AAON Mini Controller

User's Manual

⚠ WARNING

QUALIFIED INSTALLER

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a trained, qualified installer. A copy of this manual should be kept with the unit.

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R98200 · Rev. B · 140311

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Safety

Attention should be paid to the following statements:

NOTE - Notes are intended to clarify the unit installation, operation and maintenance.

⚠ **CAUTION** - Caution statements are given to prevent actions that may result in equipment damage, property damage, or personal injury.

⚠ **WARNING** - Warning statements are given to prevent actions that could result in equipment damage, property damage, personal injury or death.

⚠ **DANGER** - Danger statements are given to prevent actions that will result in equipment damage, property damage, severe personal injury or death.

⚠ WARNING

ELECTRIC SHOCK, FIRE OR EXPLOSION HAZARD

Failure to follow safety warnings exactly could result in dangerous operation, serious injury, death or property damage.

Improper servicing of HVAC equipment could result in dangerous operation, serious injury, death or property damage.

- Before servicing, disconnect all electrical power to the equipment. More than one disconnect may be provided.
- When servicing controls, label all wires prior to disconnecting. Reconnect wires correctly.
- Verify proper operation after servicing. Secure all doors with key-lock or nut and bolt.

⚠ WARNING

Electric shock hazard. Before servicing, disconnect all electrical power to the equipment, including remote disconnects, to avoid shock hazard or injury from rotating parts. Follow proper Lockout-Tagout procedures.

⚠ WARNING

GROUNDING REQUIRED

All field installed wiring must be completed by qualified personnel. Field installed wiring must comply with NEC/CEC, local and state electrical code requirements. Failure to follow code requirements could result in serious injury or death. Provide proper unit ground in accordance with these code requirements.

⚠ WARNING

During installation, testing, servicing and troubleshooting of the equipment it may be necessary to work with live electrical components. Only a qualified licensed electrician or individual properly trained in handling live electrical components shall perform these tasks.

Standard NFPA-70E, an OSHA regulation requiring an Arc Flash Boundary to be field established and marked for identification of where appropriate Personal Protective Equipment (PPE) be worn, should be followed.

1. The controller is for indoor use only. See General Information section for more information.

2. READ THE ENTIRE USER'S MANUAL. OTHER IMPORTANT SAFETY PRECAUTIONS ARE PROVIDED THROUGHOUT THIS MANUAL.

3. Keep this manual and all literature safeguarded near the equipment.

AAON® Mini Controller Features and Options

- Lead/Single Variable Capacity Scroll Compressor Control
- Constant Volume Control
- Single Zone VAV Control
- Air Conditioner or Heat Pump
- Weekday, Weekend, Entire Week or Daily Scheduling
- 12 Day Holiday Scheduling
- Alarms and Trend Logging
- Push Button Override
- 2 Compressor Stages
- Modulating Gas/SCR Electric Heat
- 1, 2 or 3 Stages of Gas Heat
- 1, 2 or 3 Stages of Electric Heat
- 1 and 2 Stages of Emergency Heat
- Sensible Controlled Fully Modulating Economizer
- BACnet MS/TP EIA-485 Network Connection

Options Available that use the Configurable Controller Input

- Modulating Hot Gas Reheat (Model R80570 only)
- Enthalpy Controlled Fully Modulating Economizer
- CO_2 Economizer Override
- Remote Averaging Space Temperature Sensor
- Remote Space Temperature Sensor Control
- Fan Status

General Information

The AAON Mini Controller has been designed for simple single zone system control.

⚠ WARNING

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Codes and Ordinances
HVAC system should be sized in accordance with the American Society of Heating, Refrigeration and Air Conditioning Engineers Handbook.

Installation of equipment must conform to the ICC standards of the International Mechanical Code, the International Building Code, Installation of Air Conditioning and Ventilating Systems Standard, NFPA 90A, and local building, plumbing and waste water codes. All appliances must be electrically grounded in accordance with local codes, or in the absence of local codes, the current National Electric Code, ANSI/NFPA 70 or the current Canadian Electrical Code CSA C22.1.

Receiving Unit
When received, the controller should be checked for damage that might have occurred in transit. Controller should also be checked to ensure the correct model has been received to match the job requirements.

AAON Mini Controller
R80570 - Space Temperature Control
R80580 - Space Temperature and Humidity Control

Specifications
Supply Voltage:
24 VAC (+15%/-10%), Class-2
Supply Power:
13 VA
Connections:
Wire clamp type terminal blocks; 14-22 AWG, copper; 4 pin EIA-485
Outputs:
Analog outputs produce 0-10 VDC, 20 mA maximum.
Binary outputs (N.O. SPST, Form A) carry 1 A maximum per relay or a total of 1.5 A per bank of 3 relays (relays 1-3, 4-6) @ 24 VAC/VDC
Inputs:
10k Type 3 Thermistor
Display:
64 x 128 pixel dot matrix LCD
Case Material:
White flame retardant plastic
Dimensions:
5.551 x 4.192 x 1.125 inches (H x W x D)
141 x 106 x 28.6 mm
Weight:
0.48 lbs, 218 g
Approvals:
UL 916 Energy Management Equipment
FCC Class B, Part 15, Subpart B
Temperature/Humidity Sensors:
10k Type 2 Thermistor (Temperature only model)
CMOS (Temperature and Humidity model)

Temperature Readings
Accuracy:
+/-0.9°F (+/-0.5°C) from 40-104°F
Resolution:
+/- 0.1°F (+/-0.2°C)
Operating Range:
36-120°F (2.2-48.8°C)
Response Time:
5-30 seconds

Humidity Readings
Range:
0-100% RH
Accuracy@77°F (25°C):
+/-2% RH (10-90% RH)
Response Time:
Less than 4 seconds

Environmental Limits
Operating:
34-125°F (1.1-51.6°C)
Shipping:
-40-140°F (-40-60°C)
Humidity:
0-95% RH non-condensing

Installation

Locating and Mounting the Controller
For optimum performance controller should be mounted on an interior wall 4-5 feet above the floor away from heat sources, sunlight, windows, air vents and air circulation obstructions.

1. Complete rough-in wiring at each location prior to controller installation.
2. Hex screws at the bottom and top of the controller backplate must be turned clockwise until clear of the controller cover to allow removal of the cover.
3. Route wiring through the backplate.
4. With the embossed UP toward the ceiling, fasten the 2x4 backplate directly to a vertical 2x4 inch wall handy box. A 4x4 inch backplate attachment is also provided for horizontal 2x4 handy box and 4x4 handy box applications.

⚠ CAUTION

To prevent mounting screw heads from touching the circuit board in the controller use only the mounting screws provided with the controller. Using screws other than the type supplied may damage the controller.

5. Make the appropriate connections to the terminal block.
6. Place controller cover over the backplate while being careful not to pinch or dislodge any wiring. Turn the hex screws counterclockwise until they engage the cover and hold it in place.

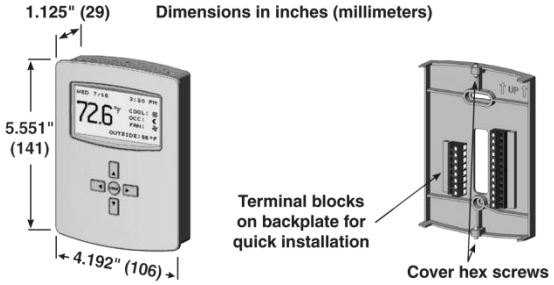

Figure 1 - Dimensions and Connections

AAON Mini Controller Backplate Layout

		Backplate Wiring Cutout	HPU | Std	
			OAD	Analog Outputs
			GND	
			G2	
			Y1(Analog)	
MS/TP	+B		RH	Relay Outputs
	-A		SC	
Inputs	OAT		E2 | W3 | Y1(Relay)	
	SAT		E | W2	
	GND		O/B | W1	Relay Outputs
	L		SC	
24 VAC	- C		Y2	
	~ R		G	

Figure 2 - Backplate Terminal Locations

BACnet MS/TP EIA-485 Network
+B = BACnet network terminal
-A = BACnet network terminal

Inputs
Space Temp (Internal) = IN1, Space Temperature
L = IN2, Configurable Input:
- Suction Pressure - 0-10 VDC
- Outside Air Humidity - 0-10 VDC
- CO_2 - 0-10 VDC
- Remote Space Temperature - 10k Type 3 Thermistor
- Fan Status - 0-10 VDC

SAT = IN3, Supply Air Temperature - 10k Type 3 Thermistor
OAT = IN4, Outside Air Temperature - 10k Type 3 Thermistor
Space RH (Internal) = IN5, Space Relative Humidity
GND = Ground

24 VAC
- C = COM, E, Common
~ R = 24 VAC Phase

Analog Outputs
OAD = OUT9, EC1, Economizer Output - 0-10, 10-0, 2-10 or 10-2 VDC (0-100%)
GND = Ground
G2 = OUT8, S1, Variable Speed Supply Fan Output - 0-10 VDC (0-100%)
Y1 (Analog) = OUT7, Variable Capacity Compressor Output - 1-5 VDC (10-100%)

Relay Outputs
RH = RLY6, Dehumidification
SC = Common (24 VAC)
E2 | W3 | Y1 (Relay) = RLY5, Emer. Heat 2/Heat 3/Compressor 1
E | W2 = RLY4, Emer. Heat 1/Heat 2
O/B | W1 = RLY3, Reversing Valve/Heat 1
SC = Common (24 VAC)
Y2 = RLY2, Compressor 2
G = RLY1, Supply Fan

Electrical
Connection terminations are made to the main terminal block of the controller and the HVAC equipment.

A complete set of unit specific wiring diagrams, showing factory and field wiring are laminated in plastic and located inside the controls compartment door of the AAON HVAC equipment.

⚠ WARNING

Disconnect all electrical power sources before servicing the unit. More than one power source may be provided. Failure to do so may result in injury or death from electrical shock or entanglement in moving parts.

Control Wiring
Control wiring size must be large enough to prevent excess voltage drop and ensure proper operation. Control voltage returning from controller circuit must be a minimum of 21 VAC. To assure proper wiring use the following table to determine the allowable wiring distances.

Table 1 - Control Wiring

Wire Size (Stranded) - Copper Conductors Only	Total Wire Distance Allowable
20 AWG	200 ft
18 AWG	350 ft
16 AWG	500 ft
14 AWG	750 ft
12 AWG	1250 ft

Total Wire Distance Allowable =
(Quantity of Control Wires) x
(Control Wire Distance)

Take the total wire distance allowable and divide by the quantity of wires to be connected. This indicates the distance allowable for that size wire. The wiring to the unit must not exceed the total wire distance allowable. If the voltage at the connectors is less than 21 VAC, isolation relays must be installed. If under external control 21 VAC must be field verified.

All external devices must be powered via a separate external power supply.

Example:
A total of 8 wires must be pulled 75 ft to a control the unit. What size wire should be used?

According to Table 1, 16 AWG allows for 63 ft (500 ft/8 wires) and 14 AWG allows for 94 ft (750 ft/8 wires). Thus, 14 AWG should be used.

BACnet MS/TP EIA-485 Wiring
Connect the -A terminals in parallel with all other -A terminals on the network and the +B terminals in parallel with all other +B terminals. Connect the shields of the cable together at each device using a wire nut. Connect the cable shield to a good earth ground at one end only.

Controllers on the physical ends of the EIA-485 wiring segment must have end-of-line termination installed for proper network operation. If a controller is at the physical end of the MS/TP network line, set both the EOL termination switches to the *On* position on the back of the circuit board. If not on the end, ensure that both switches are *Off*.

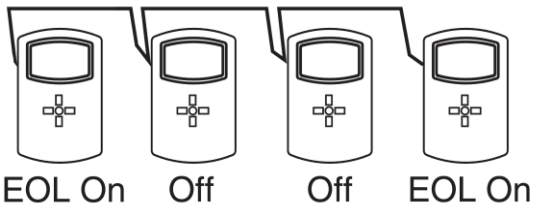

Figure 3 - MS/TP Network End-of-Line Terminology

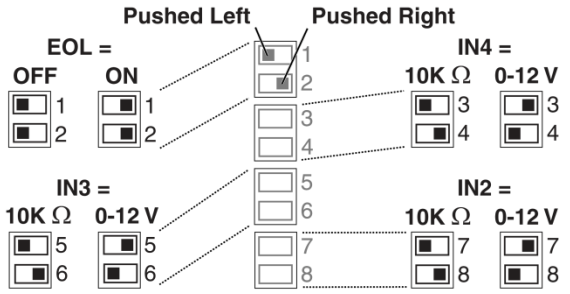

Figure 4 - EOL and Pull-Up Switch Resistor Positions on Reverse Side of Controller

See BACnet Points List section for additional information.

Input Connections
Passive input devices require pull-up resistors in the circuit. For passive input devices, such as 10k Type 3 thermistors, on the IN2 through IN4, set the pull-up switches on the back of the circuit board to the *10K* position. For active voltage devices, set the switches to the *0-12 V* position.

The input switch pairs (3-4, 5-6, 7-8) must not have both switches set to the left or both set to the right. For example, if switch 3 is set to the left, switch 4 must be set to the right. The input pull-up resistor switch pairs must be fully latched in either the *10K* or *0-12 V* positions - even if a switch pair has no input connected.

IN3 and IN4, the outside and supply air temperature sensor inputs, should not be changed and must always be set to the *10K* position.

For IN2, with factory provided sensors, inputs should be set up as:
Suction pressure sensor - *0-12 V*
Outside air humidity sensor - *0-12 V*
CO_2 sensor - *0-12 V*
Remote space temperature - *10K*
Fan status - *0-12 V*

The controller does not support 1k ohm RTDs.

Remote Space Temperature Sensor
A maximum of 4 remote space temperature sensors may be wired in a series-parallel arrangement to provide an average remote space temperature reading. With remote space temperature sensor averaging configured this average remote space temperature is then averaged with the internal space temperature reading.

Supply Air Temperature Sensor
Supply air temperature sensor must be field installed in the supply ductwork 6-8 feet downstream from the unit to get an accurate reading.

Output Connections
Connect the device under control between the desired output terminal and the related SC (Switched Common for relay outputs) or GND (Ground for analog outputs). For a bank of three relays, there is one SC connection.

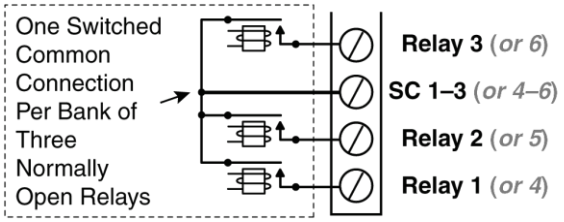

Figure 5 - Switched Common and Relays

Do not attach a device that draws current exceeding the controller's capacity. Maximum output current for individual Analog outputs is 20 mA @ 12 VDC. Maximum output current for individual relays is 1 A @ 24 VAC/VDC or a total of 1.5 A per bank of 3 relays (relays 1-3, 4-6).

Relays 1-6 are NO, SPST, Form A.

⚠ CAUTION

Relays are for Class-2 (24 VAC) only. Do not connect line voltage to the relays.

CAUTION

Do not mistakenly connect 24 VAC to an analog output ground. This is not the same as a relay's switched common. See the backplate's terminal label for the correct terminal.

Power Connection

The controller requires an external 24 VAC power source. Use a Class-2 transformer to supply power. Connect the transformer's neutral lead to the 24 VAC Common (- C) terminal and the AC phase lead to the 24 VAC Phase (~ R) terminal. Power is applied to the controller when the transformer is plugged in.

AAON recommends powering only one controller from each transformer. If installing a system with other controllers powered from a single transformer, however, phasing must be correct and total power drawn from the transformer must not exceed its rating.

Startup

(See back of the manual for startup form)

WARNING

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Navigation

General

Enter - Select or exit value editing
Up/Down - Move among entries
Left/Right - Move among value fields
Left - Back or return to Home Screen

Home Screen

Enter - Turn on backlight
Up/Down - Space temperature setpoint viewing and override
Left - Open Override Menu
Right - Open Main Menu

Figure 6 - AAON Mini Controller

Home Screen Configuration

Space Temperature Setpoint Override

Press *Up*/*Down* once to view the existing space temperature setpoint

For temporary push button override of the current space temperature setpoint, press *Up*/*Down* repeatedly until the desired temperature setpoint is displayed and press *Enter*. The new setpoint will hold for the duration of the occupancy override amount of time (adjustable under Main Menu: System) or until the occupancy override has been turned off manually from the Home Screen.

System Mode of Operation

The System Mode of Operation options available are Auto, Cooling, Heating, Emergency Heating and Off.

When System Enable is set to Auto, the controller will maintain both the space heating and cooling setpoints with operation depending on the space temperature. When System Enable is set to Heating, the controller will maintain only the space heating setpoint. When System Enable is set to Cooling, the controller will maintain only the space cooling setpoint. For heat pump units, when System Enable is set to Emergency Heating, the controller will maintain only the space heating setpoint using only the emergency heating. When System Enable is set to Off, the controller operation will be turned off.

When the controller is in the heating mode of operation HEAT and an animated icon will be displayed. When the controller is in the cooling mode of operation COOL and an animated icon will be displayed. When OFF is displayed the mode of operation display is off.

Occupancy Override (OCC:)
The Occupancy Override options available are On and Off. Override is automatically turned on if the space temperature setpoint has been temporarily changed from the home screen. The occupancy override will hold for the duration of the occupancy override amount of time (adjustable under Main Menu: System) or until the occupancy override has been turned off manually from the Home Screen.

When in the occupied mode of operation a sun icon is displayed. When in the unoccupied mode of operation a quarter moon icon is displayed. OVR is displayed when the space temperature setpoint has been temporarily changed from the home screen or occupancy override has been turned on manually.

Fan Mode (Fan:)
The Fan Mode options available for both the unoccupied and occupied modes of operation are Auto and On.

Auto activates the fan only during heating and cooling operation. On activates the fan for the duration of the occupied or unoccupied mode of operation.

When the supply fan has been commanded to run an animated fan icon is displayed. When the supply fan command stops the fan icon is motionless.

Main Menu Configuration
About
About menu displays information about the controller, including:

FW: Firmware
VERSION: Firmware version
BUILT: Date and time of firmware build
ASV: Application software version
MODEL: Controller model number
APP: Application configuration
OPT: Heating and cooling staging
INSTANCE: BACnet instance number
MAC ADDRESS: BACnet Mac Address
S/N: Serial Number
BOARD REV: Hardware revision

Alarm
A flashing SERVICE message on the Home Screen, below the space temperature, indicates an alarm. Within the Alarm menu, press *Enter* while an alarm is highlighted to view details. Press *Enter* on the alarm details to delete the alarm or *Left* to go back.

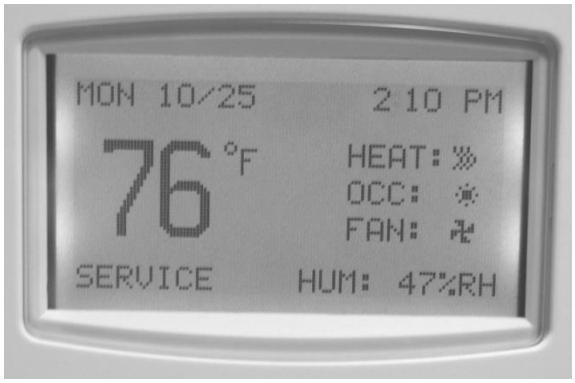


Figure 7 - Home Screen with Flashing Service Message

Space Temperature Alarm
Activated when the space temperature is outside the range of 56-86°F for over 300 seconds. Alarm is available on all controllers.

Space Humidity Alarm
Activated when the space humidity is above 65% RH for over 300 seconds. Alarm is only available on controllers with humidity control.

Fan Fail Alarm
Activated when there is no fan status signal within 5 seconds on a call for fan. Alarm is only available on controllers with a fan status sensor connected.

Low Limit Alarm
Activated when the supply air temperature is below the low limit alarm temperature setpoint for 2 seconds (Main Menu: Advanced: Limits). Cooling will be disabled until supply air temperature is 2°F above the low limit setpoint. Alarm is only available on controllers with a supply air temperature sensor connected.

High Limit Alarm
Activated when the supply air temperature is above the high limit alarm temperature setpoint for 2 seconds (Main Menu: Advanced: Limits). Heating will be disabled until supply air temperature is 2°F below the high limit setpoint. Alarm is only available on controllers with a supply air temperature sensor connected.

Space CO_2 Alarm
Activated when the space CO_2 is above 2000 ppm. Alarm is only available on controllers with CO_2 sensor connected.

Date/Time
Date/Time menu is used to configure the date and time. Day, month, year and time are available for configuration.

Schedule
Schedule menu is used to configure an entire week schedule, a weekday/weekend schedule or an individual day schedule. Only one weekly schedule can be setup. Up to 6 occupied/unoccupied changes can be made per day. Up to 12 individual days of unoccupied holidays can be setup within the menu.

The schedule mode of operation changes available are On, Off and Null. On is a change to occupied operation. Off is a change to unoccupied operation. Null is no change in mode of operation.

Setpoints
Setpoints menu is used to configure the controller setpoints.

COOL SETPT
Occupied cooling space temperature setpoint. Default setpoint is 74°F.

HEAT SETPT
Occupied heating space temperature setpoint. Default setpoint is 70°F.

COOL SETBACK
Unoccupied cooling space temperature setpoint. Default setpoint is 80°F.

HEAT SETBACK
Unoccupied heating space temperature setpoint. Default setpoint is 64°F.

MIN SETPT DIFF
Minimum setpoint differential between the cooling and heating space temperature setpoints. Used for both the occupied and unoccupied modes of operation. Default setpoint differential is 2°F and range is 1-15°F.

DEADBAND
Space temperature setpoint deadband. Default setpoint deadband is 2°F and range is 2-15°F.

SAT COOL SETPT
Cooling supply air temperature setpoint. Default setpoint is 55°F and range is 50-70°F.

SAT HEAT SETPT
Heating supply air temperature setpoint. Default setpoint is 120°F and range is 75-200°F.

CO2 SETPT (PPM)
Space CO_2 override setpoint. Default setpoint is 1100 ppm and range is 500-1800 ppm.

DEHUM SETPT
Occupied space relative humidity setpoint. Default setpoint is 50% RH and range is 20-85% RH.

DEHUM DEADBAND
Space humidity setpoint deadband. Default setpoint is 5% RH and range is 5-15% RH.

UNOCC DEHUM SETPT
Unoccupied space humidity setpoint. Default setpoint is 65% RH and range is 20-85% RH.

SUCTION (PSI)
Dehumidification suction pressure setpoint. Default setpoint is 119.4 psi and range is 50-250 psi.

<u>System</u>
System menu is used for additional startup configuration.

SYSTEM ENABLE
System Mode of Operation. Default value is *Off*.
Auto - Controller will maintain both the space heating and cooling setpoints with operation depending on the space temperature.
Cooling - Controller will maintain only the space cooling setpoint.
Heating - Controller will maintain only the space heating setpoint.
Emergency Heating - Controller will maintain only the space heating setpoint using only emergency heating.
Off - Turns the controller operation off.

OCC OVRIDE (HRS)
Amount of time a space temperature setpoint override and occupancy override will last. Default value is 1 hour and range is 0-12 hours. When set at 0, the override will last until the next schedule change.

INACTIVITY (SECS)
Amount of time the backlight will stay on and the current password will stay active after the last button push. Default value is 60 seconds and range is 5-600 seconds.

DISPLAY BLANKING
Available options are *Yes* and *No*. Default value is *No*. With *Yes* selected, display will turn off at the same time the backlight goes off. With *No* selected, display will turn stay on when the backlight goes off. When any key is pressed the display and backlight will turn on.

<u>Trend Viewer</u>
Trend viewer displays the trend logs that have already been setup. Press *Enter* when the trend is highlighted to view details.

Advanced Menu Configuration

(Advanced) Application

Application menu is used for application configuration.

DEGREE SCALE

°F or °C

APP

Controller application

Standard - Air conditioner application

Heat Pump - Heat pump application

Not Configured - Default value

OPT

Number of heating and cooling stages. Air conditioners are available with 1 or 2 stages of cooling and 1, 2 or 3 stages of heating. Heat pumps are available with 1 or 2 compressor stages, 0, 1 or 2 stages of emergency heat.

SAT CONTROL

Available options are *No SAT Control, SAT Cooling Only Control* and *SAT Heating & Cooling Control*. Use for single zone VAV applications with supply air temperature cooling capacity control or supply air temperature cooling and heating capacity control.

ADDITIONAL SETUP

HEAT - DELAY (MINS)

Stage delay between auxiliary heating stages. Default value is 3 minutes and range is 3-60 minutes.

HEAT1 MIN OFF (SECS)

Heating minimum off time. Default is 120 seconds and range is 120-600 seconds.

HEAT1 MIN ON (SECS)

Heating minimum on time. Default is 120 seconds and range is 120-600 seconds.

DAMPER - ECON

Available economizer options are *None* or *Modulating*.

DAMPER - ENTHALPY

Available economizer options are *Enable* or *Disable*.

DAMPER - MIN POSITION (%)

Minimum economizer damper position. Default value is 10% and range is 0-95%.

DAMPER - CNTRL (0-100%)

Available options are 0-10 VDC, 10-0 VDC, 2-10 VDC or 10-2 VDC. Default value is 0-10 VDC.

DAMPER - ECON ENBLE TEMP

Economizer enable outside air temperature setpoint. Default setpoint is 60°F and range is 50-70°F.

DAMPER - LOW LIMIT

Economizer supply air temperature low limit which returns the economizer to the minimum position. Default value is 45°F and range is 0-100°F.

FAN - SPEEDS

Available options are *Constant Spd C & H, Variable Spd Cool Only,* or *Variable Spd Cool and Heat*.

Constant Spd C & H - Constant volume application.

Variable Spd Cool Only - Single zone VAV application with single zone VAV cooling and constant volume heating.

Variable Spd C & H - Single zone VAV application with single VAV cooling and single zone VAV heating.

FAN - OFF DELAY (SECS)

Amount of time the fan will continue to run after heating and cooling is deactivated with Auto fan operation. Default value is 180 seconds and range is 0-600 seconds.

FAN - COOL MAX SPEED

Maximum cooling speed of a variable speed fan. Default is 100%, range is 50-100% and value must be greater than the minimum cooling speed.

FAN - COOL MIN SPEED
Minimum cooling speed of a variable speed fan. Default is 30%, range is 30-80% and value must be less than the maximum cooling speed.

FAN - HEAT MAX SPEED
Maximum heating speed of a variable speed fan. Default is 100%, range is 50-100% and value must be greater than the minimum heating speed.

FAN - HEAT MIN SPEED
Minimum heating speed of a variable speed fan. Default is 50% for non-heat pump units, 75% for heat pump units, range is 50-100% and value must be less than the maximum heating speed.

FAN - DEHUM SPEED
Dehumidification speed of a variable speed fan. Default is 50% and range is 25-75%

FAN - UNOCC
Unoccupied fan mode options are *Auto* or *On*. *Auto* activates the fan only during unoccupied heating and cooling operation. *On* activates the fan for the duration of the unoccupied mode of operation. Default value is *Auto*.

FAN - OCC
Occupied fan mode options are *Auto* or *On*. *Auto* activates the fan only during occupied heating and cooling operation. *On* activates the fan for the duration of the occupied mode of operation. Default value is *On*.

HUMIDITY - DEHUMIDIFICATION - DEHUM
Options available are *None* or *Dehum*. Enables modulating hot gas reheat humidity control.

HUMIDITY - DEHUMIDIFICATION - DEHUM PRIORITY
Options available are *False* or *True*. *False* activates dehumidification only when heating and cooling setpoints are satisfied. *True* activates dehumidification anytime space humidity is outside dehumidification setpoints. Default is *False*.

HUMIDITY - DEHUMIDIFICATION - DEHUM SETPT
Default setpoint is 50% RH and range is 20-85% RH.

HUMIDITY - DEHUMIDIFICATION - DEHUM DEADBAND
Default value is 5% RH and range is 5-15% RH.

SENSOR SETUP - OAT SENSOR (AI4)
Available outside air temperature sensor options are *Yes* or *No*. Outside air temperature sensor is required for all air-cooled application and default value is *Yes*.

SENSOR - SAT SENSOR (AI3)
Available supply air temperature options are *Yes* or *No*. Supply air temperature sensor is required for single zone VAV, modulating hot gas reheat and economizer applications and default value is *No*.

SENSOR - AI2
Additional controller input options. Default value is *Not Used*.
Not Used - No analog input 2 is connected.
Fan Status - Airflow sensor is connected for fan status option.
Remote CO_2 Sensor - CO_2 sensor is connected for CO_2 economizer override option.
Suction Line PSI - Suction pressure sensor is connected for modulating hot gas reheat humidity control option.
Remote Space Avg - Space temperature sensor is connected for remote averaging space temperature option.
Remote Space Only - Space temperature sensor is connected for remote space temperature option.
OA Humidity - Outside air humidity sensor is connected for enthalpy controlled economizer option.

COMP STG DELAY (MINS)
Compressor stage delay. Used for cooling and heat pump heating. Default is 3 minutes and range 2-15 minutes.

VALVE - REV VALVE
Heat pump reversing valve options.
Active Htg - Reversing valve is active during the heating mode of operation. Default value.
Active Cool - Reversing valve is active during cooling mode of operation.

Note: RQ and RN Series units are wired for activating the reversing valve during the heating mode of operation. H3/V3 and CB/CC Series units are wired for activating the reversing valve during the cooling mode of operation.

(Advanced) CB Programs
The CB Programs displays the status of the software on the controller. No adjustments can be made within this menu.

(Advanced) Communication
MAC ADDRESS
Default is 1 and range is 0-127. Best practice is to assign the MAC ADDRESS in sequence for most efficient communication.

BAUD RATE
Default is 38400 and options available include 9600, 19200, 38400 and 76800.

MAX MASTER
Default is 127 and range is 0-127. Best practice is to set the MAX MASTER to the highest assigned MAC ADDRESS.

(Advanced) Date/Time
The Advanced Date/Time menu is used to configure the date, time, UTC offset (Coordinated Universal Time), and Daylight Saving Time.

For areas which observe Daylight Saving Time, it must be enabled from this menu.

If the controller is used in a BACnet network with UTC synchronization set the UTC offset value. The offset value is in minutes and corresponds to the distance of the local time zone to the zero degree meridian.

Table 2 - UTC Offset

Sample Time Zone	Offset to Equal UTC
Alaska Standard	540
Pacific Standard	480
Mountain Standard	420
Central Standard	360
Eastern Standard	300

(Advanced) Device
The Device menu allows setting of the BACnet device instance, name and location. In addition a warm restart, a cold restart and a factory restore can be done from this menu. Restarting the controller from this menu is recommended, rather than removing power to the controller.

Warm Restart - The least disruptive restart option which lasts around 10 seconds. Analog outputs go to 0 and relays go to their normally open state. Compressor and fan minimum off delay times should be set before a restart as there may be several changes of state for an output. Warm restart restores present values of objects to their last values before restart. Configuration remains intact.

Cold Restart - Restart option which lasts around 10 seconds. Analog outputs go to 0 and relays go to their normally open state. Compressor and fan minimum off delay times should be set before a restart as there may be several changes of state for an output. Cold restart restores all values of objects to their relinquished default values and then rewrites menu changes. Menu changes may take up to about 2 minutes to write to memory. If power to the controller is lost during this time, changes may be lost. Configuration remains intact.

Factory Restore - Restore option clears all present values, restores configuration to the defaults and restarts the controller.

(Advanced) Inputs
The Inputs menu shows all analog inputs, their current value and any calibration offset.

(Advanced) Limits
The Limits menu allows setting of minimum and maximum values.

OCC MAX CLG
Occupied maximum cooling space temperature setpoint. Default is 78°F and range is 55-92°F.

OCC MIN CLG
Occupied minimum cooling space temperature setpoint. Default is 68°F and range is 55-90°F.

OCC MAX HTG
Occupied maximum heating space temperature setpoint. Default is 72°F and range is 55-90°F.

OCC MIN HTG
Occupied minimum heating space temperature setpoint. Default is 65°F and range is 53-90°F.

UNOCC MIN CLG
Unoccupied minimum cooling space temperature setpoint. Default is 68°F and range is 55-90°F.

UNOCC MAX HTG
Unoccupied maximum heating space temperature setpoint. Default is 72°F and range is 55-90°F.

HEAT OAT HIGH
Auxiliary heating outside air temperature lockout. Heat pump heating will still be available. Default is 70°F and range is 50-150°F.

COMP OAT LOW
Compressor cooling outside air temperature lockout. Default is 40°F and range is 0-50°F.

OAT HIGH
Description. Default is 150°F and range is 110-160°F.

OAT LOW
Description. Default is -40°F and range is -50-40°F.

SAT HIGH
Maximum supply air temperature. Default is 200°F and range is 120-250°F. Disable all outputs.

SAT LOW
Minimum supply air temperature. Default is 40°F and range is 32-60°F. Disable all outputs.

MIN DGTL COMP
Minimum allowable capacity of the variable capacity scroll compressor. Default is 50%, range is 20-80% and value must be 5% less than the maximum variable capacity scroll compressor capacity setpoint.

MAX DGTL COMP
Maximum allowable capacity of the variable capacity scroll compressor. Default is 100% and range is 25-100% value must be 5% greater than the minimum variable capacity scroll compressor capacity setpoint.

COMP1 MIN OFF (SECS)
Compressor minimum off time. Default is 120 seconds and range is 120-600 seconds.

COMP1 MIN ON (SECS)
Compressor minimum on time. Default is 120 seconds and range is 0-600 seconds.

HEAT MIN OFF
Description. Default is 120 units and range is -120-600 units.

HEAT MAX ON
Description. Default is 120 units and range is -120-600 units.

(Advanced) Security
The Security menu allows setting of User, Operator and Administrator access to setpoint adjustment, Main Menu, system mode, occupancy override, and fan operation. Passwords for the User, Operator and Administrator can be changed from this menu.

(Advanced) Trend Logs
Trend Logs can be set up from this menu, including input/output to monitor and interval of time to monitor the input/output. See individual analog and binary inputs, outputs and variables for numbers (BI, BO, AI, AO, AV).

(Advanced) Test
Test menu is used for testing of the controller display pixels and buttons.

Default Configuration Access
Default User Password = 0000
Default Operator Password = 1988
Default Administrator Password = 2425

Note: Administrator Password is required to set security passwords. If changed, keep a record of the new administrator password in a trusted location.

⚠ WARNING

QUALIFIED INSTALLER

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a trained, qualified installer. A copy of this IOM should be kept with the unit.

Table 3 - Default Access Levels

	User	Operator	Administrator
Home Screen			
Space Temp Setpoint Adjustment	Y	Y	Y
Mode of Operation Override	Y	Y	Y
Occupancy Override	Y	Y	Y
Supply Fan Override	Y	Y	Y
Main Menu			
About	Y	Y	Y
Alarm	N	Y	Y
Date/Time	N	Y	Y
Schedule	N	Y	Y
Setpoints	N	Y	Y
System	N	Y	Y
Trend Viewer	Y	Y	Y
Advanced			
Application	N	N	Y
CB Programs	N	Y	Y
Communication	N	N	Y
Date/Time	N	Y	Y
Device	N	N	Y
Inputs	N	Y	Y
Limits	N	Y	Y
Security	N	N	Y
Trend Logs	N	Y	Y
Test	N	Y	Y

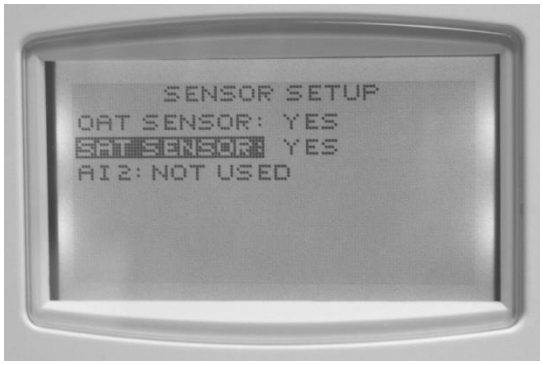
Controller Configuration Steps

1. Unit Application
2. Heating and Cooling Stages
3. Sensors
4. Supply Fan
5. Features
6. Limits
7. Setpoints
8. Date/Time
9. Schedule/Holidays
10. Trend Logs
11. Security Access
12. Restart

Constant Volume Air Conditioner Configuration

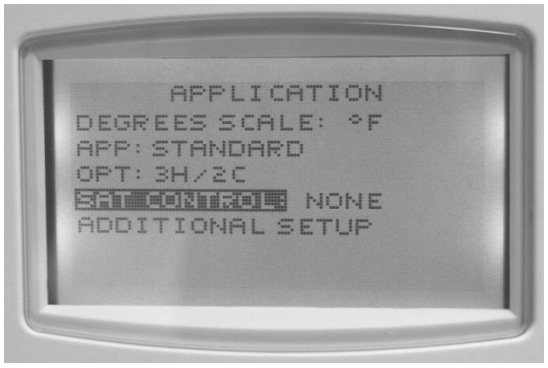
1. Main Menu: Advanced: Application:
   App = **Standard**
   Opt = # **Heat Stages** / # **Cool Stages**

2. Main Menu: Advanced: Application: Additional Setup: Sensors:
   OAT Sensor = **Yes**
   SAT Sensor = **Yes**



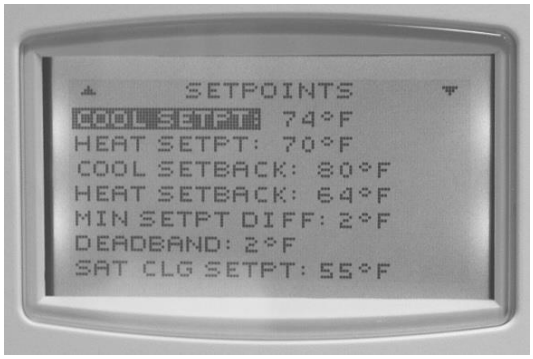
3. Main Menu: Advanced: Application: Additional Setup: Fan:
   Speeds: **Constant**
   Unocc: **On or Auto**
   Occ: **On or Auto**

4. Main Menu: Advanced: Application: SAT Control = **None**



5. Main Menu: Advanced: Limits:
   Check Limit Values

6. Main Menu: Setpoints:
   Check Setpoint Values



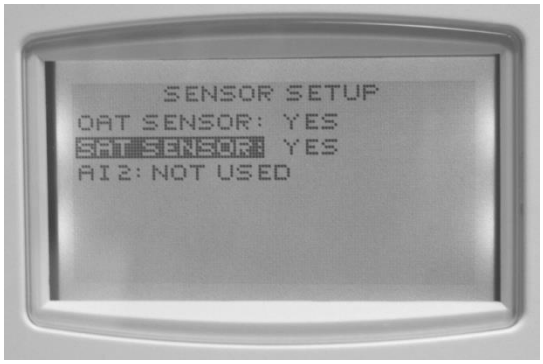
7. Main Menu: Advanced: Date/Time:
   Check Date and Time

8. Main Menu: Schedule:
   Setup a Schedule and Holidays

Single Zone VAV Air Conditioner Configuration - VAV Cool + CV Heat

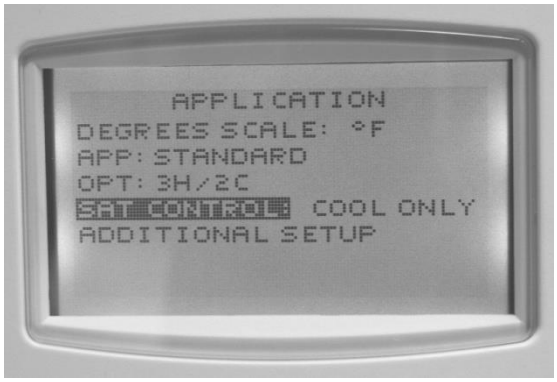
1. Main Menu: Advanced: Application:
   App = **Standard**
   Opt = # **Heat Stages** / # **Cool Stages**

2. Main Menu: Advanced: Application: Additional Setup: Sensors:
   OAT Sensor = **Yes**
   SAT Sensor = **Yes**



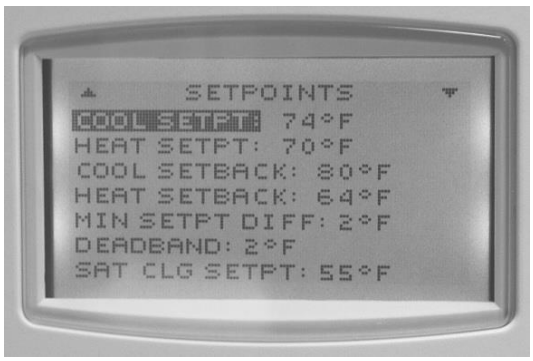
3. Main Menu: Advanced: Application: Additional Setup: Fan:
   Speeds: **Variable Cooling**
   Unocc: **On or Auto**
   Occ: **On or Auto**
   Check Minimum Speed

4. Main Menu: Advanced: Application:
   SAT Control = **Cooling**



5. Main Menu: Advanced: Limits:
   Check Limit Values

6. Main Menu: Setpoints:
   Check Setpoint Values



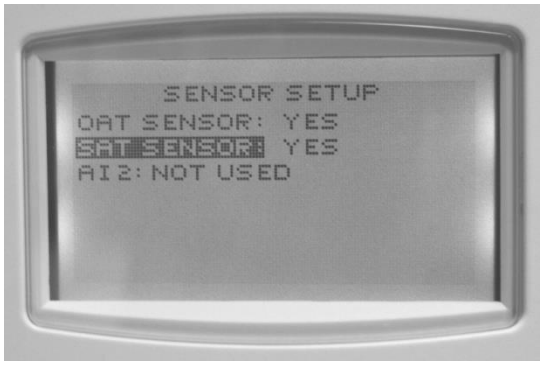
7. Main Menu: Advanced: Date/Time:
   Check Date and Time

8. Main Menu: Schedule:
   Setup a Schedule and Holidays

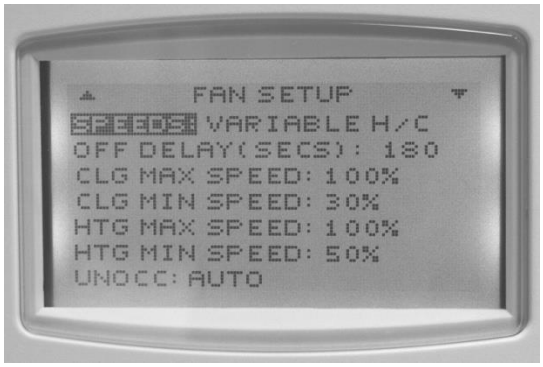
Single Zone VAV Air Conditioner Configuration - VAV Cool + VAV Heat

1. Main Menu: Advanced: Application:
   App = **Standard**
   Opt = # **Heat Stages** / # **Cool Stages**

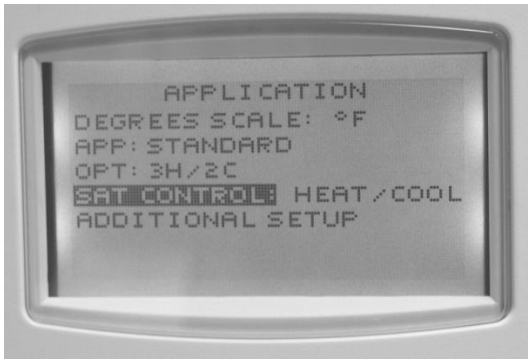
2. Main Menu: Advanced: Application: Additional Setup: Sensors:
   OAT Sensor = **Yes**
   SAT Sensor = **Yes**



3. Main Menu: Advanced: Application: Additional Setup: Fan:
   Speeds: **Variable Heating and Cooling**
   Unocc: **On or Auto**
   Occ: **On or Auto**
   Check Minimum Speeds

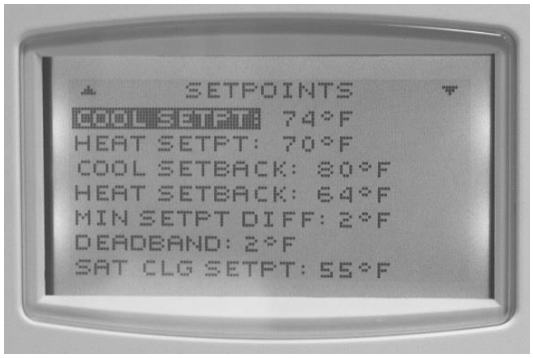


4. Main Menu: Advanced: Application: SAT Control = **Heating and Cooling**



5. Main Menu: Advanced: Limits: **Check Limit Values**

6. Main Menu: Setpoints: **Check Setpoint Values**

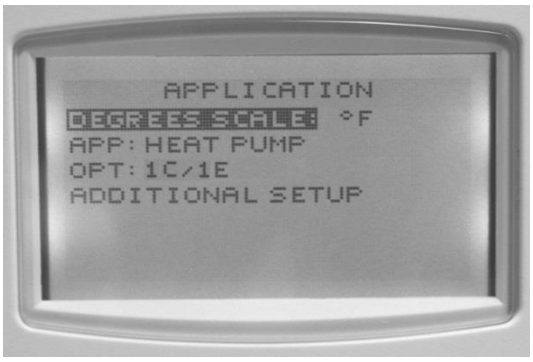


7. Main Menu: Advanced: Date/Time: **Check Date and Time**

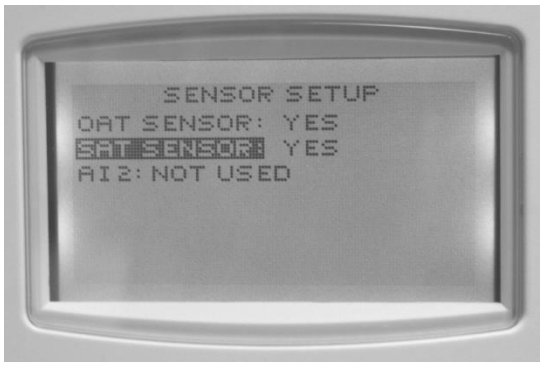
8. Main Menu: Schedule:
   Setup a Schedule and Holidays

Constant Volume Heat Pump Configuration

1. Main Menu: Advanced: Application:
   App = **Heat Pump**
   Opt = # **Compressor Stages / with or without Emergency Heat**



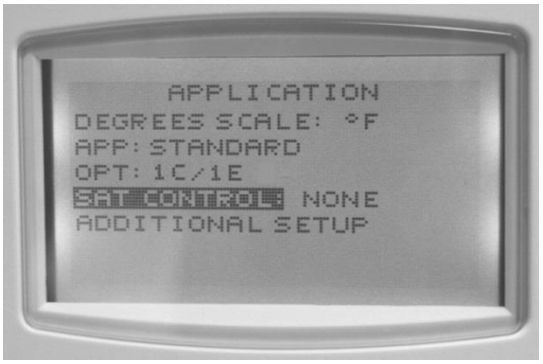
2. Main Menu: Advanced: Application: Additional Setup: Sensors:
   OAT Sensor = **Yes**
   SAT Sensor = **Yes**



3. Main Menu: Advanced: Application: Additional Setup: Valve:
   Check Reversing Valve Active Mode

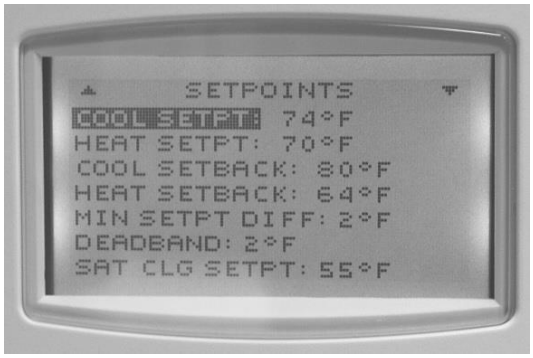
4. Main Menu: Advanced: Application: Additional Setup: Fan:
   Speeds: **Constant**
   Unocc: **On or Auto**
   Occ: **On or Auto**

5. Main Menu: Advanced: Application:
   SAT Control = **None**



6. Main Menu: Advanced: Limits:
   Check Limit Values

7. Main Menu: Setpoints:
   Check Setpoint Values

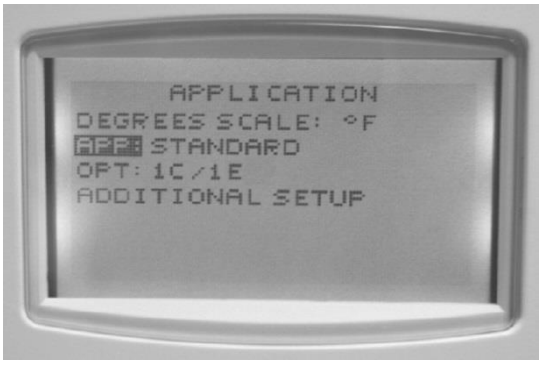


8. Main Menu: Advanced: Date/Time:
   Check Date and Time

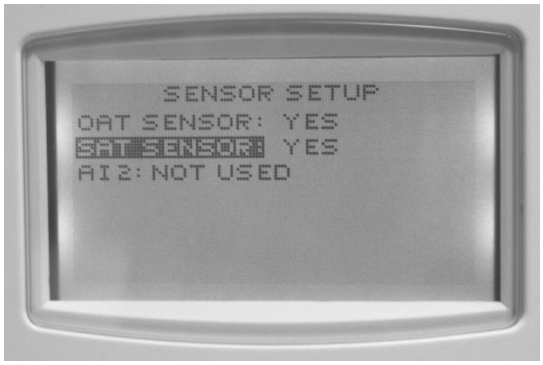
9. Main Menu: Schedule:
   Setup a Schedule and Holidays

Single Zone VAV Heat Pump Configuration- VAV Cool + CV Heat

1. Main Menu: Advanced: Application:
   App = **Standard**
   Opt = # **Heat Stages** / # **Cool Stages**

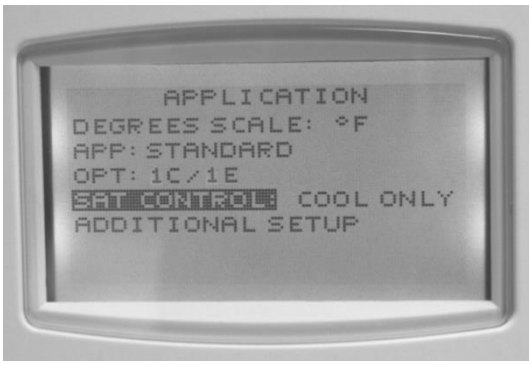


2. Main Menu: Advanced: Application: Additional Setup: Sensors:
   OAT Sensor = **Yes**
   SAT Sensor = **Yes**



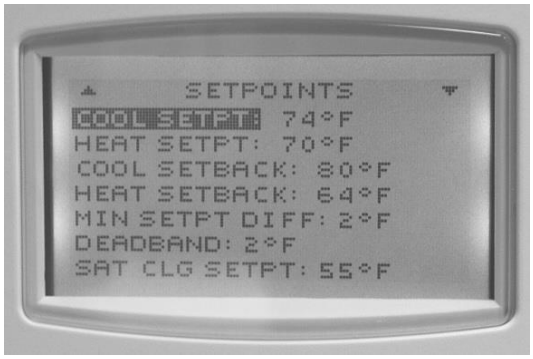
3. Main Menu: Advanced: Application: Additional Setup: Fan:
   Speeds: **Variable Cooling**
   Unocc: **On or Auto**
   Occ: **On or Auto**
   Check Minimum Speed

4. Main Menu: Advanced: Application: SAT Control = **Cooling**



5. Main Menu: Advanced: Limits:
   Check Limit Values

6. Main Menu: Setpoints:
   Check Setpoint Values

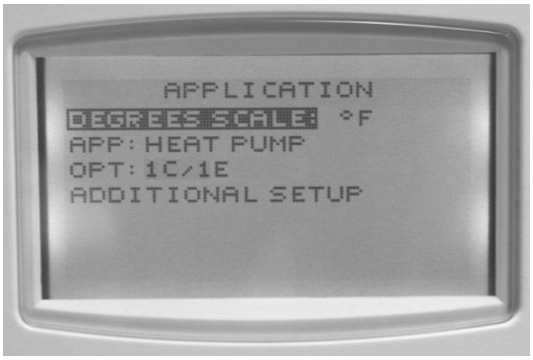


7. Main Menu: Advanced: Date/Time:
   Check Date and Time

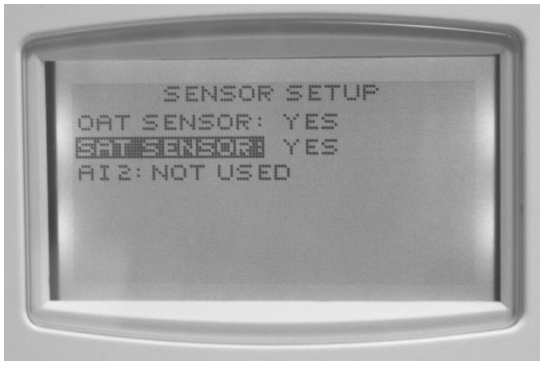
8. Main Menu: Schedule:
   Setup a Schedule and Holidays

Single Zone VAV Heat Pump Configuration- VAV Cool + VAV Heat

1. Main Menu: Advanced: Application:
   App = **Heat Pump**
   Opt = # **Compressor Stages / with or without Emergency Heat**



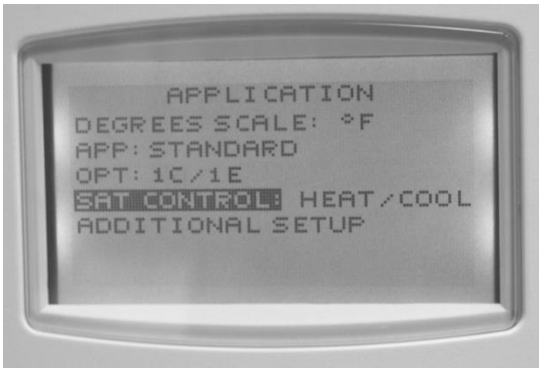
2. Main Menu: Advanced: Application: Additional Setup: Sensors:
   OAT Sensor = **Yes**
   SAT Sensor = **Yes**



3. Main Menu: Advanced: Application: Additional Setup: Valves:
   Check Reversing Valve Active Mode

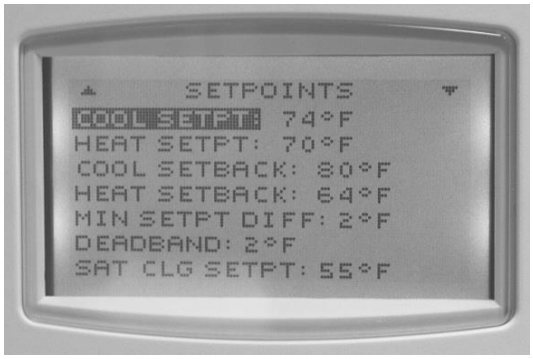
4. Main Menu: Advanced: Application: Additional Setup: Fan:
   Speeds: **Variable Heating and Cooling**
   Unocc: **On or Auto**
   Occ: **On or Auto**
   Check Minimum Speeds

5. Main Menu: Advanced: Application:
   SAT Control = **Heating and Cooling**



6. Main Menu: Advanced: Limits:
   Check Limit Values

7. Main Menu: Setpoints:
   Check Setpoint Values

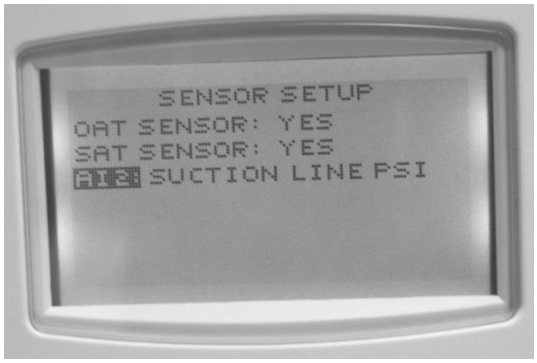


8. Main Menu: Advanced: Date/Time:
   Check Date and Time

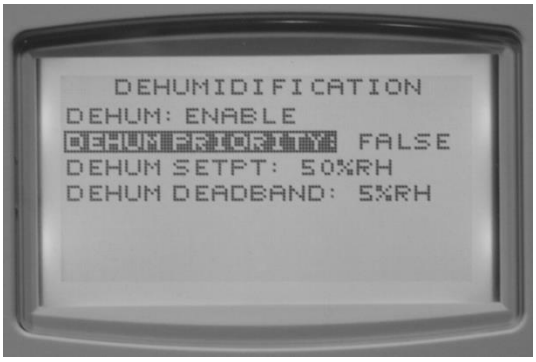
9. Main Menu: Schedule:
   Setup a Schedule and Holidays

Modulating Hot Gas Reheat
Mini Controller with space humidity sensor (R80580) and Wattmaster Modulating Hot Gas Reheat Board are required for humidity control.

1. Main Menu: Advanced: Application: Additional Setup: Sensors:
   Configure Suction Pressure Sensor



2. Main Menu: Advanced: Application: Additional Setup: Humidity: Dehumidification:
   Setup Dehumidification



3. Main Menu: Setpoints:
   Check Humidity Control Setpoint Values

4. **Setup Supply Air Temperature Setpoint on Wattmaster Modulating Hot Gas Reheat Board.**

Economizer

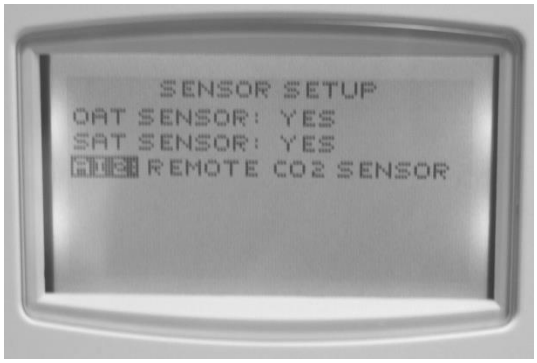
1. Main Menu: Advanced: Application: Additional Setup: Sensors: **Configure OA Humidity Sensor if Enthalpy Controlled**

2. Main Menu: Advanced: Application: Additional Setup: Damper: **Setup Modulating Economizer Damper and Checks Setpoint Values**

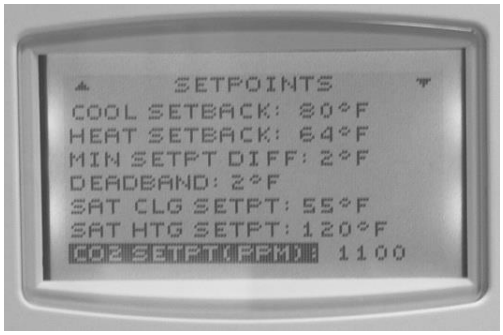
3. Main Menu: Advanced: Application: Additional Setup: Damper: **Enable Enthalpy Economizer if Enthalpy Controlled**

CO_2 Override

1. Main Menu: Advanced: Application: Additional Setup: Sensors: **Configure OA Humidity Sensor**

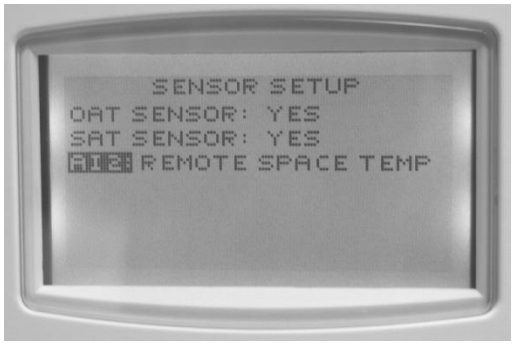


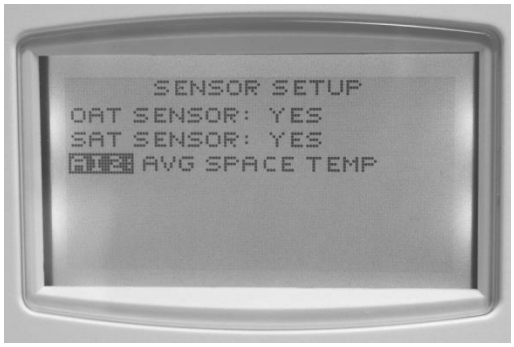
2. Main Menu: Setpoints: **Check CO_2 Setpoint Value**



<u>Remote Space Temperature</u>

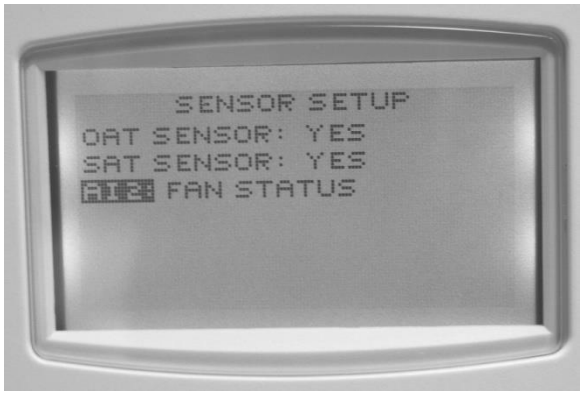
1. Main Menu: Advanced: Application: Additional Setup: Sensors: **Configure Remote Space Temperature Sensor** or **Configure Remote Space Temperature Sensor Averaging**





Fan Status

1. Main Menu: Advanced: Application: Additional Setup: Sensor: **Configure Fan Status Sensor**



Operation

Unit operations should be controlled with the controller, never at the main power supply, except for servicing, emergency or complete shutdown of the unit.

Cooling
Single or Two Stage
Stage 1 - Variable Capacity Scroll Compressor
Stage 2 - Single Stage Compressor

RN/RQ - Unit Size = 3-25 or 30 tons
RN/RQ - Refrigerant Style = E, F
RN/RQ - Unit Configuration = A, B, J, K, 6, 7
RN/RQ - Model Option A4 - Cooling/Heat Pump Staging = 9, A

Heating
0, 1, 2 or 3 Stages or Modulating/SCR Gas or Electric Heat

RN/RQ - Model Option B1 - Heating Type = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
RN/RQ - Model Option B3 - Heating Stages = 0, 1, 2, 3, 9

Return Air/Outside Air Section
Manual Outside Air Opening, Motorized Outside Air Damper, Economizer and CO_2 Override

RN/RQ - Feature 1A - Return/Outside Air Section = 0, A, B, C, F, G, H, J, L, N, P, Q, R, S, T, U, V, W, Y, Z, 1, 2, 3, 5
RN/RQ - Feature 2 - Outside Air Control = 0, C, D, E, P, R

Refrigeration Options
Standard or Modulating Hot Gas Reheat

RN/RQ - Feature 8 - Refrigeration Controls = 0, A, B, C, D, E, F, G, H, J, K, L, M, N

Controls
Constant Volume, Constant Volume Heat Pump, Single Zone VAV - VAV Cool + CV Heat, Single Zone VAV - VAV Cool + VAV Heat, or Single Zone VAV Heat Pump - VAV Cool + VAV Heat

RN/RQ - Feature 13 - Special Controls = E, Y, Z, 2, 3
RN/RQ - Feature 22 - Control Vendors = E

Constant Volume Cooling Operation - Space Temperature Control
When the space temperature has deviated ½ of the space temperature deadband above the cooling space temperature setpoint the variable capacity scroll compressor is activated at 100% for one minute. The compressor then modulates to maintain the cooling space temperature setpoint.

For heat pump units with the controller configured for the reversing valve to be activated during the cooling mode of operation, all reversing valves are activated along with the variable capacity scroll compressor.

For units with two stage cooling, if the variable capacity scroll compressor operates at a maximum capacity for a compressor stage delay amount of time and the space temperature is increasing the second compressor is activated and the variable capacity scroll compressor modulates to maintain the cooling space temperature setpoint.

For units with two stage cooling, if the variable capacity scroll compressor operates at a minimum capacity for the compressor stage delay amount of time and the space temperature is decreasing the second compressor is de-activated. The variable capacity scroll compressor then modulates to maintain the cooling space temperature setpoint.

As the space temperature achieves the cooling space temperature setpoint minus ½ of the space temperature deadband the

variable capacity scroll compressor is de-activated.

Single Zone VAV Cooling Operation - Supply Air Temperature Control

When the space temperature has deviated ½ of the space temperature deadband above the cooling space temperature setpoint supply air temperature control is activated. The variable capacity scroll compressor is activated at 100% for one minute, The compressor then modulates to maintain the cooling supply air temperature setpoint.

For heat pump units with the controller configured for the reversing valve to be activated during the cooling mode of operation, all reversing valves are activated along with the variable capacity scroll compressor.

For units with two stage cooling, if the variable capacity scroll compressor operates at a maximum capacity for the compressor stage delay amount of time and the supply air temperature is increasing the second compressor is activated and the variable capacity scroll compressor modulates to maintain the cooling supply air temperature setpoint.

For units with two stage cooling, if the variable capacity scroll compressor operates at a minimum capacity for the compressor stage delay amount of time and the cooling supply air temperature is decreasing the second compressor is de-activated. The variable capacity scroll compressor modulates to maintain the cooling supply air temperature setpoint.

As the space temperature achieves the cooling space temperature setpoint minus ½ of the space temperature deadband supply air temperature control is de-activated and the variable capacity scroll compressor is de-activated.

Constant Volume Heating Operation - Space Temperature Control

When the space temperature has deviated ½ of the space temperature deadband below the heating space temperature setpoint the first stage of heating is activated.

If the space temperature remains ½ of the space temperature deadband below the heating space temperature setpoint for the heating stage delay amount of time, if available, the second stage of heating is activated.

If the space temperature remains ½ of the space temperature deadband below the heating space temperature setpoint for another heating stage delay amount of time, if available, the third stage of heating is activated.

When the space temperature reaches the heating space temperature setpoint, the third stage of heating, if available, is de-activated.

As the space temperature achieves the heating space temperature setpoint plus ½ of the space temperature deadband the first and second stages of heating are de-activated.

Modulating/SCR electric heating operates as a single stage of heating. Heating elements modulate using a supply air temperature sensor and setpoint potentiometer to meet a specific supply air temperature setpoint.

Modulating natural gas heating operates as a single stage of heating. Supply air temperature setpoint must be set on the MODGAS board. See WattMaster MODGAS Controller manual for modulating gas heat operation.

Equipment with Modulating Gas/SCR Electric Heat will require an additional supply air temperature sensor be field installed for the modulating heating controls.

Single Zone VAV Heating Operation - Supply Air Temperature Control

When the space temperature has deviated ½ of the space temperature deadband below the heating space temperature setpoint supply air temperature control is activated. The first stage of heating modulates to maintain the heating supply air temperature setpoint.

As the space temperature achieves the heating space temperature setpoint plus ½ of the space temperature deadband the first and second heating stages are de-activated.

Modulating/SCR electric heating operates as a single stage of heating. Heating elements modulate using a supply air temperature sensor and setpoint potentiometer to meet a specific supply air temperature setpoint.

Modulating natural gas heating operates as a single stage of heating. Supply air temperature setpoint must be set on the MODGAS board. See WattMaster MODGAS Controller manual for modulating gas heat operation.

Equipment with Modulating Gas/SCR Electric Heat will require an additional supply air temperature sensor be field installed for the modulating heating controls.

Constant Volume Heat Pump Heating Operation - Space Temperature Control

When the space temperature has deviated ½ of the space temperature deadband below the heating space temperature setpoint the variable capacity scroll compressor is activated. The compressor modulates to maintain the heating space temperature setpoint.

For heat pump units with the controller configured for the reversing valve to be activated during the heating mode of operation, all reversing valves are activated along with the variable capacity scroll compressor.

For units with two stage heat pump heating, if the variable capacity scroll compressor operates at a maximum capacity for the compressor stage delay amount of time and the space temperature is still decreasing the second compressor is activated and the variable capacity scroll compressor modulates to maintain the heating space temperature setpoint.

For units with two stage heat pump heating, if the variable capacity scroll compressor operates at a minimum capacity for the compressor stage delay amount of time and the space temperature is increasing the second compressor is de-activated. The variable capacity scroll compressor then modulates to maintain the heating space temperature setpoint.

As the space temperature achieves the heating space temperature setpoint plus ½ of the space temperature deadband, heat pump heating de-activated.

If the space temperature has deviated ½ of the space temperature deadband below the heating space temperature setpoint for the heating stage delay amount of time and the outside air temperature is below the compressor outside air temperature lockout, if available, the first stage of emergency heating is activated.

If the space temperature remains ½ of the space temperature deadband below the heating space temperature setpoint for another heating stage delay amount of time and the outside air temperature is below the compressor outside air temperature lockout, if available, the second stage of emergency heating is activated.

As the space temperature achieves the heating space temperature setpoint plus ½ of the space temperature deadband and the outside air temperature remains below the compressor outside air temperature lockout,

the emergency heating stages are de-activated.

Modulating/SCR electric heating operates as a single stage of auxiliary/emergency heating. Heating elements modulate using a supply air temperature sensor and setpoint potentiometer to meet a specific supply air temperature setpoint.

Modulating natural gas heating operates as a single stage of auxiliary/emergency heating. Supply air temperature setpoint must be set on the MODGAS board. See WattMaster MODGAS Controller manual for modulating gas heat operation.

Equipment with Modulating Gas/SCR Electric Heat will require an additional supply air temperature sensor be field installed for the modulating heating controls.

Single Zone VAV Heat Pump Heating Operation - Supply Air Temperature Control

When the space temperature has deviated ½ of the space temperature deadband below the heating space temperature setpoint supply air temperature control is activated. The variable capacity scroll compressor modulates to maintain the heating supply air temperature setpoint.

For heat pump units with the controller configured for the reversing valve to be activated during the heating mode of operation, all reversing valves are activated along with the variable capacity scroll compressor.

As the space temperature achieves the heating space temperature setpoint plus ½ of the space temperature deadband supply air temperature control is de-activated and heat pump heating de-activated.

If the space temperature has deviated ½ of the space temperature deadband below the heating space temperature setpoint and the outside air temperature is below the compressor outside air temperature lockout, if available, the first stage of emergency heating is activated.

If the supply air temperature is decreasing below the heating supply air temperature setpoint for the heating stage delay amount of time and the outside air temperature is below the compressor outside air temperature lockout, if available, the second stage of emergency heating is activated.

As the space temperature achieves the heating space temperature setpoint plus ½ of the space temperature deadband and the outside air temperature remains below the compressor outside air temperature lockout, the emergency heating stages are de-activated.

Modulating/SCR electric heating operates as a single stage of auxiliary/emergency heating. Heating elements modulate using a supply air temperature sensor and setpoint potentiometer to meet a specific supply air temperature setpoint.

Modulating natural gas heating operates as a single stage of auxiliary/emergency heating. Supply air temperature setpoint must be set on the MODGAS board. See WattMaster MODGAS Controller manual for modulating gas heat operation.

Equipment with Modulating Gas/SCR Electric Heat will require an additional supply air temperature sensor be field installed for the modulating heating controls.

Constant Volume Supply Fan

Supply fan operation is selectable between "Auto" and "On". The supply fan will either cycle with cooling/heating operation (Auto) or operate continuously (On). The setting is selectable for both occupied and unoccupied modes of operation.

The supply fan will be constant speed with any speed controller input (VFD or ECM)

wired for constant speed/constant volume operation.

Single Zone VAV Supply Fan

Supply fan operation is selectable between "Auto" and "On". The supply fan will either cycle with cooling/heating operation (Auto) or operate continuously (On). The setting is selectable for both occupied and unoccupied modes of operation.

As the space temperature deviates ½ of the space temperature deadband above the space cooling setpoint the supply fan will be activated and operate at the cooling minimum speed. As the space temperature increases the supply fan will increase in speed to the cooling maximum speed delivering more cool air. As the space temperature decreases toward the cooling space temperature setpoint the supply fan will decrease in speed delivering less cool air. As the space temperature reaches the cooling space temperature setpoint the supply fan will operate at cooling minimum speed.

As the space temperature achieves the cooling space temperature setpoint minus ½ of the space temperature deadband the supply fan is de-activated (Auto) or operates at the cooling minimum speed (On).

As the space temperature deviates ½ of the space temperature deadband below the space heating setpoint the supply fan will be activated and operate at the heating minimum speed. As the space temperature decreases the supply fan will increase in speed to the heating maximum speed delivering more hot air. As the space temperature increases toward the heating space temperature setpoint the supply fan will decrease in speed delivering less hot air. As the space temperature reaches the heating space temperature setpoint the supply fan will operate at heating minimum speed.

As the space temperature achieves the heating space temperature setpoint plus ½ of the space temperature the supply fan is de-activated (Auto) or operates at the cooling minimum speed (On).

During the dehumidification mode of operation the supply fan will operate at the constant dehumidification speed.

Economizer

If the space temperature deviates ½ of the space temperature deadband above the space cooling setpoint and the outside air temperature is below the economizer enable temperature setpoint, the unit will use outside air to cool the space.

If the controller is enabled for enthalpy controlled economizer the outside air enthalpy must be below 25 Btu/lb before the economizer will be activated.

For constant volume systems if the outside air temperature is below 50°F the economizer will modulate to maintain 55°F supply air temperature.

For single zone VAV systems if the outside air temperature is below the cooling supply air temperature setpoint the economizer will modulate to maintain the cooling supply air temperature setpoint.

Minimum damper position setpoint, compressor low limit setpoint and low supply air temperature setpoint are required. The economizer control is used only for occupied cooling.

If the economizer control does not satisfy the space within three concurrent compressor stage delays mechanical cooling will be activated.

Dehumidification

When the space relative humidity rises above the space relativity humidity setpoint, the cooling stages will be activated and

modulate to maintain the suction pressure setpoint. If the space temperature deviates below the space cooling setpoint minus ½ of the space temperature deadband the reheat relay is activated.

The dehumidification priority determines whether or not Dehumidification Mode takes priority over Heating and Cooling Modes. Default is False. If set to True, Dehumidification Mode will enable any time the space humidity rises above the dehumidification setpoints, regardless of the current mode at that time. If set to False, Dehumidification Mode will enable only when the space heating and cooling setpoints are satisfied (i.e. vent mode if FAN OCC = ON) and the space humidity has risen above the dehumidification setpoints.

See WattMaster MHGRV Controller manual for modulating hot gas reheat operation.

Equipment with Modulating Hot Gas Reheat will require an additional supply air temperature sensor be field installed for the modulating reheat controls.

CO_2 Economizer Override

As the CO_2 ppm increases above the CO_2 setpoint the economizer outside air damper position increases proportionally to increase ventilation to the space. As the CO_2 ppm decreases toward the CO_2 setpoint the economizer outside air damper decreases proportionally toward the minimum outside air damper position. Compressor lockout and economizer supply air low limit have priority over CO_2 override and CO_2 override has priority over the economizer control.

Note: CO_2 Override requires a field installed CO_2 sensor.

Remote Averaging Space Temperature

Option is used to average the space temperature with the controller's internal space temperature sensor and a remote space temperature sensor for space temperature control.

Remote Space Temperature

Option is used to disable the controller's space temperature sensor and only use a remote space temperature sensor for space temperature control.

Fan Status

Option is used to confirm the operation of the supply fans. An alarm will be activated if fan operation cannot be confirmed

Note: Because of the AAON Mini Controller's limited number of inputs, only one of the following options is available with a single controller: *Dehumidification, Enthalpy Controlled Economizer, CO_2 Override, Remote Averaging Space Temperature, Remote Space Temperature or Fan Status*.

BACnet Points List

Table 4 - Analog Values

Object	Read/Write	Description	Default	Min	Max
AV1	R/W	Min Space Temp Setpoint Diff	2°F	1°F	15°F
AV2	R	Active Cooling Setpoint	-	-	-
AV3	R	Active Heating Setpoint	-	-	-
AV4	R/W	Unocc Cooling Setpoint	80°F	55°F	90°F
AV5	R/W	Unocc Heating Setpoint	64°F	55°F	90°F
AV6	R/W	Deadband	2°F	1°F	15°F
AV7	R/W	Occ Min Cooling Setpoint	68°F	55°F	90°F
AV8	R/W	Occ Max Heating Setpoint	72°F	55°F	90°F
AV9	R/W	Cooling Supply Air Setpoint	55°F	50°F	70°F
AV10	R/W	Econ Min OA Damper Pos	10%	0%	95%
AV11	R/W	Econ OA Temp Enable	60°F	50°F	70°F
AV12	R/W	Compressor Stage Delay	3 min	2 min	15 min
AV13	R/W	Fan Shutoff Delay	180 sec	0 sec	600 sec
AV14	R/W	Heat Stage Delay	3 min	3 min	60 min
AV15	R/W	Dehumidification Setpoint	50%	20%	85%
AV16	R/W	Override Timer	1 hour	0 hour	12 hour
AV17	R/W	Compressor OA Temp Lockout	40°F	0°F	50°F
AV18	R/W	Economizer SA Low Limit	40°F	0°F	100°F
AV19	R/W	CO2 Setpoint	1100 ppm	500 ppm	1800 ppm
AV20	R/W	Occ Cooling Setpoint	74°F	55°F	90°F
AV21	R/W	Occ Heating Setpoint	70°F	55°F	90°F
AV22	R	Space Humidity	-	-	-
AV23	R	Outside Air Temp	-	-	-
AV24	R	Supply Air Temp	-	-	-
AV25	R	Configurable Input - AI2	-	-	-
AV26	R	Current Mode Setpoint	-	-	-
AV27	R	UI Setpoint	-	-	-
AV28	R/W	Dehumidification Deadband	5%	5%	15%
AV29*	R/W	Cooling Loop P	2	0.50	10.00
AV30*	R/W	Cooling Loop I	0.1	0.01	1.00
AV31	R/W	Unocc Min Cooling Setpoint	68°F	55°F	90°F
AV32	R/W	Unocc Max Heating Setpoint	72°F	55°F	90°F
AV33	R/W	Minimum Setpoint Differential	2°F	1°F	15°F
AV34	R/W	Minimum Setpoint Limit	2°F	1°F	15°F
AV35*	R/W	Heating Loop P	2	0.50	10.00
AV36*	R/W	Heating Loop I	0.1	0.01	1.00
AV37*	R/W	Economizer Loop P	2	0.50	10.00
AV38*	R/W	Economizer Loop I	0.1	0.01	1.00
AV40	R	UI Display Space Temerature	-	-	-
AV41	R/W	Min Digital Comp Setpoint	50%	20%	80%
AV42	R/W	Max Digital Comp Setpoint	100%	5%>min	100%
AV43	R/W	Cool Supply Fan Min Speed Setpoint	30%	30%	80%

* Through version R1.2.2.10 these are only accessible through BACnet

Table 5 - Analog Values Continued

AV44	R/W	Cool Supply Fan Max Speed Setpoint	100%	50%	100%
AV45	R/W	Dehum Suction PSI Setpoint	119.4 psi	50 psi	250 psi
AV46	R/W	Dehum Fan Speed Setpoint	50%	25%	75%
AV47	R/W	Unocc Dehum Setpoint	65%	20%	85%
AV48	R/W	SAT Low Limit Alarm	40°F	32°F	60°F
AV49	R/W	Heat Supply Fan Min Speed Setpoint	50%/75%	50%	100%
AV50	R/W	Heat Supply Fan Max Speed Setpoint	100%	>Min	100%
AV51	R/W	Heating Supply Air Temp Setpoint	120°F	75°F	200°F
AV52	R/W	Heating OAT High Limit	70°F	50°F	150°F
AV53	R/W	SAT High Limit Alarm	200°F	120°F	250°F
AV54	-	Not Used	-	-	-
AV55	R/W	Occ Min Heating Setpoint	65°F	53°F	90°F
AV56	R/W	Occ Max Cooling Setpoint	78°F	55°F	92°F
AV57	R/W	OAT Low Limit	150°F	110°F	160°F
AV58	R/W	OAT High Limit	-40°F	-50°F	40°F
AV59	-	Not Used	-	-	-
AV60	-	Not Used	-	-	-

Table 6 - Relay Values

Object	Read/Write	Description
BV1	R	Occupancy Mode
BV2	R	Setpoint Override Mode
BV3	R	Economizer Mode
BV4	R	Economizer SA Temp Low Limit
BV5	R	Fan Alarm
BV6	R	Fan Need
BV7	R	Heating/Cooling Mode
BV8	R	Compressor Lockout
BV12	R/W	Occ Fan Auto/On
BV13	R/W	Unocc Fan Auto/On
BV14	R/W	°F/°C
BV15	R/W	Reversing Valve Polarity
BV16	R	Fan Status
BV17	R	Backlight Control
BV18	R	U/I Fan Icon
BV21	R	Dehum Mode Active
BV24	R	Occ Sensor Override Enable
BV31	R/W	Dehum Priority
BV36	R	Allow Econ Cooling
BV37	R	Comp 1 On/Off
BV38	R	OAT Sensor Installed
BV39	R	SAT Sensor Installed
BV40	R	Econ with Enthalpy

Table 7 - Multi-State Values

Object	Read/Write	Description	Options
MSV1	R/W	Application Main	Standard, Heat Pump
MSV2	R/W	Application Sub	#Heat Stages/#Cool Stages or #Comp Stages/#Emer. Heat Stages
MSV3	R/W	Fan Control	Constant Speed, Variable Speed Cool, Variable Speed Cool and Heat
MSV4	R/W	Economizer Damper	None, Fully Modulating
MSV5	R/W	Configurable Input - AI2	None, Fan Status, CO_2, Compressor Suction Pressure, OA Humidity, Average Remote Space Temp, Standalone Space Temp
MSV6	R/W	Supply Air Temp Control	None, Supply Air Temp Cool, Supply Air Temp Heat and Cool
MSV7	R/W	System Mode	Auto, Heat, Cool, Emer. Heat, Off
MSV8	R/W	Dehumidification/Energy Recovery	None, Dehumid/Heat Wheel
MSV13	R/W	BO5 Option	Not Used, Comp 1

Table 8 - Analog Inputs

Object	Read/Write	Description
AI1	R	Space Temp
AI2	R	Configurable Input
AI3	R	Supply Air Temp
AI4	R	Outside Air Temp
AI5	R	Space Humidity

Table 9 - Analog Outputs

Object	Read/Write	Description
AO7	R	Digital Compressor
AO8	R	Variable Speed Fan
AO9	R	Economizer Damper

Table 10 - Relay Outputs

Object	Read/Write	Description
BO1	R	Fan
BO2	R	Compressor 2
BO3	R	Heat 1/Reversing Valve
BO4	R	Heat 2/Emergency Heat 1
BO5	R	Heat 3/Emergency Heat 2/Y2
BO6	R	Dehumidification/Heat Wheel

Maintenance and Support

(See back of the manual for maintenance log.)

At least once each year, a qualified service technician should check out the unit. Supply fans, evaporator coils and air filters should be inspected monthly.

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a qualified installer. A copy of this IOM should be kept with the unit.

Periodically during operation, it is necessary to perform routine service checks on the performance of the unit. This includes checking of the airflow, the air filters, condenser water flow and refrigerant charge.

Replacement Parts

Parts for AAON equipment may be obtained from AAON at www.aaonparts.com. When ordering parts, reference the unit serial number and part number.

AAON
Warranty, Service and Parts Department
2424 S. Yukon Ave.
Tulsa, OK 74107
Ph: 918-583-2266
Fax: 918-382-6364
www.aaon.com

Note: Before calling, technician should have model and serial number of the unit available for the service department to help answer questions regarding the unit and controller.

Glossary

BAUD RATE: Default is 38400 and options available include 9600, 19200, 38400 and 76800.

CO2 SETPT (PPM): Space CO_2 override setpoint. Default setpoint is 1100 ppm and range is 500-1800 ppm.

COMP1 MIN OFF (SECS): Compressor minimum off time. Default is 120 seconds and range is 120-600 seconds.

COMP1 MIN ON (SECS): Compressor minimum on time. Default is 120 seconds and range is 0-600 seconds.

COMP OAT LOW: Compressor cooling outside air temperature lockout. Default is 40°F and range is 0-50°F.

COMP STG DELAY (MINS): Compressor stage delay. Used for cooling and heat pump heating. Default is 3 minutes and range 2-15 minutes.

COOL SETBACK: Unoccupied cooling space temperature setpoint. Default setpoint is 80°F.

COOL SETPT : Occupied cooling space temperature setpoint. Default setpoint is 74°F and range is 55-90°F.

DAMPER - CNTRL (0-100%): Available options are 0-10 VDC, 10-0 VDC, 2-10 VDC or 10-2 VDC. Default value is 2-10 VDC.

DAMPER - ECON: Available economizer options are *None* or *Modulating*.

DAMPER - ECON ENBLE TEMP: Economizer enable outside air temperature setpoint. Default setpoint is 60°F and range is 50-70°F.

DAMPER - ENTHALPY: Available economizer options are *Enable* or *Disable*.

DAMPER - LOW LIMIT ALARM: Economizer supply air temperature low limit which returns the economizer to the minimum position. Default value is 45°F and range is 0-100°F.

DAMPER - MIN POSITION (%): Minimum economizer damper position. Default value is 10% and range is 0-95%.

DEADBAND: Space temperature setpoint deadband. Default setpoint deadband is 2°F and range is 2-15°F.

DEHUM DEADBAND: Space humidity setpoint deadband. Default setpoint is 5% RH and range is 5-15% RH.

DEHUM PRIORITY: Available dehumidification priority options are *True* or *False*.

DEHUM SETPT: Occupied space relative humidity setpoint. Default setpoint is 50% RH and range is 20-85% RH.

FAN - COOL MAX SPEED: Maximum cooling speed of a variable speed fan. Default is 100%, range is 50-100% and value must be greater than the minimum cooling speed.

FAN - COOL MIN SPEED: Minimum cooling speed of a variable speed fan. Default is 30%, range is 30-80% and value must be less than the maximum cooling speed.

FAN - DEHUM SPEED: Dehumidification speed of a variable speed fan. Default is 50% and range is 25-75%

FAN - HEAT MAX SPEED: Maximum heating speed of a variable speed fan. Default is 100%, range is 50-100% and value must be greater than the minimum heating speed.

FAN - HEAT MIN SPEED: Minimum heating speed of a variable speed fan. Default is 50% for non-heat pump units, 75% for heat pump units, range is 50-100% and value must be less than the maximum heating speed.

FAN - OFF DELAY (SECS): Amount of time the fan will continue to run after heating and cooling is deactivated with Auto fan operation. Default value is 180 seconds and range is 0-600 seconds.

HEAT - DELAY (MINS): Stage delay between auxiliary heating stages. Default value is 3 minutes and range is 3-60 minutes.

HEAT1 MIN OFF (SECS): Heating minimum off time. Default is 120 seconds and range is 120-600 seconds.

HEAT1 MIN ON (SECS): Heating minimum on time. Default is 120 seconds and range is 120-600 seconds.

HEAT SETBACK: Unoccupied heating space temperature setpoint. Default setpoint is 64°F.

HEAT SETPT: Occupied heating space temperature setpoint. Default setpoint is 70° F and range is 55-90°F.

HTG OAT HIGH: Auxiliary heating outside air temperature lockout. Heat pump heating will still be available. Default is 70°F and range is 50-150°F.

INACTIVITY (SECS): Amount of time the backlight will stay on and the current password will stay active after the last button push. Default value is 60 seconds and range is 5-600 seconds.

MAC ADDRESS: Default is 1 and range is 0-127. Best practice is to assign the MAC ADDRESS in sequence for most efficient communication.

MAX DGTL COMP: Maximum allowable capacity of the variable capacity scroll compressor. Default is 100% and range is 25-100% and value must be 5% greater than the minimum variable capacity scroll compressor capacity setpoint.

MAX MASTER: Default is 127 and range is 0-127. Best practice is to set the MAX MASTER to the highest assigned MAC ADDRESS.

MIN DGTL COMP: Minimum allowable capacity of the variable capacity scroll compressor. Default is 50%, range is 20-80% and value must be 5% less than the maximum variable capacity scroll compressor capacity setpoint.

MIN SETPT DIFF: Minimum setpoint differential between the cooling and heating space temperature setpoints. Used for both the occupied and unoccupied modes of operation. Default setpoint differential is 2°F and range is 1-15°F.

OAT HIGH: Description. Default is 150°F and range is 110-160°F.

OAT LOW: Description. Default is -40°F and range is -50-40°F.

OCC MAX CLG: Occupied maximum cooling space temperature setpoint. Default is 78°F and range is 55-92°F.

OCC MIN CLG: Occupied minimum cooling space temperature setpoint. Default is 68°F and range is 55-90°F.

OCC MAX HTG: Occupied maximum heating space temperature setpoint. Default is 72°F and range is 55-90°F.

OCC MIN HTG: Occupied minimum heating space temperature setpoint. Default is 65°F and range is 53-90°F.

OCC OVRIDE (HRS): Amount of time a space temperature setpoint override and occupancy override will last. Default value is 1 hour and range is 0-12 hours. When set at 0, the override will last until the next schedule change.

SAT COOL SETPT: Cooling supply air temperature setpoint. Default setpoint is 55°F and range is 50-70°F.

SAT HEAT SETPT: Heating supply air temperature setpoint. Default setpoint is 120°F and range is 75-200°F.

SAT HIGH: Maximum supply air temperature. Default is 200°F and range is 120-250°F. Disable all outputs.

SAT LOW: Minimum supply air temperature. Default is 40°F and range is 32-60°F. Disable all outputs.

SUCTION (PSI): Dehumidification suction pressure setpoint. Default setpoint is 119.4 psi and range is 50-250 psi.

UNOCC DEHUM SETPT: Unoccupied space humidity setpoint. Default setpoint is 65% RH and range is 20-85% RH.

UNOCC MAX HTG: Unoccupied maximum heating space temperature setpoint. Default is 72°F and range is 55-90°F.

UNOCC MIN CLG: Unoccupied minimum cooling space temperature setpoint. Default is 68°F and range is 55-90°F.

AAON Mini Controller Startup Form

Date:_____

Job Name:_____

Address:_____

Model Number:_____

_____

Serial Number:_____ Tag:_____

Startup Contractor:_____

Address:_____ Phone_____

Pre Startup Checklist

Installing contractor should verify the following items:

1. Is there any visible shipping damage? _____ Yes ☐ No ☐
2. Are the clearances adequate for service and operation? _____ Yes ☐ No ☐
3. Have all electrical connections been tested for tightness? _____ Yes ☐ No ☐

Unit Configuration

Water-Cooled Condenser _____ ☐ Air-Cooled Condenser _____ ☐

Water-Source Heat Pump_____ ☐ Air-Source Heat Pump_____ ☐

Constant Volume Cooling_____ ☐ Single Zone VAV Cooling_____ ☐

Constant Volume Heating_____ ☐ Single Zone VAV Heating_____ ☐

Supply Fan Control - VFD ☐ ECM ☐ NA ☐

Supply Fan Cooling Max Speed_____ Supply Fan Heating Max Speed_____

Supply Fan Cooling Min Speed_____ Supply Fan Heating Min Speed_____

Maintenance Log

This log must be kept with the unit. It is the responsibility of the owner and/or maintenance/service contractor to document any service, repair or adjustments. AAON Service and Warranty Departments are available to advise and provide phone help for proper operation and replacement parts. The responsibility for proper start-up, maintenance and servicing of the equipment falls to the owner and qualified licensed technician.

Entry Date	Action Taken	Name/Tel.

Literature Change History

October 2010
Revision of the manual correcting the sequence of operation for enthalpy controlled economizer.

December 2013
Added BACnet Points List, glossary, and how relay output 5 can be used as the Y1 compressor 1 relay output.

March 2014
Added dehumidification priority.

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AAON Mini Controller
User's Manual
R98200 · Rev. B · 140311

It is the intent of AAON to provide accurate and current product information. However, in the interest of product improvement, AAON reserves the right to change pricing, specifications, and/or design of its product without notice, obligation, or liability.