**Reference Guide for Microprocessor Controller**

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.

**Introduction**

**Program Features**

The microprocessor controller offers control through easy monitoring and adjustment of unit parameters by way of a lighted graphical display and an integral push-button keypad.

**Pre-Programmed Operating Sequences**

The controller has been pre-programmed to offer multiple control sequences to provide tempered air. Factory default settings allow for easy setup and commissioning. The sequence parameters are fully adjustable. Refer to the Sequence of Operation for details.

**BMS Communication**

The user can remotely adjust set points, view unit status points and alarms. The microprocessor controller is capable of communicating over several protocols:

- BACnet® MSTP
- BACnet® IP
- Modbus RTU
- Modbus TCP
- LonWorks®

Reference Points List for a complete list of BMS points.

**Built-In Occupancy Schedule**

The controller has an internal programmable time clock, allowing the user to set occupancy schedules for each day of the week. The controller option also has morning warm-up and cool down capability for improved comfort at the time of occupancy.

**Alarm Management**

The microprocessor controller will monitor the unit’s status for alarm conditions. Upon detecting an alarm, the controller will record the alarm description, time, date, and input/output status points for user review. A digital output is reserved for remote alarm indication. Alarms are also communicated via BMS (if equipped).

**Occupancy Modes**

The microprocessor controller offers three modes of determining occupancy: a digital input, occupancy schedule or the BMS. If in the unoccupied mode, the unit will either be shut down, continue normal operation utilizing adjustable unoccupied set points, recirculate with unoccupied set points or will cycle on to maintain adjustable unoccupied space temperature and humidity set points (space temperature and humidity sensor is optional).

**Remote Unit Access (if equipped)**

The WebUI and Remote Display are two ways to gain access to the unit controller allowing monitoring of the unit and parameter adjustment without being at the unit.

The WebUI can be accessed via a building network and is included with every unit controller. The Remote Display is an LCD to be panel mounted in a remote location and is an option available for purchase.

**WARNING**

Electrical shock hazard. Can cause personal injury or equipment damage. Service must be performed only by personnel that are knowledgeable in the operation of the equipment being controlled.

**WARNING**

Mechanical high static protection cutoffs must be installed by others to protect the system and equipment from over-pressurization when using factory provided control sensors. The manufacturer does not assume responsibility for this.
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Sequence of Operation

The microprocessor controller can be configured for air handler, energy recovery, and dedicated outdoor air systems. Each application utilizes similar technologies for heating and cooling: chilled water, hot water, indirect gas, electric heat, and packaged or split DX cooling. All set points, lockouts and delays are user adjustable via the integral keypad display, remote display, or web user interface.

General Operation

UNIT START COMMAND: The microprocessor controller requires a digital input to enable operation. The unit can then be commanded on or off by this digital input, keypad, the BMS or schedule. When a start command becomes active the following steps occur:

- Energy recovery wheel starts, if equipped
- Factory mounted and wired dampers are powered (Outside air, exhaust air, and recirculation air dampers, if equipped)
- Exhaust fan, if equipped, starts after adjustable delay
- Supply fan starts after adjustable delay
- Tempering operation starts after adjustable delay

UNIT STOP COMMAND: A shutdown occurs when there is not an occupied or unoccupied start command. The following shutdown methods can occur.

Hard shutdown occurs under the following conditions:
- A user or the BMS disables the system, and the supply temperature is less than the soft shutdown enable set point.
- Occupancy is commanded to unoccupied while there is no unoccupied start command, and the supply temperature is less than the soft shutdown enable set point.

When a hard shutdown occurs:
- The unit shuts down immediately.
- Dampers spring-return to their off position. Damper power is cut 30 sec. after the fans. This allows the fans to slow down prior to spring closing the dampers.

Soft shutdown occurs under the following conditions:
- A user or the BMS disables the system, and the supply temperature is greater than or equal to the soft shutdown enable set point.
- There is no unoccupied or occupied start command and the supply temperature is greater than or equal to the soft shutdown enable set point.

The following occurs during a soft shutdown:
- Tempering outputs immediately revert back to their off value; while
- Dampers remain open and fans continue to run; until
  - The supply air temperature falls below the soft shutdown enable set point minus 5.0°F; or
  - The soft shutdown delay timer has expired.

UNIT/SYSTEM DISABLED COMMAND:
The unit becomes disabled due to the following:
- The unit was disabled from the controller’s Unit Enable screen.
- The unit enable digital input changes to the disabled state.
- The unit was disabled from the BMS.
- The remote start input is in the off position.
- The shutdown input is in the shutdown position.
- A system shutdown alarm was activated.

When disabled the following actions occur:
- The unit shuts down immediately; and
- Dampers spring-return to their off position.

OCCUPANCY: The microprocessor controller offers five modes of determining occupancy: digital input, occupancy schedule, BMS, always occupied, or always unoccupied. When in the unoccupied mode, the unit can be configured to shut down, or cycle on to maintain the unoccupied space set points. The unit can be temporarily overridden to the occupied mode via a digital input, keypad display, or space thermostat, if equipped.

- Occupied Mode:
  - Exhaust fan on, if equipped
  - Supply fan on
  - Energy Recovery Wheel Control (refer to Energy Recovery Wheel section), if equipped
  - Damper Control (refer to Outside Air and Recirculated Air section), if equipped
  - Heating (refer to Heating section)
  - Cooling (refer to Cooling section)

- Unoccupied Mode:
  - Unit Off: Unit remains off when in unoccupied mode.
  - Normal operation with unoccupied set points: Unoccupied mode will operate as if in occupied mode but will utilize adjustable unoccupied set points.
    - Exhaust fan on, if equipped
    - Supply fan on
    - Energy Recovery Wheel Control (refer to Energy Recovery Wheel section), if equipped
    - Damper Control (refer to Outside Air and Recirculated Air section), if equipped
    - Heating (refer to Heating section)
    - Cooling (refer to Cooling section)
  - Recirculation with unoccupied set points: Optional unoccupied mode when there is an unoccupied recirculation damper. The unit will continue to run, but in full recirculation.
    - Supply fan on
    - Recirculation air damper open
    - OA damper closed
    - Tempering operations begin
Sequence of Operation

- **Night Setback:** Unoccupied mode when there is space temperature and/or humidity sensor(s) connected to the controller. The unit will cycle on to maintain unoccupied space set points if there is a call for unoccupied heating, cooling or dehumidification.
  - Exhaust fan off, if equipped
  - Supply fan on
  - Recirculation air damper open
  - OA damper closed
  - Tempering operations begin

Set Point Control (Occupied)

Supply air temperature set point can be configured as constant, or can be reset by either outside air temperature, or space temperature set point. If equipped with BMS communications, the user can also directly command the temperature set point, if equipped.

- **Outside Air Temperature Reset Function:** The controller will default to supply temperature reset based on OA temperature. The controller will monitor the OA temperature and reset the supply temperature set point based upon the OA reset function.
- **Space temperature Reset:** With a space temperature sensor, the controller will adjust the supply air temperature set point between the min (55°F) and max (90°F), to satisfy the desired space temperature. The temperature set point can be adjusted locally at the microprocessor, the BMS or a space thermostat.

Set Point Control (Unoccupied)

When equipped with an unoccupied recirculation damper and optional space temperature and/or humidity sensors, the unit will cycle on to maintain the unoccupied space set points.

- **Unoccupied Heating:** If equipped with heating, the unit is enabled when the space temperature is less than the unoccupied heating set point minus differential (60°F). The supply air temperature set point will be set to the supply max reset limit (90°F). The unit cycles off when the space temperature reaches the unoccupied heating set point.

- **Unoccupied Cooling:** If equipped with cooling, the unit is enabled when the space temperature is greater than the unoccupied cooling set point plus differential (80°F+5°F). The supply air temperature set point will be set to the supply min reset limit (55°F). The unit cycles off when the space temperature reaches the unoccupied cooling set point.

- **Unoccupied Dehumidification:** If equipped with cooling, the unit is enabled when the space relative humidity exceeds the unoccupied space relative humidity set point plus differential (50%+5%). The supply air temperature set point will be set to the equivalent occupied supply set point.

- **Morning Warm-Up/Cool Down:** At the request to occupy the space, the unit will run using the warm-up or cool down sequence until the occupied set point is achieved. The heating or cooling mode must not be locked out and the space temperature is below or above set point by the unoccupied hysteresis (5°F, adj). This optional sequence requires a space temperature sensor and is field-enabled.

  The following steps occur during a morning warm-up/cool down:
  - The dampers would be in full recirc if the damper if the damper actuators are not powered (adj) during occupied mode. Otherwise the following is true:
    - Outside air damper is open to minimum OAD position.
    - Recirculation air damper is open at 100% minus OAD position.
  - Supply Fan is ON at 100%.
  - Exhaust fan is OFF.
  - In heating, controls to maintain the maximum supply set point (90°F).
  - In cooling, controls to the minimum supply set point (50°F).
  - Reheat off.
  - Energy recovery wheel off.

Heating

The heating is controlled to maintain the supply temperature set point. The heating will be locked out when the outside air temperature is above the heating lockout (80°F adj).

- **Indirect Gas Furnace:** Microprocessor controller will modulate the indirect gas furnace to maintain the supply temperature set point.

- **Hot Water Coil:** Microprocessor controller will modulate a hot water valve (provided by others) to maintain the supply temperature set point. **Coil freeze protection must be provided by others in the field!**

- **Electric Heater:** Microprocessor controller will modulate an electric heater to maintain the supply temperature set point.
Cooling

The cooling is controlled to maintain the supply temperature set point. The cooling will be locked out when the outside air temperature is below the cooling lockout (55°F).

- **Chilled Water:** Microprocessor controller will modulate a chilled water valve (provided by others) to maintain supply air set point. Coil freeze protection must be provided by others in the field!

- **Mechanical Cooling:** Microprocessor controller enables stages of cooling to maintain the supply air setpoint. When a modulating compressor is installed (Digital or Inverter Scroll), the compressor modulates to maintain the supply air setpoint. Mechanical cooling is available in the following configurations:
  - **Packaged DX:** Unit with compressors and condensing section located within the same unit. This unit may have lead standard, lead digital scroll, or lead inverter scroll compressors.
  - **Split DX:** Unit with compressors located in the unit and utilizes a remote condenser section. This type of unit may have lead standard, or lead digital scroll compressors.

**Active Head Pressure Control**

Packaged DX mechanical systems will maintain head pressure control by utilizing transducers on each refrigerant circuit. The pressure reading from the transducer is converted to a saturated discharge temperature for each circuit. The temperature, or maximum temperature when two circuits are present, is compared to a setpoint.

The following sequences are based on the type of condenser fan modulation installed in the unit.

- **No Modulating Fans (All AC):** Condenser fans are staged using digital outputs and the saturated discharge temperature. The first fan stages on with the start of the first compressor. Each additional stage turns on based on the saturated temperature reaching setpoint plus an offset and turns off when the temperature falls below setpoint. Built-in delays between stages assist in staging fans off or on too quickly.

- **Lead Modulating Fan:** A unit with this option has one modulating condenser fan per fan bank. The modulating condenser fan utilizes an analog output to vary the speed of the fan. The modulating fan turns on with the start of the first compressor. When the saturated temperature is above setpoint, the modulating fan speed will increase to maintain head pressure. When below setpoint, the fan speed will decrease.

Additionally, non-modulating fans are staged using digital outputs and an offset. Each additional stage turns on based on the saturated temperature reaching setpoint plus an offset and turns off when the temperature falls below setpoint. Built-in delays between stages assist in staging fans off or on too quickly.

### Sliding Head Pressure Control

The head pressure control setpoint changes based on the outside air temperature and an offset. As the outside temperature increases so does the control setpoint for the condenser fans. This feature is active in cooling and dehumidification modes unless disabled in the controller. Sliding head pressure control is enabled by default.
Air Source Heat Pump

When a unit is configured as an ASHP, compressors are used for cooling and heat pump heating. A reversing valve is energized when the unit is in heating mode to reverse the flow of the refrigerant. The ASHP is only available as a packaged unit with an inverter scroll as the lead compressor.

- **Cooling**: Mechanical cooling operates the same as any other unit with compressors by controlling the compressors to maintain the supply air temperature set point in cooling mode and to maintain the cooling coil temperature in dehumidification mode.

- **Heat Pump Heating**: When heat is required, the reversing valve is switched, and the compressors are staged to maintain the supply air temperature set point.

- **Heat Pump Heating Lockout**: Heat pump heating may be locked out for any of the following reasons:
  - Defrost is initiated 3 times in one hour.
  - Supply Air temperature is 5°F below set point for more than 10 minutes and secondary heat is available as backup only.
  - Outside ambient temperature is below the HP ambient lockout set point(10°F).

- **Resetting HP Heating Lockout**: One of the following conditions must occur to return to HP heating:
  - The outside temperature increases by 5°F.
  - The outside humidity decreases by 20%RH, if humidity sensor is installed.
  - The unit has been locked out for more than 2 hours when a humidity sensor is not installed and not locked out on low ambient condition.

- **Defrost**: Periodically, the ASHP need to initiate a defrost cycle to remove accumulated frost from the outside coil when operating in heating mode. The saturated suction temperature, the outside ambient temperature and/or the outside humidity determine when a defrost initiates and terminates.

  - **Initiation**: One of the following must be true for a defrost cycle to initiate:
    - The saturated suction temperature is less than -15°F; or
    - The saturated suction temperature is less than ambient conditions (temp/dewpoint) minus an offset (35°F/25°F).

  - **Termination**: The defrost cycle is terminated when one of the following occur:
    - The saturated discharge temperatures of all refrigerant circuits are greater than the cancel defrost set point (80°F); or
    - The max defrost time (5 min) has been exceeded.

- **Outside Coil Fan Control**: Head pressure control of the outside fans will maintain head pressure control by utilizing transducers on each refrigerant circuit. The outside fan options available on the ASHP are lead modulating or all modulating fans and utilize refrigerant transducers to stage fans on and off in cooling/dehumidification and heating modes

  - **Cooling/Dehumidification**: Reference the Active Head Pressure Control section of the IOM for operation in cooling and dehumidification modes of operation.

  - **Heating**: In heating mode, the pressure reading from the transducer is converted to a saturated suction temperature for each circuit. The temperature, or minimum temperature when two circuits are present, is compared to a setpoint. When the saturated temperature is below setpoint, the modulating fan speed will increase to maintain head pressure. When above setpoint, the modulating fan speed will decrease. Non-modulating fans, if installed, will stage on and off based on setpoint minus/plus setpoint. This function is similar to the cooling/dehumidification active head pressure control for lead modulating fans.

  - **Defrost**: When defrost is initiated, the outside fans turn off allowing the heat to build and defrost the outside coil. When defrost is terminated, the outside fans turn on to bring the pressure down before switching back to heating mode

- **Secondary Heat**: A secondary heating device may be installed in the unit. This device may be electric heat, gas furnace, or a hot water coil. The following sequences are available for secondary heat:

  - **Backup**: Secondary heat only operates when heat pump heating is not available.

  - **Supplemental**: Secondary heat will operate simultaneously with heat pump heating when the compressors are not producing enough heat to stay within 2°F of set point.
Economizer

If the application requires cooling, and the OA conditions are suitable for free cooling, the controller will enter economizer mode. If the unit is economizing and the discharge temperature set point is not being met, the controller will bring on mechanical cooling. If equipped with a modulating OA and recirculated air damper, the dampers will modulate between the min OA and max positions to maintain the supply temperature set point. If equipped with an energy wheel, Reference Energy Recovery Wheel Sequence.

• **Temperature:** The economizer will be locked out when:
  - The outside air is greater than the economizer high lockout (65°F).
  - The unit is operating in dehumidification mode.
  - There is a call for heating.

• **Temperature/Enthalpy:** The economizer will be locked out when:
  - The outside air is greater than the economizer high lockout (65°F dry-bulb).
  - The outside air is greater than the economizer high enthalpy lockout (23 btu/lb).
  - The unit is operating in dehumidification mode.
  - There is a call for heating.

Dehumidification

The cooling is controlled to maintain the cold coil set point. Dehumidification is enabled when the OA temperature is greater than the cold coil set point plus an offset (adj. 10°F). Dehumidification is disabled when the OA temperature falls below the enable point by a hysteresis (2°F). If equipped with BMS communications, the user can also directly set the cold coil leaving air set point.

• **Optional Room Relative Humidity Sensor or Thermostat:** The controller will adjust the cold coil leaving air temperature set point between the min (50°F) and max (55°F) set point to satisfy the desired space relative humidity set point.

Reheat

While the unit is dehumidifying, the supply air temperature is maintained by controlling the reheat device to the supply air set point.

• **Hot Gas Reheat (valve):** The microprocessor controller modulates to maintain set point.
• **Reheat Plus:** The microprocessor controller can be configured to use the primary heat source as secondary reheat.

Supply Fan VFD Sequence

The factory installed VFD is wired to the controller. Supply fan speed needs to be set during test and balance of the unit. If equipped with BMS communications, the user can also directly command the supply fan speed. The following sequences are selectable for supply fan control. The fan speed in constrained by its min and max speed set points.

• **Constant Volume:** Supply fan operates at a constant speed based on a constant volume set point based on occupancy.

• **0-10 VDC by Others to VFD:** The supply fan is enabled by the unit controller. An external field-supplied 0-10 VDC signal to the fan’s VFD is responsible for modulating the supply fan’s speed. The signal is linear and the speed is at min when 0V is present and at max when 10V is present.

• **CO₂ Control:** The supply fan modulates to maintain CO₂ set point based on a sensor located in the space or return duct. A CO₂ sensor or BMS communicated value is required for this sequence.

• **Duct Static Pressure Sensor:** The supply fan modulates to maintain an adjustable duct static set point based on a sensor located in the supply duct. A static pressure sensor or BMS communicated value in required for this sequence.

• **Space Static Pressure:** The supply fan modulates to maintain a space static pressure set point based on a sensor located in the space. A space static pressure sensor or BMS communicated value in required for this sequence.

• **Single Zone VAV:** The controller will control the supply air temperature and supply fan speed in order to maintain the space temperature.

  **Heating Mode** - The supply temperature set point will be increased before increasing the supply fan speed in order to maintain the space temperature set point. If the calculated supply temperature set point is greater than the current space temperature, the supply fan speed will be increased while the supply temperature set point is increased.

  **Cooling Mode** - The supply temperature set point will be decreased before increasing the supply fan speed in order to maintain the space temperature set point.
The factory installed VFD is wired to the controller. Exhaust fan speed needs to be set during test and balance of the unit. If equipped with BMS communications, the user can also directly command the exhaust fan speed. The following sequences are selectable for exhaust fan control. The fan speed constrained by its min and max speed set points.

- **Constant Volume**: Exhaust fan operates at a constant speed based on a constant volume set point based on occupancy.

- **0-10 VDC by Others to VFD**: The exhaust fan is enabled by the unit controller. An external field-supplied 0-10 VDC signal to the fan’s VFD is responsible for modulating the supply fan’s speed. The signal is linear and the speed is at min when 0V is present and at max when 10V is present.

- **Space Static Pressure**: The exhaust fan modulates to maintain a space static pressure set point based on a sensor located in the space. A space static pressure sensor or BMS communicated value in required for this sequence.

- **Supply Fan Tracking**: The exhaust fan proportionally modulates based on the supply fan speed plus an adjustable offset.

- **Outside Air Damper Tracking**: The exhaust fan proportionally modulates based on the outdoor air damper modulation. (This sequence requires a modulating outdoor air damper.)

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### Outside Air and Recirculated (Recirc) Air Damper Control

If equipped with a modulating OA and recirculated air damper, the recirculated air damper will operate inverse of the OA damper. The OA damper opens to its min position. If the controller is configured to modulate the supply fan speed, the min and max OA positions can be reset based on supply fan speed. If equipped with BMS communications, the BMS can directly control the outside damper position. The damper position is constrained by its min and max set point positions.

- **CO₂ Control**: The controller will proportionally modulate the OA/RA dampers based upon a comparison of the CO₂ set point to the actual CO₂ level reported from the sensor. As the CO₂ level rises, the controller will proportionally modulate the OA damper open, between the min OA damper position and max CO₂ position.

- **Space Static Pressure**: The OA/RA dampers will modulate based upon the signal from a building static pressure sensor. The controller will modulate the dampers, between the min and max OA positions, based upon a comparison of the building static pressure set point to the actual building static pressure level reported from the sensor.

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**Economizer**: If the unit is equipped with an energy recovery wheel, the economizer will modulate/stop the energy wheel to achieve free cooling.

- **Stop Wheel**: When economizer mode is enabled and there is a call for cooling, the wheel will stop rotating to allow free cooling. Jog wheel control is available during stop wheel economizer operation. This sequence allows the wheel to rotate for a short period of time exposing a new section to the air stream.

- **Modulate Wheel**: When economizer mode is enabled and there is a call for cooling, the controller modulates wheel speed to maintain the supply temperature set point.

- **Energy Wheel Bypass Dampers, if equipped**: During normal operation, the dampers shall remain open to allow full operation of the energy wheel. During economizer sequences, the dampers will be open to bypass the energy wheel.

**Frost Control**: The microprocessor controller will activate the frost control method when the OA temperature is less than the defrost set point (5°F) and the wheel pressure switch is closed due to a high wheel pressure drop. Once the pressure drop decreases below the pressure switch point or the OA temperature increases, the unit will resume normal operation.

- **Electric Preheater**: When frosting is occurring, the preheater is energized to defrost the wheel.

- **Modulate Wheel**: When frosting is occurring, the wheel slows to allow defrosting to occur.

- **Cycle Wheel**: When frosting is occurring, the energy wheel is cycled off for a defrost cycle time (5 minutes). After the defrost cycle time, the wheel is re-energized to continue normal operation. The controller will not allow another defrost cycle for a min normal operating cycle time (30 minutes).

- **Timed Exhaust**: When frosting is occurring, the supply fan is cycled off along with the tempering for a defrost cycle time (5 minutes). The exhaust fan will continue to run allowing the warm exhaust air to defrost the wheel. After the defrost cycle time, the supply fan and tempering are re-energized to continue normal operation. The controller will not allow another defrost cycle for a min normal operating cycle time (30 minutes).
Alarms

The microprocessor controller includes a digital output for remote indication of an alarm condition, which connects via the J15 port. Alarms include:

- **Dirty Filter Alarm:** If the outside air or return air filter differential pressure rises above the differential pressure switch set point, the microprocessor controller will activate an alarm.

- **Supply and Exhaust Air Proving Alarm:**
  Microprocessor controller monitors proving switch on each blower and displays an alarm in case of blower failure.

- **Sensor Alarm:** Microprocessor controller will send an alarm if a failed sensor is detected (temperature, pressure, relative humidity).

- **Supply Air Low Limit:** If the supply air temperature drops below the supply air low limit (35°F), the controller disables the unit and activate the alarm output after a preset time delay (300 sec.).

- **Other Alarms:** Wheel Rotation, High Wheel Pressure, High/Low Refrigerant Pressure.

- **Condensate Overflow:** Microprocessor controller monitors the float switch installed in the drain pan and will disable the unit and activate an alarm on high condensate.
Large Controller Overview

- Optional LonWorks cards are located in BMS Card port.
- Optional Modbus RTU/BACnet MSTP connections are made to the J25 BMS2 terminal.

Remote Display
- Six conductor RJ25 cable
- Connects to J10

Optional BACnet IP, Modbus TCP, Web UI, Ethernet Connections

- 24 VAC When Unit On
- Compressor 2 S/S
- Compressor 3 S/S
- Compressor 4 S/S
- 24 VAC from Supply Fan Proving
- Ramp 1 Condenser Fan Stage 1
- Ramp 1 Condenser Fan Stage 2
- Ramp 1 Condenser Fan Stage 3
- 24 VAC
- Damper Power
- Heating Enable - Electric Heat Only
- Alarm Dry Contact
- Heat Wheel Frost Mode

- Ramp 2 Condenser Fan Stage 1
- Ramp 2 Condenser Fan Stage 2
- Ramp 2 Condenser Fan Stage 3
- Supply Fan Enable
- Exhaust Fan Enable
- Inverter Compressor E-Stop (VSC)/Compressor 1 S/S
- Heat Pump Reversing Valve Output
- Heat Wheel S/S
- Supply Fan Enable
- 2 Speed Fan Input
- 2 Position Damper Input
- 24VAC to Controller
- Discharge Pressure CKT A
- Discharge Pressure CKT A
- After Cold Coil Temperature Sensor
- Sensor U1, U2, U3 Common
- Supply Discharge Temperature Sensor
- Outdoor Air Temperature Sensor
- 24VAC for Analog Outputs
- Cooling Output
- Hot Gas Reheat Output
- Condenser Fan Modulation Ramp 1
- Condenser Fan Modulation Ramp 2
- Supply Fan Proving
- Wheel Pressure Limit
- Wheel Rotation Alarm
- Unit On/Off Input
- Exhaust Fan Proving
- Occupied/Unoccupied Input
- Dirty Filter Input
- Condensate Drain Pan Switch
- Outside Air Damper Output/Input FDD
- Supply Fan Speed Output
- Exhaust Fan Speed Output
- High Pressure Circuit A
- Low Pressure Circuit A
- High Pressure Circuit B
- Low Pressure Circuit B
- Heat Wheel Output
- Heating Output
- Supply Fan Control Input
- 2 Speed Fan Input
- Outside Air RH
- 2 Position Damper Input
- 6 Speed Fan Input
- Outside Air Damper Output/Input FDD
- Supply Fan Speed Output
- Exhaust Fan Speed Output
- High Pressure Circuit A
- Low Pressure Circuit A
- High Pressure Circuit B
- Low Pressure Circuit B
- Heat Wheel Output
- Heating Output
- Supply Fan Control Input
- 2 Speed Fan Input
- Outside Air RH
- 2 Position Damper Input
- 6 Speed Fan Input

Outside Air Damper
Supply Fan Speed
Exhaust Fan Speed
High Pressure
Low Pressure
High Pressure
Low Pressure
Heat Wheel
Heating
Supply Fan Control
2 Speed Fan
Outside Air RH
2 Position Damper
6 Speed Fan
Outside Air Damper
Supply Fan Speed
Exhaust Fan Speed
High Pressure
Low Pressure
High Pressure
Low Pressure
Heat Wheel
Heating
Supply Fan Control
2 Speed Fan
Outside Air RH
2 Position Damper
6 Speed Fan
Optional LonWorks cards are located in BMS Card port.
Optional Modbus RTU/BACnet MSTP connections are made to the J25 BMS2 terminal.
Remote Display
- Six conductor RJ25 cable
- Connects to J10

Optional BACnet IP, Modbus TCP, Web UI, Ethernet Connections

Optional LonWorks cards are located in BMS Card port.
Optional Modbus RTU/BACnet MSTP connections are made to the J25BMS2 terminal.
The expansion board is an I/O module that can be used to monitor additional statuses or provide commands from large board controller.

The expansion board is an I/O module that can be used to monitor additional statuses or provide commands from medium board controller.
Display Use

The microprocessor controller is located in the unit control center. The face of the controller has six buttons, allowing the user to view unit conditions and alter parameters. The microprocessor controller is pre-programmed with easy to use menus. A remote display is also available, which connects via the J10 port with six wire patch.

### Keypad Description

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Menu</td>
<td>Press to go directly to the Main Menu from any screen. From the Main Menu, navigate to the following screens: • Unit Enable • Unit Status • Ctrl Variables • Alarm Menu</td>
<td></td>
</tr>
<tr>
<td>Alarm</td>
<td>The Alarm button flashes when there is an active alarm. Press to view alarms. Press twice to go to the alarms reset screen.</td>
<td></td>
</tr>
<tr>
<td>Escape</td>
<td>Press from the Main Menu to view the Unit Status screen. Press to go back one menu level.</td>
<td></td>
</tr>
<tr>
<td>Up</td>
<td>Press to navigate through the menus/screens. Press after entering a variable to increase a current value.</td>
<td></td>
</tr>
<tr>
<td>Enter</td>
<td>Press to enter a highlighted menu or screen item. Press to enter a writable variable and press again to confirm the new variable value.</td>
<td></td>
</tr>
<tr>
<td>Down</td>
<td>Press to navigate menus/screens. Press after entering a variable to decrease the current value.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2 Button Click</th>
<th>2 Button Hold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit display on web interface only. These two buttons on the virtual keypad/display are used to simulate two-button actions on the handheld keypad/display.</td>
<td></td>
</tr>
</tbody>
</table>

- **To simulate pressing two buttons simultaneously:**
  1. Click on 2-Button Click.
  2. Then, sequentially click on two keypad buttons (Main, Alarm, Escape, Up, Enter, Down).

- **To simulate pressing and holding two buttons simultaneously:**
  1. Click on 2-Button Hold.
  2. Then, sequentially click on two keypad buttons (Main, Alarm, Escape, Up, Enter, Down).

### Parameter Adjustment

#### Supply air low limit

- Alarm when supply is below: 35.0º F
- Alarm delay: 300s

The cursor always begins in the upper left corner of the display and will be blinking. Press the ← button to move the cursor down for parameter adjustment.

Once the cursor has reached the desired parameter, press the ↑ ↓ buttons to adjust the value.

When satisfied with the adjustment, press the ← button to save the parameter. When finished, make certain the cursor is in the upper left corner. If the cursor is not in the upper left corner, the changes will not be saved. The cursor must be in the upper left corner to enable screen advancement.
The Web User Interface allows access to the unit controller through the building network. Reference Ctrl Variables/Advanced/Network Settings to set the IP network protocol. Once proper communication is established, the user can click on the follow tabs:

**Overview** – Includes a functioning unit graphic, monitoring points, and active set point adjustment.

**Alarms** – Shows current and cleared alarms.

**Trending** – User can view past and present controller points.

**Information** – Provides manufacturer support information as well as IOM resources.

**Service** – User must be logged with service access criteria (9998). Once proper login is established, the user can view configured input/output points associated with the unit controller.

### Pop-Up Tools

**Live Trend** - User can see current values from the controller. The list of variables available is preselected based on the configuration of the unit.

**Unit Display** - Mimics the unit controller display. Allows the user full access to the controller without having to physically be at the unit.

**Dewpoint Calculator** - A calculator with three sliders to determine the dew point, temperature, or humidity. Two of the three values are necessary to get the third.

**Upgrade Application** - A new application program can be loaded to the controller via the WebUI.
Main Menu Navigation

Unit Enable

Main Status

- Unit Status
- Input Output Status

Note:
Additional status screens are displayed depending on unit configuration. Screens may include, but are not limited to:
- Occupancy
- Damper positions
- Fan status
- Airflow
- Set Points
- Economizer
- Energy recovery
- Cooling
- Circuit pressure
- Heating
- Dehumidification
- Static pressure

Ctrl Variables

- Temp Control
- Dehumidification

- Refrigeration
  - Compressor Control
  - Pressure Control
  - Heat Pump Control

- Damper Control

- Energy Recovery

- Fan Control
  - Supply Fan Control
  - Exhaust Fan Control

- Occupancy

Advanced

Note:
The Advanced menu is read-only. The service password is required to change these settings. Reference the Advanced menu section for more information.

- Login
- Manual Overrides
- Adv. Set Points*
- PID Tuning*
- Network Settings
- Backup/Restore
- IO Status/Offset*
- IO Config

- Unit Config*

- Unit Settings*

- Service Info*

- Alarm Management
  - Shutdown Alarms
  - General Alarms

Alarm Menu

- Alarm History
- Active Alarms
- Reset History
- Clear History
- Export History

*Consult factory for more information.
The microprocessor controller will revert to a default main menu loop. This loop includes several screens to view the operating conditions of the unit. Scroll through the menu screens by using the ↑ ↓ buttons.

### The initial menu screen displays the job name, unit tag, unit status, outside air conditions, space conditions and set points.

Possible modes include:
- Off/Standby
- Unoccupied Start
- Dampers Open
- Fan Start Delay
- Fans Starting
- Startup Delay
- System On
- Soft Shutdown
- System Disabled
- Remote Off
- Shutdown Alarm
- Fans Only
- Economizing
- Cooling
- Dehumidifying
- Heating
- HGRH Purging
- Defrost Active
- Overrides Active
- Expansion Offline

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Indicates</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Symbol" /></td>
<td>Supply air fan status. Rotation indicates airflow; static blades indicate no airflow.</td>
</tr>
<tr>
<td><img src="image2" alt="Symbol" /></td>
<td>Cooling</td>
</tr>
<tr>
<td><img src="image3" alt="Symbol" /></td>
<td>Heating</td>
</tr>
<tr>
<td><img src="image4" alt="Symbol" /></td>
<td>Dehumidifying</td>
</tr>
<tr>
<td><img src="image5" alt="Symbol" /></td>
<td>Economizing</td>
</tr>
<tr>
<td><img src="image6" alt="Symbol" /></td>
<td>Defrost</td>
</tr>
</tbody>
</table>

### Input Output Status
Displays real time conditions from sensors located in the unit and building space if equipped with space mounted sensors. Controller output conditions can also be viewed from this screen. To view the desired input/output point, the user must select the desired channel. Reference the Controller Overview section in this manual for individual point locations.

### Occupancy Status
Displays current status of occupancy and the configured occupancy control method and time zone.

### Damper Commanded Pos
This screen appears if equipped with modulating OA and recirculated air dampers. Displays current position of the OA damper.

### Supply Fan Status
This screen displays the fan enable command, fan proving status, and the supply fan ramp being sent from the controller to the VFD. The min and max speeds are set in the VFD (Reference unit Installation and Operation Manual for VFD programming). The controller can modulate the fan between the min and max speeds via an analog output.
**Unit Status Overview**

---

**Exhaust Fan Status**

This screen displays the fan enable command, fan proving status, and the exhaust fan ramp being sent from the controller to the VFD. The min and max speeds are set in the VFD (Reference unit Installation and Operation Manual for VFD programming). The controller can modulate the fan between the min and max speeds via an analog output.

---

**Airflow Status**

This screen displays the current status of airflow volumes if the unit is provided with airflow monitoring.

---

**Ambient Lockout Status**

Displays heating and cooling lockout status based on the outside air ambient temperature. Ambient lockouts for heating and cooling can be altered by entering Main Menu/Ctrl Variables/Temp Control/Cooling or Heating.

---

**Outside Reset**

This screen will be active if the controller is configured for outside air reset. The heating and cooling devices modulate to maintain the supply air temperature set point as determined by the outside reset calculation.

---

**Active Reset**

This screen will be active if temperature control mode is set for space or return air reset. The supply temperature set point is calculated based on the active set point and the current space or return temperature. The calculated set point is scaled between the supply temperature min and max set points determined by the current mode of operation.

---

**Supply Set Point**

This screen is active when supply temp control is selected or the active mode of control. Displays current supply temperature and supply temperature set point to be achieved.

---

**Economizer Ramp**

The economizer ramp screen will be active if the unit is configured for economizer control. This screen displays the economizer set point, supply air discharge temperature, economizer ramp status, and economizer control mode. Economizer control mode options include, outside dry bulb, outside enthalpy, comparative dry bulb, and comparative enthalpy.

---

**CO₂ Ramp Output**

The CO₂ Ramp Output screen will be active if the unit is configured for CO₂ control. This screen displays the CO₂ set point, CO₂ level from the space, and the status of the control ramp.

---

**Energy Recovery Wheel Status**

This screen provides overall status of the energy recovery wheel.
Unit Status Overview

**Defrost Ramp Output**
This screen only appears if the unit has an energy recovery wheel and a frost control method was provided on the unit.
Upon sensing a high differential pressure across the energy wheel, the unit will go into defrost if the outside air temperature is below the defrost temperature set point.

**Cooling Ramp 1**
This screen displays the active set point, supply discharge temperature, cooling enable/disable, cooling ramp being sent from the controller, and the overall capacity being demanded.

**Heat Pump Heating Ramp**
The Heat Pump Heating Ramp status screen is active when the unit is configured as a heat pump. The screen displays the active set point, supply temperature, status of the heat pump heating control ramp, the current ramp percentage, and the current capacity of the operating compressors.

**Compressor Request**
The compressor request screen will be active if the unit is equipped with DX cooling. This screen displays overall status of individual compressor operation being sent from the unit controller. Example: Circuit A compressor enable (On) with modulating value of 26%.

**ExV Status**
The ExV Status screen is active when the unit is equipped with an inverter scroll compressor and electronic expansion valve (ExV). The screen displays information from the EVD (electronic valve driver) including the number of steps (stp) of the valve, the open percentage of the valve, the EVD control status, the suction superheat, the suction temperature, the suction pressure, and the saturated suction temperature. The second status screen also displays the capacity of the circuit the valve is installed on and the discharge refrigerant temperature for that circuit.

**Inverter Compressor Status**
The inverter compressor screen is active when an inverter scroll compressor is installed in the unit. This screen displays information about the operation of the inverter scroll starting with the requested capacity of the compressor compared to its actual operating capacity. The requested capacity and the actual could be different at startup and depending on where it is in the operating envelope. The status of the compressor, current envelope zone and current refrigerant temperatures and pressures are also displayed.

**Condenser Fan Status**
The pressure control status screen is active when a unit is equipped with active head pressure control, this is currently available only with inverter scroll compressors. This screen provides information regarding the outside fan ramp status, circuits affected by the ramp, the status of the fans, and the set point, offset and current saturated temperature.
Refrigerant Circuit Status
The refrigerant circuit status screen is active when the unit is equipped with active head pressure control. This screen provides temperatures and pressures for suction, discharge, and liquid line sensors when installed. Superheat is also displayed when suction temperature and pressure sensors are installed.

Heating Ramp
This screen displays the active set point, supply air temperature, status of the heating control ramp, and heating ramp being sent from the controller.

Dehumidification
This screen will display the overall dehumidification status and selected dehumidification control mode.

The following dehumidification modes are available when the space is in occupied mode:
- Cold coil set point plus offset (10°F)
- Inside RH*
- Inside dew point*
- Outside dew point
- Inside RH or inside dew point*
- Inside RH or inside dew point or outside dew point
- Inside RH and inside dew point*
- Inside RH and inside dew point or outside dew point
*Available during unoccupied mode.

HGRH Ramp
This screen will display the status of the hot gas reheat ramp. The screen includes the active set point, supply air discharge temperature, the ramp status, and hot gas reheat valve request being sent from the controller.

Supply Space Static
This screen displays status points if the unit is configured for space static pressure control. Status points include controller output ramp, static pressure in the space, and the space static pressure set point. Similar status screen will appear for the exhaust fan if the unit is configured for exhaust fan space static control.

Supply/Return Duct Static
This screen displays status points if the unit is configured for duct static pressure control. Status points include controller output ramp, static pressure in the duct, and the duct static pressure set point. Similar status screen will appear for the exhaust fan if the unit is configured for exhaust fan duct static control.

Conditions
The condition screens are active when both temperature and humidity sensors for the location are installed in the unit. The enthalpy and dew point are calculated based on the temperature and humidity readings. The unit altitude is used for the enthalpy calculation.
The controller is equipped with several menus to help guide users with altering program parameters. The following menus can be accessed by pressing the button. To enter the desired menu, press the button.

**Unit Enable**

The **Unit Enable** menu allows the user to enable and disable the unit through the controller. Reference sequence of operation for additional unit starts/stop details.

- **Enable/Disable Unit**: Enables user to manually turn unit on/off via display. Unit terminal **G** must have 24 VAC power to enable the unit.

- **Unit Enable**: The unit ships from the factory in a disabled state. To allow the unit to operate, the controller must receive a run command from digital input **ID4**. **Jumper unit terminals R - G** to allow the unit to operate.

**Change to (Enabled/Disabled)**: Enables user to manually turn unit on/off via display. Unit terminal **G** must have 24 VAC power to enable the unit.

**Control Variables**

The **Control Variables** menu allows the user to view and adjust unit control parameters.

- **Control Variables**: The **Temperature Control** menu allows the user to view and adjust temperature control conditions of the unit.

**Method for Temperature Control**

**Set Point Selections**:

- **Supply Temp Control**: The supply discharge set point is a constant value (e.g. 72°F). Reference Temperature Set point screen for set point adjustment.

- **Space Reset**: The controller will reset the supply air temperature set point to maintain the space temperature set point (requires space temp sensor). Reference the Temperature Set point screen for space set point adjustment.

- **Return Reset**: The controller will reset the supply air temperature set point to maintain the return air temperature set point (requires duct mounted return air temp sensor). Reference the Temperature Set point screen for return air set point adjustment.

- **OA Reset**: The controller monitors the OA temperature and adjusts the desired supply temperature set point accordingly. For example, when the OA is below 55°F, the controller will change the supply set point to 70°F. If the OA is above 65°F, the controller will change the supply set point to 55°F. If the OA temperature is between 55°F and 65°F, the supply set point changes according to the OA reset function. A visual representation of the OA reset function is shown below. Reference Outside Set points for min and max outside air limits.

**Outdoor Air Reset Function**

![Graph of Outdoor Air Reset Function](image)

*Outside Air Temperature (°F)*

*Supply Air Set Point (°F)*
**Menu**

**Temperature Set Point**
This screen only appears if supply temp control, space reset, or return reset is selected as the reset control mode.

**Set Point Selections:**
- **Local** – The space set point will be constant; set from screen (e.g. 72°F).
- **BMS** – The BMS can directly control the space temperature set point (requires BMS communication option).
- **T-Stat** – The space set point will be adjustable from the space thermostat.

Reference Appendix: Room Thermostat Quick Start for additional information.

**Heat Cool Deadband**
This screen only appears if space reset or return air reset is selected as the reset control mode. The heat cool deadband allows for separate cooling and heating set points when the reset control mode is set for space reset or return air reset.

**Supply Set Points**
Cooling and heating supply set points screens only appear if outdoor reset, space reset, or return air reset is selected. These screens allow the user to set the min and max set point limits for cooling or heating operation. The controller will adjust the supply temperature set point between the set limits depending on mode of operation.

**Outside Set Points**
This screen only appears if outside reset is selected as the reset control mode.

**Mode Switch Display**
This screen displays the delay time required before switching between heating and cooling mode.

**Startup Display**
This screen displays the delay time after the fans have started and tempering begins.
### Cooling Lockout

This screen displays the cooling lockout temperature. Cooling will be disabled when outside air is below the cooling lockout temperature (55ºF).

### Heating Lockout

This screen displays the heating lockout temperature. Heating will be disabled when outside air is above the lockout temperature (80ºF).

### Space Set Points during Unoccupied Mode

The controller will have separate screens for unoccupied cooling and heating set points.

Unoccupied Cooling Example: If set point = 80ºF, unoccupied cooling is enabled when space equals 80ºF and above. Unoccupied cooling is disabled when space temperature is below 75ºF.

Unoccupied Heating Example: If set point = 60ºF, unoccupied heating is enabled when space temperature equals 60ºF and below. Unoccupied heating is disabled when space temperature is above 65ºF.

### Winter Ramp

The winter ramp function prevents the supply temperature from dropping below set point under the following conditions:

- Outside air temperature is below the winter ramp enable set point; and
- Heating capacity is at 100%

One of the following is used to perform the winter ramp function:

- Supply fan speed; or
- Outside air damper position

Note: If the unit is a heat pump, the supply fan is always used.

### Modbus Space T-Stat

The quantity of thermostats installed in the space that communicate the temperature, humidity, and set point to the controller. The controller averages the temperature and humidity readings when there is more than one installed. See Appendix C for more information.
The **Dehumidification** menu allows the user to view and adjust dehumidification control parameters.

### Dehumidification Mode - Occupied.

**Possible Modes:**
- Outside Air Temp is greater than cold coil set point plus offset (10°F)
- Inside RH
- Inside dew point
- Outside dew point
- Inside RH or inside dew point
- Inside RH or inside dew point or outside dew point
- Inside RH and inside dew point
- *Available during unoccupied mode.

There must be a constant call for dehumidification for the duration of the enable delay for dehumidification mode to become enabled. The call remains active until conditions are satisfied and dehumidification mode has been active for the min active time. Reference Ctrl Variables/Advanced/Unit Config/Unit Configuration Occupied Dehum Call for dehumidification method options.

### Dehumidification Mode - Unoccupied.

If the unit is unoccupied while there is a dehumidification call, the unit will start and dehumidify until the unoccupied dehumidification set points are satisfied. The above dehumidification modes marked with an * indicate availability during unoccupied mode. The unoccupied dehumidification mode can be set differently than the occupied dehumidification mode. Reference Ctrl Variables/Advanced/Unit Config/Unit Configuration Unoccupied Dehum Call for dehumidification method options.

### Dehumidification Hysteresis

This screen displays hysteresis for enabling dehumidification during occupied and unoccupied conditions. %RH for indoor RH control and °F for indoor dew point control. Example: If indoor RH set point = 50%, dehumidification is enabled when indoor RH equals 50% and above. Dehumidification is disabled when indoor RH is below 44%.

### Dehumidification Timers

This screen allows adjustment for delay and min on time for dehumidification mode. Times are in place to prevent short cycling between dehumidification and other control modes.

### Cold Coil Set Point

This screen displays the temperature set points for the cooling coil. This screen only appears if the unit is equipped with cooling. When in dehumidification mode, the cooling ramp maintains the cold coil set point by increasing or decreasing the amount of cooling provided from the cooling device installed. The calculated coil set point has a min and max set point that is based on the demand from the dehumidification ramp. When the demand is high, the temperature is low. If a constant temperature off the coil is desired during dehumidification, the min and max can be set to the same value. If a BMS is available, the set points can be adjusted over the BMS.
The following priorities are used to determine what is more important in the unit: temperature over dehumidification or heating over dehumidification. Both priority selections determine when the unit is allowed to dehumidify.

1. Temperature over Dehumidification
   Determines when the unit is allowed to dehumidify based on the space/return air temperatures.
   
   a. **Temperature** - If temperature is set as the priority, box not checked, and the space or return air is overcooled, dehumidification is locked out until the space or return temperature is no longer overcooled.
   
   b. **Dehumidification** - If the priority is dehumidification, box checked, and the space or return air is overcooled, the coil offset will be added to the coil leaving set point. (Default 0ºF offset).
   
   c. **Overcooled** - If space or return reset is enabled, the target is considered over cooled when it is 4°F below set point for 5 minutes. It remains overcooled until the target is at set point and the over-cool logic has been active for a min of 5 minutes.

2. Heating over Dehumidification
   Determines when the unit is allowed to dehumidify when heating is active.
   
   a. **Heating** - If priority is set to heating, box in checked, the unit locks out dehumidification while heating is active.
   
   b. **Dehumidification** - If priority is set to dehumidification, box is not checked, the unit is allowed to switch to dehumidification when heating is active.

**Compressor Dehumidification Force.**
In dehumidification mode, the lead compressor will continue to run as long as the dehumidification mode sequence has been enabled in order to prevent compressor cycling and potential reevaporation of moisture. To disable this operation and allow the compressor to cycle in dehumidification mode, uncheck the applicable cooling ramps.
The Refrigeration menu allows the user to view and adjust compressor and condenser settings, if equipped.

**Compressor Control**
Consult factory prior to adjusting parameters in the compressor control menu.

**Pressure Control**
Consult factory prior to adjusting parameters in the pressure control menu.

**Compressor Control**
Allows the user to adjust heat pump heating control set points.

**Air-Source Heat Pump Ambient Lockout**
The screen allows the user to adjust the minimum ambient temperature the compressors can be utilized for heating. When the outside air temperature drops below this temperature, heating with the compressors will not be allowed.

**Heat Pump Defrost**
Consult factory prior to adjusting set points related to heat pump defrost operation.

The Damper Control menu's allows the user to adjust damper control set points. Economizer set point adjust will also be found at this location if the unit is equipped with outside air and recirculation dampers.

**Fan Damper Delay**
This screen allows adjustment for delay time between damper opening and fan operation. This timer allows the damper to open before the fan start sequence begins. This prevents the fans from having to overcome higher static pressure when the damper(s) are opening.

**Outside Damper Position**
This screen only appears if equipped with a modulating OA and recirculating damper. The screen displays the min and max positions for the outside air damper. These set points reflect the percentage of the outside air damper being opened.

- 0% = Full recirculation air
- 100% = Full OA

**Minimum Position** – When in the occupied mode, the active set point will be equal to a local min OA set point, which may be constant or reset by fan speed if equipped with a modulating supply fan.

The OA damper set point can then be further adjusted between the min and max OA settings with sequences such as DCV CO₂, Building Pressure and Economizer.
**Economizer** – The active set point will be reset based on Economizer demand, between the min and max positions.

**Set Point Selections:**

- **Local** – The min OA percentage is constant; set by the controller.
- **SF Reset** – The min and max positions are reset by the supply fan speed.
- **BMS** – The BMS can directly control the OA damper position between the min ad max percentages.
- **Building Pressure** – Damper position is reset by a building pressure control loop.
- **DCV CO₂** – Damper position is reset by a demand-controlled ventilation control loop based on space CO₂ levels. The CO₂ max is the highest percentage that the OA damper can modulate when solely based on CO₂.
- **2 Position** – Damper position is reset to “2-Pos/Max Vent:” set point when a contact closure is made. The 2-position damper operation can be configured to temporarily force the unit into occupied mode until the contact is open (Max Ventilation Mode - enabled in Advanced menu).

**Economizer Control Variables.**

The economizer screen appears when economizer function is enabled. The outside air damper will modulate between the min and max position to maintain the supply temperature set point. The user can select the economizer control method from the following options:

- **Outside Dry Bulb** – Economizing is allowed when the outside dry bulb is less than the economizer temperature enable set point.

- **Outside Enthalpy** - Economizing is allowed when outside enthalpy is less than the economizer enthalpy set point.

- **Comparative Dry Bulb** - Economizing is allowed when outside temperature is less than the space or return temperature.

- **Comparative Enthalpy** - Economizing is allowed when outside enthalpy is less than the space or return enthalpy.
**Menu**

### Energy Recovery Menu

**ECONOMIZER SETTINGS**
There is a built-in hysteresis that disables economizer above the economizer set point. (Example: If economizer uutside dry bulb = 65°F, economizer operation is disabled above 67°F).

**ENERGY REDUCTION ONLY CONTROL.**
If enabled, the OA damper and recirculation damper will not modulate during economizer. Instead, only the energy recovery wheel will be stopped to ensure no energy is transferred from the supply airstream and exhaust airstream.

### Control Variables

**Energy Recovery**

The *Energy Recovery* menu allows the user to adjust energy recovery wheel sequence set points.

### Defrost Ramp
This screen displays the temperature at which the unit will enable frost control mode if necessary (factory default = 5°F) This screen only appears if the unit has an energy recovery wheel and a frost control method was provided with the unit. Upon sensing a high differential pressure across the energy wheel, the unit will enter defrost mode if the outside air temperature is below this temperature setting. Max active time and min off time will be available if the frost control method was provided as timed exhaust or cycle wheel.

### Energy Recovery Wheel Jog Function
This screen display the energy recovery wheel jog function. This screen only appears if the unit has an energy recovery wheel and stop wheel economizer method for control.

Momentarily enables the wheel in order to expose a new section to the airstream.
Control Variables

- Fan Control
- Supply Fan Control

**Supply Fan**

Enable Delay: 5s
Adjust delay time to offset starting fans.

**Supply Fan Speed**

This screen displays min and max supply fan speed percentages. The speed set point is the proportional percentage of the analog output from the controller to the VFD.

50% Speed = Min speed
100% Speed = Max speed

**Set Point Selections:**

- **Constant Volume** – The fan speed will be constant; set from screen (e.g. 100%).
- **BMS** – The BMS can directly control the fan speed (requires BMS communication option).
- **Duct Pressure** – Fan speed is determined by duct pressure control loop.
- **Space Pressure** – Fan speed is determined by building pressure control loop.
- **CO₂** – Fan speed is determined by CO₂ control loop.
- **Single Zone VAV** - The supply fan is modulated in addition to the supply air temperature to satisfy the space temperature set point.
- **2-Speed (High Speed Set Point)** - Supply fan speed is reset to max speed when a contact closure is made. (Max Ventilation Mode).

**Soft Shutdown Enable Conditions**

During a soft shutdown the following will occur:
- Tempering outputs immediately revert back to their off value; while
- Dampers remain open and fans continue to run; until
  - The supply air temperature falls below the soft shutdown enable set point minus 5°F; or
  - The soft shutdown delay timer has expired.

**Supply Fan Delay**

The supply fan delay will begin once the damper sequence is complete. This delay can be used to offset starting times between the supply fan and exhaust fan.
Microprocessor Controller for DOAS

Control Variables

- Fan Control
- Exhaust Fan Control

**Exhaust Fan Delay and Enable**

This screen displays min and max exhaust fan speed percentages. This screen displays the exhaust fan delay and enable based on OA damper position. The exhaust fan delay will begin once the damper sequence is complete. This delay can be used to offset starting times between the supply fan and exhaust fan. This screen also provides the ability to enable the exhaust fan on a set OA damper position if the unit is equipped with a modulating OA damper.

**Exhaust Fan Speed Percentages**

The speed set point is the proportional percentage of the analog output from the controller to the VFD.

- 25% Speed = Min speed
- 100% Speed = Max speed

**Set Point Selections:**

- **Constant Volume** – The fan speed will be constant; set from screen (e.g. 100%).
- **BMS** – The BMS can directly control the fan speed (requires BMS communication option).
- **Space Pressure** – Fan speed is determined by building pressure control loop.
- **Supply Fan Tracking with Offset** – The exhaust fan will track the supply fan, between a min and max position. An offset can be added to achieve the proper balance.
- **Outside Air Damper Tracking** – The exhaust fan will proportionally track the OA damper, between a min and max position.
- **Return Duct Static Pressure** – Fan speed is determined by duct pressure control loop.
The Occupancy menu allows the user to adjust occupancy control parameters which includes occupancy control mode and schedule.

**Occupancy Control**
This screen displays the current mode of operation for occupancy control. Status of the other mode option can also be found on this screen. This screen allows the user to select the source of determining occupancy. The factory default is BMS control.

**BMS:** BMS control (Reference Points List). BMS can be overridden with ID6.

**Digital Input:** Typically used with a remote time clock, motion sensor or switch.

**Always Occ:** Controller will always remain in occupancy mode.

**Always Unocc:** Controller will always remain in unoccupancy mode.

**Schedule:** Allows the user to set an occupancy schedule for each individual day of the week.

**Occupancy Schedule**
This screen allows the user to adjust the schedule. Requires the user to enter a start time, stop time and the applicable days of the schedule.

**Unoccupied Start Enable Modes.**
This screen only appears if unit is provided with unoccupied recirculation.

This screen allows the user to enable/disable modes of operation when in unoccupied recirculation control.

**Occupancy Timed Override**
Screen allows the user to override occupancy for a set duration.
The Advanced menu allows the user to access several submenus regarding controller information, controller overrides, network settings, I/O configuration, and unit configuration. Submenu options are read only and will require the user to input proper login criteria. The service password (9998) is required to change service access menus. Consult factory for factory level access.

The Manual Overrides menus are for start-up, commissioning, and troubleshooting.

### IG Furnace Commissioning Menu
This screen only appears if an indirect gas furnace was provided with the unit. Entering the furnace commissioning menu will step the user through the furnace start-up.

### Manual Override Mode
The Manual Overrides menu is for start-up, commissioning, and troubleshooting. This menu allows the user to override the control loops and specific inputs and outputs.

To access the Manual Overrides submenus, enter the service password (9998). Manual overrides must be enabled at this screen to allow the user to override control loops. Override options must be changed from Auto to Manual for manual control.

### Override the Unit On or Off
When manual override is set to enable, use the arrow buttons to turn the unit on or off.

### Override Occupancy Control
When manual override is set to enable, use the arrow buttons to change occupancy control.

### Override the Supply Fan VFD Speed
The speed is the proportional percentage of the analog output from the controller to the VFD.

0% Speed = Min speed (determined by VFD)
100% Speed = Max speed (determined by VFD)

(Reference unit Installation and Operation Manual for VFD programming).
**Override Exhaust Fan VFD Speed**

This screen only appears if the unit is equipped with an exhaust fan VFD controlled by the microprocessor.

The speed is the proportional percentage of the analog output from the controller to the VFD.

0% Speed = Min speed (determined by VFD)

100% Speed = Max speed (determined by VFD)

(Reference unit Installation and Operation Manual for VFD programming).

**Override the Position of the Outside Air Damper**

This screen only appears if the unit is equipped with a modulating OA and recirculation damper. The recirculation damper position will be the inverse of the OA damper position shown.

0% = Outside air damper closed

100% = Outside air damper fully open

**Override the Compressor**

This screen only appears if the unit is equipped with DX cooling. When manual override is set to enable, use the arrow buttons to turn individual compressor requests on or off.

**Override the Modulating Compressor Control Loop**

When manual override is set to enable, use the arrow buttons to change the compressor modulation value.

**Override Cooling**

When the cooling control is in the manual mode, use the arrow buttons to vary the cooling output.

*Chilled Water:* The cooling percent is directly proportional to the 0 - 10 VDC output signal.

0% Cooling = 0 VDC

100% Cooling = 10 VDC

*Packaged Cooling:* The cooling percent displays compressor engagement as a percent. The compressors are subject to the min on/off times and heating/cooling lockouts.

**Override the Electric Heater**

This screen only appears if the unit is equipped with electric post heat. Electric heater percentage is directly proportional to the 0 – 10 VDC output signal.
**Menu**

### OVERRIDE HEATING

When the heating control is in the manual mode, use the arrow buttons to vary the heating output.

### OVERRIDE HEAT PUMP HEATING

This screen will be available when the unit is configured as a heat pump. When in manual mode, change the demand to control the position of the reversing valve and the amount of compressor request. The compressors are subject to the minimum on/off times and heating lockouts.

### OVERRIDE THE ECONOMIZER CONTROL

When the heating control is in the manual mode, use the arrow buttons to vary the heating output.

### OVERRIDE THE HOT GAS REHEAT

This screen only appears if modulating hot gas reheat option was provided with the unit. When the hot gas reheat loop control is in the manual mode, use the arrow buttons to vary the reheat output.

### OVERRIDE THE ENERGY RECOVERY DEFROST

This screen only appears if modulating wheel frost control is equipped. When the defrost control ramp is in manual mode, use the arrow buttons to vary the defrost output.

- 0% = Maximum Wheel Speed
- 100% = Minimum Wheel Speed

### OVERRIDE PRESSURE CONTROL FANS

This screen will be available when active head pressure control is installed in the unit. When in manual mode, with the compressors off, the modulating fan speed can be altered by using the arrows to change the output. The fixed stage fan can be enabled by changing the output to On.

### Control Variables

- [Advanced Setpoints](#)

### The Advanced Setpoints Menus allows the user to view and modify network settings. The service password (9998) is required to make changes.

### OCCUPIED DEHUMIDIFICATION CALL

Reference control variables for possible Occupied dehumidification call methods.

### UNOCCUPIED DEHUMIDIFICATION CALL

Reference control variables for possible unoccupied dehumidification call methods.
**Menu**

**View and Change the Unoccupied Unit Operation.**

Possible unoccupied unit operation methods include:
- Unit Off
- Night Setback Cycle
- Recirculation with Unoccupied Set Points
- Normal Operation with Unoccupied Set Points

**Enable Morning Warm Up and Cool Down.**

The user can enable morning warm up, morning cool down, and set the duration for the sequence.

**Control Variables**

The Network Settings Menus allows the user to view and modify network settings. The service password (9998) is required to make changes.

**c.pco Board Address**

This screen will appear with or without a network protocol provided with the unit. This screen allows the user to configure the IP setting for BMS and/or when the Web User Interface will be utilized. The controller may have a DHCP server-assigned address or a manually-assigned static IP address. Factory settings are shown in the screen to the left.

**Controller BACnet IP Config**

This screen will appear if the unit is set for BACnet IP and allows the user to set the device and port settings.

**Modbus TCP Slave**

This screen will appear if the unit is set for Modbus TCP and allows the user to set device ID number.

**BACnet MSTP Parameters**

This screen only appears if the selected BMS protocol is set to BACnet MSTP. Factory settings are shown in the screen to the left.

**To change BACnet MSTP parameters:**

1. Go to Network Settings menu and view BACnet MSTP Config screen.
2. Move cursor to desired parameter by pressing the enter button. Press up and down arrows to adjust the parameter. Press enter to accept adjusted value.
3. Once desired parameters have been entered, enable the ‘Save Settings’ option and press the enter button.
4. Reboot the controller by cycling power to the unit. Allow several minutes for the controller to initialize.
Menu

**Modbus RTU Parameters**

This screen only appears if the selected BMS protocol is set to Modbus. Factory settings are shown in the screen to the left.

**To change Modbus RTU parameters:**
1. Go to Network Settings menu and view Modbus RTU Config screen.
2. Move cursor to desired parameter by pressing the enter button. Press up and down arrows to adjust the parameter. Press enter to accept adjusted value.
3. Once desired parameters have been entered, enable the ‘Save Settings’ option and press the enter button.
4. Reboot the controller by cycling power to the unit. Allow several minutes for the controller to initialize.

**BMS Watchdog**

The BMS watchdog function verifies BMS connectivity. The watchdog is required for the BMS to take the place of a hardwired sensor. The BMS toggles the watchdog variable from true to false within the timeout delay. If the timer expires, the controller falls back to hardwired sensors until the BMS connection can be established. At this time, a BMS watchdog alarm activates.

The following variables may be used by the BMS in place of hardwired sensors:

- Outside_RH_from_BMS
- Outside_Temp_from_BMS
- Return_RH_from_BMS
- Return_Temp_from_BMS
- Space_1_CO2_from_BMS
- Return_CO2_from_BMS
- Space_RH_from_BMS
- Space_Static_from_BMS
- Space_Temp_from_BMS

**Sensor Source**

The sensor source can be changed to source by BMS through the controller or by a dedicated BMS point. Reference Points List above and in the Appendix for more detailed point information. Screen to the left is an example of the sensor source type. Source can be set for local or BMS at this screen.

**Control Variables**

The Backup/Restore Menus allows the user to create a backup file of set points and configuration variables on a USB drive or in the controller's internal memory.

**Connecting to USB Drives**

The controller has built-in USB ports for connecting to USB drives. The USB drives can be used for backing up all settings and reported conditions such as alarm history and current values. This creates a file named User_Backup.txt.
**CREATING A BACKUP FILE**

Important:
- At first startup or commissioning, or prior to communicating with Technical Support about performance issues, we recommend creating a backup file for each controller.
- Name each file with the unit sales order–line number found on the silver nameplate attached to the electrical access door.
- Also consider creating a backup file whenever significant program changes are made.

To create a system backup file using the handheld or virtual keypad/display buttons:

1. Go to the Main Menu/Ctrl Variables/Advanced/Login screen. Press the Enter and Up or Down arrow buttons to enter the service password, which is 9998.
2. Go to the Main Menu/Ctrl Variables/Advanced/Backup/Restore screen.
3. Press the Up or Down arrow buttons to navigate to the Backup Settings screen.
4. Press the Enter and Up or Down arrow buttons to select the backup location (internal memory or USB). If creating a backup to a USB drive, insert a USB drive into the main controller.
5. Press Enter to highlight and then the Up or Down arrow buttons to fill the Save checkbox. This action creates the backup file.

**RESTORING FROM A BACKUP FILE**

**From USB**

1. Place the restore file in the root directory of a USB drive. (Do not place the file within a folder on the USB drive.) The file must be named: User_Backup.txt
2. Insert the USB drive into the controller's USB port.
3. Go to the Main Menu/Unit Enable screen. Press the Enter and Up or Down arrow buttons to disable the unit.
4. Go to the Main Menu/Ctrl Variables/Advanced/Login screen. Press the Enter and Up or Down arrow buttons to enter the service password (9998).
5. Go to the Main Menu/Ctrl Variables/Advanced/Backup/Restore screen.
6. Press the Up or Down arrow buttons to navigate to the USB Restore screen.
7. Press Enter to highlight and then the Up or Down arrow buttons to fill the Restore checkbox. This action restores the backup file. If there is an error during the process, the specific error is displayed on this screen.
8. Cycle power to the controller.

**From internal memory**

1. Go to the Main Menu/Unit Enable screen. Press the Enter and Up or Down arrow buttons to disable the unit.
2. Go to the Main Menu/Ctrl Variables/Advanced/Login screen. Press the Enter and Up or Down arrow buttons to enter the service password, which is 9998.
3. Go to the Main Menu/Ctrl Variables/Advanced/Backup/Restore screen.
4. Press the Up or Down arrow buttons to navigate to the Internal Restore screen. This screen is only available when a backup file exists in internal memory.
5. Press Enter to highlight and then the Up or Down arrow buttons to fill the Restore checkbox. This action restores the backup file. If there is an error during the process, the specific error is displayed on this screen.
6. Cycle power to the controller.
The IO Configuration Menu allows the user to view and modify controller input and output points.

**I/O Configuration**

This screen is read only and will require the factory password to make changes. Screen to the left is an example of an analog input configuration screen. Similar screens appear for remaining I/O when selected.

To monitor individual I/O points:

1. Press the enter button to highlight the I/O type.
2. Press the up and down arrows to change the I/O type.
3. Press the enter button to highlight the controller channel.
4. Press the up and down arrows to change the channel.

**I/O Configuration Options**

Changes to the IO configuration requires the factory login password. Consult factory for IO configuration changes.

ADJUSTMENT OF I/O CONFIGURATION MUST ONLY BE DONE UNDER FACTORY GUIDANCE! IMPROPER ADJUSTMENT MAY RESULT IN SYSTEM DAMAGE!

The Unit Configuration menus allows the user to view unit configuration provided from factory. Configuration menus listed below can be altered with the service password. Consult factory for unit configuration changes!

**Supply Fan Control Type**

Reference control variables for possible supply fan control methods.

**Exhaust Fan Control Type**

Reference control variables for possible exhaust fan control methods.
### Alarms

The Alarms menu allows the user to view active alarms, reset active alarm (if possible), and alarm history.

#### Active Alarms

If an alarm occurs, the button will glow red on the controller and the remote display (if installed).

To view alarm, press the Alarm button once. This will display the most recent alarm. If the alarm cannot be cleared, the cause of the alarm has not been fixed. Press the up and down buttons to view any additional occurring alarms.

#### Reset Active Alarms

This screen allows the user to clear active alarms.

#### Alarm Event History

This screen allows the user view recent alarms. To view all saved alarms, press the “down” button to enter the data logger.

#### Clear Alarm Log

This screen allows the user to clear all alarms in alarm log history.

### IG Furnace Alarm (AL) Descriptions

<table>
<thead>
<tr>
<th>Alarm Description</th>
<th>Description</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>IG no flame 3 try AL</td>
<td>Indicates a furnace failure to light or properly sense flame after 3 trials.</td>
<td>Alarm only</td>
</tr>
<tr>
<td>IG combustion fan high pressure switch failure</td>
<td>Indicates a call for high speed combustion fan but high pressure switch did not close.</td>
<td>Alarm only</td>
</tr>
<tr>
<td>IG furnace ignition control</td>
<td>Indicates an alarm from the ignition controller.</td>
<td>Alarm only</td>
</tr>
<tr>
<td>Pressure switch closed with combustion fan off</td>
<td>Indicates low pressure switch was closed with no call for combustion fan.</td>
<td>Alarm only</td>
</tr>
<tr>
<td>Combustion fan not proved</td>
<td>Indicates a call for low speed combustion fan but low pressure switch did not close.</td>
<td>Alarm only</td>
</tr>
<tr>
<td>IG furnace max retry</td>
<td>Indicates that the max number of retries was reached.</td>
<td>Alarm and Furnace lockout</td>
</tr>
<tr>
<td>IG High Temp AL</td>
<td>Indicates that power was lost from the High Temp Limit Sensor.</td>
<td>Alarm only</td>
</tr>
<tr>
<td>IG offline</td>
<td>Indicates communication with furnace control has failed.</td>
<td>Alarm only</td>
</tr>
<tr>
<td>IG Lg Man No Flame AL</td>
<td>No flame after 3 trials for ignition on the large manifold.</td>
<td>Alarm only</td>
</tr>
</tbody>
</table>
Appendix A: Remote Display (pGD1)

The pGD1 is an optional remote display for use with manufacturer’s microprocessor controllers. The remote display allows for remote monitoring and adjustment of parameters of the unit mounted controller. The remote display allows identical access to menus and screens as the unit mounted controller display.

<table>
<thead>
<tr>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carel Model</td>
</tr>
<tr>
<td>Power Supply</td>
</tr>
<tr>
<td>Max distance from unit controller</td>
</tr>
<tr>
<td>Required Cable</td>
</tr>
<tr>
<td>Operating Conditions</td>
</tr>
<tr>
<td>Display Type</td>
</tr>
</tbody>
</table>

**Installation**

The remote display connects to the unit mounted controller through a six-wire RJ25 or RJ12 telephone cable (straight). When ordered from the factory, a 10 ft. cable is provided with the remote display. The display and cable can be used to assist with start-up and maintenance.

**Connecting Cable**

If mounted remotely, the factory cable can either be extended or replaced with a longer cable to obtain the necessary distance. The resulting cable connections should be a “straight through cable,” where pins on one end correspond identically to the pins on the opposite end. If making your own cable, use the same pin-out for each end.

**NTC Temperature Sensor Chart**

![Temperature vs. Resistance Chart]
Appendix B: I/O Expansion Board (c.pCOe) Quick Start

The expansion board is an I/O module that can be used to monitor additional statuses or provide commands from a large board controller. It allows the user to view and control:

- 6 Universal Inputs (Digital Input*, NTC, 0/1VDC, 0/10VDC, 0/20mA, 4/20mA, 0/5VDC)
  
*Only dry to ground contacts can be utilized for digital inputs. Applying voltage will result in damage to the I/O expansion board.

- 4 Analog Outputs (VDC)
- 6 Digital Outputs

The inputs and outputs can be monitored and controlled by the Building Management System. Reference Points List for detailed point information.

Setup

In order for the controller to communicate with the c.pCOe, several parameters must be adjusted. If you have a c.pCOe installed from the factory, the controller is already set up for communication with the main controller. The factory password is required for expansion board and I/O configuration updates. Consult factory for I/O configuration changes.

Enabling the c.pCOe in the Main Controller. - To enable the c.pCOe expansion I/O module, go to Ctrl Variables/Advanced/Unit Config. User will have to enter the Factory Password to make any edits at this point. Consult factory for factory password and configuring the expansion board. The expansion board must be enabled to configure spare I/O points. Once enabled, the user must reboot the controller. See screens to the left for expansion board enable points.

Configuring the I/O Type - In order to edit and configure the I/O configuration of the unit, go to Ctrl Variables/Advanced/I/O Configuration. The user must enable the Editable option for configuring I/O points. If configuring a new I/O point, ‘Scroll by All Configured’ must be deselected to view all I/O options.

Change or Update the I/O Point - Once the editable option is selected, the user must scroll to the I/O Configuration Menu. At this menu the desired I/O type can be selected. Once selected the user can configure the desired channel at the expansion board. The channel will have an ‘E’ designation for expansion board. Aux In Customer 1–6, Aux Analog Out 1-4, and Aux Digital Out 1-6 will be allocated for the I/O expansion board. See example to the left.

Viewing c.pCOe Auxiliary Values – Once the expansion board I/O is configured, the user can view and/or change the I/O type by navigating to Ctrl Variables/Aux I/O Config.
Appendix C: Space Thermostat Quick Start

The space thermostat gives users the ability to view the space temperature and relative humidity (optional) and control the active space set points from the adjustable display. The space thermostat also has the ability to send the unit into temporary occupied mode. It is also provides the functionality to average up to 4 temperature readings through the microprocessor.

The space thermostat is shipped loose with installation by others and is a Modbus connected device.

Room thermostat functions:
- Temporary occupancy override control
- Temperature and relative humidity monitoring
- Temperature and relative humidity set point adjustability
- Status icon on LCD display with push buttons
- Optional temperature monitoring up to 4 sensors

Display

If more than one space thermostat is provided for averaging, only one space thermostat will be provided with a display and push buttons for adjustment.

Adjusting SET POINT - The default display will show the current temperature value for the room. Use the scroll button to index through additional sensor parameters. Parameters with the "SET POINT" icon displayed above the temperature display are adjustable. Use the Up/Down buttons to adjust the set point, and use the scroll button to view the next parameter or return to the normal display mode.

Up/Down Button Function - The Up/Down buttons are used to adjust editable parameters including the temperature and humidity set point.

Override Button Function - The display shows a person in the lower left corner of the display at all times. If the person is solid, the unit is operating in occupied mode. If it is an outline of the person, the unit is in unoccupied mode. Pushing the Override button when the unit is in unoccupied mode will allow a temporary override sequence to Occupied mode for a period of 1 to 3 hours (adjustable at the unit microprocessor).

Initial Setup and Communication Configuration

The space thermostat is a Modbus connected device. There can be up to three additional Modbus temperature sensors added for space temperature averaging. The sensors must all be connected in a daisy chain configuration.

The microprocessor controller will be pre-configured for one space thermostat. If space temperature averaging is desired, additional field setup will be required both in the controller and on the Modbus space sensors:

- Each space sensor must have the DIP switches adjusted on the back of the sensor to the corresponding switches. Reference Room Thermostat Modbus Address chart on the following page for DIP switches settings.
- Once the address is set and the wires are connected the “Status” LED should be a steady green and the “Network” LED should be a quick blinking amber/green color.
- In the Controller, enter the Ctrl Variables Menu/Temperature and scroll down in the Temperature Menu to select Space Thermostat. Choose the number of space sensor being used (1-4).
Baud Rate Setting

In order for the space thermostat to communicate with the microprocessor, the correct baud rate must be set in the space thermostat. To set the baud rate:

- The “PROG” DIP switch on the back of the space thermostat must be flipped to the right side.
- Use the Set Point Down button to display P11 on the space thermostat.
- Push the Scroll button and use the Set Point Up/Down buttons to adjust the baud rate to 192.
- Once 192 is displayed, push the Scroll button again to save the setting. Once the setting is saved, P11 should appear on the display.
- Flip the “PROG” DIP switch on the back of the space thermostat back to the left. The space thermostat should communicate and be set back to normal mode.

Occupancy Override Time Adjustment

If the occupancy override time needs to be adjusted:

- If the occupancy override is enabled from the space thermostat or the unit microprocessor, it will override for the period of time set on this menu screen.
- To adjust the temperature override time, enter the following menu options at the controller, Ctrl Variables/Occupancy. Scroll down at the Occupancy Menu and select Occ Timed Override. This menu will allow the user to enable occupancy override from the controller and set override duration.
The GreenTrol® airflow monitoring station measures airflow using advanced thermal dispersion technology. An integral LCD display provides a local indication of airflow measurement and device configuration. The airflow monitor also features Modbus communication allowing the main unit microprocessor to monitor the airflow as well. The GreenTrol also accepts up to two airflow probes for averaging.

GreenTrol Airflow Monitor functions:
- LCD readout of measured airflow
- Dual airflow probe averaging
- Modbus connectivity

Display and Navigation

The LCD screen will by default show the current airflow that is being measured. To enter the menu to set up the monitoring station the user must remove the front cover of the GreenTrol to uncover the navigation buttons. Press and hold the UP and DOWN buttons at the same time for 3 seconds to enter the menu.

Enter Button Function - The ENTER button allows the user to go into the selected menu or function, as well as save the selected value.

Up/Down Button Function - The Up/Down buttons are used to navigate the menu and to change values in the menu.

Esc Button Function - The ESC button allows the user to exit the current menu or function.
<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
<th>ACTIVE TEXT</th>
<th>INACTIVE TEXT</th>
<th>BACNET</th>
<th>MODBUS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OBJECT INSTANCE</td>
<td>OBJECT TYPE</td>
<td>ACCESS</td>
<td>HYST</td>
</tr>
<tr>
<td>Circuit_A_Discharge_Temp_Analog_Input</td>
<td>Circuit A Discharge Temperature</td>
<td>1</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>Circuit_A_Suction_Temp_Analog_Input</td>
<td>Circuit A Suction Temperature</td>
<td>3</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
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<tr>
<td>Cold_Coil_1_Temp_Analog_Input</td>
<td>Cold Coil 1 Temperature</td>
<td>25</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>CL_Coil_Spt_Temp</td>
<td>Controls Lite Cooling Coil Set Point Temperature value</td>
<td>31</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>CL_Supply_Spt_Temp</td>
<td>Controls Lite Supply Set Point Temperature value</td>
<td>32</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>Outside_Air_Temp_Analog_Input</td>
<td>Outside Air Temperature</td>
<td>37</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>Space_Temp_Analog_Input</td>
<td>Space Temperature</td>
<td>44</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>Supply_Temp_Analog_Input</td>
<td>Supply Temperature</td>
<td>45</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>Outside_RH_Analog_Input</td>
<td>Outside % Relative Humidity</td>
<td>86</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
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<tr>
<td>Space_RH_Analog_Input</td>
<td>Space % Relative Humidity</td>
<td>89</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
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<tr>
<td>Space_Static_Pressure_Analog_Input</td>
<td>Space Static Pressure</td>
<td>94</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.01</td>
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<tr>
<td>Supply_Duct_Static_Pressure_Analog_Input</td>
<td>Supply Duct Static Pressure</td>
<td>95</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.01</td>
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<tr>
<td>Space_CO2_1_Analog_Input</td>
<td>Space 1 CO2 ppm</td>
<td>116</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>10</td>
</tr>
<tr>
<td>Circuit_A_Discharge_Pressure_Analog_Input</td>
<td>Circuit A Discharge Pressure</td>
<td>119</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>Circuit_A_Suction_Pressure_Analog_Input</td>
<td>Circuit A Suction Pressure</td>
<td>120</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>Circuit_B_Discharge_Pressure_Analog_Input</td>
<td>Circuit B Discharge Pressure</td>
<td>121</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>1</td>
</tr>
<tr>
<td>Aux_In_Customer_1</td>
<td>Customer defined auxiliary input</td>
<td>640</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>Aux_In_Customer_2</td>
<td>Customer defined auxiliary input</td>
<td>642</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>Aux_In_Customer_3</td>
<td>Customer defined auxiliary input</td>
<td>644</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>Aux_In_Customer_4</td>
<td>Customer defined auxiliary input</td>
<td>646</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>Aux_In_Customer_5</td>
<td>Customer defined auxiliary input</td>
<td>648</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>Aux_In_Customer_6</td>
<td>Customer defined auxiliary input</td>
<td>650</td>
<td>AI</td>
<td>ReadCOV NoWrite</td>
<td>0.1</td>
</tr>
</tbody>
</table>
### Appendix E: Points List

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
<th>ACTIVE TEXT</th>
<th>INACTIVE TEXT</th>
<th>BACNET</th>
<th>MODBUS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature_Set Point</strong></td>
<td>Main Temperature Set point. Supply, Space, or Return target temperature</td>
<td>1 AV</td>
<td>ReadCOV, Commandable</td>
<td>0</td>
<td>40001 Holding 2</td>
</tr>
<tr>
<td><strong>Temperature_Hot_Cool_Deadband</strong></td>
<td>Heat/Cool Spt Deadband when Room or Return control is active. Clg Spt = Deadband /2 + Temp Spt. Htg Spt = Deadband /2 - Temp Spt.</td>
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Analog Values - Read/Write - Commandable
## Appendix E: Points List

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## Appendix E: Points List

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**Analog Values - Read Only**

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## Appendix E: Points List

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<th>VARIABLE</th>
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<td>OAD_Space_Static_Pressure_Ramp</td>
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## Appendix E: Points List

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<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
<th>ACTIVE TEXT</th>
<th>INACTIVE TEXT</th>
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<td>Wheel_Status_Digital_Input</td>
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<td>BMS_Watchdog</td>
<td>BMS Watchdog command. Used to determine comm status. Must heartbeat within the watchdog timeout delay to detect comm status.</td>
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<td>System_Enable</td>
<td>Master system enable/disable point.</td>
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<td>Occupancy Command. True = Unoccupied. False = Occupied.</td>
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<td>Occupy</td>
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<td>Reset_All_Alarms</td>
<td>Alarm Reset Command.</td>
<td>Reset</td>
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<td>Outside RH Source_BMS</td>
<td>Outside RH Source Selection. True = BMS. False = Local.</td>
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<td>Outside Temp Source_BMS</td>
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<td>Return Temp Source_BMS</td>
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<td>Space_Static_Source_BMS</td>
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<td>Space_Temp_Source_BMS</td>
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<td>SF_Control_Source_BMS</td>
<td>Allows the BMS to control supply fan speed. True = BMS. False = Local.</td>
<td>BMS</td>
<td>Local</td>
<td>56</td>
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<td>EF_Control_Source_BMS</td>
<td>Allows the BMS to control exhaust fan speed. True = BMS. False = Local.</td>
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<td>OAD_Control_Source_BMS</td>
<td>Allows the BMS to control OAD position. True = BMS. False = Local.</td>
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**Binary Inputs - Read Only**

**Binary Values - Read/Write - Commandable**
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<th>INACTIVE TEXT</th>
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<td>Unoccupied Cooling Call Status.</td>
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<td>Enable_Consols</td>
<td>Status to indicate startup is complete and the unit is ready.</td>
<td>Enabled</td>
<td>Disabled</td>
<td>BV</td>
<td>ReadCOV, NoWrite</td>
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<tr>
<td>Global_Alarm</td>
<td>General alarm point. When true, System Enable will be set to false and the unit will remain off.</td>
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<td>System_Shutdown_Alarm</td>
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<td>Damper_Open</td>
<td>Indicates there is a open air path and the supply fan can run.</td>
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<tr>
<td>Cooling_is_On</td>
<td>Indicates that the unit is cooling.</td>
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<td>Inactive</td>
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<td>ReadCOV, NoWrite</td>
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<tr>
<td>Economizer_is_On</td>
<td>Indicates that the unit is economizing.</td>
<td>Active</td>
<td>Inactive</td>
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<td>ReadCOV, NoWrite</td>
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<tr>
<td>Heating_is_On</td>
<td>Indicates that the unit is heating.</td>
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<td>Inactive</td>
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<td>Dehumidification_Mode_Enabled</td>
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<td>Active</td>
<td>Inactive</td>
<td>BV</td>
<td>ReadCOV, NoWrite</td>
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<tr>
<td>Manual_Override_Active</td>
<td>Indicates that manual overrides are active.</td>
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<td>Cooling_NotLocked_Out</td>
<td>Indicates that cooling is not allowed.</td>
<td>Allowed</td>
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<td>ReadCOV, NoWrite</td>
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<td>Indicates that heating is not allowed.</td>
<td>Allowed</td>
<td>Locked_Out</td>
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<td>ReadCOV, NoWrite</td>
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<tr>
<td>Preheat_NotLocked_Out</td>
<td>Indicates that preheat is not allowed.</td>
<td>Allowed</td>
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<td>ReadCOV, NoWrite</td>
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<tr>
<td>HGRH_Purging</td>
<td>Indicates that the hot gas reheat value is purging.</td>
<td>Active</td>
<td>Inactive</td>
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<td>ReadCOV, NoWrite</td>
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<td>Allow_Dampers</td>
<td>Startup sequence command to open dampers.</td>
<td>Yes</td>
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<td>BV</td>
<td>ReadCOV, NoWrite</td>
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<tr>
<td>Allow_Exhaust_Fans</td>
<td>Startup sequence command to trigger exhaust fans to start.</td>
<td>Yes</td>
<td>No</td>
<td>BV</td>
<td>ReadCOV, NoWrite</td>
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<tr>
<td>Allow_Supply_Fans</td>
<td>Startup sequence command to trigger supply fans to start.</td>
<td>Yes</td>
<td>No</td>
<td>BV</td>
<td>ReadCOV, NoWrite</td>
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<td>BMS_Watchdog_Active</td>
<td>Status of the BMS watchdog ping.</td>
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<tr>
<td>BMS_Occupancy_Status</td>
<td>Status of the BMS occupancy command.</td>
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<td>Active</td>
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<td>ReadCOV, NoWrite</td>
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Binary Values - Read Only
## Appendix E: Points List

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<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
<th>ACTIVE TEXT</th>
<th>INACTIVE TEXT</th>
<th>BACNET OBJECT INSTANCE</th>
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## Appendix E: Points List

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<th>VARIABLE</th>
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<th>BACNET</th>
<th>MODBUS</th>
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### Appendix E: Points List

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<td>Unexpected EEV Position (0=Normal 1=Alarm)</td>
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<td><strong>Integer Values - Read Only</strong></td>
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<tr>
<td>Allow_Fan_Delay_Remaining</td>
<td>Startup Sequence Fan Damper Delay. Time before enabling Fan startup sequence.</td>
<td>1</td>
<td>IV</td>
<td>30182</td>
<td>Input 1</td>
</tr>
<tr>
<td>Supply_Fan_Delay_Remaining</td>
<td>Supply Fan startup sequence. Time before starting supply fan.</td>
<td>2</td>
<td>IV</td>
<td>30184</td>
<td>Input 1</td>
</tr>
<tr>
<td>Exhaust_Fan_Delay_Remaining</td>
<td>Exhaust Fan startup sequence. Time before starting exhaust fan.</td>
<td>3</td>
<td>IV</td>
<td>30186</td>
<td>Input 1</td>
</tr>
<tr>
<td>LatestAlm</td>
<td>Most recent alarm. See alarm table.</td>
<td>7</td>
<td>IV</td>
<td>30195</td>
<td>Input 2</td>
</tr>
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</tr>
<tr>
<td>Active_Temperature_Reset_Mode</td>
<td>Temperature Reset Type (1=No Reset, Supply Control 2=Space 3=Return 4=outside)</td>
<td>9</td>
<td>IV</td>
<td>656</td>
<td>Input Register 1</td>
</tr>
<tr>
<td>Temperature_Reset_Mode</td>
<td>Temperature Reset Type (1=No Reset, Supply Control 2=Space 3=Return 4=outside)</td>
<td>8</td>
<td>IV</td>
<td>106</td>
<td>Holding Register 1</td>
</tr>
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<td><strong>Large Board Points</strong></td>
<td>Binary Values - Read Only</td>
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</tr>
<tr>
<td>High_Low_Press_Circ_A_Alarm.Active</td>
<td>High Low Pressure Switch Alarm Circuit A</td>
<td>Alarm</td>
<td>Normal</td>
<td>733</td>
<td>BV</td>
</tr>
<tr>
<td>High_Low_Press_Circ_B_Alarm.Active</td>
<td>High Low Pressure Switch Alarm Circuit B</td>
<td>Alarm</td>
<td>Normal</td>
<td>734</td>
<td>BV</td>
</tr>
<tr>
<td>High_Low_Press_Circ_C_Alarm.Active</td>
<td>High Low Pressure Switch Alarm Circuit C</td>
<td>Alarm</td>
<td>Normal</td>
<td>735</td>
<td>BV</td>
</tr>
<tr>
<td>High_Low_Press_Circ_D_Alarm.Active</td>
<td>High Low Pressure Switch Alarm Circuit D</td>
<td>Alarm</td>
<td>Normal</td>
<td>736</td>
<td>BV</td>
</tr>
<tr>
<td>Greentrol_1_Alarm_Active</td>
<td>Greentral Device Alarm</td>
<td>Alarm</td>
<td>Normal</td>
<td>737</td>
<td>BV</td>
</tr>
<tr>
<td>Greentrol_2_Alarm_Active</td>
<td>Greentral Device Alarm</td>
<td>Alarm</td>
<td>Normal</td>
<td>738</td>
<td>BV</td>
</tr>
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<td>Greentrol_3_Alarm_Active</td>
<td>Greentral Device Alarm</td>
<td>Alarm</td>
<td>Normal</td>
<td>739</td>
<td>BV</td>
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### Appendix E: Points List

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DESCRIPTION</th>
<th>ACTIVE TEXT</th>
<th>INACTIVE TEXT</th>
<th>BACNET</th>
<th>MODBUS</th>
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<tr>
<td><strong>Binary Inputs - Read Only</strong></td>
<td></td>
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<tr>
<td>Mixed_Temp_Analog_Input</td>
<td>Mixed Temperature</td>
<td>35</td>
<td>AI</td>
<td>ReadCOV-NoWrite</td>
<td>0.1</td>
</tr>
<tr>
<td>Exhaust_Fan_Speed_Analog_Input</td>
<td>Exhaust Fan Speed Remote Command Analog Input value</td>
<td>143</td>
<td>AI</td>
<td>ReadCOV-NoWrite</td>
<td>1</td>
</tr>
<tr>
<td>Supply_Fan_Speed_Analog_Input</td>
<td>Supply Fan Speed Remote Command Analog Input value</td>
<td>155</td>
<td>AI</td>
<td>ReadCOV-NoWrite</td>
<td>1</td>
</tr>
<tr>
<td><strong>Binary Inputs - Read Only</strong></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>EAD_End_Switch_Digital_Input</td>
<td>Exhaust Air Damper End Switch Digital Input Status</td>
<td>Active</td>
<td>Inactive</td>
<td>BI</td>
<td>ReadCOV-NoWrite</td>
</tr>
<tr>
<td>OAD_End_Switch_Digital_Input</td>
<td>OAD End Switch Digital Input Status</td>
<td>Active</td>
<td>Inactive</td>
<td>BI</td>
<td>ReadCOV-NoWrite</td>
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<tr>
<td><strong>Binary Values - Read Only</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condenser_Fan_5_Digital_Output</td>
<td>Condenser Fan 5 Digital Output</td>
<td>Active</td>
<td>Inactive</td>
<td>BV</td>
<td>ReadCOV-NoWrite</td>
</tr>
<tr>
<td>Condenser_Fan_6_Digital_Output</td>
<td>Condenser Fan 6 Digital Output</td>
<td>Active</td>
<td>Inactive</td>
<td>BV</td>
<td>ReadCOV-NoWrite</td>
</tr>
<tr>
<td>Condenser_Fan_7_Digital_Output</td>
<td>Condenser Fan 7 Digital Output</td>
<td>Active</td>
<td>Inactive</td>
<td>BV</td>
<td>ReadCOV-NoWrite</td>
</tr>
<tr>
<td>Damper_End_Switch_Alarm</td>
<td>Damper End Switch Alarm (0=Normal 1=Alarm)</td>
<td>Alarm</td>
<td>Normal</td>
<td>BV</td>
<td>ReadCOV-NoWrite</td>
</tr>
<tr>
<td>Exhaust_Fan_1_AMD_analog_input_Alarm_Active</td>
<td>Exhaust Fan 1 CFM Analog Input Alarm (0=Normal 1=Alarm)</td>
<td>Alarm</td>
<td>Normal</td>
<td>BV</td>
<td>ReadCOV-NoWrite</td>
</tr>
<tr>
<td>Freeze_Stat_Alarm_Active</td>
<td>Freeze Stat Alarm (0=Normal 1=Alarm)</td>
<td>Alarm</td>
<td>Normal</td>
<td>BV</td>
<td>ReadCOV-NoWrite</td>
</tr>
<tr>
<td>Mixed_Temperature_Sensor_Alarm_Active</td>
<td>Mixed Temperature Sensor Alarm (0=Normal 1=Alarm)</td>
<td>Alarm</td>
<td>Normal</td>
<td>BV</td>
<td>ReadCOV-NoWrite</td>
</tr>
<tr>
<td>OAD_AMD_analog_input_Alarm</td>
<td>OAD CFM Analog Input Alarm (0=Normal 1=Alarm)</td>
<td>Alarm</td>
<td>Normal</td>
<td>BV</td>
<td>ReadCOV-NoWrite</td>
</tr>
<tr>
<td><strong>Integer Value - Read Only</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active_Temperature_Reset_Mode</td>
<td>Temperature Reset Type (1=No Alarm, Supply Control 2=Space 3=Return 4=outside)</td>
<td>9</td>
<td>IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature_Reset_Mode</td>
<td>Temperature Reset Type (1=No Alarm, Supply Control 2=Space 3=Return 4=outside)</td>
<td>8</td>
<td>IV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**56 Microprocessor Controller for DOAS**
The Fault Detection and Diagnostics (FDD) will send a feedback signal from the outdoor air (OA) damper to the controller on the OA damper user interface. This allows the controller to determine if the economizer is operating correctly. Various faults and statuses will display on the controller and through the Building Management System as per the Title 24 Economizer Fault Detection and Diagnostic requirements.

### Enable Fault Detection and Diagnostics

When ordered, the FDD will come enabled from the factory. The FDD alarms can be disabled through the service config menu in the controller. To access the service config menu, navigate the following way: ‘Ctrl variables’ → ‘Advanced’ → ‘Unit Config’ → ‘Service Config’. Alarm tolerance and read frequency will also be able to be adjusted through this menu.

There will be an ‘Actuator Feedback’ screen in the ‘Service Info’ menu that will show the commanded damper position, the actual feedback position, and when the damper positions were last read. This screen is also where the field could force the FDD to read the damper position via a check box option. The service info menu can be accessed via the following: ‘Ctrl variables’ → ‘Advanced’ → ‘Service Info’.

### Faults/Alarms

Additional faults can generate when the Economizer FDD is enabled, below is a list of the alarms and a description of each. These alarms can also be generated through a BACnet® protocol only.

- **Not Economizing when it should** will generate when FDD is enabled, the outdoor damper status is NOT active on economizer, and the feedback signal from the OA damper is below the damper commanded position by more than 1VDC. Because of the speed of the actuator there is a 3-minute alarm delay to allow the actuator a chance to “catch up” if a sudden change in damper position happens.

- **Economizing when it should not** will generate when FDD is enabled, the outdoor damper status is NOT active on economizer, and the feedback signal from the OA damper is above the damper commanded position by more than 1VDC. Because of the speed of the actuator there is a 3-minute alarm delay to allow the actuator a chance to “catch up” if a sudden change in damper position happens.

- **Damper not modulating** will show up when FDD is enabled, Damper status is NOT Active on Economizer, and feedback signal is not within 1VDC above or below the damper commanded position within 180 seconds.

- **Excess outdoor air** will generate when FDD is enabled, the outdoor damper status is active on economizer, and the feedback signal from the OA damper is above the damper commanded position by more than 1VDC. Because of the speed of the actuator there is a 3-minute alarm delay to allow the actuator a chance to “catch up” if a sudden change in damper position happens.
Appendix G: Fault Detection and Diagnostics

Below is the BACnet Point if the Fault Detection and Diagnostic Alarms are to be read through BACnet:

<table>
<thead>
<tr>
<th>Type</th>
<th>Instance</th>
<th>Name</th>
<th>Read Write</th>
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</thead>
<tbody>
<tr>
<td>Binary</td>
<td>741</td>
<td>OAD_Feedback_Error_Not_Economizing.Active</td>
<td>ReadCOV_NoWrite</td>
</tr>
<tr>
<td>Binary</td>
<td>742</td>
<td>OAD_Feedback_Error_Economizing.Active</td>
<td>ReadCOV_NoWrite</td>
</tr>
<tr>
<td>Binary</td>
<td>743</td>
<td>OAD_Feedback_Error_OAD_Not_Modulating.Active</td>
<td>ReadCOV_NoWrite</td>
</tr>
<tr>
<td>Binary</td>
<td>744</td>
<td>OAD_Feedback_Error_Excess_OA.Active</td>
<td>ReadCOV_NoWrite</td>
</tr>
</tbody>
</table>
Our Commitment

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

Specific Greenheck product warranties are located on greenheck.com within the product area tabs and in the Library under Warranties.

AMCA Publication 410-96, Safety Practices for Users and Installers of Industrial and Commercial Fans, provides additional safety information. This publication can be obtained from AMCA International, Inc. at www.amca.org.