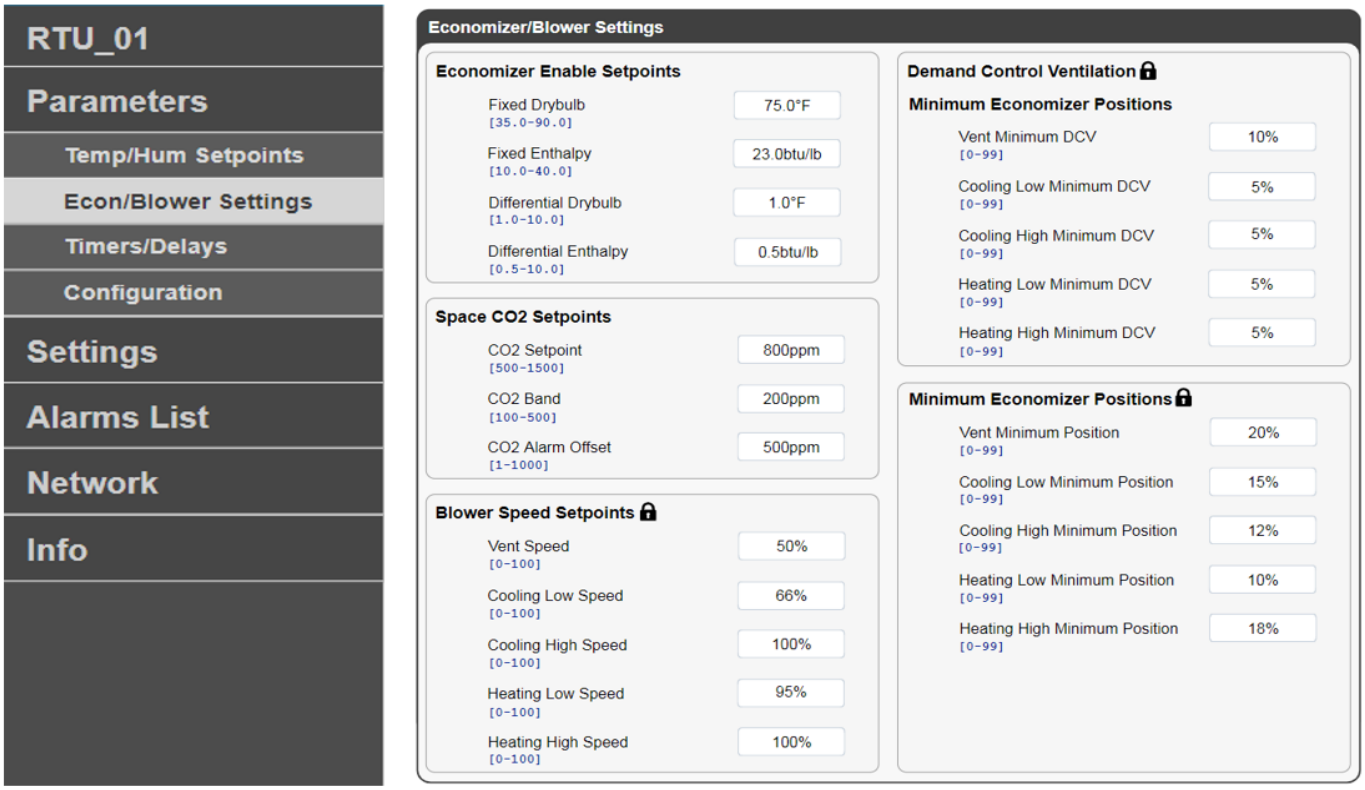
10.3.16 Temp/Hum Setpoints

The temp/hum setpoints page allows the user to modify temperature and humidity setpoint parameters. To modify a parameter, manually enter a value within the limits listed below the parameter name.



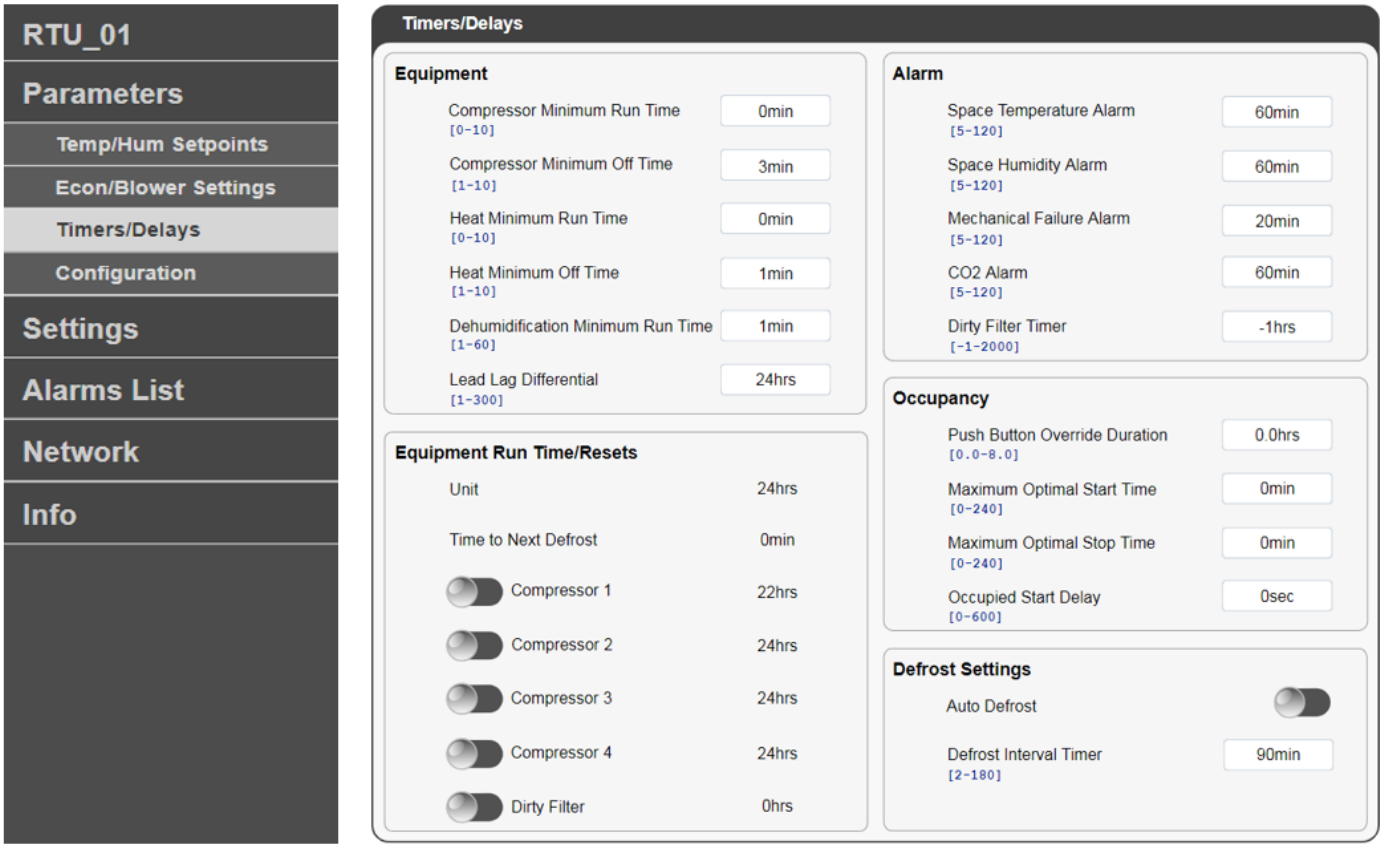
10.3.17 Econ/Blower Settings

The econ/blower settings page allows the user to modify economizer enable setpoints, space CO_2 setpoints, blower speed setpoints, and minimum economizer positions. To modify a parameter, manually enter a value within the limits listed below the parameter name.



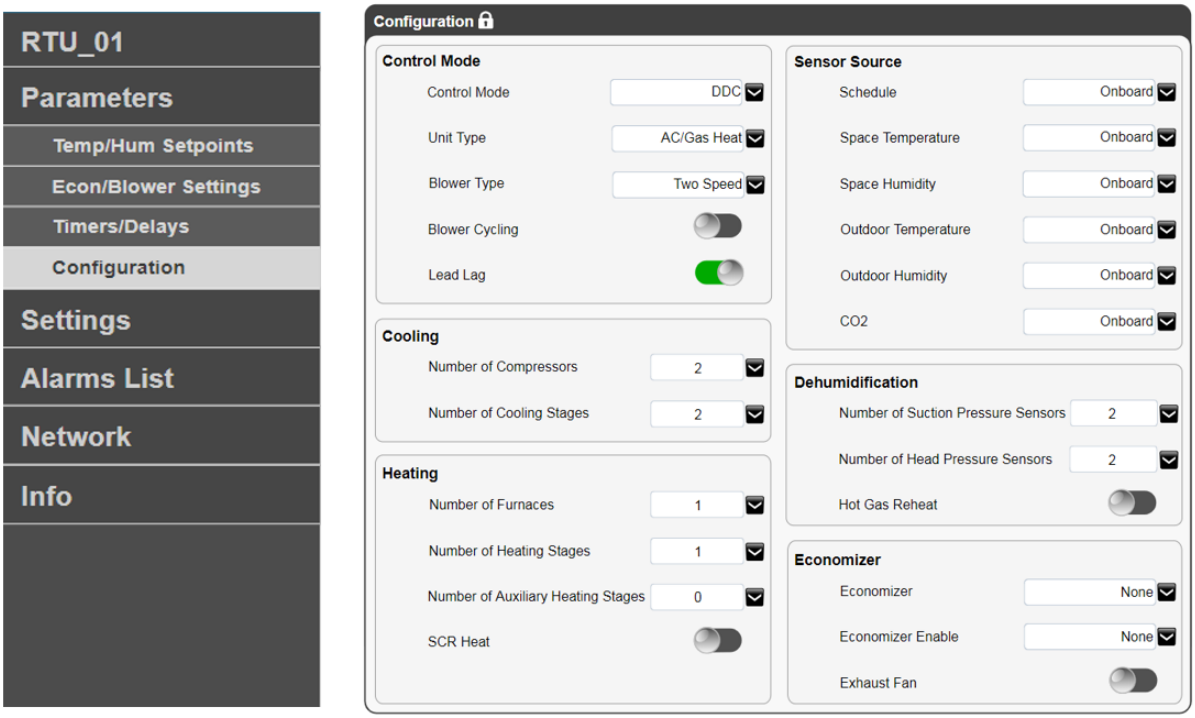
10.3.18 Timers/Delays

The timers/delays page allows the user to modify equipment runtime settings, alarm time delays, occupancy timers, and defrost parameters. Use the toggle switches to reset equipment runtimes and enable auto defrost. When resetting runtime, the toggle switch will automatically return to the disabled position. To modify a parameter, manually enter a value within the limits listed below the parameter name.



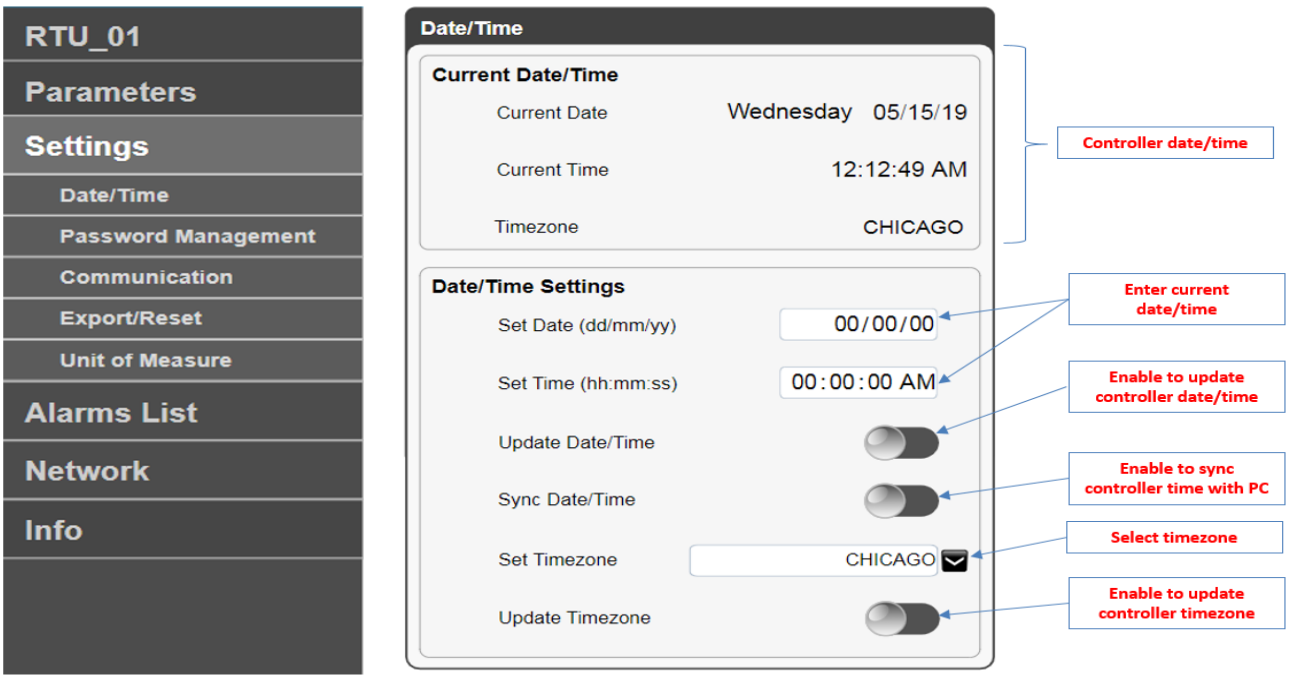
10.3.19 Configuration

The configuration page allows the user to select control modes, sensor sources, and equipment configurations.



10.3.20 Date/Time

The date/time page displays the current date, time, and timezone. This page allows the user to set and update the timezone, date, and time. Alternatively, the date and time of the controller can be synchronized with the current date and time of the connected PC.



Timezone:

To set a timezone, click the set timezone drop down menu and select the local timezone from the list. Once the correct timezone is selected, click the update timezone toggle switch. The toggle switch will return to the disabled position and the new timezone will be displayed in the current timezone field.

Date Format:

The date is presented in the MM/DD/YYYY format.

Setting the Date/Time:

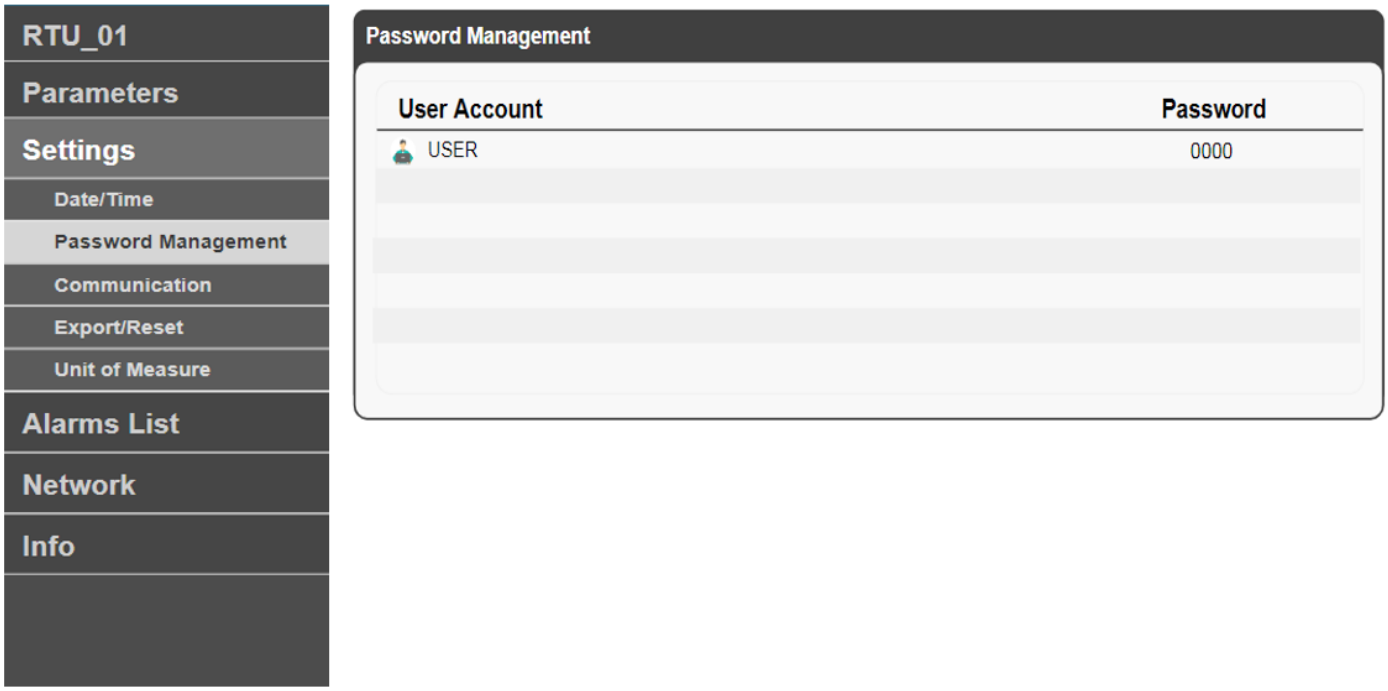
To set the date, enter the month, day, and year in the set date field. To set the current time, enter the hour, minute, second, and select the AM/PM designation. Once the date and time have been entered, click the update date/time toggle switch. The toggle switch will return to the disabled position and the new date and time will be displayed as the current date and time.

Sync Date/Time:

To synchronize the date and time of the controller with the PC, click the sync date/time toggle switch. The toggle switch will return to the disabled position and the computer's date and time will be displayed as the controller's current date and time. **The timezone setting should be configured correctly before using the sync date/time feature.**

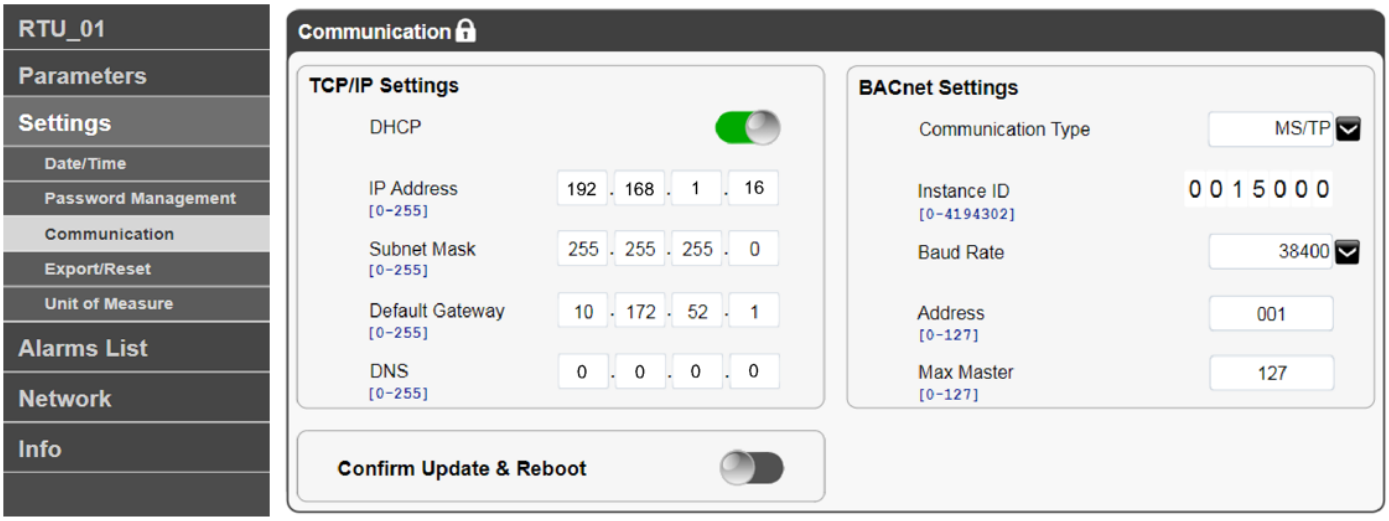
10.3.21 Password Management

The password management page allows the user to change the password for each account. If the service account is active, the user can change both the user and service account passwords. If the user account is active, only the user account password can be modified. To change an account password, click the account's existing password, type the new four digit password, and press enter.



10.3.22 Communication

The communication page allows the user to change the controller's TCP/IP and *BACnet* Settings.



DHCP:

To configure the controller for a dynamic IP address, click the DHCP toggle switch followed by the confirm update & reboot toggle switch. Once the confirm update & reboot toggle switch is clicked, the controller will reboot and the controller will be assigned new TCP/IP settings from the DHCP server. If the controller has rebooted and no TCP/IP changes are observed, contact the network administrator.

Static IP:

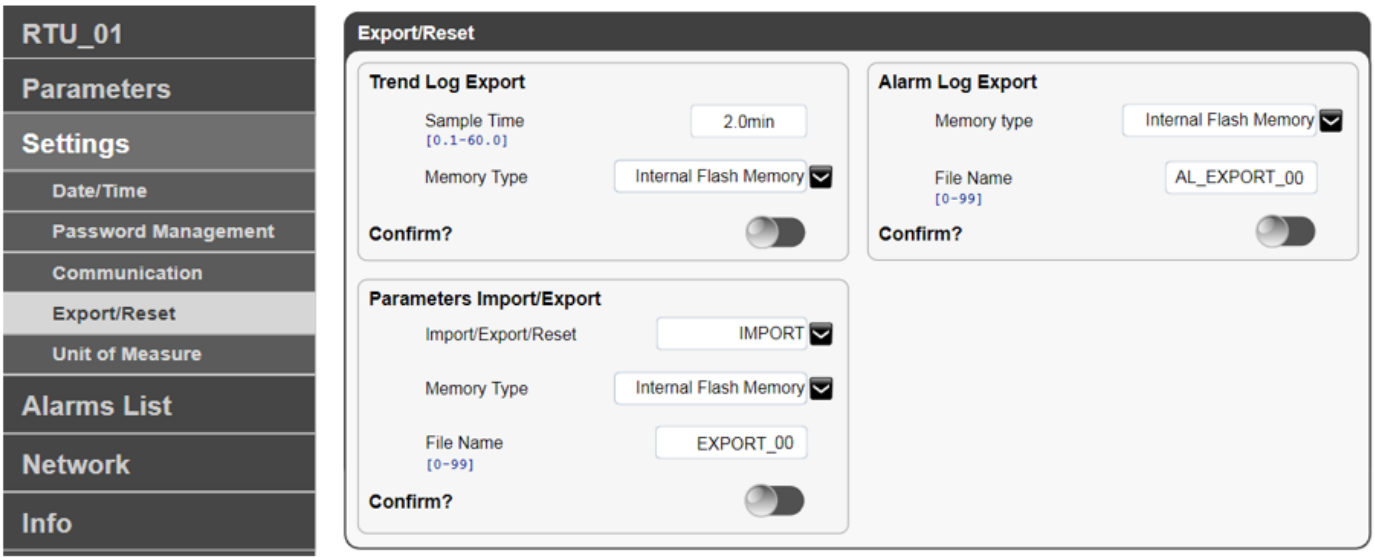
To assign a static IP address, enter the IP address, subnet mask, default gateway, and DNS settings. Once the TCP/IP settings have been entered, click the confirm update & reboot toggle switch. The controller will reboot and the new TCP/IP settings will be active. If the user does not click the confirm update & reboot toggle switch, no TCP/IP changes will be made.

BACnet Settings:

In order to interface the controller with a BAS system via *BACnet* communication, the user must configure *BACnet* settings as required by the BAS network. After modifying the settings as needed, click the confirm update & reboot toggle switch. Once the confirm update & reboot toggle switch has been clicked, the controller will reboot and the new *BACnet* settings will be active.

10.3.23 Export/Reset

The export reset page allows the user to export trend and alarm logs. In addition, the controller's parameters can be reset to factory defaults, exported, or imported.



Note: Any USB connection between the controller and a PC must be unplugged prior to performing an export to internal memory.

Trend Log Export:

The trend log export section allows the user to export the controller's internal historical trend log. The trend log sample time, is adjustable between 0.1 and 60 minutes.

To export the trend log, select the target trend log export destination from the memory type dropdown menu. If USB is selected, a USB storage device must be inserted into the USB port under the controller's front panel before initiating the export. The controller exports the log file with a default file name of PeriodicLog.csv. If the destination folder contains a file with the name PeriodicLog.csv, it will be overwritten. Click the confirm toggle switch to initiate the export, wait for the status window to read operation done, and click ok.

Alarm Log Export:

The alarm log export section allows the user to export the controller's internal alarm log.

To export the alarm log, select the target alarm log export destination from the memory type dropdown menu and enter a file name. If USB is selected, a USB storage device must be inserted into the USB port under the controller's front panel before initiating the export. If the destination folder contains a file name identical to the export file name entered, the existing file will be overwritten. The alarm export file will follow the format AL_EXPORT_XX.csv where XX is the user defined file name setting between 0 and 99. Click the confirm toggle switch to initiate the export, wait for the status window to read operation done, and click ok.

Parameters Import/Export/Reset:

The parameters import/export/reset section allows the user to import, export, or reset the controller's setpoint and configuration settings.

To export parameters, select export from the import/export/reset dropdown menu and select the parameter export destination from the memory type dropdown menu. If USB is selected, a USB storage device must be inserted into the USB port under the controller's front panel before initiating the export. Enter the name for the export file in place of the existing file name. The parameters export file will follow the format EXPORT_XX.txt where XX is the user defined file name between 0 and 98. From the factory, the controller stores its factory parameter settings as EXPORT_99. To ensure factory settings are never overwritten, the web interface will not allow the user to export parameters to this file name. Click the confirm toggle switch to initiate the export, wait for the status window to read operation done, and click ok. As stated in the warning message, if the destination folder contains a file name identical to the export file name entered, the existing file will be overwritten.

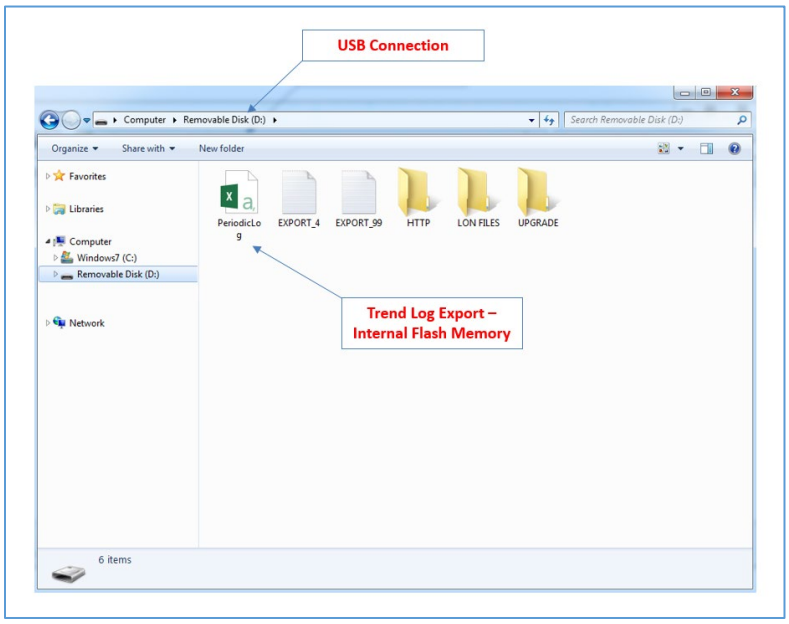
To import parameters, select import from the import/export/reset dropdown menu and select the location of the parameter file from the memory type dropdown menu. If USB is selected, a USB storage device must be inserted into the USB port under the controller's front panel before initiating the import. Enter the name of the parameter file to be imported in place of the existing file name. Click the confirm toggle switch to initiate the import, wait for the status window to read operation done, and click ok. If the parameter file to be imported cannot be located by the controller, a warning message is displayed. The file name EXPORT_99 is reserved for the reset function and cannot be used as an import file name.

To reset the controller back to factory settings, select reset from the import/export/reset dropdown menu. The file name defaults to EXPORT_99. Click the confirm toggle switch to initiate the reset. A warning message is displayed to remind the user that any changes made since installation of the unit will be lost. Click yes to confirm.

10.3.24 Accessing Export Files

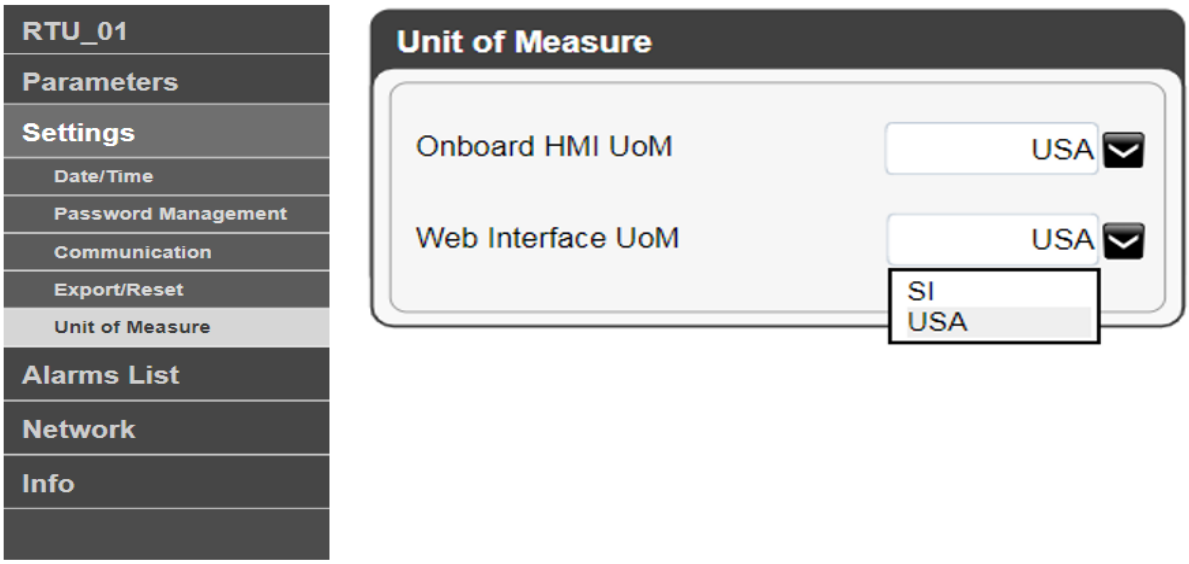
A file that has been exported to internal controller memory can be copied to a PC by direct connection with a USB cable. When exporting, any previously exported files of the same name are overwritten by the new file. The export files can be copied or deleted as needed.

Note: The EXPORT_99 file contains the factory parameter settings and should never be deleted.



10.3.25 Unit of Measure

The unit of measure page allows the user to select the units of measurement used for both the controller's onboard display and the web interface. The user may select between imperial (USA) and metric (SI) using the dropdown menus.



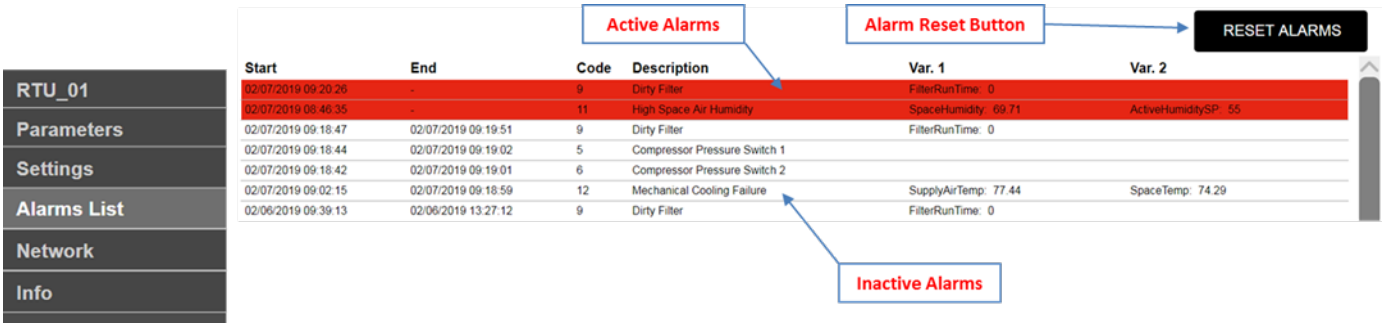
10.3.26 Alarms List

The alarms list page is a historical log of all controller alarms. Active alarms are highlighted red and located at the top of the log while inactive alarms are not highlighted and appear below active alarms in order of the alarm start time.

For each instance of an alarm the alarm list records the following information:

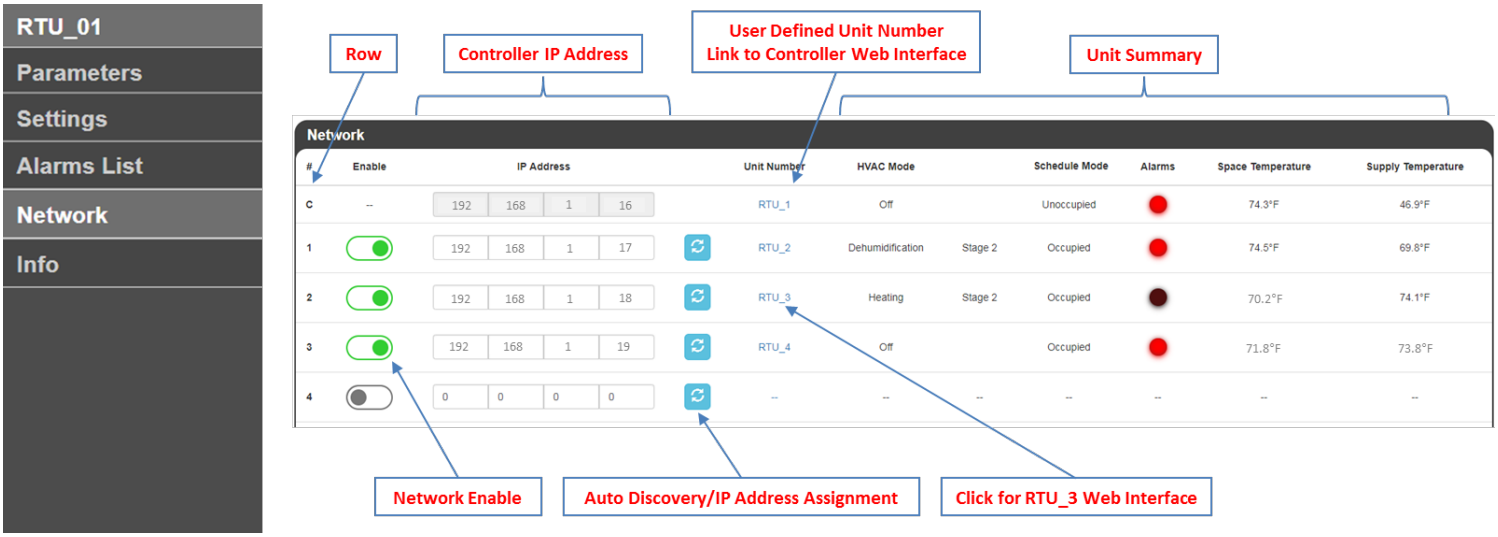
- Start: the date/time that the alarm became active
- End: the date/time that the alarm cleared
- Code: two digit alarm code
- Description: description of alarm
- Var 1: the value of a related parameter or sensor value at the time the alarm became active
- Var 2: the value of a related parameter or sensor value at the time the alarm became active

If a Compressor Pressure Switch Alarm is generated 5 times within a 4 hour period, the alarm must be manually reset. To manually reset this alarm, click the reset alarms button in the top right corner of the alarms list page.



10.3.27 Network

The network page allows the networking of up to 10 Daikin *iLINQ* controllers together on a TCP/IP network resulting in seamless navigation of multiple controller web interfaces. Row C of the network page designates the current controller that is being accessed via the PC. Once a controller is discovered and added to the network page, the IP address, unit number, and a brief unit summary are displayed. The unit number serves as a link to the specific controller's web interface. It is recommended to assign each controller a different unit number to assist with the network configuration process. For optimal navigation, populate the network page for each connected controller.



Local Network Requirements:

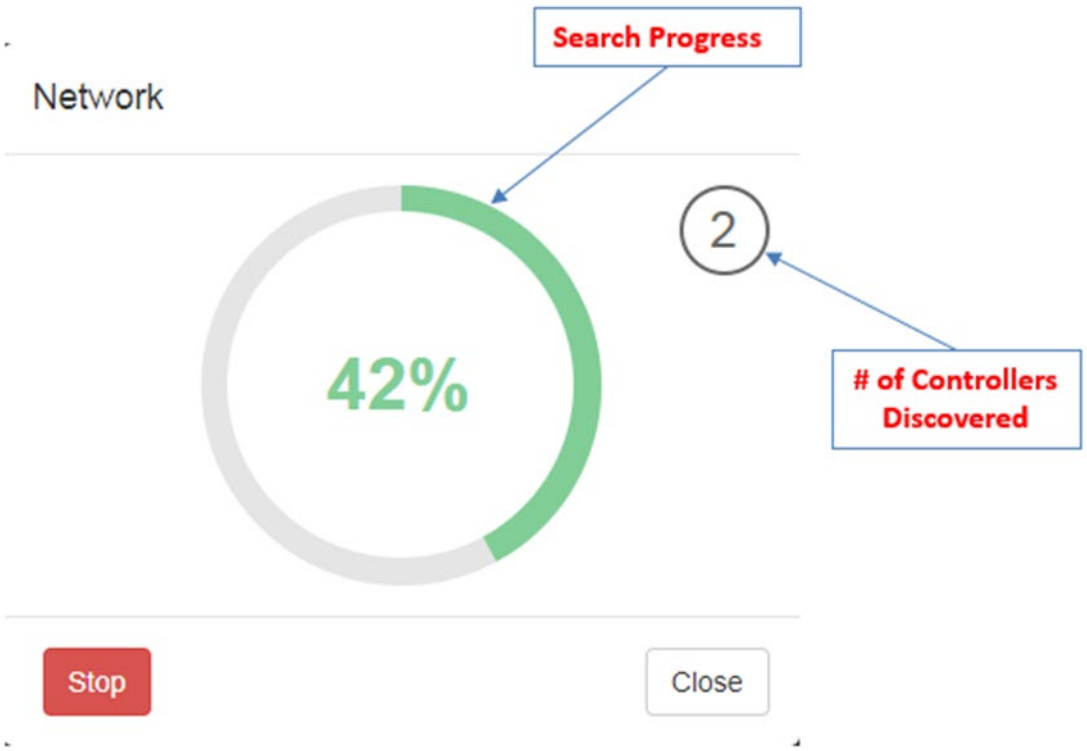
In order to utilize the network feature, all controllers must be connected to the same Ethernet network and be assigned unique IP addresses.

Adding a Controller Manually:

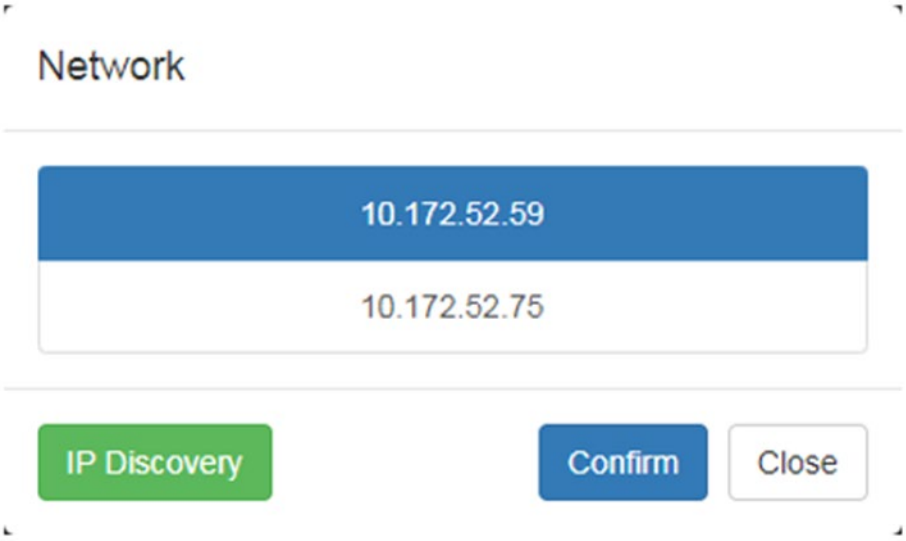
To manually add a controller to the network, enter the IP address of one of the controllers connected to the network in any row. Once the IP address is entered, click the corresponding enable toggle switch. If the controller has been successfully added to the network, the unit summary parameters of the controller will populate the row. If unsuccessful, the unit number will be populated with “Unknown”. Repeat this process for up to 9 controllers.

Automatic Controller Discovery:

To automatically discover a controller, click the icon and the network discovery window is displayed. To initiate a network search click the IP discovery button. The network discovery window displays the progress of the network search. The number in the top right corner indicates the current number of controllers discovered by the search. To halt the search, click the stop button. If the close button is clicked, the search will continue in the background.



Once the search concludes, the network discovery window displays the IP addresses of the discovered controllers. If the user closes the network discovery window prior to the search completing, the search results may still be viewed by, clicking the icon on any row.



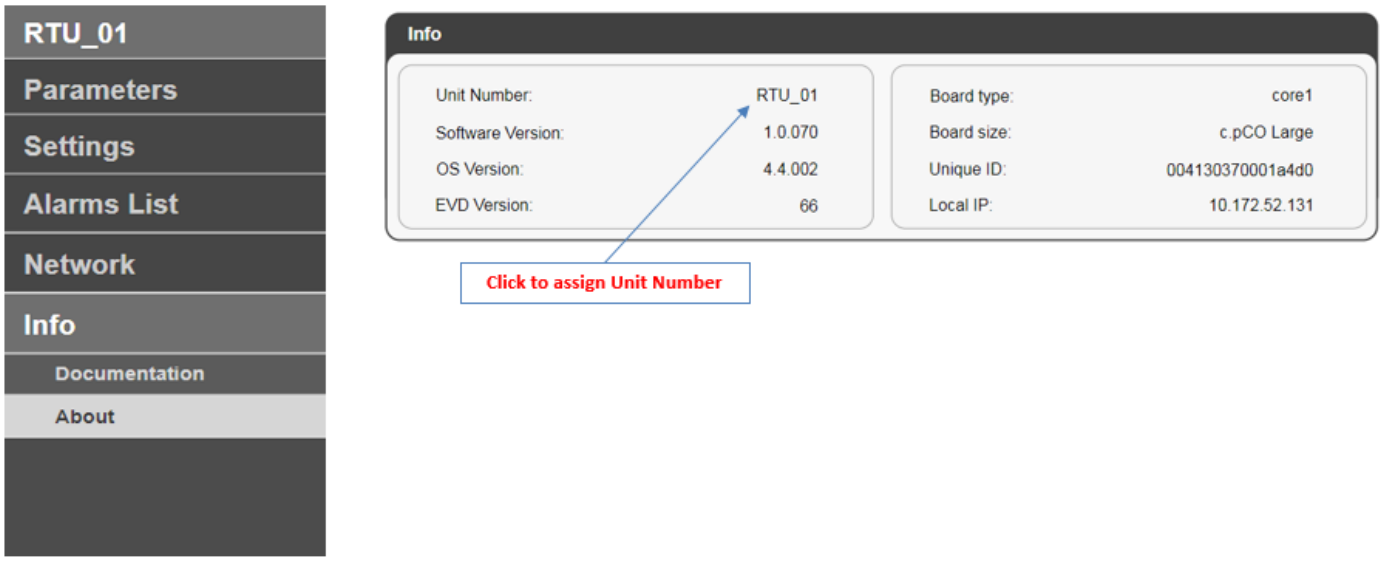
To add a controller, click the icon, select an IP address, and click confirm. Click the enable toggle switch to activate controller communication.

10.3.28 Documentation

The documentation page contains information about how to access digital copies of the Daikin *iLINQ* user manual, quick start guide, *BACnet* design guide, and *LonWorks* design guide.

10.3.29 About

The about page displays the unit number and other controller attributes. The user can modify the unit number to assign a unique identifier to each installed controller. The unit number is displayed at the top of the navigation menu and on the network page.



11 Troubleshooting/FAQs

11.1 Temperature Sensors

The controller temperature inputs are configured to work with 10K Type III Thermistor temperature sensors. The resistance measured across the sensor wires (no power) or the DC voltage measured from the controller input to ground can be used to confirm that the controller is reading the sensor properly. Values are provided in the table below.

Temperature °F	Temperature °C	Resistance Ω	Input Voltage Vdc
-10	-23.33	94,155	4.661
-5	-20.56	81,304	4.024
0	-17.78	70,377	3.484
5	-15	61,064	3.023
10	-12.22	53,106	2.629
15	-9.44	46,291	2.291
20	-6.67	40,440	2.002
25	-3.89	35,406	1.753
30	-1.11	31,064	1.538
35	1.67	27,312	1.352
40	4.44	24,062	1.191
45	7.22	21,242	1.051
50	10	18,788	0.931
52	11.11	17,898	0.888
54	12.22	17,055	0.845
56	13.33	16,256	0.805
58	14.44	15,500	0.768
60	15.56	14,783	0.732
62	16.67	14,103	0.7
64	17.78	13,459	0.666
66	18.89	12,848	0.636
68	20	12,268	0.608
69	20.56	11,989	0.594
70	21.11	11,717	0.58
71	21.67	11,452	0.567

Temperature °F	Temperature °C	Resistance Ω	Input Voltage Vdc
72	22.22	11,194	0.555
73	22.78	10,943	0.542
74	23.33	10,698	0.531
75	23.89	10,459	0.519
76	24.44	10,226	0.507
77	25	10,000	0.495
78	25.56	9,779	0.484
80	26.67	9,353	0.463
82	27.78	8,948	0.443
84	28.89	8,563	0.424
86	30	8,196	0.406
88	31.11	7,848	0.388
90	32.22	7,516	0.372
95	35	6,754	0.335
100	37.78	6,079	0.301
105	40.56	5,480	0.271
110	43.33	4,947	0.245
115	46.11	4,473	2.21
120	48.89	4,050	2.01
125	51.67	3,672	1.82
130	54.44	3,334	1.65
135	57.22	3,032	1.502
140	60	2,760	1.368
145	62.78	2,516	1.248
150	65.56	2,297	1.137

The sensor is reading a value that is different from the value determined by a test instrument.

1. Verify the test instrument is properly calibrated and that the test reading was taken in an appropriate location to verify the temperature value in question.
2. The resistance of the wire used to connect the temperature sensor to the controller has a small effect on the reading. There may also be small variations due to sensor tolerances. To correct for small variations, a calibration offset should be entered for the sensor value from the Test/Balance Menu in the onboard display or web interface.
3. Verify that a temperature sensor of the correct specifications has been installed. The temperature sensor should be a 10K Type III thermistor.

The sensor is reading a very low value, very high value, or a negative value is displayed.

1. **Check sensor & sensor wiring resistance:** Disconnect the sensor wiring from the controller or remove power from the controller and measure the sensor resistance with an ohmmeter. Compare the measured resistance with the expected value based on the actual temperature. If this measurement is correct, there may have been a problem with the wiring connection at the controller, and the wires should be re-terminated. If the ohmmeter reads > 1MΩ or 0Ω, check for broken wiring, disconnected wiring, or a faulty sensor.

2. **Check sensor wiring for short circuit:** Disconnect the wiring from the temperature sensor. From the controller, measure the resistance of the sensor wires. If the value read is 0Ω, there is a short in the sensor cable and it should be replaced. If the value read is >1MΩ, the wire is not shorted and the cable should be checked for a break.
3. **Check sensor wiring for cable break:** Disconnect the wiring from the temperature sensor and connect the two wires together with a wire nut. From the controller, measure the resistance of the sensor wires. If the value read is > 1MΩ or "overload", there is a break in the sensor cable and it should be replaced. If the value read is 0Ω, the wire is ok, and the sensor should be verified.
4. **Check sensor resistance:** With the wiring disconnected from the sensor, measure the resistance of the temperature output and compare with the values in the table above. If the measured resistance is very low or very high, the sensor should be replaced.

The sensor value is reading erratically or is rapidly changing.

1. This could be caused by poor wiring connections at the controller or sensor. Disconnect all sensor wiring connections and re-terminate the wires.
2. Condensation at the sensor wiring terminals will cause erratic readings. Ensure that the sensor is installed in an environment free of excessive moisture or protect the wiring connections from moisture build-up.
3. Incorrect sensor placement could cause unexpected readings. Ensure that sensors are installed in proper locations.
   a) Outdoor air temperature sensors should be located in an area free of direct sunlight.
   b) Supply air temperature sensor should be located in the supply air duct approximately 10 feet downstream of the unit.
   c) Space temperature sensor should be installed on an interior wall in an area where it is not in direct contact with air from supply air diffusers.

A temperature alarm is displayed, but the associated temperature value appears to be correct.

1. There are several different alarms related to temperature sensor readings that can be displayed by the controller. Alarms such as the Mechanical Cooling Alarm and Mechanical Heating Alarm are determined based on readings from the supply air temperature sensor, but indicate a possible problem with cooling or heating equipment while the unit is operating. Refer to the alarm description and use the force modes in the controller to verify proper unit operation.
2. Some temperature alarms are determined by comparing current values with user definable alarm setpoints. Verify the unit temperature setpoint configuration settings are correct for the installation to avoid unnecessary alarms.

11.2 Humidity and CO_2 Sensors

Humidity and CO_2 sensors provide a 0-10Vdc signal at the controller which corresponds to a 0-100%RH humidity level or 0-2000ppm CO_2 value. The DC voltage measured from the controller input to ground can be used to confirm that the controller is reading the sensor properly. Example values are provided in the table below.

Input Voltage Vdc	Humidity %RH	CO2 ppm
0	0	0
2	20	400
4	40	800
6	60	1,200
8	80	1,600
10	100	2,000

The sensor value displayed is 0.

1. Check that the sensor is wired correctly according to the supplied data sheet and that the correct supply power voltage is present at the terminal blocks in the sensor.
2. Verify that any DIP switch settings in the sensor are correct for 0-10Vdc output, or that a sensor with the correct output range has been installed.
3. Verify that the terminal screws are all connected tightly and that the wires are firmly in place at the sensor and at the controller input.
4. Check the wires from the controller to the sensor for a break or short circuit.

The sensor value displayed is erratic and changing rapidly.

1. Check that the sensor is wired correctly according to the supplied data sheet and that the correct supply power voltage is present at the terminal blocks in the sensor.
2. Verify that there is no condensation on the sensor circuit board.
3. In areas of high RF interference or noise, a shielded sensor cable may be necessary.

The sensor is reading a value that is different from the value determined by a test instrument.

1. Verify the test instrument is properly calibrated and that the test reading was taken in an appropriate location to verify the sensor value in question.
2. If necessary, a small sensor calibration offset may be entered for the sensor value from the Test/Balance Menu in the onboard display or web interface.
3. If the transmitter is not reading within the specified tolerance, the sensor may need to be replaced.
4. Incorrect sensor placement could cause unexpected readings. Ensure that sensors are installed in proper locations.

A humidity or CO_2 alarm is displayed, but the associated sensor value appears to be correct.

Some humidity and CO_2 alarms are determined by comparing current values with user definable alarm setpoints. Verify the unit humidity and CO_2 setpoint configuration settings are correct for the installation to avoid unnecessary alarms.

11.3 Blower Off Alarm

The blower is commanded differently depending on the Blower Type configuration setting. Verify the Blower Type configuration setting is correct for the unit where the controller is installed. An incorrect setting may result in a Blower Off Alarm and unexpected blower operation.

Blower is not operating while a Blower Off Alarm is active.

One Speed Blower:

1. Use the onboard display or web interface to place the unit into Force Vent Mode. Set the force mode Blower Speed setting equal to 100.
2. Verify 24VAC at controller terminal J12-C1. If 24VAC is not present, the blower contactor cannot be energized. Check for 24VAC at the control transformer(s) and verify wiring per the unit wiring diagram.

3. Verify 24VAC at the controller terminal J12-NO3. If 24VAC is present on terminal J12-C1 but not at terminal J12-NO3, the controller output may be failed.
4. Verify 24VAC between the blower contactor control terminals A1 and A2. If 24VAC is not present, the contactor is not energized and the blower cannot operate. Verify wiring from the contactor coil to the controller and from the contactor coil to ground.
5. Verify primary voltage at the contactor terminals L1, L2, L3 match the unit nameplate. If the expected voltage is not present, check for blown fuses and correct wiring between the unit power block and the blower contactor.
6. Verify primary voltage at the contactor terminals T1, T2, T3 match the unit nameplate. If 24VAC is present at the contactor control terminals, and primary power is present at contactor terminals L1, L2, and L3 but no voltage is present at terminals T1, T2, and T3 then the contactor may be failed.
7. If primary voltage is present at terminals T1, T2, and T3 of the blower contactor, there could be a problem with the motor.

Two Speed Blower - Low Speed:

1. Use the onboard display or web interface to place the unit into Force Vent Mode. Set the force mode Blower Speed setting equal to a value less than 100.
2. Verify 24VAC at controller terminal J12-C1. If 24VAC is not present, the blower contactor cannot be energized. Check for 24VAC at the control transformer(s) and verify wiring per the unit wiring diagram.
3. Verify 24VAC at the controller terminal J12-NO3. If 24VAC is present on terminal J12-C1 but not at terminal J12-NO3, the controller output may be failed.
4. Verify 24VAC between the blower contactor control terminals A1 and A2. If 24VAC is not present, the contactor is not energized and the blower cannot operate. Verify wiring from the contactor coil to the controller and from the contactor coil to ground.
5. Verify primary voltage at the contactor terminals L1, L2, L3 match the unit nameplate. If the expected voltage is not present, check for blown fuses and correct wiring between the unit power block and the blower contactor.
6. Verify primary voltage at the contactor terminals T1, T2, T3 match the unit nameplate. If 24VAC is present at the contactor control terminals, and primary power is present at contactor terminals L1, L2, and L3 but no voltage is present at terminals T1, T2, and T3 then the contactor may be failed.
7. If primary voltage is present at terminals T1, T2, and T3 of the blower contactor, there could be a problem with the motor.

Two Speed Blower - High Speed:

1. Use the onboard display or web interface to place the unit into Force Vent Mode. Set the force mode Blower Speed setting equal to 100.
2. Verify 24VAC at controller terminal J13-C4. If 24VAC is not present, the blower contactor cannot be energized. Check for 24VAC at the control transformer(s) and verify wiring per the unit wiring diagram.
3. Verify 24VAC at the controller terminal J13-NO4. If 24VAC is present on terminal J13-C4 but not at terminal J13-NO4, the controller output may be failed.
4. Verify 24VAC between the blower contactor control terminals A1 and A2. If 24VAC is not present, the contactor is not energized and the blower cannot operate. Verify wiring from the contactor coil to the controller and from the contactor coil to ground.
5. Verify primary voltage at the contactor terminals L1, L2, L3 match the unit nameplate. If the expected voltage is not present, check for blown fuses and correct wiring between the unit power block and the blower contactor.

6. Verify primary voltage at the contactor terminals T1, T2, T3 match the unit nameplate. If 24VAC is present at the contactor control terminals, and primary power is present at contactor terminals L1, L2, and L3 but no voltage is present at terminals T1, T2, and T3 then the contactor may be failed.
7. If primary voltage is present at terminals T1, T2, and T3 of the blower contactor, there could be a problem with the motor.

Variable Speed (0-10Vdc control) blower:

1. Use the onboard display or web interface to place the unit into Force Vent Mode. Set the force mode Blower Speed setting equal to the unit's Vent Speed setpoint.
2. The blower contactor is energized by the Emergency Shutdown circuit and the motor is commanded by the controller through a 0-10Vdc analog output.
3. Verify 24VAC between the blower contactor control terminals A1 and A2. If 24VAC is not present, the contactor is not energized and the blower cannot operate. Verify wiring from the contactor coil to the "ES" terminal at the unit terminal block and from the contactor coil to ground.
4. Verify primary voltage at the contactor terminals L1, L2, L3 match the unit nameplate. If the expected voltage is not present, check for blown fuses and correct wiring between the unit power block and the blower contactor.
5. Verify primary voltage at the contactor terminals T1, T2, T3 match the unit nameplate. If 24VAC is present at the contactor control terminals, and primary power is present at contactor terminals L1, L2, and L3 but no voltage is present at terminals T1, T2, and T3 then the contactor may be failed.
6. Verify 24VAC between controller terminals J4-VG and J4-VG0. If 24VAC is not present, the analog output to the motor cannot be supplied and the motor cannot operate. Check for 24VAC at the control transformer(s) and verify wiring per the unit wiring diagram.
7. Verify DC voltage between controller terminals J4-VG0 and J4-Y2. The measured voltage should correspond to the value entered in the force mode Blower Speed setting divided by 10. For example, a setting of 34% corresponds to a control voltage of 3.4Vdc. Large chassis blower motors will not run if the control voltage is less than 1Vdc. Small and medium chassis motors will not run if the control voltage is less than 2Vdc. Verify control voltages at various force mode Blower Speed settings.
8. Verify that Blower Speed configuration settings are set correctly to provide the required CFM for the unit using the airflow tables provided in the unit IO manual as a guide.
9. If the DC control voltage signal is not present, disconnect the wire terminated at controller terminal J4-Y2 and check for voltage again. If the expected DC voltage is not present, and the Blower Type configuration is set to Variable, there may be a problem with the controller hardware.
10. Verify the wiring between the controller and the motor. If the motor does not operate when primary voltage and the correct DC control voltage are present, there could be a problem with the motor.

Blower is operating while a Blower Off Alarm is active.

1. Verify that Blower Speed settings are correctly configured for units with the Blower Type set to Variable. The speed settings should be set so that that the unit provides the required CFM for the application. Use the airflow tables provided in the unit IO manual as a guide.
2. A differential pressure switch is used to determine blower status. The pressure inside the blower housing (-) is compared with the ambient pressure where the pressure switch is located. If the blower compartment panel has been removed, the pressure differential may not be large enough to trigger the switch and should be installed for the unit to operate correctly.

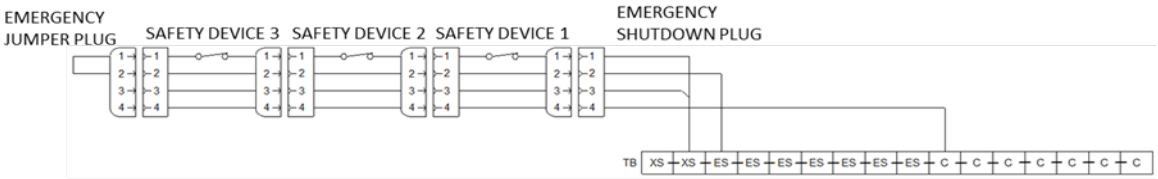
3. Verify 24VAC between controller terminals J5-IDC1 and J5-ID2. If 24VAC is present, and the controller is not indicating that the blower is operating, there could be a problem with the controller input. If 24VAC is not present, verify that J5-IDC1 is connected to ground by verifying 24VAC between J5-IDC1 and unit terminal “XS”. Verify wiring of the blower proving switch is correct according to the unit wiring diagram.
4. Locate the differential pressure switch used for blower status and disconnect the wires. Verify that 24VAC is present on only one of the two wires when measured with reference to ground. If 24VAC is measured at both wires, verify wiring and check for a short circuit. If 24VAC is not present, verify wiring and check for a broken wire.
5. Locate the differential pressure switch used for blower status and verify that the connected tubing between the pressure switch and the blower housing is not kinked or blocked causing a restriction.
6. Locate the pressure pickup port and verify that it is securely mounted and that the tubing from the pressure switch is securely installed.
7. With the wires disconnected from the differential pressure switch, use a multi-meter to check for continuity between the two terminals when the blower is operating. A closed contact indicates the blower is operating and an open contact indicates the blower is off.
8. Disconnect the tubing from the differential pressure switch and use a manometer to measure the pressure between the tubing and ambient air. The pressure measured at the tubing should less than -0.1 “W.C. to trigger the pressure switch. If the pressure is less than -0.1” with the blower operating and the switch contacts are not closed, the switch may need to be replaced. If the pressure differential is not negative enough, the blower speed needs to be increased or a more sensitive switch needs to be installed.

11.4 Emergency Shutdown Alarm

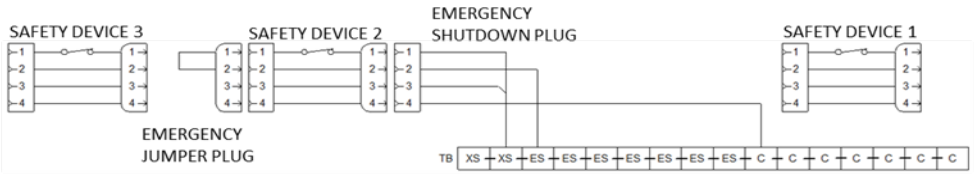
All installed emergency shutdown devices are wired in series between unit terminal “XS” 24VAC from the control transformer and unit terminal “ES”. A failure of any of these devices will result in an Emergency Shutdown Alarm.

1. A safety jumper plug is installed on the wire harness of the last safety device. If this plug is not installed, the unit will have an emergency shutdown alarm.
2. Check the status of any installed emergency shutdown devices for correct functionality. Individual devices can be isolated for testing by relocating the emergency jumper plug and emergency shutdown plug as needed to help identify which device is causing the shutdown.

Emergency Shutdown Circuit
Three Safety Devices



Emergency Shutdown Circuit
Troubleshooting Device 2



3. Verify 24VAC between unit terminal “XS” and ground. If 24VAC is not present, verify wiring of the control voltage transformer and check for transformer failure.
4. Verify 24VAC between unit terminal “ES” and ground. If 24VAC is not present, verify wiring and functionality of the emergency shutdown devices.
5. Verify 24VAC between controller terminals J5-IDC1 and J5-ID1. If 24VAC is present, and the controller is indicating that an emergency shutdown alarm is active, there could be a problem with the controller input. If 24VAC is not present, confirm that J5-IDC1 is connected to ground by measuring 24VAC between J5-IDC1 and unit terminal “ES”. Verify wiring from the unit terminal block to the controller terminals is correct according to the unit wiring diagram.

11.5 Compressor Pressure Switch Alarms

Each compressor installed in the unit has an associated low pressure switch and high pressure switch. These are wired in series back to the controller so that a failure of either device results in a Compressor Pressure Switch Alarm being generated for that compressor.

1. Verify status, operation, and wiring of each compressor pressure switch. A closed contact at a pressure switch indicates that the pressure is within an acceptable range. An open contact at the low pressure switch could indicate that the unit is low on refrigerant, the presence of a leak in the system, or that the conditions are present to potentially freeze the coil. An open contact at the high pressure switch could indicate that the condenser fans are not operating as they should, causing the pressure to rise.
2. Verify that the controller configuration parameters are set for the correct number of compressors in the unit. The controller is capable of operating a unit with up to 4 compressors, but may be installed in a unit with only one compressor.
3. To prevent the unit from repeatedly attempting to operate, then shutting down due to high or low pressure, the pressure switch alarm must be manually reset by the user after 5 repeated alarm events within a 4 hour time. Once the condition that caused the alarm has been corrected, the alarm may need to be reset at the controller by pressing and holding the ALARM button for 3 seconds.
4. Verify 24VAC between controller terminals J5-IDC1 and J5-ID3, J5-ID4, J5-ID5, or J5-ID6 depending on the compressor pressure switch in question. If 24VAC is present, and the controller is indicating that a compressor pressure switch alarm is active, there could be a problem with the controller input. If 24VAC is not present, confirm that J5-IDC1 is connected to ground by measuring 24VAC between J5-IDC1 and unit terminal “ES”. Verify wiring from the compressor pressure switches to the controller terminals is correct according to the unit wiring diagram.

11.6 Gas Furnace Board Alarms

Each furnace installed in the unit has an associated ignition control board. The DDC controller provides a signal calling for heat to the ignition control board which then controls the functions/safeties necessary to operate the gas furnace. A 24VAC feedback signal is monitored by the DDC controller. In addition to indicating to the DDC controller that the unit blower needs to operate to dissipate heat generated by the furnace, an unexpected feedback status may indicate that there is a problem and an alarm is generated.

1. Verify that the controller configuration settings are correct for the unit where the controller is installed.
    a) The Unit Type should be set as A/C With Gas Heat only when gas heat is the primary heating source. Otherwise, the Unit Type should be set to A/C With Electric Heat or Heat Pump accordingly.

b) The Number of Furnaces setting should be 0 on heat pump units or on units with electric heat. On units with gas heat the Number of Furnaces setting value should be equal to the number of ignition control boards installed in the unit. Some large chassis (15 to 25 Ton) units may have 2 furnaces while all other units will have 1.

2. Check the ignition control board for the presence of an alarm condition. Refer to the unit IO Manual for information on the ignition control board alarm LED flash codes which will provide additional information.
3. Use the Test / Balance menus in the controller to operate the unit in Force Low Heat mode. Verify 24VAC between controller terminals J8-IDC13 and J8-ID13. If 24VAC is present, and the controller is indicating that a gas furnace board alarm is active, there could be a problem with the controller input. If 24VAC is not present, confirm that J8-IDC13 is connected to ground by measuring 24VAC between J8-IDC13 and unit terminal "ES". Verify wiring from the ignition control board to the controller terminals is correct according to the unit wiring diagram.
4. On units with 2 furnaces, repeat the above steps with the unit operating in Force High Heat mode at terminals J8-IDC13 and J8-ID14.

11.7 Defrost Cycle Incomplete Alarm

A unit is allowed to remain in the defrost cycle for a maximum of 10 minutes or until the defrost switches indicate that the defrost cycle is no longer needed. If the unit has been operating in the defrost cycle for 10 minutes and the defrost switches remain closed, an alarm is generated to indicate that the unit was not able to successfully defrost the condenser coil.

1. Verify that the controller configuration settings are correct for the unit where the controller is installed.
    a) Check the Defrost Interval Timer setting in the Timers / Delays menu. This value indicates to the controller how long to delay after the defrost switch indicates possible frost before initiating a defrost cycle. If this value is set longer than necessary, too much frost will be allowed to accumulate before the defrost cycle begins. Changing this to a lower value may be necessary to allow the unit to successfully complete the defrost cycle in the allowed time.
    b) If the Auto Defrost setting is enabled, the Defrost Interval Timer is automatically recalculated following each defrost cycle. Allow the unit to operate though several defrost cycles so that the correct Defrost Interval Timer can be determined by the program. A sudden change in conditions may require a few cycles for the program to successfully adjust.
    c) Check that the Outdoor Heat Pump Heating Lockout setting in the Temperature / Humidity settings menu is correct. Heat pump heating is not an efficient source of heat below a certain outdoor temperature and this setting can be used to prevent the unit to attempt to use heat pump heating in these conditions. Units with auxiliary electric heat installed will use the electric heat as the primary heat source when heat pump heating is locked out.
2. Verify 24VAC between controller terminals J5-IDC1 and J5-ID7 or J5-ID8 depending on the defrost switch in question. If 24VAC is not present, and the controller is indicating that a defrost cycle alarm is active, there could be a problem with the controller input. If 24VAC is present, confirm that J5-IDC1 is connected to ground by measuring 24VAC between J5-IDC1 and unit terminal "ES". Verify wiring from the defrost switches to the controller terminals is correct according to the unit wiring diagram.
3. Individual defrost switches can be tested by removing the wiring from the switch and testing for continuity between the contacts with a multi-meter. The location of the defrost switches should also be verified as an incorrect installation location could indicate a need for defrost when none exists.

11.8 Economizer Damper Alarms

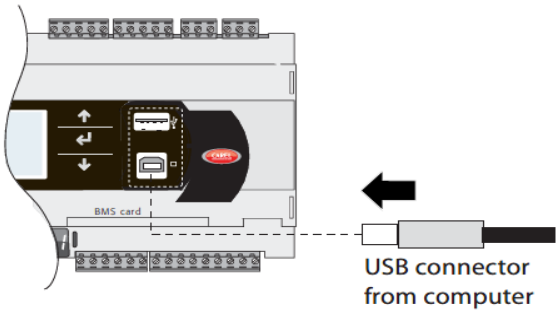
The DDC controller commands the economizer damper to the correct position through a 2-10Vdc signal and the actuator provides a 2-10Vdc feedback signal that corresponds to the physical position of the damper. These values are compared and used to generate several alarms to indicate potential economizer failure.

1. Verify that the controller configuration settings are correct for the unit where the controller is installed.
    a) The Economizer configuration setting should be set to None when no economizer is installed. If the unit is configured for an economizer when one is not installed, the controller will not receive the feedback signal expected and alarms will be generated.
2. Verify that the correct economizer assembly is installed in the unit. Economizer assemblies intended for use on units with the DDC controls option will be equipped with a modulating damper actuator that accepts a 2-10Vdc control signal and provides a 2-10Vdc feedback signal.
3. Verify that the wiring between the controller terminals and the economizer actuator is correct according to the unit wiring diagram.
4. Use the onboard display or web interface to place the unit into Force Vent Mode. Enter a value of 100% in the Economizer Damper forced command. Set the multi-meter to read DC voltage and check that the voltage between controller terminal J4-Y1 and J4-VG0 is 10Vdc. If no voltage is present, set the multi-meter to read AC voltage and check that the voltage between J4-VG0 and J4-VG is 24VAC. If 24VAC is present at J4-VG, but 10Vdc is not present at J4-Y1, then there may be a problem with the controller output. If 24VAC is not present at J4-VG, check the wiring from controller terminal J4-VG and unit terminal “ES”.
5. Use the onboard display or web interface to place the unit into Force Vent Mode. Enter a value of 100% in the Economizer Damper forced command. Set the multi-meter to read DC voltage and check that the voltage between controller terminal J3-U5 and J3-GND is 10Vdc. If no voltage is present, verify that the economizer damper is physically open and that no obstruction is preventing the damper from operating. Verify wiring at the damper actuator is correct.
6. Verify that 24VAC is present at the damper actuator between the common wire and power wire. Verify that the same voltage read on controller terminal J4-Y1 is read between the common wire and input signal wire at the actuator. Verify that the same voltage read on controller terminal J3-U5 is read between the common wire and feedback signal wire at the actuator. If the actuator is supplied with 24VAC and the 10Vdc signal is present at the actuator but the economizer damper is not open, the actuator may be failed.

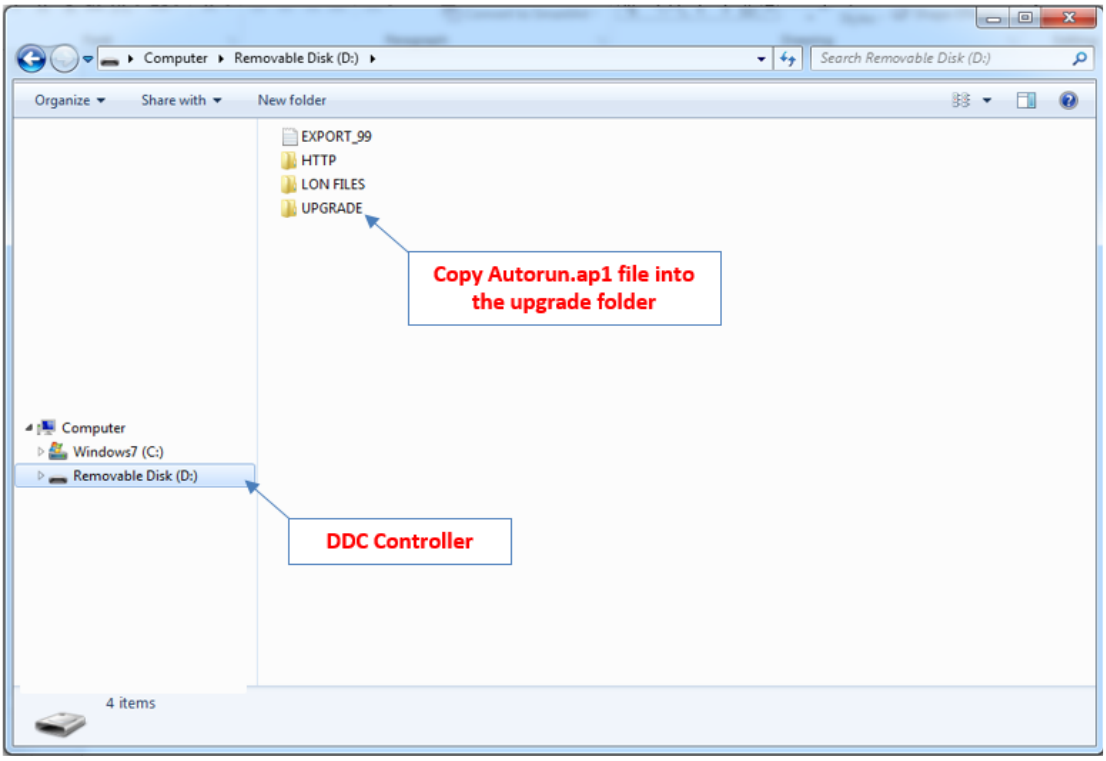
11.9 Field Application Upload

There are two methods available for field uploading an application file to the DDC controller, USB connection from the controller to a PC or by using a portable USB storage device.

11.9.1 USB Connection – PC to Controller

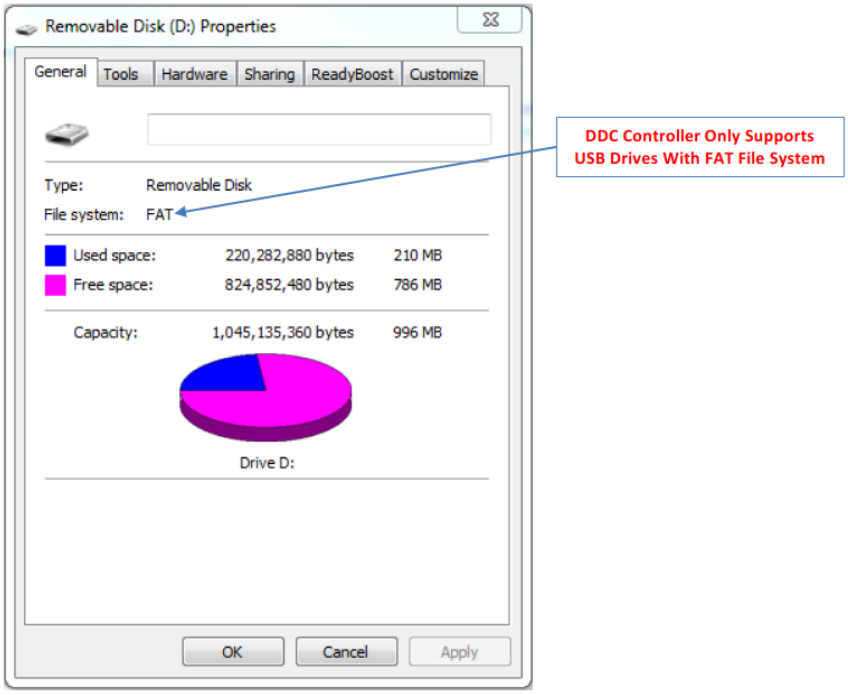


Connect the PC to the controller with a USB-A to USB-B cable. Once the controller is connected to the PC via USB, the controller appears as a removable disk in windows explorer. Copy the Autorun.ap1 file supplied by Daikin into the upgrade folder and remove the USB connection from the front of the controller. After the USB connection is disconnected, the controller will start the upload process.

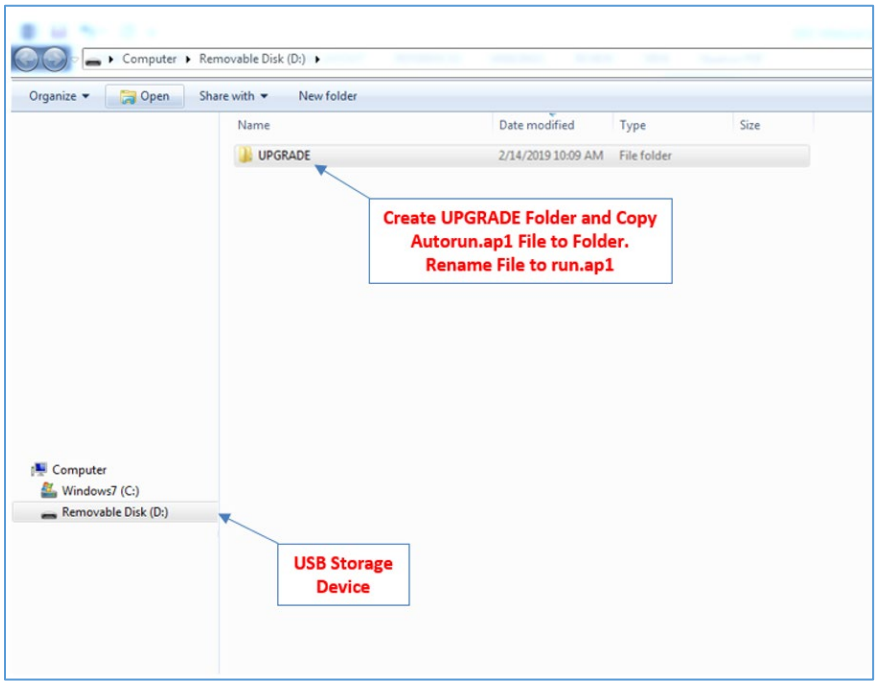


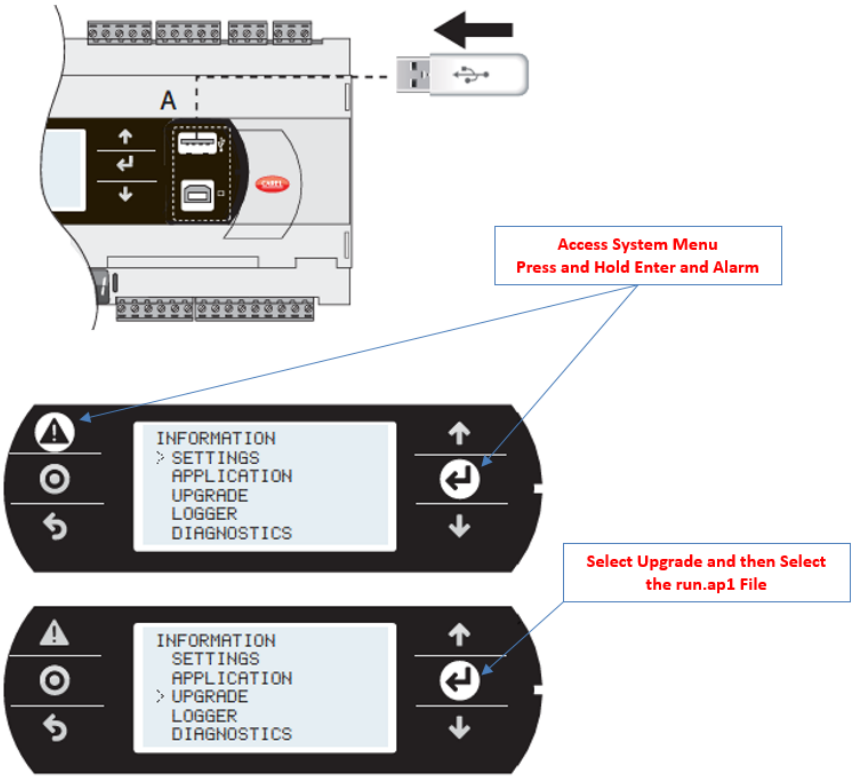
11.9.2 USB Storage Device

The controller is only compatible with USB storage devices that use the FAT file system. Any other type of file system will not be recognized by the controller.



In order for the controller to locate the upload file, a folder named UPGRADE must be created on the USB storage device. Using a PC, copy the Autorun.ap1 file supplied by Daikin into the UPGRADE folder of the USB storage device. Rename the Autorun.ap1 file to run.ap1. Insert the USB storage device into the controllers USB slot. Press and hold the alarm and enter buttons on the onboard display to access the system menu. Scroll down to UPGRADE and press enter. The password to access the upgrade folder is 99000. Select the run.ap1 file and press enter. Leave the USB storage device plugged into the controller until the onboard display reads “upload successful”.





12 User Adjustable Parameter List

12.1 Unit Configuration

NAME	LCD DISPLAY	DESCRIPTION	DEFAULT	RANGE
Control Mode	Control Mode	Select from DDC Control, and Thermostat Control to set the preferred control sequence to be used.	DDC	N/A
Unit Type	Unit Type	Select from A/C With Electric Heat, A/C With Gas Heat, and Heat Pump to set the type of unit where the controller is installed.	Factory Set	N/A
Blower Type	Blower Type	Select from One Speed, Two Speed, and Variable Speed blowers to set the type if blower motor installed in the unit.	Factory Set	N/A
SCR Heat	SCR Heat	When SCR Heat is Yes, the controller is set to control the electric heat through an analog 0-10Vdc signal instead of discrete stage commands.	Factory Set	N/A
Hot Gas Reheat	Hot Gas Reheat	When Hot Gas Reheat Installed is Yes, the unit is capable of performing dehumidification control.	Factory Set	N/A
Blower Cycling	Blower Cycling	When Blower Cycling is Yes, the blower is commanded off whenever there is no need for mechanical heating or cooling. When Fan Cycling is No, the blower runs continuously while the unit is occupied.	No	N/A
Number Of Compressors	# Compressors	Configure the controller for the number of compressors in the unit.	Factory Set	1, 2, 4
Number Of Cooling Stages	# Cool Stages	Configure the controller for the number of cooling stages utilized by the unit.	Factory Set	1, 2
Number Of Furnaces	# Furnaces	Configure the controller for the number of gas furnace boards installed in the unit.	Factory Set	0, 1, 2
Number Of Heating Stages	# Heat Stages	Configure the controller for the number of heating stages utilized by the unit.	Factory Set	0, 1, 2
Number Of Auxiliary Heating Stages	# Aux Heat Stages	Configure the controller for the number of auxiliary electric heating stages installed in the unit.	Factory Set	0, 1, 2
Number Of Suction Pressure Sensors	# Suction Pres Snsr	Configure the controller for the number of suction pressure sensors installed when the modulating hot gas reheat dehumidification option is installed.	Factory Set	1, 2
Number Of Head Pressure Sensors	# Head Pres Snsr	Configure the controller for the number of head pressure sensors installed when the modulating hot gas reheat dehumidification option is installed.	Factory Set	1, 2
Economizer	Economizer	Select from None, Economizer Installed, and Economizer With CO_2 Control to set the type of economizer control to use.	Factory Set	N/A
Economizer Enable	Econ Enable	Select from None, Fixed Drybulb, Differential Drybulb, Fixed Enthalpy, and Differential Enthalpy to set the type of economizer enable function to use.	Factory Set	N/A
Exhaust Fan Installed	Exhaust Fan	When this value is Yes, the Exhaust Fan output is commanded according to the sequence of operation.	Factory Set	N/A
Lead Lag	Lead Lag	When Lead Lag is On, compressor operating priority is rotated based on run time settings.	Factory Set	N/A
Schedule Source	Schedule Src	Select from Onboard, Remote, Force Occupied, and Force Unoccupied to set the preferred source for determining unit occupancy status.	Onboard	N/A
Space Temperature Source	Space Temp Src	Select from Onboard, and Network to set the source of the space temperature control value.	Onboard	N/A
Space Humidity Source	Space Hum Src	Select from Onboard, and Network to set the source of the space humidity control value.	Onboard	N/A
Outdoor Temperature Source	Outdr Temp Src	Select from Onboard, and Network to set the source of the outdoor air temperature control value.	Onboard	N/A
Outdoor Humidity Source	Outdr Hum Src	Select from Onboard, and Network to set the source of the outdoor air humidity control value.	Onboard	N/A
CO2 Source	Space CO2 Src	Select from Onboard, and Network to set the source of the space CO_2 control value.	Onboard	N/A

12.2 Temperature / Humidity

NAME	LCD DISPLAY	DESCRIPTION	DEFAULT	RANGE
Space Cooling Setpoint	Space Cool SP	Base setpoint for cooling mode operation before offsets for local user adjustment, unoccupied mode, load shedding, etc. are calculated into the Active Cooling Setpoint.	74.0°F	40.0-90.0°F
Space Heating Setpoint	Space Heat SP	Base setpoint for heating mode operation before offsets for local user adjustment, unoccupied mode, load shedding, etc. are calculated into the Active Heating Setpoint.	68.0°F	40.0-90.0°F
Unoccupied Cooling Offset	Unoc Cool Ofst	This offset value is added to the Space Cooling Setpoint during scheduled unoccupied time periods.	8.0°F	0.0-50.0°F
Unoccupied Heating Offset	Unoc Heat Ofst	This offset value is subtracted from the Space Heating Setpoint during scheduled unoccupied time periods.	8.0°F	0.0-50.0°F
Cooling Band	Cooling Band	This is the proportional control window around the Active Cooling Setpoint used in Cooling Load calculations.	3.0°F	2.0-8.0°F
Heating Band	Heating Band	This is the proportional control window around the Active Heating Setpoint used in Heating Load calculations.	3.0°F	2.0-8.0°F
Space Temperature Alarm Offset	Spc Tmp Alm Ofst	An alarm is generated if the differential between the active setpoint and current temperature is greater than this value.	10.0°F	1.0-30.0°F
Maximum Setpoint Adjust	Max SP Adjust	This is the maximum allowable user setpoint adjustment from the resistive slide adjust input from the space temperature sensor.	0.0°F	0.0-10.0°F
Auxiliary Heat Offset	Aux Heat Ofst	In heat pump units, the Space Temperature must fall below the Active Heating Setpoint by more than this value before auxiliary electric heating stages are commanded on.	3.0°F	0.0-10.0°F
Outdoor Cooling Lockout	OAT Cool Lockout	Compressors are prevented from operating when the Outdoor Air Temperature is below this value.	40.0°F	0.0-100.0°F
Outdoor Heating Lockout	OAT Heat Lockout	Heating stages are prevented from operating when the Outdoor Air Temperature is above this value.	70.0°F	0.0-100.0°F
Outdoor Heat Pump Heating Lockout	OAT HP Lockout	Compressors are prevented from operating in heat pump heating mode when the Outdoor Air Temperature is below this value.	20.0°F	-10.0-50.0°F
Supply Cooling Low Limit	Supply Cool Min	When the Supply Air Temperature falls below this value, cooling equipment is staged off to prevent coil freezing.	40.0°F	35.0-55.0°F
Supply Heating High Limit	Supply Heat Max	When the Supply Air Temperature rises above this value, heating equipment is staged off to prevent damage to duct mounted devices.	140.0°F	80.0-180.0°F
Supply Low Alarm Limit	Supply Low Alm	An alarm is generated if the Supply Temperature is below this value.	35.0°F	0.0-50.0°F
Supply High Alarm Limit	Supply High Alm	An alarm is generated if the Supply Temperature is above this value.	170.0°F	100.0-180.0°F
Supply Mechanical Cooling Alarm Offset	Cool Fail Ofst	An alarm is generated if the Supply Air Temperature is not decreased by more than this value after compressors are commanded on.	5.0°F	0.0-30.0°F
Supply Mechanical Heating Alarm Offset	Heat Fail Ofst	An alarm is generated if the Supply Air Temperature is not increased by more than this value after heating has been commanded on.	0.0°F	0.0-30.0°F
Supply Dehumidification Minimum Setpoint	SAT Dehum Min	This is the Active Supply Air Temperature Setpoint during dehumidification when the Cooling Load is 100%.	55.0°F	50.0-65.0°F
Supply Dehumidification Maximum Setpoint	SAT Dehum Max	This is the Active Supply Air Temperature Setpoint during dehumidification when the Cooling Load is 0%.	70.0°F	65.0-75.0°F
Space Humidity Setpoint	Space Hum SP	Base setpoint used for enabling dehumidification before unoccupied and load shedding offsets are added.	55.0%RH	0.0-100.0%RH
Unoccupied Humidity Offset	Unoc Hum Ofst	This offset value is added to the Space Humidity Setpoint during scheduled unoccupied time periods.	10.0%RH	0.0-50.0%RH
Space Humidity Band	Space Hum Band	This is the proportional control window around the Active Humidity Setpoint used to determine if dehumidification is required.	10.0%RH	2.0-20.0%RH
Space Humidity Alarm Offset	Spc Hum Alm Ofst	An alarm is generated if the differential between the active setpoint and current humidity is greater than this value.	10.0%RH	1.0-30.0%RH
Space Temperature Load Shed Offset	Load Shed Ofst	This offset value is added to the Space Cooling Setpoint and subtracted from the Space Heating Setpoint when the Load Shedding input is active.	4.0°F	0.0-30.0°F
Space Humidity Load Shed Offset	Load Shed Ofst	This offset value is added to the Space Humidity Setpoint when the Load Shedding input is active.	10.0%RH	0.0-50.0%RH

12.3 Economizer / Blower

NAME	LCD DISPLAY	DESCRIPTION	DEFAULT	RANGE
Fixed Drybulb Setpoint	Drybulb SP	This setpoint is used to determine the availability of free cooling when the Economizer Enable is set to Fixed Drybulb.	75.0°F	35.0-90.0°F
Fixed Enthalpy Setpoint	Enthalpy SP	This setpoint is used to determine the availability of free cooling when the Economizer Enable is set to Fixed Enthalpy.	23.0 Btu/lb	10.0-40.0 Btu/lb
Differential Drybulb Setpoint	Dif Drybulb SP	This setpoint is used to determine the availability of free cooling when the Economizer Enable is set to Differential Drybulb.	1.0°F	1.0-10.0°F
Differential Enthalpy Setpoint	Dif Enth SP	This setpoint is used to determine the availability of free cooling when the Economizer Enable is set to Differential Enthalpy.	0.5 Btu/lb	0.5-10.0 Btu/lb
Vent Minimum Position	Vent Min Pos	Economizer damper position when the unit is operating in Vent Mode and Demand Control Ventilation is not enabled.	20.0%	0.0-99%
Cooling Low Minimum Position	Cool Low Min Pos	Economizer damper position when the unit is operating in Cooling Mode Stage 1 and Demand Control Ventilation is not enabled.	15.0%	0.0-99%
Cooling High Minimum Position	Cool High Min Pos	Economizer damper position when the unit is operating in Cooling Mode Stage 2 and Demand Control Ventilation is not enabled.	10.0%	0.0-99%
Heating Low Minimum Position	Heat Low Min Pos	Economizer damper position when the unit is operating in Heating Mode Stage 1 and Demand Control Ventilation is not enabled.	10.0%	0.0-99%
Heating High Minimum Position	Heat High Min Pos	Economizer damper position when the unit is operating in Heating Mode Stage 2 and Demand Control Ventilation is not enabled.	10.0%	0.0-99%
Vent Minimum DCV	Vent Min DCV	Economizer damper position when the unit is operating in Vent Mode and Demand Control Ventilation is enabled.	10.0%	0.0-99%
Cooling Low Minimum DCV	Cool Low Min DCV	Economizer damper position when the unit is operating in Cooling Mode Stage 1 and Demand Control Ventilation is enabled.	5.0%	0.0-99%
Cooling High Minimum DCV	Cool High Min DCV	Economizer damper position when the unit is operating in Cooling Mode Stage 2 and Demand Control Ventilation is enabled.	5.0%	0.0-99%
Heating Low Minimum DCV	Heat Low Min DCV	Economizer damper position when the unit is operating in Heating Mode Stage 1 and Demand Control Ventilation is enabled.	5.0%	0.0-99%
Heating High Minimum DCV	Heat High Min DCV	Economizer damper position when the unit is operating in Heating Mode Stage 2 and Demand Control Ventilation is enabled.	5.0%	0.0-99%
Vent Speed	Vent Speed	On units with Variable Speed blowers, this is the blower speed when the unit is operating in Vent Mode.	Factory Set	0.0-100.0%
Cooling Low Speed	Cool Low Speed	On units with Variable Speed blowers, this is the blower speed when the unit is operating in Cooling Mode Stage 1.	Factory Set	0.0-100.0%
Cooling High Speed	Cool High Speed	On units with Variable Speed blowers, this is the blower speed when the unit is operating in Cooling Mode Stage 2.	Factory Set	0.0-100.0%
Heating Low Speed	Heat Low Speed	On units with Variable Speed blowers, this is the blower speed when the unit is operating in Heating Mode Stage 1.	Factory Set	0.0-100.0%
Heating High Speed	Heat High Speed	On units with Variable Speed blowers, this is the blower speed when the unit is operating in Heating Mode Stage 2.	Factory Set	0.0-100.0%
CO2 Setpoint	CO2 Setpoint	Setpoint for demand control ventilation reset of economizer damper position.	800.0 ppm	500.0-1500.0ppm
CO2 Band	CO2 Band	When the CO_2 level rises above CO_2 Setpoint by more than this value, the full amount of design outdoor air is required.	200.0ppm	100.0-500.0ppm
CO2 Alarm Offset	CO2 Alm Ofst	An alarm is generated when the CO_2 level rises above CO_2 Setpoint by more than this value.	500.0ppm	1.0-1000.0ppm

12.4 Timers / Delays

NAME	LCD DISPLAY	DESCRIPTION	DEFAULT	RANGE
Compressor Minimum Run Time	Comp Min Run	The minimum time that a compressor must be commanded on before it is allowed to cycle off. This setting is ignored if the compressor must be off because of an alarm.	0.0 min	0.0-10.0 min
Compressor Minimum Off Time	Comp Min Off	The minimum time that a compressor must be commanded off before it is allowed to cycle on.	3.0 min	1.0-10.0 min
Heat Minimum Run Time	Heat Min Run	The minimum time that a heating stage must be commanded on before it is allowed to cycle off. This setting is ignored if the heating stage must be off because of an alarm.	0.0 min	0.0-10.0 min
Heat Minimum Off Time	Heat Min Off	The minimum time that a heating stage must be commanded off before it is allowed to cycle on.	1.0 min	1.0-10.0 min
Dehumidification Minimum Run Time	Dehum Min Run	The minimum time that Dehumidification Mode must remain active before it is allowed to deactivate. This setting is ignored if Dehumidification Mode must be deactivated because of an alarm. This setting is also the minimum time that Dehumidification Mode must remain inactive before it is allowed to activate.	1.0 min	1.0-60.0 min
Space Temperature Alarm Delay	Space Tmp Alm	Delay before generating space temperature alarms after the conditions for alarm have been met.	60.0 min	5.0-120.0 min
Space Humidity Alarm Delay	Space Hum Alm	Delay before generating space humidity alarm after the conditions for alarm have been met.	60.0 min	5.0-120.0 min
Mechanical Failure Alarm Delay	Mech Fail Alm	Delay before generating mechanical failure alarms after the conditions for alarm have been met.	20.0 min	5.0-120.0 min
CO2 Alarm Delay	C02 Alarm	Delay before generating CO_2 alarm after the conditions for the alarm have been met.	60.0 min	5.0-120.0 min
Dirty Filter Timer	Dirty Filter	When set to a value greater than 0, an alarm indicating that the filters are dirty is generated when filter run time exceeds this value.	-1.0 h	-1.0-2000.0 h
Lead Lag Differential	Lead Lag Diff	When lead lag rotation has been enabled, the compressor priority is rotated when the run time differential between compressors is greater than this value.	24.0 h	1.0-300.0 h
Defrost Interval Timer	Defrost Timer	The length of time after the defrost switch indicates the formation of frost before the defrost cycle is started.	90.0 min	0.0-180.0 min
Auto Defrost	Auto Defrost	When this value is Yes, the Defrost Interval Timer is automatically calculated to optimize the defrost cycle.	No	No, Yes
Push Button Override Duration	Push Btn Ovr	When the push button override on the space sensor is pressed while the time schedule is unoccupied, the unit schedule will switch to push button occupied for this length of time.	0.0 h	0.0-8.0 h
Maximum Optimal Start Time	Max Opt Start	This is the maximum amount of time that the unit is allowed to start prior to the scheduled occupied time.	0.0 min	0.0-240.0 min
Maximum Optimal Stop Time	Max Opt Stop	This is the maximum amount of time prior to the end of the scheduled occupied time that mechanical cooling and heating are locked out.	0.0 min	0.0-240.0 min
Occupied Start Delay	Occ Start Dly	At the scheduled occupied time, the unit delays for this time before setting the Schedule Mode to Occupied and allowing equipment to start. This allows for the creation of a staggered system start-up on units with the same time schedule or after a loss of power.	0.0 s	0.0-600.0 s
Compressor 1 Run Time Reset	Comp 1: Reset	Setting this value to Yes resets the Compressor 1 accumulated run time to 0.	No	No, Yes
Compressor 2 Run Time Reset	Comp 2: Reset	Setting this value to Yes resets the Compressor 2 accumulated run time to 0.	No	No, Yes
Compressor 3 Run Time Reset	Comp 3: Reset	Setting this value to Yes resets the Compressor 3 accumulated run time to 0.	No	No, Yes
Compressor 4 Run Time Reset	Comp 4: Reset	Setting this value to Yes resets the Compressor 4 accumulated run time to 0.	No	No, Yes
Filter Run Time Reset	Filter: Reset	Setting this value to Yes resets the Filter accumulated run time to 0.	No	No, Yes

12.5 Test / Balance

NAME	LCD DISPLAY	DESCRIPTION	DEFAULT	RANGE
Force Enabled	Force Enabled	When Force Enabled is set to Yes, the unit is forced to operate in the mode defined by the Force Mode Setting.	No	N/A
Force Mode	Force Mode	Select from Off, Vent, Low Cool, High Cool, Low Heat, High Heat, and Dehumidification force modes.	Off	N/A
Economizer Damper	Econ Damper	When Force Enabled is set to Yes and Force Mode is set to Vent, the economizer is commanded to this position.	0.0%	0.0-100.0%
Blower Speed	Blower Speed	When Force Enabled is set to Yes and Force Mode is set to Vent, the blower speed is commanded to this value.	0.0%	0.0-100.0%
Reheat Valve	Reheat Valve	When Force Enabled is set to Yes and Force Mode is set to Dehumidification, the reheat valve is commanded to this position.	0.0%	0.0-100.0%
Space Temperature Offset	Spc Temp Ofst	The sensor reading is offset by this value.	0.0°F	-20.0-20.0°F
Space Humidity Offset	Spc Hum Ofst	The sensor reading is offset by this value.	0.0%RH	-20.0-20.0%RH
Supply Temperature Offset	Sply Temp Ofst	The sensor reading is offset by this value.	0.0°F	-20.0-20.0°F
Outdoor Temperature Offset	OA Temp Ofst	The sensor reading is offset by this value.	0.0°F	-20.0-20.0°F
Outdoor Humidity Offset	OA Hum Ofst	The sensor reading is offset by this value.	0.0%RH	-20.0-20.0%RH
Space CO2 Offset	CO2 Ofst	The sensor reading is offset by this value.	0.0ppm	-200.0-200.0ppm

12.6 Date & Time

NAME	LCD DISPLAY	DESCRIPTION	DEFAULT	RANGE
Set Date	Date	Enter the Date for the controller internal clock.	N/A	N/A
Set Time	Time	Enter the Time for the controller internal clock.	N/A	N/A
Update Date/Time	N/A	When this value is set to Yes, the controller Date and Time become the entered Set Date and Set Time values.	No	N/A
Set Timezone	New Timezone	Select the Timezone where the controller is installed.	Chicago	N/A
Update Timezone	Update Timezone	When this value is set to Yes, the controller Timezone value is updated to be the Set Timezone value.	No	N/A

12.7 Password

NAME	LCD DISPLAY	DESCRIPTION	DEFAULT	RANGE
User	User	User level access password.	0000	0000-9999
Service	Service	Service level access password.	1954	0000-9999

12.8 Communication

NAME	LCD DISPLAY	DESCRIPTION	DEFAULT	RANGE
TCP/IP Settings				
DHCP	DHCP	When DHCP is set to On, the controller will be assigned an IP address by the attached network and can change automatically.	Off	N/A
IP Address	IP	IP Address	192.168.1.16	0.0.0.0 - 255.255.255.255
Subnet Mask	Mask	Subnet Mask	255.255.255.0	0.0.0.0 - 255.255.255.255
Default Gateway	GW	Default Network Gateway	0.0.0.0	0.0.0.0 - 255.255.255.255
DNS	DNS	DNS Server Address	0.0.0.0	0.0.0.0 - 255.255.255.255
Update	Update	When Update is set to Yes, the modified settings are implemented and the controller restarts.	No	N/A
***BACnet* Settings**				
Communication Type	Comm Type	Select from *BACnet* MS/TP, and *BACnet* IP communication types.	MS/TP	N/A
Instance ID	Instance ID	Enter the *BACnet* Instance ID of the controller.	15000	0-4194302
Baud Rate	Baud Rate	Select from 9600, 19200, 38400, 57600, and 76800 communication speeds.	38400	N/A
MAC Address	MAC Address	Enter the *BACnet* MAC Address of the controller.	1	0-127
Max Master	Max Master	Enter the *BACnet* Max Master of the connected network.	127	0-127
Update	Update	When Update is set to Yes, the modified settings are implemented and the controller restarts.	No	N/A

12.9 Export / Reset

NAME	LCD DISPLAY	DESCRIPTION	DEFAULT	RANGE
Log Export				
Sample Time	Sample Time	Time interval between log samples.	2.0 min	0.1-60.0 min
Memory Type	Memory Type	Select from Internal Flash Memory, and USB to set the destination of the export file.	Internal	N/A
Confirm	Confirm	When this setting is set to Yes, the trend log in the controller is exported to a .csv file either to internal memory or to a USB drive.	No	N/A
Parameters Import/Export				
Import/Export	Import/Export	Select Import from file, Export to file, or Reset to factory default for the function to be performed.	Import	N/A
Memory Type	Memory Type	Select from Internal Flash Memory, or USB to set the destination or source of the export file.	Internal	N/A
File Name	File Name	File Name for saved parameter set; EXPORT_##	0	0-98
Confirm	Confirm	When this setting is set to Yes, the parameter Import/Export action selected is performed.	No	N/A
Alarm Log Export				
Memory Type	Memory Type	Select from Internal Flash Memory, and USB to set the destination of the export file.	Internal	N/A
File Name	File Name	File Name for saved parameter set; AL_EXPORT_##	0	0-99
Confirm	Confirm	When this setting is set to Yes, the alarm log in the controller is exported to a .csv file either to internal memory or to a USB drive.	No	N/A
Alarm Log Reset				
Delete Alarm Logs	Delete Alarm Logs	When set to Yes, the alarm log in the controller is cleared.	No	N/A
Clear AutoReset Counters	Clear AutoReset Counters	When set to Yes, the counters used to determine the number of times an alarm has been triggered are cleared.	No	N/A

12.10 Unit Of Measure

NAME	LCD DISPLAY	DESCRIPTION	DEFAULT	RANGE
Onboard HMI UoM	Onbrd HMI UoM	Select units of measurement for values displayed on the controller LCD display.	USA	USA, SI
tERA/Web UoM	tERA/Web UoM	Select units of measurement for values displayed on the controller web interface display.	USA	USA, SI

13 Display Variable List

13.1 Controller Information

Name	Description
Unit Name	The unit number can be modified by the user and is displayed as RTU##.
IP: ###.###.###.###	The current IP address of the controller.
SW Ver.: #.#.#	The software application version currently loaded in the controller.
OS Ver.: #.#.#	The operating system version currently running in the controller.
EVD Ver.: ###	The firmware version of the reheat valve control module, if it is installed.
Board Type:	Board manufacturer model name.
Board Size:	Board manufacturer size code.
Core:	Core chipset manufacturer source code.
Board Temp.:	Current board temperature.
Ret Mem Writes:	Number of writes that have been made to retained memory.
Main Task:	The main last cycle time.
Current Time:	The current date and time of the controller.
Power Off Time:	The date and time of the previous power loss.
Length Last Time Off:	The length in days, hours, and minutes of the previous power loss.

13.2 Unit Status

Unit Status:

NAME	LCD DISPLAY	DESCRIPTION
Schedule Mode	Sched Mode	The current schedule mode of the unit: Unoccupied, Occupied, Push Button Occupied, Holiday Unoccupied, Holiday Occupied.
HVAC Mode	HVAC Mode	The current HVAC mode and stage of operation: Off, Ventilation, Cooling, Economizer Cooling, Heating, Dehumidification, Forced Override.
Space Temperature	Space Temp	The current space temperature sensor reading.
Supply Temperature	Supply Temp	The current supply air temperature sensor reading.
Outdoor Temperature	Outdoor Temp	The current outdoor air temperature sensor reading.
Space Setpoint Adjust	Setpoint Adj	The current value of the local setpoint adjust offset.
Space CO2	Space CO2	The current value of the space CO_2 sensor reading.
Economizer Feedback	Econ Feedback	The current value of the feedback signal from the economizer damper actuator.
Outdoor Enthalpy	Outdr Enth	The current calculated value of the outdoor enthalpy.
Space Enthalpy	Space Enth	The current calculated value of the space enthalpy.
Outdoor Humidity	Outdr Air Hum	The current value of the outdoor relative humidity sensor reading.
Space Humidity	Space Hum	The current value of the space relative humidity sensor reading.
Suction Pressure 1	Suctn Pres 1	The current value of the circuit 1 suction pressure sensor reading.
Suction Pressure 2	Suctn Pres 2	The current value of the circuit 2 suction pressure sensor reading.
Head Pressure 1	Head Pres 1	The current value of the circuit 1 head pressure sensor reading.
Head Pressure 2	Head Pres 2	The current value of the circuit 2 head pressure sensor reading.
Reheat Valve Position	Reheat Valve Pos	The current value of the modulating hot gas reheat valve position signal feedback from the EVD control module.

Digital Inputs:

NAME	LCD DISPLAY	DESCRIPTION
Emergency Shutdown	Emergency Shutdown	The current value of the emergency shutdown digital input.
Blower Proving Switch	Blower Proving Sw	The current value of the blower proving switch digital input.
Compressor 1 Pressure Switch	Comp 1 Pres Switch	The current value of the circuit 1 pressure switch digital input which monitors the high and low pressure switches wired in series.
Compressor 2 Pressure Switch	Comp 2 Pres Switch	The current value of the circuit 2 pressure switch digital input which monitors the high and low pressure switches wired in series.
Compressor 3 Pressure Switch	Comp 3 Pres Switch	The current value of the circuit 3 pressure switch digital input which monitors the high and low pressure switches wired in series.
Compressor 4 Pressure Switch	Comp 4 Pres Switch	The current value of the circuit 4 pressure switch digital input which monitors the high and low pressure switches wired in series.
Defrost Switch C1	Defrost Switch C1	The current value of the circuit 1 defrost switch digital input which indicates that conditions exist which could cause frost to form on the condenser coil.
Defrost Switch C2	Defrost Switch C2	The current value of the circuit 2 defrost switch digital input which indicates that conditions exist which could cause frost to form on the condenser coil.
Remote Start Stop	Remote Start Stop	The current value of the remote start stop request digital input.
Load Shedding	Load Shedding	The current value of the load shedding request digital input.
Filter Switch	Filter Switch	The current value of the dirty filter switch digital input.
Furnace Feedback 1	Furnace Brd Fbk 1	The current value of the feedback signal from furnace control board 1 which indicates the need for the blower to operate and that the furnace has been ignited.
Furnace Feedback 2	Furnace Brd Fbk 2	The current value of the feedback signal from furnace control board 2 which indicates the need for the blower to operate and that the furnace has been ignited.

Thermostat Inputs:

NAME	LCD DISPLAY	DESCRIPTION
G	G	The current value of the "G" signal from the thermostat when the unit is configured to use TSTAT control mode instead of DDC control.
Y1	Y1	The current value of the "Y1" signal from the thermostat when the unit is configured to use TSTAT control mode instead of DDC control.
Y2	Y2	The current value of the "Y2" signal from the thermostat when the unit is configured to use TSTAT control mode instead of DDC control.
W1	W1	The current value of the "W1" signal from the thermostat when the unit is configured to use TSTAT control mode instead of DDC control.
W2	W2	The current value of the "W2" signal from the thermostat when the unit is configured to use TSTAT control mode instead of DDC control.
O	O	The current value of the "O" signal from the thermostat when the unit is configured to use TSTAT control mode instead of DDC control.

Analog Outputs:

NAME	LCD DISPLAY	DESCRIPTION
Economizer Position	Econ Position	The current value of the economizer position command.
Blower Speed	Blower Speed	The current value of the blower speed command.
SCR Heat Output	SCR Heat Output	The current value of the SCR heat command.
Alarm Output	Alarm Output	The current value of the alarm output indicating if there are any active alarms.
Blower Stage 1	Blower Stage 1	The current value of the blower stage 1 command output.
Blower Stage 2	Blower Stage 2	The current value of the blower stage 2 command output.
Heating Stage 1	Heating Stage 1	The current value of the heating stage 1 command output.
Heating Stage 2	Heating Stage 2	The current value of the heating stage 2 command output.
Reversing Valve 1	Reversing Valve 1	The current value of the reversing valve 1 command output.
Reversing Valve 2	Reversing Valve 2	The current value of the reversing valve 2 command output.
Exhaust Fan	Exhaust Fan	The current value of the exhaust fan command.
Compressor 1	Compressor 1	The current value of the compressor 1 command.
Compressor 2	Compressor 2	The current value of the compressor 2 or compressor 1 stage 2 command.
Compressor 3	Compressor 3	The current value of the compressor 3 command.
Compressor 4	Compressor 4	The current value of the compressor 4 command.
Condenser Fan 1	Condenser Fan 1	The current value of the condenser fan 1 command.
Condenser Fan 2	Condenser Fan 2	The current value of the condenser fan 2 command.
Purge Valve	Purge Valve	The current value of the reheat coil purge valve command output.

Setpoint Status:

NAME	LCD DISPLAY	DESCRIPTION
Setpoint Status		
Active Cooling Setpoint	Active Cool SP	The current calculated active cooling setpoint which includes setpoint configuration parameters, unoccupied offsets, load shedding offset, and local adjust value.
Active Heating Setpoint	Active Heat SP	The current calculated active heating setpoint which includes setpoint configuration parameters, unoccupied offsets, load shedding offset, and local adjust value.
Active Supply Temperature Setpoint	Active SAT SP	The current calculated active supply temperature setpoint based on the current HVAC Mode, operating conditions, and setpoint configuration parameters.
Space Humidity Setpoint	Active Hum SP	The current calculated active space humidity setpoint which includes setpoint configuration parameters, unoccupied offsets, and load shedding offset.
Lead Compressor	Lead Compressor	The current lead compressor based on equipment run time and configuration settings.
Cooling Load	Cooling Load	The current calculated cooling load which indicates the amount of cooling capacity needed to satisfy the active space temperature cooling setpoint.
Heating Load	Heating Load	The current calculated heating load which indicates the amount of heating capacity needed to satisfy the active space temperature heating setpoint.

Lockouts / Enables:

NAME	LCD DISPLAY	DESCRIPTION
Cooling Lockout	Cooling Lockout	The current status of the cooling lockout indicating if the unit is allowed to enter cooling mode.
Heating Lockout	Heating Lockout	The current status of the heating lockout indicating if the unit is allowed to enter heating mode.
Heat Pump Heating Lockout	HP Heating Lockout	The current status of the heat pump heating lockout indicating if the unit is allowed to use compressors for heating.
Dehumidification Lockout	Dehum Lockout	The current status of the dehumidification lockout indicating if the unit is allowed to enter dehumidification mode.
Defrost Enabled	Defrost Enabled	The current status of the defrost enable indicating that the unit is currently performing a defrost cycle.
Economizer Enabled	Econ Enabled	The current status of the economizer enable indicating that conditions are favorable for free cooling to be used if needed.

13.3 Modbus Enabled Blower Motor Info

Unit Models DRX180 – DRX300:

NAME	LCD DISPLAY	DESCRIPTION
Manufacturer	Manufact.	Motor manufacturer name is displayed.
Manufacturer Model Number	Model	Motor manufacturer's model number is displayed.
Serial Number	Serial	Motor serial number is displayed.
Maximum Speed	Max Speed	Motor maximum speed setting is displayed in units of rpm.
Speed Setpoint	Set Speed	Current motor speed setpoint is displayed in units of rpm. This is the speed setpoint received from the 0-10Vdc signal from the DDC controller.
Current Speed	Current Speed	The current speed in rpm is displayed.
Rotation Direction	Rotation Dir.	The rotation direction is displayed as either CW or CCW as referenced from the perspective view facing the motor shaft.
Run Time	Run Time	The cumulative run time of the motor in hours is displayed.
Motor Status	Status	The current motor status is displayed as NORMAL, WARNING, or ALARM based on the alarm and warning signals provided from the motor.
DC Link Voltage	DC Link Volt.	The current DC Link Voltage is displayed in units of Volts.
DC Link Current	DC Link Curr.	The current DC Link Current is displayed in units of Amps.
Power	Power	The current Power is displayed in units of Watts.
Control Voltage Ain 1	Ctrl Vlt Ain 1	The current Control Voltage present on input 1 is displayed in units of Volts. This is the voltage signal received from the DDC controller and corresponds to the Set Speed variable.
Control Voltage Ain 2	Ctrl Vlt Ain 2	The current Control Voltage present on input 2 is displayed in units of Volts. This is the voltage signal received from the DDC controller and corresponds to the Set Speed variable.

Unit Models DRX036 – DRX150:

NAME	LCD DISPLAY	DESCRIPTION
Manufacturer	Manuf. ID	Motor manufacturer name is displayed.
Firmware Version	Driver Version	Motor manufacturer's firmware revision number is displayed.
Rated Horsepower	Motor HP Code	Motor rated horsepower is displayed.
Minimum Torque	Min Torque	Motor minimum torque limit is displayed in units of oz-ft.
Maximum Torque	Max Torque	Motor maximum torque limit is displayed in units of oz-ft.
Target Torque	Target Torque	Current motor torque setpoint is displayed in units of oz-ft. This is the torque setpoint received from the 0-10Vdc signal from the DDC controller.
Target Torque Percentage	Target Torque %	Current motor torque setpoint is displayed as a percentage of maximum torque. This is the torque setpoint received from the 0-10Vdc signal from the DDC controller.
Current Speed	Current Speed	The current speed in rpm is displayed.
Rotation Direction	Rotation Dir.	The rotation direction is displayed as either CW or CCW as viewed from the lead end of the motor.
Motor Status	Alarm Present	The current presence of any motor alarm is represented as YES or NO.

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