



HB Controller Technical Guide

HB Controller Code: SS1019
HB MHGR Controller: SS1020
HB Processor Board: SS1021
Requires HB Service Tool Code: SS1100

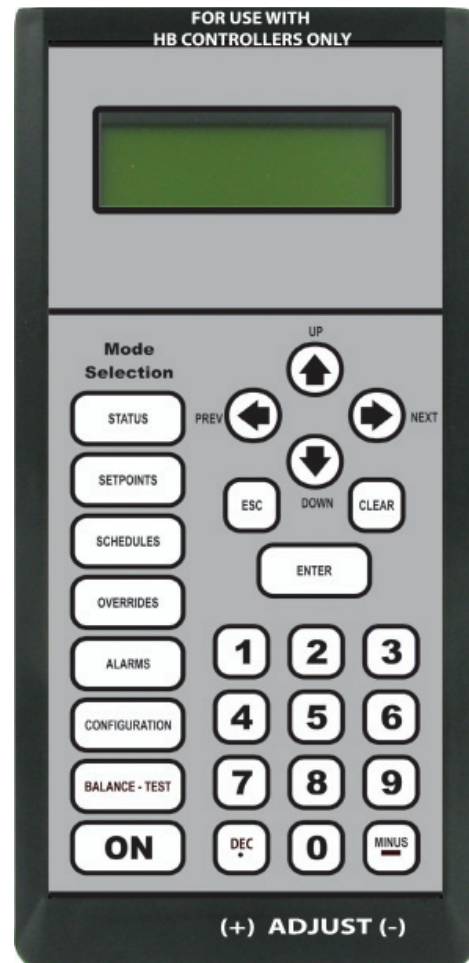
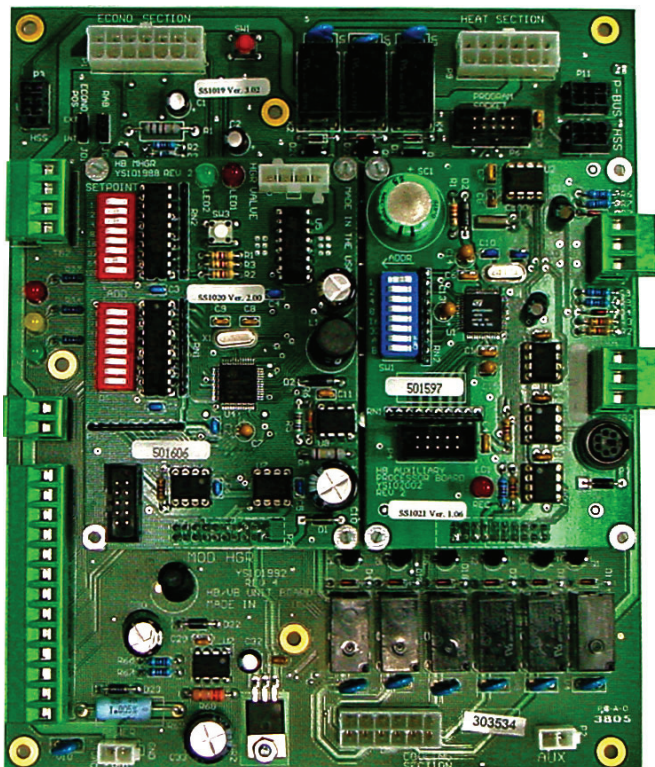


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HB Controller Overview

General

The HB Controller (Orion Part No. OE377-00-00046; AAON Part No. R29280) is designed to work with a normal 24 VAC Thermostat and Dehumidistat. Single or Multi-stage Thermostats can be used. When a Single-Stage Thermostat is used, an auto-staging feature is built-in for Multi-stage HB units. Fan speed can be adjusted for both high and low speeds by way of an interface when the HB unit is equipped with an adjustable speed controller. Dehumidification is optimized by use of a Return Air Bypass damper. Modulating Hot-Gas Reheat can be used to reheat the Supply Air during Dehumidification.

A CO₂ sensor can be connected through the wiring harness when IAQ control is desired. Also, two damper positions are available when using Two-Speed Supply Fans, thus providing enhanced IAQ control.

The HB Controller also monitors equipment safeties, logs information, and locks out the equipment in the event of multiple failures. All sensors are needed in order to provide all modes of operation. However, to prevent a potential freeze condition, Heating Mode will still operate if all sensors have failed or are missing.

Terminal block style connections are provided for field wiring of the Thermostat, Dehumidistat, and Supply Air Temperature Sensor wires. All other inputs and outputs are connected via a wiring harness on the HB unit. A list of all available inputs and outputs follows.

The HB Controller is programmed using the HB Modular Service Tool (Orion Part No. OE391-12-HB; AAON Part No. V97740). Programming instructions start on **page 16** of this manual. This manual also includes instructions for programming the HB Processor and the MHGR Controller.

Inputs

G, Y1, Y2, W1, W2, W3
RH: Dehumidistat
SAT: Supply Air Temperature Sensor
MHGRV Reset: Modulating Hot-Gas Reheat Signal (0-10VDC)
RAB: Return Air Bypass Damper Actuator (by others)
ECS: (Enthalpy Changeover Switch)
Econo Pos: Economizer Control (by others)
Carbon Dioxide Sensor
Outdoor Air Temperature Sensor
Liquid Line Temperature Sensor (currently not used)
Heat Safety Monitor (monitors main and auxiliary limit thermostats)
High-Pressure Switch
Low-Pressure Switch
Clogged Filter Switch

Outputs

Supply Fan High-Speed Relay
Supply Fan Low-Speed Relay
Cool-1 Relay
Cool-2 Relay
Heat-1 Relay
Heat-2 Relay
Heat-3 Relay
Condenser Fan Relay
AUX: Currently used for an exhaust fan relay
Modulating Hot-Gas Reheat Signal (from HGR controller)
Adjustable Two-Speed Fan Signal (0-10VDC)
Return Air Bypass Damper Actuator (0-10VDC)
Economizer Damper Actuator (2-10VDC)
Modulating Hot-Gas Reheat Reset Signal (0-10 VDC)
A1, A2: Economizer 24 VAC Power Supply Jumper Terminals
C1, C2: Clogged Filter Switch 24 VAC Output Terminals

HB Controller Dimensions

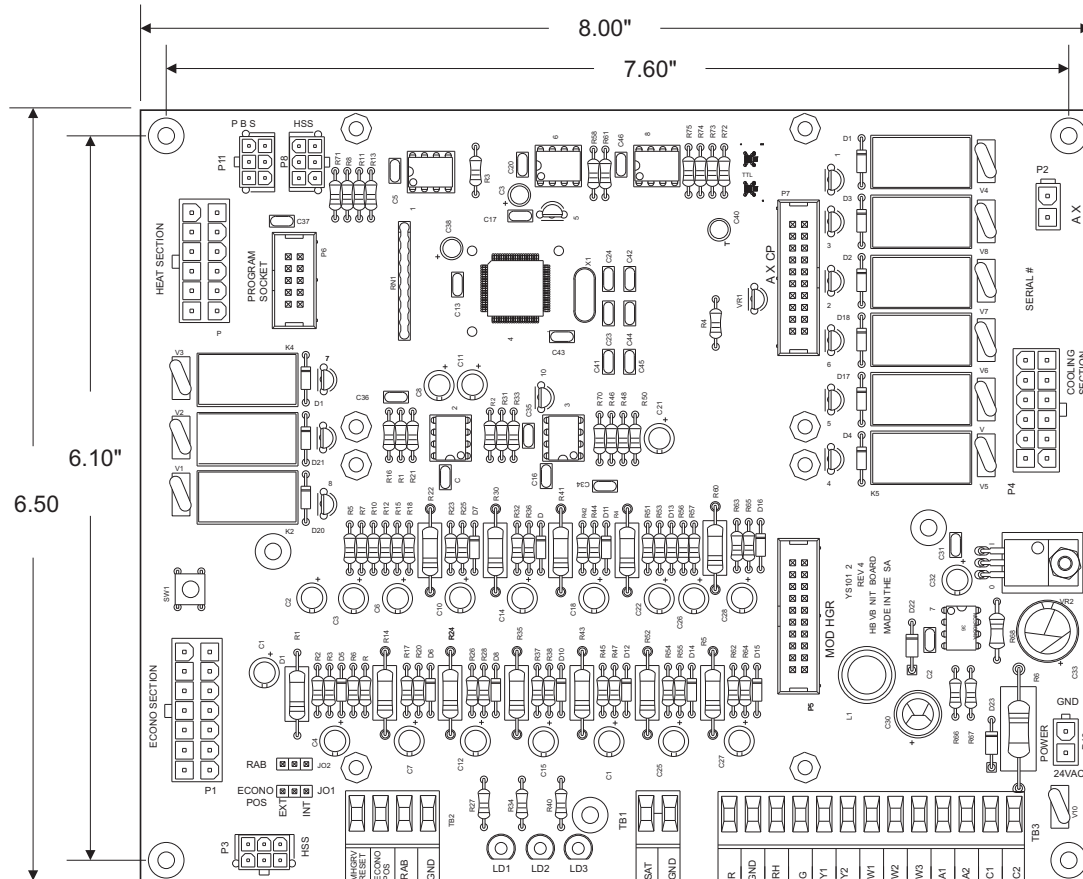


Figure 1: HB Controller Dimensions

Controller Sequence of Operations

Fan Mode

The HB Controller supports 2 different Supply Fan configurations. It can be configured for Adjustable Two-Speed Fan or Two-Speed Fan. On a call for “G,” the Supply Fan runs at Low Speed. Minimum on and off times are maintained in the event of a short cycled call for “G.”

Heating Mode

On a call for “W1,” the Supply Fan runs at High Speed (maintained during the Heating mode), and Heat Stage 1 is energized. On a call for “W2,” Heat Stage 2 is energized after the Stage-Up delay. If “W2” is called without “W1,” Heat Stage 1 is energized, and then Heat Stage 2 is energized after the Auto Stage-Up Delay period. On a call for “W3,” Heat Stage 3 is energized after the Stage-Up delay. If “W3” is called without “W1” or “W2,” Heat Stages 1, 2, and 3 will energize based on Auto Stage-Up Delays.

Cooling Mode

If the HB Controller is configured for 1 stage of Cooling, on a call for “Y1,” the Supply Fan runs at High speed, and Cool Stage 1 will energize. If the HB Controller is configured for 2 stages of Cooling, on a call for “Y1,” the Supply Fan runs at Low Speed, and Cool Stage 1 is energized. On a call for “Y2,” the Supply Fan runs at High Speed, and Cool Stage 2 is energized after the Stage-Up Delay. If “Y2” is called without “Y1,” Cool Stage 1 is energized, and then Cool Stage 2 is energized after the Auto Stage-Up Delay.

Economizer Cooling

General Economizer Operation

If the Outdoor Air Temperature is below the Economizer Enable Setpoint and there is a call on “Y1,” the compressors will be locked out, and the Economizer will modulate to achieve a 55° F Supply Air Temperature. If the HB Controller is configured for 1 stage of Cooling, on a call for “Y1,” the Supply Fan will run at High Speed. If the HB Controller is configured for 2 stages of Cooling, on a call for “Y1,” the Supply Fan will run at low speed. When “Y2” is called, the Supply Fan will go to high speed.

Economizer Operation with ECS Control

If the Enthalpy Changeover Switch (ECS) is closed and the outdoor air temperature is below the ECS, OAT Enable setpoint (default 65° F), the economizer will modulate and attempt to achieve 55° F supply air temperature. If the outdoor air temperature is above 55° F, the economizer will generally open to 100%. Mechanical cooling can be used to supplement the economizer if the outdoor air temperature is above the ECS OAT Enable setpoint and the economizer signal is at 100%. Once mechanical cooling is activated to supplement the economizer, the economizer will remain at 100% until the cooling call is satisfied.

Mechanical Cooling Staging with ECS Control

If the HB Controller is configured for 1 stage of Cooling, on a call for “Y1,” the Supply Fan will run at High Speed. Cool Stage 1 will activate after the Cooling Auto Stage-Up Delay. If the HB Controller is configured for 2 stages of Cooling, on a call for “Y1,” the Supply Fan will run at Low Speed. Cool Stage 1 will activate after either the Cooling Auto Stage-Up Delay Expires or a call for “Y2” is made. When “Y2” is called, Cool Stage 2 will activate after the Cooling Auto Stage-Up Delay. After Cool Stage 2 is activated, the Supply Fan will switch to High-Speed operation.

Economizer IAQ Control

The economizer is also used for CO₂ control. If the CO₂ level is above the Minimum CO₂ PPM setpoint, the Economizer Minimum Position will be reset proportionally between the Minimum CO₂ PPM and Maximum CO₂ PPM setpoints. When the CO₂ level is above the Maximum CO₂ PPM setpoint, the Economizer will open as far as the Maximum Damper Adjustment Position setpoint setting. There are two Minimum and two Maximum Economizer Damper Positions depending on the Supply Fan speed. These are the Maximum Damper Position with Low-Speed Fan, the Minimum Damper Position with Low-Speed Fan, the Maximum Damper Position with High-Speed Fan, and the Minimum Damper Position with High-Speed Fan. The air balancing contractor should determine these settings in order to maintain the proper amount of fresh air being supplied to the building.

Economizer Dehumidification

1-or 2-Stage Cooling Units with Adjustable Two-Speed or Two-Speed Supply Fan Control

If the Outdoor Air Temperature is below the Economizer Enable Setpoint and there is a call for Dehumidification on “RH,” the compressors will be locked out, and the Economizer will modulate to achieve 55° F Supply Air Temperature. The Supply Fan will run at Low Speed, and the Return Air Bypass will be closed.

For 1 stage Cooling units, on a call for “Y1,” the HB Controller will enter the Cooling Mode, and the Supply Fan will run at High Speed. The Cooling Mode will be maintained until “Y1” is satisfied. As long as there is still a call for “RH,” the Dehumidification Mode will resume.

For 2 stage Cooling Units, “Y1” is ignored during this mode to extend Dehumidification. On a call for “Y2,” the HB Controller will enter the Cooling mode, and the Supply Fan will run at High Speed. The Cooling Mode will be maintained until both “Y2” and “Y1” are satisfied. As long as there is still a call for “RH,” the Dehumidification Mode will resume, and the Supply Fan will run at Low Speed.

If the HB Controller is configured for 1 stage of Heating, on a call for “W1,” the mode changes to Heating. The Economizer will close to its Minimum Position, Heat Stage 1 will energize, and the Supply Fan will run at High Speed.

Controller Sequence of Operations

If the HB Controller is configured for 2 or 3 stages of Heating, on a call for “W1,” the Economizer will be locked at its current position, attempting to deliver 55° F Supply Air to the heating section. Heat Stage 1 is energized, and the Supply Fan will run on High speed. On a call for “W2,” the HB Controller will enter the Heating Mode. The Economizer will move to its Minimum Position, and Heat Stage 2 will energize after the Stage-Up Delay. The Heating Mode will be maintained until both “W2” and “W1” are satisfied. W3 is also available for 3 Stage Electric Heating Units. As long as there is still a call for “RH,” the Dehumidification Mode will resume, and the Supply Fan will run at Low Speed.

Dehumidification Mode (No Reheat)

NOTE: If the HB Controller is configured for 1 stage of Cooling, regardless of the Supply Fan configuration, the Dehumidification call on “RH” is ignored during this mode.

On a call for “RH,” Cooling Stage 1 is energized and the Supply Fan runs at Low Speed. The Return Air Bypass Damper will open to 100%. “Y1” is ignored during this mode. On a call for “Y2,” the HB Controller will enter the Cooling Mode, and the Supply Fan will run at High Speed. The Cooling Mode will be maintained until both “Y2” and “Y1” are satisfied. As long as there is still a call for “RH,” the Dehumidification Mode will resume, and the Supply Fan will run at Low Speed.

If the HB Controller is configured for 1 stage of Heating, on a call for “W1,” the mode changes to Heating. Cool Stage 1 will de-energize, the Return Air Bypass will close, Heat Stage 1 will energize, and the Supply Fan will run at High Speed.

If the HB Controller is configured for 2 or 3 stages of Heating, a “W1” call will be delayed to extend Dehumidification. On a call for “W2,” the HB Controller will enter the Heating Mode. Cool Stage 1 will de-energize, the Return Air Bypass will close, Heat Stage 1 will energize, and the Supply Fan will run at High Speed. Heat Stage 2 will energize after the Auto Stage-Up Delay. The Heating Mode will be maintained until both “W2” and “W1” are satisfied. W3 is also available for 3- Stage Electric Heating Units. As long as there is still a call for “RH,” the Dehumidification Mode will resume, and the Supply Fan will run at Low Speed.

Dehumidification Mode with Hot-Gas Reheat**1-Stage Cooling with Adjustable Two-Speed or Two-Speed Supply Fan Control**

On a call for “RH,” Cool Stage 1 is energized, and the Supply Fan runs at High Speed. The Return Air Bypass is opened to 100%. The Hot Gas Reheat will then modulate the valves to achieve the Supply Air Setpoint DIP Switch setting. On a call for “Y1,” the HB Controller enters the Cooling Mode. The Return Air Bypass will close, and the Hot Gas Reheat will modulate to full Cooling. The Cooling Mode will be maintained until “Y1” is satisfied. As long as

there is still a call for “RH,” the Dehumidification Mode will resume. If the HB Controller is configured for 1 stage of Heating, on a call for “W1,” the mode changes to Heating, and the Supply Fan will run at High Speed. Cool Stage 1 will de-energize, the Return Air Bypass will close, Heat Stage 1 will energize, and the Supply Fan will run at High Speed. If the HB Controller is configured for 2 or 3 Stages of Heating, on a call for “W1,” the Supply Air Setpoint on the Reheat Controller is raised 10° F, and Cool Stage 1 continues to run. On a call for “W2,” the HB Controller will enter the Heating Mode. Cool Stage 1 will de-energize, the Return Air Bypass will close, Heat Stage 1 will energize, and the Supply Fan will run at High Speed. Heat Stage 2 will energize after the Auto Stage-Up Delay. The Heating Mode will be maintained until both “W2” and “W1” are satisfied. W3 is also available for 3- Stage Electric Heating Units. As long as there is still a call for “RH,” the Dehumidification Mode will resume.

2-Stage Cooling with Adjustable Two-Speed or Two-Speed Supply Fan Control

On a call for “RH,” Cool Stage 1 is energized, and the Supply Fan runs at low speed. The Return Air Bypass is opened to 100%. The hot-gas reheat will then modulate the valves to achieve the Supply Air setpoint DIP switch setting. On a call for “Y1,” the Supply Air setpoint on the reheat controller is lowered 10° F, and the Return Air Bypass will close. On a call for “Y2,” the HB Controller will enter the Cooling Mode. The Supply Fan will switch to high speed, and Cool Stage 2 is energized. The modulating hot-gas reheat valves will move to the full Cooling position. The Cooling mode will be maintained until both “Y2” and “Y1” are satisfied. As long as there is still a call for “RH,” the dehumidification mode will resume.

If the HB Controller is configured for 1 stage of heating, on a call for “W1,” the mode changes to Heating, and the Supply Fan will run at High Speed. Cool Stage 1 will de-energize, the Return Air Bypass will close, Heat Stage 1 will energize, and the Supply Fan will run at High Speed. If the HB Controller is configured for 2 or 3 stages of Heating, on a call for “W1,” the Supply Air Setpoint on the Reheat Controller is raised 10° F, and Cool Stage 1 continues to run. On a call for “W2,” the HB Controller will enter the Heating Mode. Cool Stage 1 will de-energize, the Return Air Bypass will close, Heat Stage 1 will energize, and the Supply Fan will run at High Speed. Heat Stage 2 will energize after the Auto Stage-Up Delay. The Heating Mode will be maintained until both “W2” and “W1” are satisfied. W3 is also available for 3 Stage Electric Heating Units. As long as there is still a call for “RH,” the Dehumidification Mode will resume, and the Supply Fan will run at Low Speed.

Lockout Modes

Heating Mode is locked out if the HSM (Heat Safety Monitor) trips 3 times during a call for Heating. To reset the lockout condition, either remove the call for Heating or cycle power to the HB Controller. Heating Mode is also locked out if the Outdoor Air Temperature is above the OAT Heat Lockout setpoint temperature.

Cooling Mode is locked out if the LPS (Low Pressure Switch) trips 3 times during a call for Cooling or Dehumidification. To reset the lockout condition, either remove the call for Cooling or Dehumidi-

Sequence of Operations

Controller Sequence of Operations

fication or cycle power to the HB Controller. Cooling Mode is also locked out if the Outdoor Air Temperature is below the OAT Cool Lockout setpoint temperature or if the OAT Sensor is bad or missing.

Economizer and Reheat during Dehumidification modes are locked out if the SAT sensor is missing.

NOTE: The Cooling OAT Lockout must be set less than the Economizer Enable.

SAT Lockout Modes

NOTE: The SAT Lockout Modes only apply if a Supply Air Temperature Sensor is installed on the HB unit.

SAT High Temperature Limit Cut Off Mode

During the Heating Mode, if the Supply Air Temperature rises above the Supply Air High Temperature Limit Cut Off (150° F), the Heating will stage off, but the main Supply Fan will remain on in Low-Speed operation. If this occurs, the Supply Air Temperature must fall below 80° F in order for the Heating to stage back on. If this condition occurs 2 times consecutively during a Heating call, the HB Controller will lockout in *Supply Air High Temperature Limit Cut Off*. To restore normal operation, either remove the call for Heating or cycle power to the HB Controller.

SAT Low Temperature Limit Cut Off Mode

During the Heating Mode, if the Supply Air Temperature falls below the Supply Air Low Temperature Limit Cut Off (40° F), the Outdoor Air Damper will close. If the Supply Air Temperature is still too cold and remains there for 15 minutes, the Heating and the Supply Fan will be turned off and locked out. This condition can only happen once, and then the HB Controller will lockout in *Supply Air Low Temperature Limit Cut Off*. To restore normal operation, either remove the call for Heating or cycle power to the HB Controller.

Exhaust Fan Control

The Exhaust Fan is energized via the Auxiliary Relay. The Exhaust Fan has two Economizer Position Activation points based on the Low- and High-Speed Supply Fan condition. The air balancing contractor should determine these settings for proper Building Pressure Control.

HB Processor Board

When the HB Controller has the optional HB Processor board installed, a Space Temperature Sensor can be connected to it for HVAC Mode Control. When the Space Temperature Sensor is used, the Push-Button Override and Slide Adjust options are also available. Occupied and Unoccupied Modes are available through week scheduling, force schedule, and a broadcast schedule. The HB Processor board also provides communication with other HB controllers. Up to 60 other controllers can be connected together via the RS-485 loop.

Space Temperature Control Sequence

When the Space Temperature Sensor is configured for control, Cooling and Heating setpoints are used to activate the HVAC Modes of operation. An HVAC Mode Deadband setpoint is used to determine the temperature at which the Cooling and Heating Modes are activated above or below the setpoints. Once in the Cooling Mode, the Space Temperature must drop below the Cooling setpoint minus the deadband to enter the Vent Mode. The same is true for the Heating mode; the Space Temperature must rise above the Heating setpoint plus the deadband to enter the Vent Mode. An additional Cooling Stage is activated for each 1° F rise of the Space Temperature above the Cooling Setpoint up to the maximum number of Cooling Stages available. In like manner, an additional Heating Stage is activated for each 1° F drop of the Space Temperature below the Heating Setpoint up to the maximum number of Heating Stages available.

When the Space Temperature rises above the Cooling setpoint plus the deadband, the HB Controller enters the Cooling Mode, and Cooling Stage 1 is activated. Cooling Stage 2 is activated if the Space Temperature rises by another 1° F above the Cooling setpoint. Cooling Stage 2 deactivates when the Space Temperature drops below the Cooling setpoint. Cooling Stage 1 deactivates when the Space Temperature drops below the Cooling setpoint minus the deadband.

When the Space Temperature drops below the Heating setpoint minus the deadband, the HB Controller enters the Heating Mode, and Heating Stage 1 is activated. Heating Stage 2 is activated if the Space Temperature drops by 1° F. Heating Stage 3 is activated if the Space Temperature drops by another 1° F below the Heating setpoint. Heating Stage 3 and Heating Stage 2 both deactivate when the Space Temperature rises above the Heating setpoint. Heating Stage 1 deactivates when the Space Temperature rises above the Heating setpoint plus the deadband.

The Slide Adjust feature on the Space Temperature Sensors that are equipped with this option allows the user to change the Heating and Cooling setpoints up or down by the Slide Adjust setpoint value. If 3° F is entered as the Slide Adjust setpoint, when the slider is all the way up, the Heating and Cooling setpoints will be raised by 3° F. When the slider is all the way down, the Heating and Cooling setpoints will be lowered by 3° F. The Override Button feature on Space Temperature sensors that are equipped with this option allows the user to force the HB Controller into the Occupied Mode. The time the controller is in Occupied Mode is determined by the Override Time Setpoint. Once this time is expired, the HB Controller will follow its normal schedule. A momentary push of the Override Button will activate the Override. Once in the Override Mode, pushing down and holding the Override Button for 5 seconds will deactivate the Override Mode.

INSTALLATION & WIRING

Controller Installation & Wiring

Controller Mounting

It is important to mount the controller in a location that is free from extreme high or low temperatures, moisture, dust, and dirt. Be careful not to damage the electronic components when mounting the controller. The HB controller mounts in the HB unit control panel using the 4 plastic standoffs located on the HB control enclosure mounting base.

Important Wiring Considerations

Please carefully read and apply the following information when wiring the HB controller.

1. All 24 VAC wiring must be connected so that all ground wires remain common. Failure to follow this procedure can result in damage to the controller and connected devices.
2. All wiring is to be in accordance with local and national electrical codes and specifications.
3. Minimum wire size for 24 VAC thermostat wiring should be 22 gauge.
4. Minimum wire size for all sensors should be 24 gauge.
5. Be sure that all wiring connections are properly inserted and tightened into the terminal blocks. Do not allow wire strands to stick out and touch adjoining terminals which could potentially cause a short circuit.
6. Be sure all modular wiring harness connectors are seated firmly in their respective modular connectors on the HB circuit board.

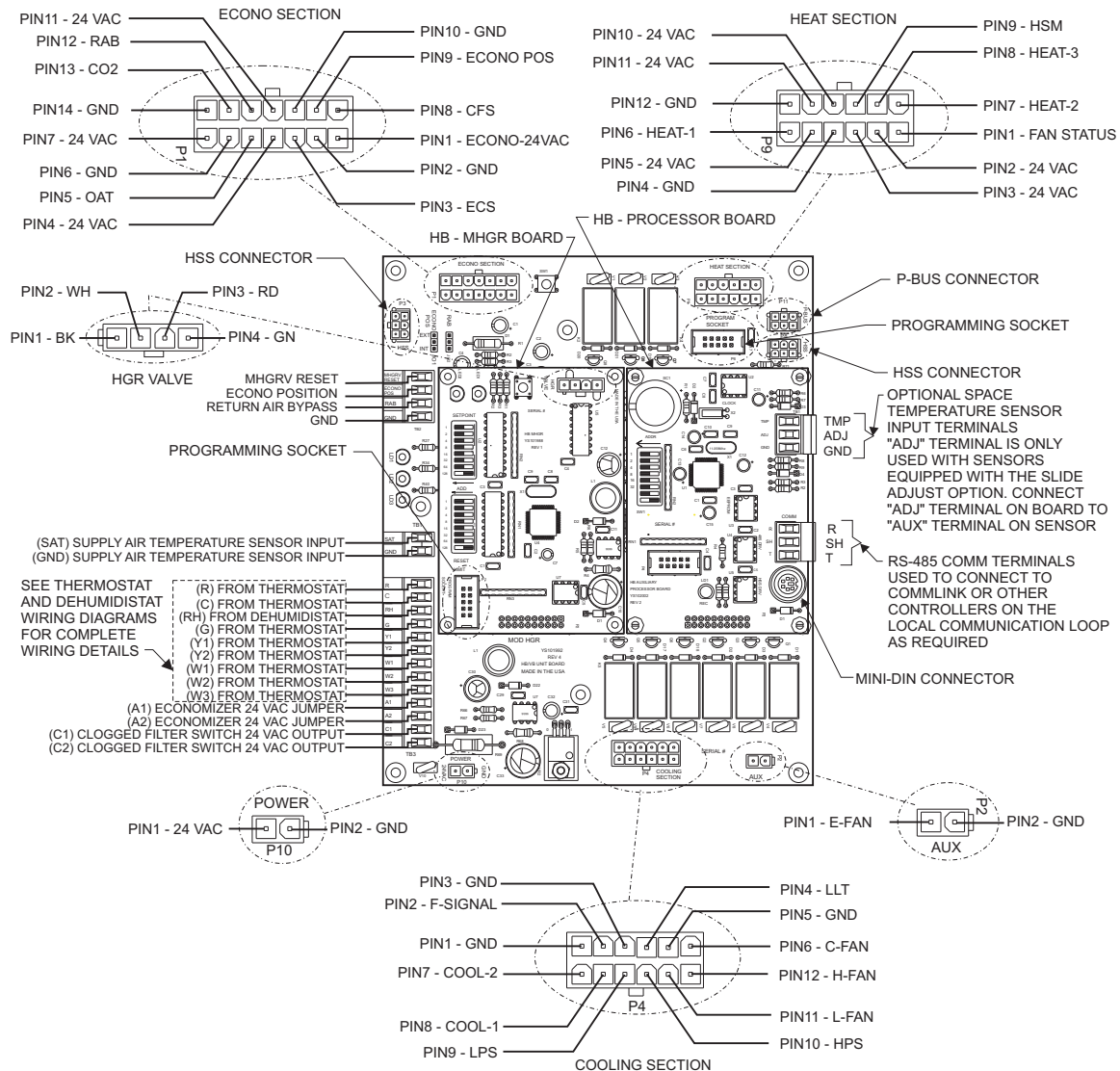


Figure 2: HB Controller Wiring (Shown with Optional MHGRV & HB Processor Boards Installed)

INSTALLATION & WIRING

Single Stage Wiring with 1 Stage Cooling & 1 Stage Heating

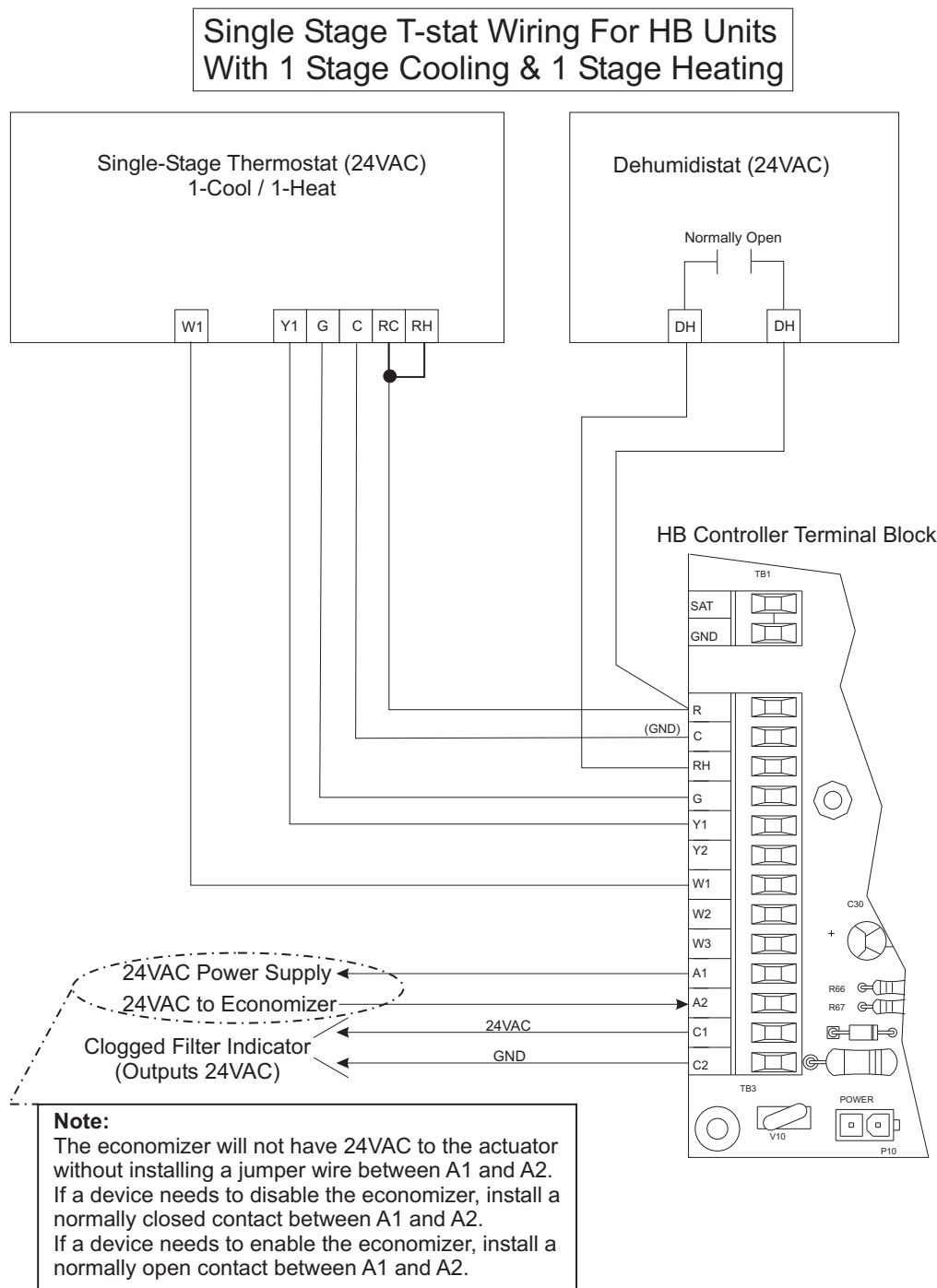


Figure 3: Single-Stage T-Stat Wiring for HB Unit with 1-Stage Cooling & 1-Stage Heating

Single Stage Wiring with 2 Stage Cooling & 2 Stage Heating

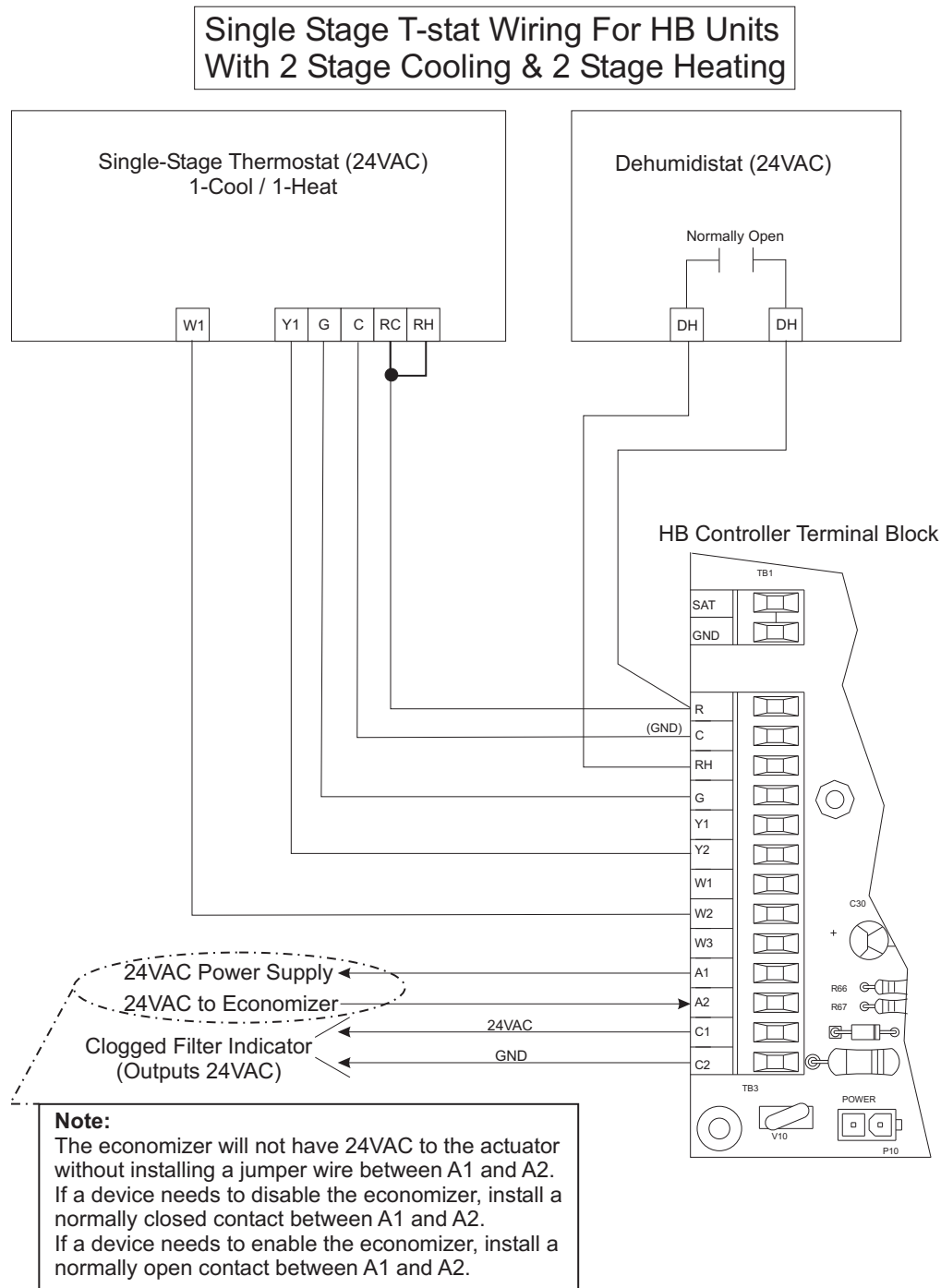


Figure 4: Single-Stage T-Stat Wiring for HB Units with 2-Stage Cooling & 2-Stage Heating

INSTALLATION & WIRING

Single Stage Wiring with 2 Stage Cooling & 3 Stage Heating

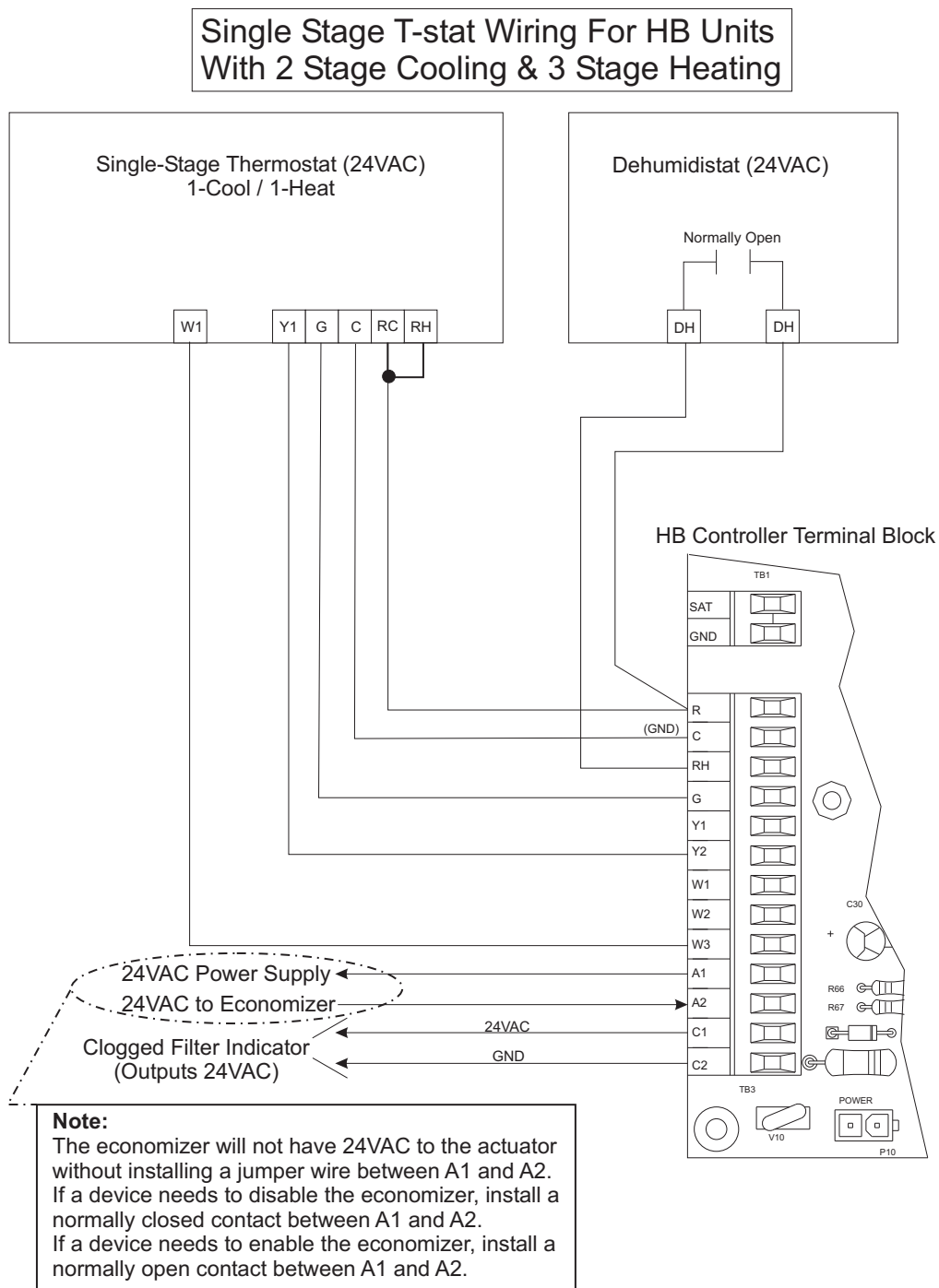


Figure 5: Single-Stage T-Stat Wiring for HB Units with 2-Stage Cooling & 3-Stage Heating

Multi-Stage Wiring with 2 Stage Cooling & 2 Stage Heating

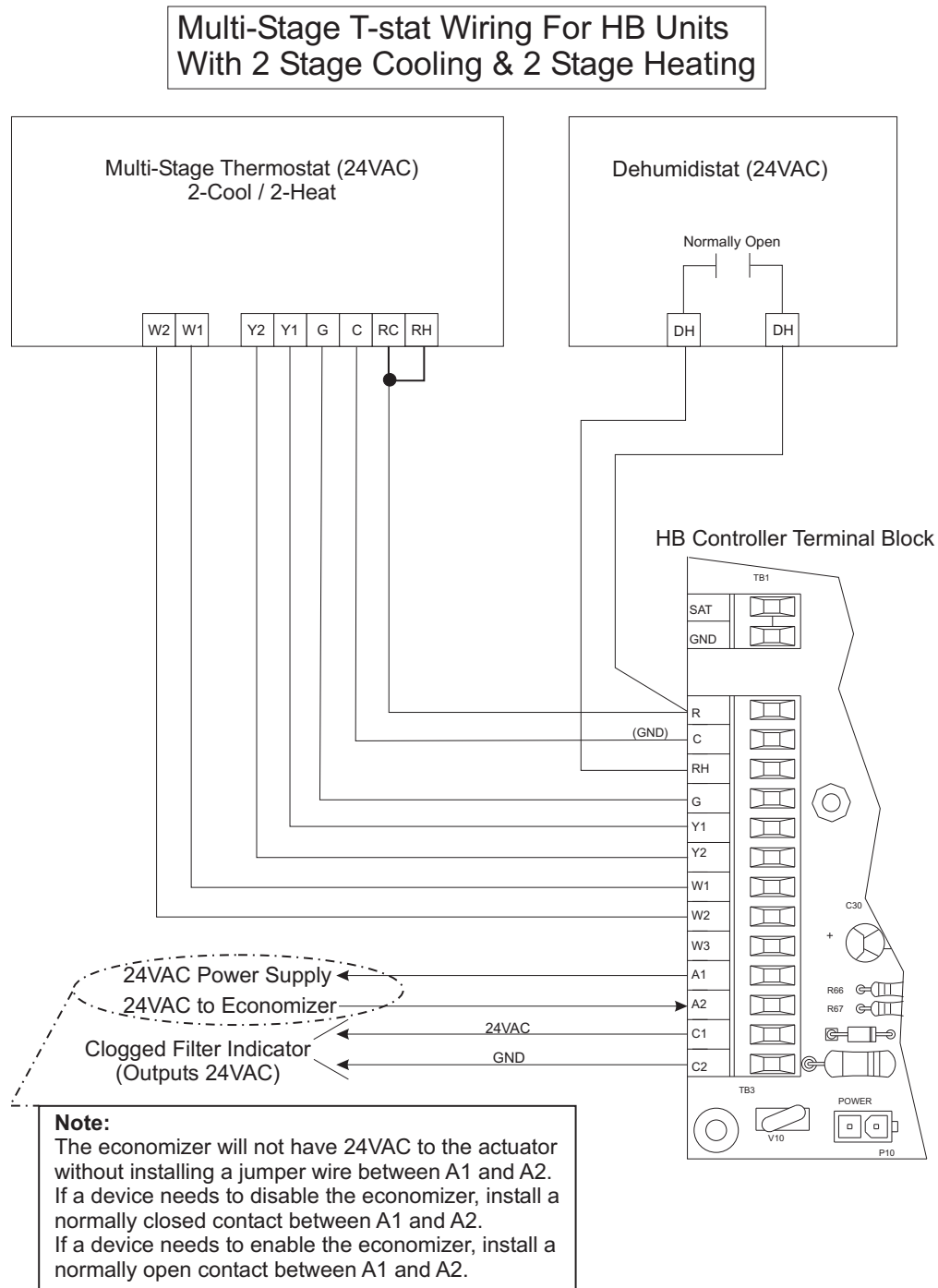


Figure 6: Multi-Stage T-Stat Wiring for HB Units with 2-Stage Cooling & 2-Stage Heating

INSTALLATION & WIRING

Multi-Stage Wiring with 2 Stage Cooling & 3 Stage Heating

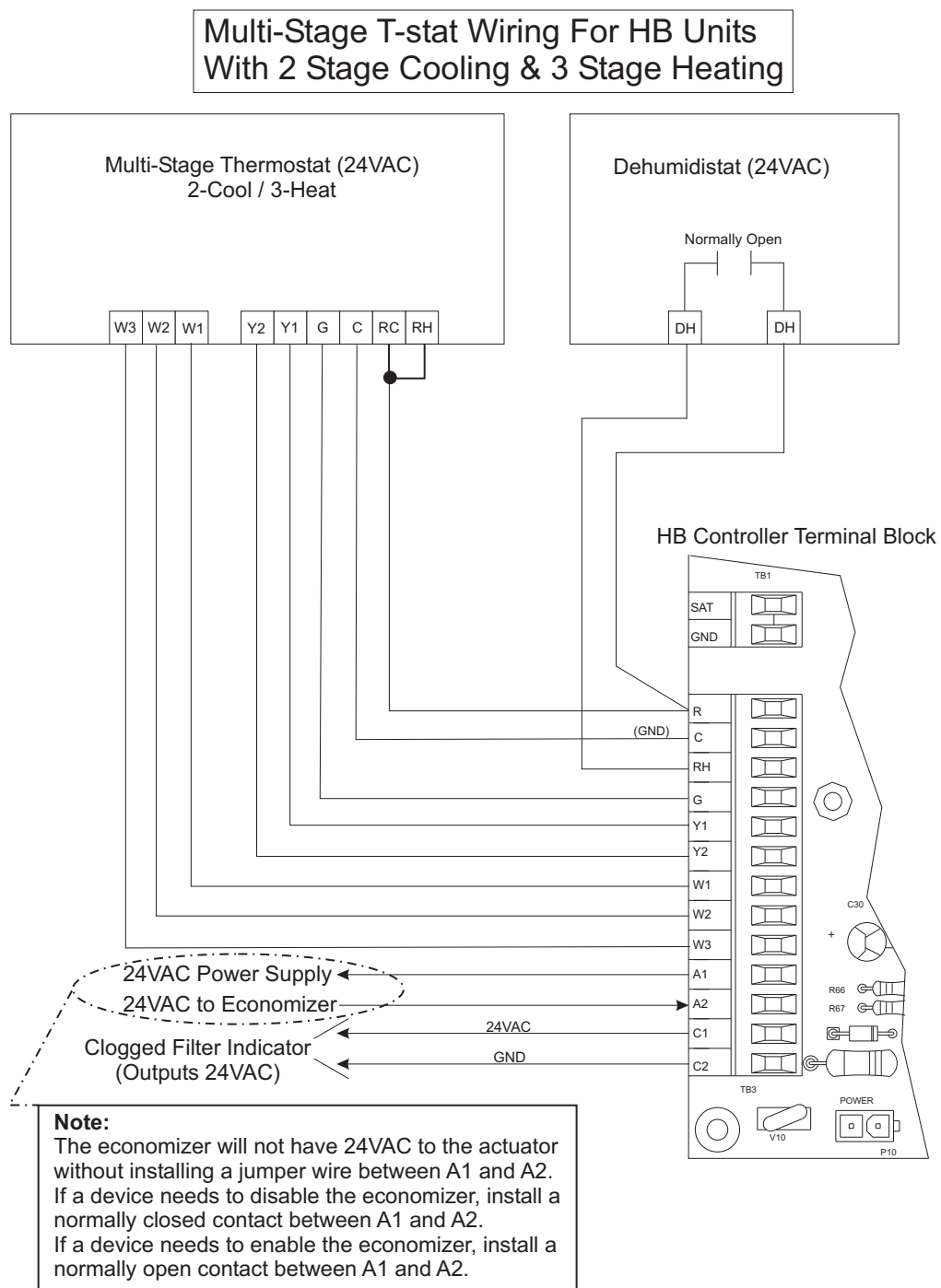


Figure 7: Multi-Stage T-Stat Wiring for HB Units with 2-Stage Cooling & 3-Stage Heating

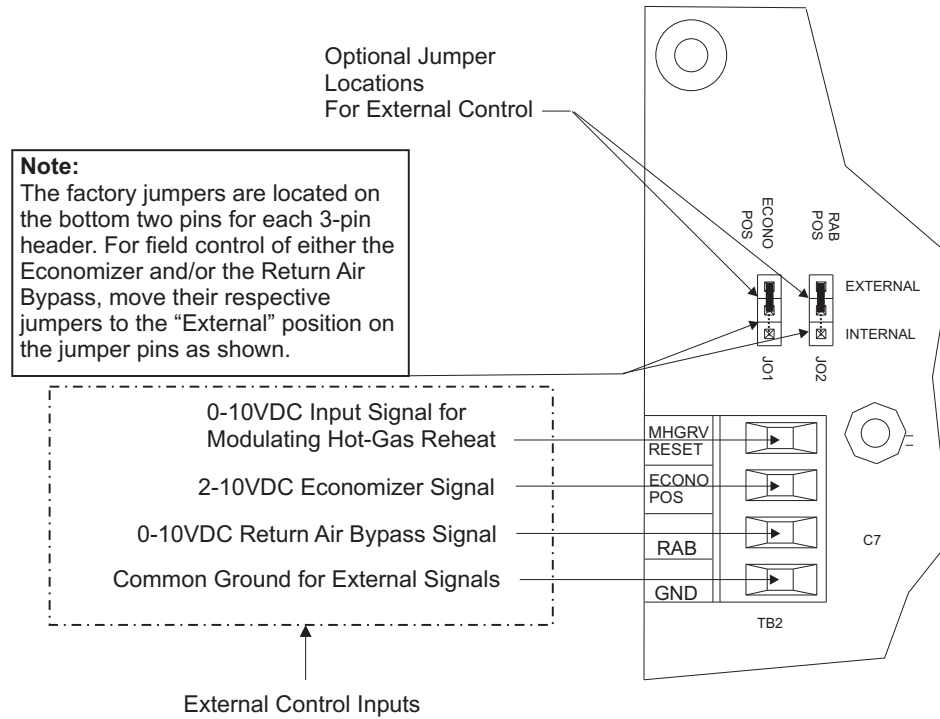


Figure 8: Field Wiring & Jumper Settings for Mod Hot Gas Reheat, Economizer & Return Air Bypass

HB Modular Service Tool

HB Modular Service Tool

The OE391-12-HB Modular Service Tool is a system operator interface that provides a direct link to enable the system operator to view the status, configure, and adjust the setpoints of the HB Controller. See **Figure 9** for dimensions.

The Modular Service Tool is housed in an attractive black plastic enclosure. The display area is covered with a clear plastic bezel for protection of the display screen. The Modular Service Tool has a 4-line-by-20-character display panel with adjustable contrast control and a 27-key membrane keypad for data selection and entry. All keypad operations are simple and straight forward, utilizing non-cryptic plain English language messages. Menu-driven programming allows for easy setup and operation without the need for specialized training. The Modular Service Tool is supplied with (4) AA 1.5 V batteries, a wall mount, a DC power supply, and an E-BUS to HSS communication cable. The E-BUS to HSS communication cable allows you to connect the HB Modular Service Tool to the HB Controller for programming, monitoring, and troubleshooting purposes.

The Modular Service Tool is designed to be hand-carried. Its rugged plastic housing provides superior protection for the electronic components housed inside. The Modular Service Tool is a top-quality service tool that will stand up to the demands of the typical job site environment for many years.

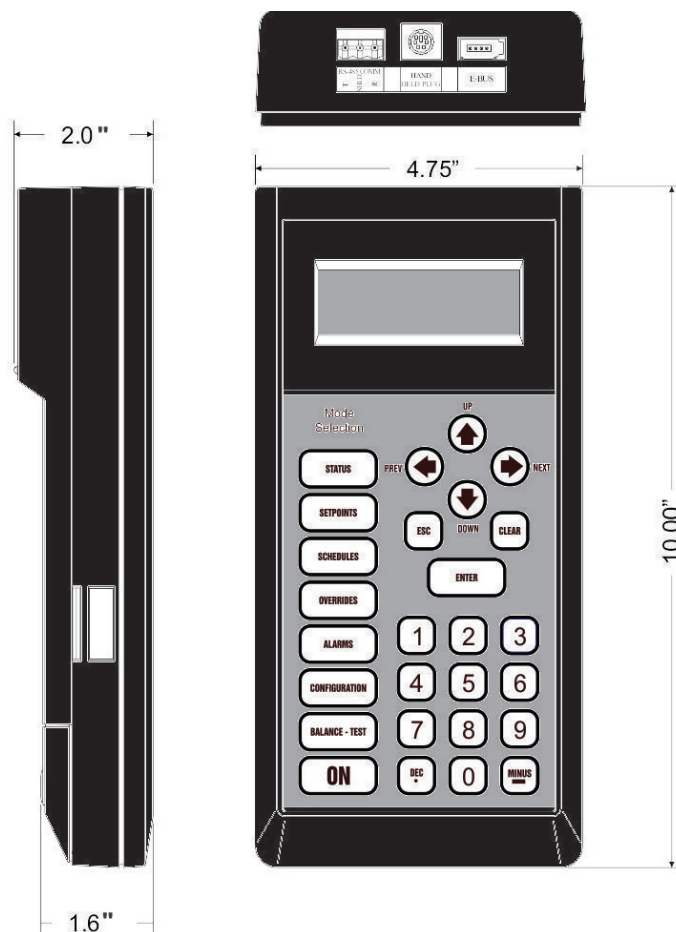


Figure 9: HB Modular Service Tool Dimensions

HB Service Tool Connection & Wiring

HB Service Tool Connection

The HB Modular Service Tool connects to the HB controller via a prefabricated cable that is supplied with the service tool. The Modular Service Tool cable is terminated on one end with an EBC E-BUS cable and ends with an HSS connector. Attach one end to the HB Modular Service Tool and the other end to the HSS connector on the controller. See **Figure 10** for wiring.

Be sure that the Modular Service Tool has fresh batteries installed or that it is connected to a power source using the supplied power pack before attempting any programming of the controller.

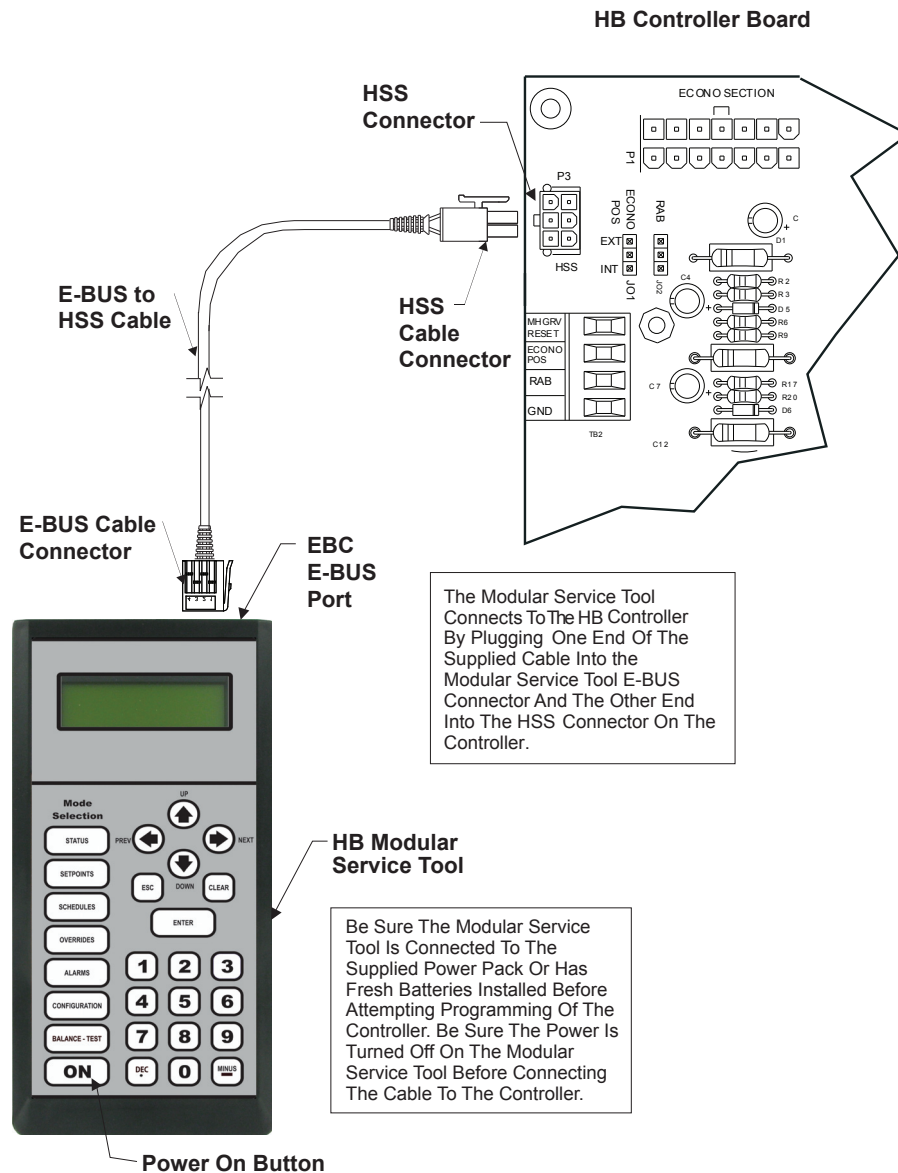


Figure 10: HB Service Tool Connection & Wiring

PROGRAMMING

Modular Service Tool Buttons & Keys

Selection Buttons

The buttons below in **Table 1** are found on the left side of the Service Tool. See **Figure 11** for locations.

Button Description	Function
ON	Pressing this button turns the Service Tool on.
CONFIGURATION	Pressing this button takes you to the Enter Passcode Screen. You must be at the Device Address Screen when pressing this button.
BALANCE-TEST	Pressing this button takes you directly to the controller “Balance-Test” screens.

Table 1: Button Descriptions

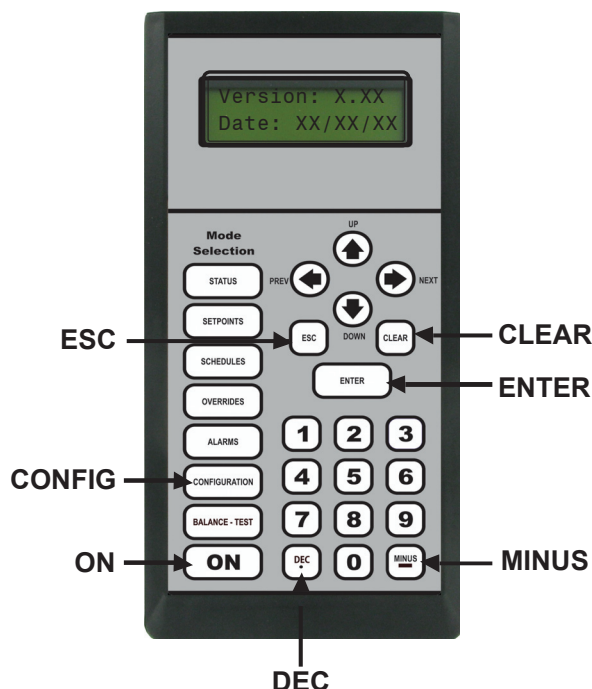


Figure 11: Button Callouts

Display Screens & Data Entry Keys

See the **Table 2** below for a list of the keypad descriptions and functions. See **Figure 11** for locations.

Keypad Description	Function
ESC	Use this key to go to the previous menu.
ENTER	Use this key to have the service tool accept the value that you entered.
CLEAR	This key turns off the power to the Service Tool.
MINUS	Press this key to decrease number values or back up through the alphabet when entering a passcode.
DEC	Press this key to increase number values or advance through the alphabet when entering a passcode.
← →	Use these keys to move left and right through a value on a screen.
↑ ↓	Use these keys to step backward or forward through the screens or move the cursor to select an item from a screen.

Table 2: Keypad Descriptions

Passcodes & Device Address Screen

Passcode Procedures

The HB Service Tool is equipped with passcode levels based on operator status. The available passcodes are:

- “AAAA” = The default level is 0 for Status
- “OPER” = The Operator is at level 1 for Status and Setpoints
- “CONT” = The Contractor is at level 2 for Status, Setpoints, and Force Modes

If you only want to view status, a passcode is not required. Proceed to the next section **General Procedures**.

If you want to change the passcode in order to change setpoints or Force modes, *press* the **<CONFIGURATION>** key twice at the initial software version screen or once at the *Device Address Screen* and the *Passcode Screen* will be displayed.

Enter Code:
AAAA

The passcode entry screen uses a four-digit alpha passcode. Position the cursor under the first letter field. To select the desired letter, use the **<DEC>** and **<MINUS>** buttons. The **<DEC>** button increases through the alphabet and the **<MINUS>** button decreases. When the desired letter appears, press the right arrow key to advance to the next letter field. Once all four letter fields spell the desired passcode, *press* **<ENTER>**.

Again, if no passcode is entered, the default level is 0 and only allows viewing of the status screens.

General Procedures

The HB Service Tool is used to program setpoints and view the status of the HB controller. It is connected to the HB controller by means of an E-BUS to HSS cable that is supplied with the Service Tool. The cable is connected between the HB Service Tool and the HB controller board. The HB controller must be powered in order for the HB Service Tool to function.

When the HB Service Tool is initially powered up, the program version and the time and date the software was created will be displayed. After the initial power up, this screen only appears when the HB power is removed and then reapplied.

Version: X.XX
Date: XX/XX/XX

Press **<ENTER>** to proceed to the next screen which is the *Device Address Screen*.

Device Address:
064

Line #2 displays the default address for the HB Controller. If equipped with a MHGRV Controller, adjust the address to 065 using the **<DEC>** key. Then proceed to the MHGR programming section on **page 38**. If equipped with the HB Processor, adjust the address to 066 using the **<DEC>** key. Then proceed to the HB Processor programming section on **page 34**.

HB Controller Module Selection Screens

At the Device Address Screen with the default 064 address, *press* **<ENTER>** and the HB Service Tool will check all current parameters. When it has finished this checking procedure, the *Device Name Screen* will be displayed.

Device Name
HB

Line #2 displays HB for the HB Controller. *Press* **<ENTER>** to advance. All of the HB controller Status and Setpoint Screens are grouped in specific modules designated by a specific function name.

Main Status
Fan Module

Cooling Module
Heating Module

EconomizerModule
DehumidifyModule

Alarms
Force Mode

Factory Options
Heat Pump Module

Using the Up and Down arrows, scroll to select the desired module on line #1 and *press* **<ENTER>**. Factory Options should not be accessed without contacting AAON® or WattMaster.

Warning: The Factory Options settings should only be applied when authorized by AAON® or WattMaster Technical Support personnel. Serious damage to the controller and/or HVAC unit could result from improper use of the Factory settings.

HB Controller Main Status Screens

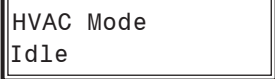
HB Controller Status & Setpoints

The Status and Setpoint screens for the various modules are accessed by selecting a specific module and *pressing* **<ENTER>**. Press **<ESC>** to return to the *Module Selection Screens*.

Main Status Screens

The *Main Status Screens* are accessed by selecting the Main Status Module and *pressing* **<ENTER>**. This screen, as its name indicates, allows you to view the Main Status screens for the HB controller. Press the down arrow key or up arrow key to move forward or backward through the *Main Status Screens*.

HVAC Mode

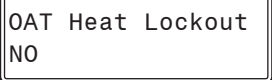


HVAC Mode
Idle

Line #2 displays one of the following HVAC Modes:

- Idle
- Cooling
- Heating
- Econo Dehumidify
- Force
- Venting
- Econo Cooling
- Dehumidify
- Fault

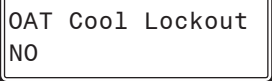
OAT Heat Lockout



OAT Heat Lockout
NO

Line #2 displays “YES” if the Outdoor Air Temperature is above the Heating Lockout Temperature Setpoint.

OAT Cool Lockout



OAT Cool Lockout
NO

Line #2 displays “YES” if the Outdoor Air Temperature is below the Cooling Lockout Temperature Setpoint.

OAT Temperature



OAT
XXX F

Line #2 displays the current Outdoor Air Temperature.


SAT Temperature



SAT
XXX F

Line #2 displays the current Supply Air Temperature.

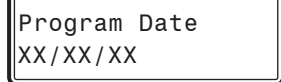
Alarms



Alarms
NO

Line #2 displays “YES” if an alarm is active. To identify the active alarm(s), *press* **<ESC>** to return to the *Module Section Screens*, select the Alarm Module, and scroll through the available alarms using the up and down arrow keys. Please see **page 30** for the *Alarm Status Screens*.

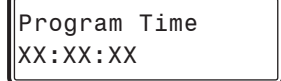
Program Date



Program Date
XX/XX/XX

Line #2 displays the Month/Day/Year that the HB Controller software was created.

Program Time



Program Time
XX:XX:XX

Line #2 displays the time, in 24-hour (military) format, that the HB Controller software was created.

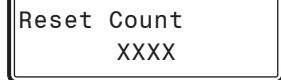
Program Version



Program Version
X.XX

Line #2 displays the HB Controller software version number.

Reset Count



Reset Count
XXXX

Line #2 displays the total number of times the HB Controller has been reset or has had its power cycled.

Press **<ESC>** to return to the *Module Selection Screens*.

HB Controller Fan Module Status & Setpoint Screens

Fan Module Status Screens

The *Fan Module Status Screens* are accessed by navigating to the Fan Module and pressing **<ENTER>**. The following screen will then appear:

```
Status
Setpoints
```

Select “Status” by pressing **<ENTER>**. Press the up and down arrow keys to move forward and backward through the *Fan Module Status Screens*.

Fan Terminal Active

```
G-Active
NO
```

Line #2 displays “YES” if there is a 24 VAC signal connected to the “G” Fan terminal on the HB controller.

Fan Status

```
Fan Status
Fan Off
```

Line #2 displays the current Supply Fan Status. If the Supply Fan is on, line #2 displays either “Fan Low Speed” or “Fan High Speed.” Line #2 displays “ON” if the High Speed Fan Relay is active.

Supply Fan Analog Output Signal

```
Fan Signal
X.XX V
```

Line #2 displays the current Supply Fan Analog Output Signal in DC Volts.

Press **<ESC>** to return to the *Fan Module Selection Screens*.

Fan Module Setpoint Screens

The *Fan Module Setpoint Screens* are accessed by navigating to the Fan Module and then pressing **<ENTER>**. You must have passcode clearance to access setpoints. The following screen will then appear:

```
Status
Setpoints
```

Press the down arrow key until “Setpoints” is on the top line of the screen and then press **<ENTER>**. Press the up and down arrow keys to move forward and backward through the *Fan Setpoint Screens*.

Please see the **Appendix** section in the back of this manual for tables listing the minimum, maximum, and default setpoints for all of the setpoint screens.

Supply Fan Configuration

```
Fan Config
Two-Speed
```

Select the appropriate Supply Fan Configuration by using the up and down ADJUST arrow keys and then pressing **<ENTER>**. Available options are Two-Speed or Adj. Two-Speed.

Adjustable Two-Speed Supply Fan Low-Speed Signal

```
Low Speed Signal
XX.XX V
```

Description	Min.	Default	Max.
Low Speed Fan Signal	1.0 VDC	3.0 VDC	10.0 VDC

Adjust the desired Low-Speed Output Signal for Adjustable Two-Speed Fan configurations by pressing the **<DEC>** or **<MINUS>** key until the desired value is displayed and then pressing **<ENTER>**. Settings are in DC Volts.

Adjustable Two-Speed Supply Fan High Speed Signal

```
High Speed Signal
XX.XX V
```

Description	Min.	Default	Max.
High Speed Fan Signal	1.0 VDC	10.0 VDC	10.0 VDC


Adjust the desired High-Speed Output Signal for Adjustable Two-Speed Fan configurations by pressing the **<DEC>** or **<MINUS>** key until the desired value is displayed and then pressing **<ENTER>**. Settings are in DC Volts.

Press **<ESC>** twice to return to the *Main Module Selection Screens*.

HB Controller Cooling Module Status Screens

Cooling Module Status Screens

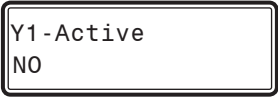
The *Cooling Module Status Screens* are accessed by navigating to the *Cooling Module Screen* from the *Main Module Selection Screens* and pressing **<ENTER>**. The following screen will then appear:



Status
Setpoints

Select “Status” by pressing **<ENTER>**. Press the up and down arrow keys to move forward and backward through the *Cooling Module Status Screens*.

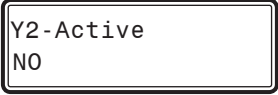
Cooling Stage 1 Energized



Y1-Active
NO

Line #2 displays “YES” if there is a 24 VAC signal on HB Controller terminal “Y1.”


Cooling Stage 2 Energized



Y2-Active
NO

Line #2 displays “YES” if there is a 24 VAC signal on HB Controller terminal “Y2.”


Fan Status



Fan Status
Fan Off

Line #2 displays the current Supply Fan Status. If the Supply Fan is on, line #2 displays either “Fan Low Speed” or “Fan High Speed.”

Fan Signal



Fan Signal
XX.XX V

Line #2 displays the current Supply Fan Analog Output Signal in DC Volts.


Cooling Relay #1



Cool 1 Relay
OFF

Line #2 displays “ON” if Cooling Relay #1 is active.


Cooling Relay #2



Cool 2 Relay
OFF

Line #2 displays “ON” if Cooling Relay #2 is active.


Liquid Line Temperature



LLT
XX F

Line #2 displays the current Liquid Line Temperature.

Condenser Fan Relay



Cond Fan Relay
OFF

Line #2 displays “ON” if the Condenser Fan Relay is active.

Low Pressure Switch



LPS
OPEN

Line #2 displays the current status of the Low Pressure Switch. It will only display “CLOSED” when Cooling Relay #1 is active and the Low Pressure Switch is operating correctly.

High Pressure Switch



HPS
OPEN

Line #2 displays the current status of the High Pressure Switch. It will only display “CLOSED” when Cooling Relay #1 relay is active and the High Pressure Switch is operating correctly.

Press **<ESC>** to return to the *Cooling Module Screens*.

HB Controller Cooling Module Setpoint Screens

Cooling Module Setpoint Screens

The *Cooling Module Setpoint Screens* are accessed by navigating to the Cooling Module screen and then *pressing* **<ENTER>**. You must have passcode clearance to access setpoints. The following screen will then appear:

Status
Setpoints

Press the down arrow key until “Setpoints” is on the top line of the screen and then *press* **<ENTER>**. Press the up and down arrow keys to move forward and backward through the *Cooling Module Setpoint Screens*.

Cooling Stages Quantity

Cool Stages
X

Description	Min.	Default	Max.
Cooling Stages	1	2	2

Adjust the quantity of Cooling Stages or Steps of Cooling by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Condenser Fan Control

Cond Fan Control
NO

Select “YES” for Condenser Fan Control if you are using a Liquid Line Temperature Sensor by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Outdoor Air Temperature Cooling Lockout

OAT Cool Lockout
XXX F

Description	Min.	Default	Max.
Cooling Lockout Temperature	32°F	40°F	80°F

Adjust the Outdoor Air Temperature Cooling Lockout by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Low Supply Air Temperature Cutoff

Low SAT Cutoff
XXX F

Description	Min.	Default	Max.
Supply Air Low Temperature Limit Cut Off	32°F	40°F	80°F

Adjust the Low Supply Air Temperature Cutoff by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**. The value must be below the Economizer Oat Enable.

Cooling Minimum Off Time

Cool Min Off
XXX Sec

Description	Min.	Default	Max.
Minimum Off Time	180 Sec	180 Sec	900 Sec

Adjust the desired Cooling Minimum Off Time by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Cooling Minimum On Time

Cool Min On
XXX Sec

Description	Min.	Default	Max.
Minimum On Time	300 Sec	300 Sec	900 Sec

Adjust the desired Cooling Minimum On Time by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Cooling Stage-Up Delay

Cool Stage Up
XXX Sec

Description	Min.	Default	Max.
Staging Up Delay Interval	180 Sec	180 Sec	900 Sec

Adjust the desired Cooling Stage-Up Delay time by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

PROGRAMMING

HB Controller Cooling Module Setpoint Screens

Cooling Stage Down Delay

Cool Stage Down
XXX Sec

Description	Min.	Default	Max.
Staging Down Delay Interval	60 Sec	60 Sec	900 Sec

Adjust the desired Cooling Stage-Down Delay time by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Low Pressure Switch Delay

LPS Delay
XXX Sec

Description	Min.	Default	Max.
Low Pressure Delay Period	5 Sec	30 Sec	60 Sec

The Low Pressure Switch Delay time is a factory setting and should not be changed unless authorized to do so by WattMaster or AAON® Technical Support.

Low Pressure Switch Safety Delay

LPS Safety
XX Sec

Description	Min.	Default	Max.
Low Pressure Safety	5 Sec	5 Sec	30 Sec

The Low Pressure Switch Safety Delay time is a factory setting and should not be changed unless authorized to do so by WattMaster or AAON® Technical Support.

LPS Maximum Trips

LPS Max trips
XX

Description	Min.	Default	Max.
Low Pressure Max. Trip Point	1	3	5

The Low Pressure Switch Max Trips is a factory setting and should not be changed unless authorized to do so by WattMaster or AAON® Technical Support.

Cooling Fan Off Delay

Cool Fan Off
Dly

Description	Min.	Default	Max.
Fan Off Delay Period	1 Sec	45 Sec	120 Sec

The Cooling Fan Off Delay is a factory setting and should not be changed unless authorized to do so by WattMaster or AAON® Technical Support.

Condenser Fan Activation Temperature

Cond Fan On
XXX F

The Condenser Fan Activation Temperature is a factory setting and should not be changed unless authorized to do so by WattMaster or AAON® Technical Support.

Condenser Fan Deactivation Temperature

Cond Fan Off
XXX F

The Condenser Fan Deactivation Temperature is a factory setting and should not be changed unless authorized to do so by WattMaster or AAON® Technical Support.

Auto Stage-Up Time

Auto Stage Up
XXX Sec

Description	Min.	Default	Max.
Auto Staging Up Delay	180 Sec	600 Sec	900 Sec

The Auto Stage-Up Time can be adjusted on this screen when you are using a single-stage thermostat with a multi-stage HB unit. Adjust the value by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Press **<ESC>** twice to return to the *Main Module Selection Screens*.

HB Controller Heating Module Status & Setpoint Screens

Heating Module Status Screens

The *Heating Module Status Screens* are accessed by navigating to the Heating Module screen and pressing **<ENTER>**. The following screen will then appear:

```
Status
Setpoints
```

Select "Status" by pressing **<ENTER>**. Press the up and down arrow keys to move forward and backward through the *Heating Module Status Screens*.

Heating Stage 1 Energized

```
W1-Active
NO
```

Line #2 displays "YES" if there is a 24 VAC signal on HB Controller terminal "W1."

Heating Stage 2 Energized

```
W2-Active
NO
```

Line #2 displays "YES" if there is a 24 VAC signal on HB Controller terminal "W2."

Heating Stage 3 Energized

```
W3 Active
NO
```

Line #2 displays "YES" if there is a 24 VAC signal on HB Controller terminal "W3."

Fan Status

```
Fan Status
Fan Off
```

Line 2 displays the current Supply Fan Status. If the Supply Fan is on, line #2 displays either "Fan Low Speed" or "Fan High Speed."

Fan Signal

```
Fan Signal
XX.XX V
```

Line #2 displays the current Supply Fan Analog Output Signal in DC Volts.

Heating Relay #1

```
Heat 1 Relay
OFF
```

Line #2 displays "ON" if Heating Relay #1 is active.

Heating Relay #2

```
Heat 2 Relay
OFF
```

Line #2 displays "ON" if Heating Relay #2 is active.

Heating Relay #3

```
Heat 3 Relay
OFF
```

Line #2 displays "ON" if Heating Relay #3 is active.

Heat Safety Monitor

```
HSM
CLOSED
```

Line #2 displays "OPEN" anytime the Heat Safety Monitor is open.

Press **<ESC>** to return to the *Heating Module Selection Screen*.

Heating Module Setpoint Screens

The *Heating Module Setpoint Screens* are accessed by navigating to the Heating Module and then pressing **<ENTER>**. The following screen will then appear:

```
Status
Setpoints
```

Press the down arrow key until "Setpoints" is on the top line of the screen and then press **<ENTER>**. Press the up and down arrow keys to move forward and backward through the *Heating Module Setpoint Screens*.

Heating Stages Quantity

```
Heat Stages
X
```

Description	Min.	Default	Max.
Heating Stages	1	3	3

Adjust the quantity of Heating Stages by pressing the **<DEC>** or **<MINUS>** key and then press **<ENTER>**.

PROGRAMMING

HB Controller Heating Module Setpoint Screens

Outdoor Air Temperature Heating Lockout

OAT Heat Lockout
XXX F

Description	Min.	Default	Max.
Heating Lockout Temperature	40°F	80°F	120°F

Adjust the Outdoor Air Temperature Heating Lockout by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Low Supply Air Temperature Cutoff

Low SAT Cutoff
XXX F

Description	Min.	Default	Max.
Supply Air Low Temperature Limit Cut Off	32°F	40°F	80°F

Adjust the Low Supply Air Temperature Cutoff by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

High Supply Air Temperature Cutoff

High SAT Cutoff
XXX F

Description	Min.	Default	Max.
Supply Air High Temperature Limit Cut Off	120°F	150°F	170°F

Adjust the High Supply Air Temperature Cutoff by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Heating Minimum Off Time

Heat Min Off
XXX Sec

Description	Min.	Default	Max.
Minimum Off Time	60 Sec	60 Sec	900 Sec

Adjust the desired Heating Minimum Off Time by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Heating Minimum On Time

Heat Min On
XXX Sec

Description	Min.	Default	Max.
Minimum On Time	120 Sec	120 Sec	900 Sec

Adjust the desired Heating Minimum On Time by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Heating Stage-Up Delay

Heat Stage Up
XXX Sec

Description	Min.	Default	Max.
Staging Up Delay Interval	180 Sec	180 Sec	900 Sec

Adjust the desired Heating Stage-Up Delay time by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Heating Stage Down Delay

Heat Stage Down
XXX Sec

Description	Min.	Default	Max.
Staging Down Delay Interval	60 Sec	60 Sec	900 Sec

Adjust the desired Heating Stage Down Delay time by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Heat Safety Monitor Maximum Trips

HSM Max Trips
X

Description	Min.	Default	Max.
Heat Safety Maximum Count	1	3	5

The Heating Safety Maximum Trips is a factory setting and should not be changed unless authorized to do so by WattMaster or AAON® Technical Support.

Heating Fan Off Delay

Heat Fan Off Dly
XXX Sec

Description	Min.	Default	Max.
Fan Off Delay Period	1 Sec	120 Sec	180 Sec

The Heating Fan Off Delay is a factory setting and should not be changed unless authorized to do so by WattMaster or AAON® Technical Support.

Auto Stage-Up Time

Auto Stage Up
XXX Sec

Description	Min.	Default	Max.
Auto Staging Up Delay	180 Sec	600 Sec	900 Sec

The Auto Stage-Up Time can be adjusted on this screen when you are using a single-stage thermostat with a multi-stage HB unit.

HB Controller Economizer Module Status & Setpoint Screens

Economizer Module Status Screens

The *Economizer Module Status Screens* are accessed by navigating to the Economizer Module and *pressing* **<ENTER>**. The following screen will then appear:

Status
Setpoints

Select “Status” by *pressing* **<ENTER>**. *Press* the up and down arrow keys to move forward and backward through the *Economizer Module Status Screens*.

Economizer Current Position

Economizer
XXX %

Line #2 displays the current Economizer Position as a percent open value.

Supply Air Temperature

SAT
XXX F

Line #2 displays the current Supply Air Temperature.

Outdoor Air Temperature

OAT
XX F

Line #2 displays the current Outdoor Air Temperature.

Fan Status

Fan Status
Fan Off

Line #2 displays the current Supply Fan status. If the Supply Fan is on, line #2 displays either “Fan Low Speed” or “Fan High Speed.”

Fan Signal

Fan Signal
XX.XX V

Line #2 displays the current Supply Fan Analog Output Signal in DC Volts.

Exhaust Fan Relay

Exhaust Fan Rly
OFF

Line #2 displays “ON” when the Exhaust Fan Relay is active.

Carbon Dioxide Level

C02
XXXX ppm

Line #2 displays the Current Carbon Dioxide levels, given in parts per million.

Economizer Change Over Switch

ECS
OPEN

Line #2 displays “CLOSED” if there is a 24 VAC signal on the Economizer Changeover Switch input. This signal is provided by an Enthalpy controller to enable the economizer for free Cooling.

Press **<ESC>** to return to the *Economizer Module Selection Screen*.

Economizer Module Setpoint Screens

The *Economizer Module Setpoint Screens* are accessed by navigating to the Economizer Module and then *pressing* **<ENTER>**. The following screen will then appear:

Status
Setpoints

Press the down arrow key until “Setpoints” is on the top line of the screen and then *press* **<ENTER>**. You must have passcode clearance to access setpoints. *Press* the up and down arrow keys to move forward and backward through the *Economizer Module Setpoint Screens*.

Economizer Configuration

Econo Config
Has Economizer

Description	Min.	Default	Max.
Outdoor Air Enable Temp	33°F	55°F	65°F

Select either “Has Economizer” or “No Economizer” and then *press* **<ENTER>**. The value must be greater than the OAT Lockout.

Outdoor Air Temperature Enable

OAT Enable
XX F

Description	Min.	Default	Max.
Outdoor Air Enable Temp	33°F	55°F	65°F

Adjust the Outdoor Air Temperature to enable Economizer Free Cooling by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

PROGRAMMING

HB Controller Economizer Module Setpoint Screens

OAT Changeover to Mechanical Cooling

ECS OAT Enable
XX F

Description	Min.	Default	Max.
ECS OAT Enable Temp	55°F	65°F	75°F

Adjust the Outdoor Air Temperature that will allow supplemental Mechanical Cooling during ECS Economizer operation by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

CO₂ Minimum Position with Low-Speed Fan

CO2MinPosLSpdFan
XXX %

Description	Min.	Default	Max.
Min. with Low-Speed Fan	0%	10%	100%

Adjust the Economizer Minimum Position during Low-Speed Supply Fan operation when CO₂ levels are below the Minimum CO₂ setpoint by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

CO₂ Minimum Position with High-Speed Fan

CO2MinPosHSpdFan
XXX %

Description	Min.	Default	Max.
Min. with High-Speed Fan	0%	5%	100%

Adjust the Economizer Minimum Position during High-Speed Supply Fan operation when CO₂ levels are below the Minimum CO₂ setpoint by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

CO₂ Maximum Position with Low Speed Fan

CO2MaxPosLSpdFan
XXX %

Description	Min.	Default	Max.
Max. with Low-Speed Fan	0%	50%	100%

Adjust the Economizer Maximum Position during Low-Speed Supply Fan operation when CO₂ levels are above the Maximum CO₂ setpoint by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

CO₂ Maximum Position with High-Speed Fan

CO2MaxPosHSpdFan
XXX %

Description	Min.	Default	Max.
Max. with High Speed Fan	0%	30%	100%

Adjust the Economizer Maximum Position during High-Speed Supply Fan operation when CO₂ levels are above the Maximum CO₂

setpoint by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Exhaust Fan On with Low-Speed Fan

ExFanOnEco%@LFan
XXX %

Description	Min.	Default	Max.
Low-Speed Supply Fan	0%	50%	100%

Adjust the Economizer Position during Low-Speed Supply Fan operation that will activate the Exhaust Fan by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Exhaust Fan On with High-Speed Fan

ExFanOnEco%@HFan
XXX %

Description	Min.	Default	Max.
High-Speed Supply Fan	0%	30%	100%

Adjust the Economizer Position during High-Speed Supply Fan operation that will activate the Exhaust Fan by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

CO₂ Level Economizer Opens Above Minimum

Min CO2
XXXX ppm

Description	Min.	Default	Max.
Min. CO ₂	0 PPM	900 PPM	2000 PPM

Adjust the Minimum CO₂ Level that will allow the Economizer to Modulate above its minimum position by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

CO₂ Level Economizer Opens to Economizer Maximum

Max CO2
XXXX ppm

Description	Min.	Default	Max.
Max. CO ₂	0 PPM	1100 PPM	2000 PPM

Adjust the Maximum CO₂ Level that will allow the Economizer to Modulate open to its maximum position by *pressing* the **<DEC>** or **<MINUS>** key and then *press* **<ENTER>**.

Press **<ESC>** twice return to the Main Module Selection Screens.

HB Controller Dehumidify Module Status Screens

Dehumidify Module Status Screens

The *Dehumidify Module Status Screens* are accessed by navigating to the Dehumidify Module and *pressing <ENTER>*. Setpoints are not available for the Dehumidify Module. After *pressing <ENTER>*, the following screen will appear:

RH Terminal Active

```
RH-Active
NO
```

Line #2 displays “YES” if there is a 24 VAC signal on the “RH” terminal.

Fan Status

```
Fan Status
Fan Off
```

Line #2 displays the current Supply Fan Status. If the Supply Fan is on, Line #2 displays either “Fan Low Speed” or “Fan High Speed.”

Fan Signal

```
Fan Signal
XX.XX V
```

Line #2 displays the current Supply Fan Analog Output Signal in DC Volts.

RAB Position

```
RAB Position
XXX%
```

Line #2 displays the current Return Air Bypass damper position.

Cooling Relay #1

```
Cool 1 Relay
OFF
```

Line #2 displays “ON” if Cooling Relay #1 is active.

Cooling Relay #2

```
Cool 2 Relay
OFF
```

Line #2 displays “ON” if Cooling Relay #2 is active.

OAT Temperature

```
OAT
XXX F
```

Line #2 displays the current Outdoor Air Temperature.

Economizer Current Position

```
Economizer
XXX%
```

Line #2 displays the current Economizer Position as a percent open value.

Supply Air Temperature

```
SAT
XXX F
```

Line #2 displays the current Supply Air Temperature.

Liquid Line Temperature

```
LLT
XXX F
```

Line #2 displays the current Liquid Line Temperature.

Condenser Fan Relay

```
Cond Fan Relay
OFF
```

Line #2 displays “ON” if the Condenser Fan Relay is active.

Press <ESC> twice to return to the Main Module Selection Screens.

HB Controller Alarm Module Status Screens

Alarm Module Status Screens

The *Alarm Module Status Screens* are accessed by navigating to the Alarm Module and then *pressing <ENTER>*. Setpoints are not available for the Alarm Module. After *pressing <ENTER>*, the following screen will appear:

HSM Lockout

HSM Lockout
NO

Line #2 displays “YES” when the Heat Safety Monitor has tripped more than the HSM Max Trips setpoint.

HPS Fault

HPS Fault
NO

Line #2 displays “YES” when the High Pressure Switch is open and a Cooling Relay is active.

LPS Lockout

LPS Lockout
NO

Line #2 displays “YES” when the Low Pressure Switch has tripped more than the LPS Max Trips setpoint.

Bad OAT Sensor

Bad OAT
NO

Line #2 displays “YES” when the Outdoor Air Temperature Sensor is bad or missing.

Bad SAT Sensor

Bad SAT
NO

Line #2 displays “YES” when the Supply Air Temperature Sensor is bad or missing.

Bad LLT

Bad LLT
NO

Line #2 displays “YES” when Condenser Fan Control is configured and the Liquid Line Temperature Sensor is bad or missing.

High SAT Cutoff

High SAT Cutoff
NO

Line #2 displays “YES” when the HB Controller is locked out in High Supply Air Temperature Cutoff.

Low SAT Cutoff

Low SAT Cutoff
NO

Line #2 displays “YES” when the HB Controller is locked out in Low Supply Air Temperature Cutoff.

OAT Cooling Lockout

OAT Cool Lockout
NO

Line #2 displays “YES” if the Outdoor Air Temperature is below the Cooling Lockout Temperature setpoint.

OAT Heating Lockout

OAT Heat Lockout
NO

Line #2 displays “YES” if the Outdoor Air Temperature is above the Heating Lockout Temperature setpoint.

Clogged Filter

Clogged Filter
NO

Line #2 displays “YES” if there is a 24 VAC signal on the Clogged Filter Input.

Press **<ESC>** twice return to the *Main Module Selection Screens*.

HB Controller Force Mode Screens

Force Mode Screens

The *Force Mode Screens* are accessed by navigating to the *Force Mode Module Screen* and pressing **<ENTER>**. The following screen will appear:

Force
Setpoints

Press the down arrow key until “Force” is on the top line of the screen and then press **<ENTER>**. You must have pass-code clearance to access force modes. Press the up and down arrow keys to move forward and backward through the *Force Mode Screens*.

Force Time Limit

Force Time Limit
XXX Min

Description	Min.	Default	Max.
Force Mode Timer	1 Min	60 Min	240 Min

Adjust the desired time needed for forcing the HB Controller into the Force Module Mode by pressing the **<DEC>** or **<MINUS>** key and then press **<ENTER>**.

Force Mode

Force Mode
Stop

Use the **<DEC>** or **<MINUS>** key to adjust to select “Start” and then press **<ENTER>** to enter Force Mode. Use the **<DEC>** or **<MINUS>** key to adjust to select “Stop” and then press **<ENTER>** to end Force Mode.

Fan Speed Force

Fan Speed
Low Speed

Use the **<DEC>** or **<MINUS>** key to select “Low Speed” and then press **<ENTER>** to place the Supply Fan in Low-Speed operation. Use the **<DEC>** or **<MINUS>** key to select “High Speed” and then press **<ENTER>** to place the Supply Fan in High-Speed operation.

Fan Signal Force

Force Fan Signal
XX.XX V

Use the **<DEC>** or **<MINUS>** key to adjust the Fan Signal Voltage signal up or down to speed up or slow down the Supply Fan and then press **<ENTER>**.

Economizer Force

Force Economizer
X %

Use the **<DEC>** or **<MINUS>** key to adjust the Economizer percentage up or down to position the Economizer where needed and then press **<ENTER>**.

Return Air Bypass Force

Force RAB
X %

Use the **<DEC>** or **<MINUS>** key to adjust the Return Air Bypass Damper percentage up or down to position the Return Air Bypass where needed and then press **<ENTER>**.

Exhaust Fan Relay Force

Ex Fan Relay
OFF

Use the **<DEC>** key to select “ON” to activate the Exhaust Fan Relay and then press **<ENTER>**.

Condenser Fan Relay Force

Cond Fan Relay
OFF

Use the **<DEC>** key to select “ON” to activate the Condenser Fan Relay and then press **<ENTER>**.

Cooling Relay #1 Force

Cool 1 Relay
OFF

Use the **<DEC>** key to select “ON” to activate Cooling Relay #1 and then press **<ENTER>**.

Cooling Relay #2 Force

Cool 2 Relay
OFF

Use the **<DEC>** key to select “ON” to activate Cooling Relay #2 and then press **<ENTER>**.

PROGRAMMING

HB Controller Force Mode & Force Mode Setpoint Screens

Heating Relay #1 Force

Heat 1 Relay
OFF

Use the **<DEC>** key to select “ON” to activate Heating Relay #1 and then press **<ENTER>**.

Heating Relay #2 Force

Heat 2 Relay
OFF

Use the **<DEC>** key to select “ON” to activate Heating Relay #2 and then press **<ENTER>**.

Heating Relay #3 Force

Heat 3 Relay
OFF

Use the **<DEC>** key to select “ON” to activate Heating Relay #3 and then press **<ENTER>**.

Press **<ESC>** to return to the *Force Mode Screen*.

Force Mode Setpoint Screens

The *Force Mode Setpoint Screens* are accessed by navigating to the *Force Mode Screen*. Press the down arrow key until “Setpoints” is on the top line of the screen and then press **<ENTER>**. You must have passcode clearance to access force modes. The following screen will appear:

Low-Speed Fan Signal

Low Speed Signal
XX.XX V

Description	Min.	Default	Max.
Low-Speed Fan Signal	1.0 VDC	3.0 VDC	10.0 VDC

Use the **<DEC>** or **<MINUS>** key to adjust the Low-Speed Supply Fan Signal and then press **<ENTER>**.

High-Speed Fan Signal

High Speed Signal
XX.XX V

Description	Min.	Default	Max.
High-Speed Fan Signal	1.0 VDC	10.0 VDC	10.0 VDC

Use the **<DEC>** or **<MINUS>** key to adjust the High-Speed Supply Fan Signal and then press **<ENTER>**.

CO₂ Minimum Position with Low-Speed Fan

CO2MinPosLSpdFan
XXX %

Description	Min.	Default	Max.
Min. with Low-Speed Fan	0%	10%	100%

Use the **<DEC>** or **<MINUS>** key to adjust the economizer minimum position during Low-Speed Supply Fan operation when CO₂ levels are below the Minimum CO₂ setpoint and then press **<ENTER>**.

CO₂ Minimum Position with High-Speed Fan

CO2MinPosHSpdFan
XXX %

Description	Min.	Default	Max.
Min. with High-Speed Fan	0%	5%	100%

Use the **<DEC>** or **<MINUS>** key to adjust the economizer minimum position during High-Speed Supply Fan operation when CO₂ levels are below the minimum CO₂ setpoint and then press **<ENTER>**.

CO₂ Maximum Position with Low-Speed Fan

CO2MaxPosLSpdFan
XXX %

Description	Min.	Default	Max.
Max. with Low-Speed Fan	0%	50%	100%

Use the **<DEC>** or **<MINUS>** key to adjust the Economizer Maximum Position during Low-Speed Supply Fan operation when CO₂ levels are above the Maximum CO₂ setpoint and press **<ENTER>**.

CO₂ Maximum Position with High-Speed Fan

CO2MaxPosHSpdFan
XXX %

Description	Min.	Default	Max.
Max. with High-Speed Fan	0%	30%	100%

Use the **<DEC>** or **<MINUS>** key to adjust the Economizer Maximum Position during High-Speed Supply Fan operation when CO₂ levels are above the Maximum CO₂ setpoint and press **<ENTER>**.

HB Controller Factory Options Screens

Exhaust Fan On with Low-Speed Fan

ExFanOnEco%@LFan
XXX %

Description	Min.	Default	Max.
Low-Speed Supply Fan	0%	50%	100%

Use the **<DEC>** or **<MINUS>** key to adjust the Economizer position during Low-Speed Supply Fan operation that will activate the Exhaust Fan and then *press* **<ENTER>**.

Exhaust Fan On with High-Speed Fan

ExFanOnEco%@HFan
XXX %

Description	Min.	Default	Max.
High-Speed Supply Fan	0%	30%	100%

Use the **<DEC>** or **<MINUS>** key to adjust the Economizer position during High-Speed Supply Fan operation that will activate the Exhaust Fan and then *press* **<ENTER>**.

Press **<ESC>** twice return to the *Main Module Selection Screens*.

Force No Limit

Force No Limit
No

Use the **<DEC>** key to adjust this setting to “Yes” to override all factory limits to timers, etc. and then *press* **<ENTER>**. This function requires high-level passcode access. This passcode can only be obtained by calling AAON or WattMaster Technical Support.

Force Defaults

Force Defaults
No

Use the **<DEC>** key to adjust this setting to “Yes” to restore all factory limits to timers, etc. and then *press* **<ENTER>**. This function requires high-level passcode access. This passcode can only be obtained by calling AAON or WattMaster Technical Support.

Factory Options Module Screens

Factory Options should not be accessed without contacting AAON® or WattMaster.

Warning: The Factory Options settings should only be applied when authorized by AAON® or WattMaster Technical Support personnel. Serious damage to the controller and/or HVAC unit could result from improper use of these settings.

The *Factory Options Module Screens* are accessed by navigating to the *Factory Option Screen* and then *pressing* **<ENTER>**. The following screen will then appear:

Force Time Limit

Force Time Limit
XXX Min

Description	Min.	Default	Max.
Force Mode Timer	1 Min	60 Min	240 Min

Use the **<DEC>** or **<MINUS>** key to adjust the desired time needed for forcing the HB Controller into the Force Mode and then *press* **<ENTER>**.

HB Processor Main Selection & Status Screens

HB Processor Board

HB Processor Main Selection Screens

If your HB Controller is equipped with the HB Processor board, you can access the available Status and Setpoint screens by using the programming directions that follow.

At the *Device Address Screen* with the default 064 address, use the **<DEC>** key to change the device address to 066 to access the HB Processor screens.

Device Address:
066

Press **<ENTER>** and the HB Service Tool will check all current parameters. When it has finished this checking procedure, the *Device Name Screen* will be displayed.

Device Name
HB Processor

Line #2 displays the HB Processor name. Press **<ENTER>** to advance to the *HB Processor Main Selection Screens*. All of the HB Processor Status and Setpoint Screens are grouped in specific modules designated by a specific function name. Certain screens need passcode clearance to access them.

NOTE: The Week Schedule, Holiday Schedule, and Real Time Clock need to be configured using Prism 2 software.

Main Status
Setpoints

Force
Command Status

Schedule Status
Week Schedule

Holiday Schedule
Real Time Clock

Using the Up and Down arrows, scroll to select the desired menu on line #1 and press **<ENTER>**.

HB Processor Main Status Screens

Select “Main Status” by pressing **<ENTER>**. Press the up and down arrow keys to move forward and backward through the *Main Status Screens*.

Date and Time

01/16/17 Mon
09:50:24

Line #1 displays the current date inside the HB Processor. Line #2 displays the current time of day inside the HB Processor in 24-hour format. Press **<ENTER>** to continue to the next screen.

Schedule Mode

Schedule Mode
Occupied

Line #2 displays the current Schedule Mode. Options that may be displayed are Occupied, Unoccupied, Force Occupied, Force Unoccupied, Global Occupied, Global Unoccupied, or Override Occupy. Press **<ENTER>** to continue to the next screen.

HVAC Mode

HVAC Mode
Cooling

Line #2 displays the current HVAC Mode when Space Temperature Control is configured. Options that may be displayed are Idle, Venting, Heating, or Cooling. Press **<ENTER>** to continue to the next screen.

Space Temperature

Space Temp
XX.X F

Line #2 displays the current Space Temperature. Press the ENTER key to continue to the next screen.

Cooling Setpoint

Cooling Setpoint
XX.X F

Line #2 displays the current Cooling Setpoint. Press **<ENTER>** to continue to the next screen.

Heating Setpoint

Heating Setpoint
XX.X F

Line #2 displays the current Heating Setpoint. Press **<ENTER>** to continue to the next screen.

HB Processor Status & Setpoint Screens

H/C Demand

```
H/C Demand
  X.X  F
```

Line #2 displays the demand for Heating or Cooling based on the Space Temperature in reference to the Heating or Cooling setpoint. Press **<ENTER>** to continue to the next screen.

Override Left

```
Override Left
  X.X Hr
```

Line #2 displays the Override Time remaining once the Push-Button Override on the Space Temperature Sensor has been activated. Press **<ENTER>** to continue to the next screen.

Slide Adjust

```
Slide Adjust
  X.X  F
```

Line #2 displays the current Slide Adjust value based on the slide position on the Space Temperature Sensor. Press **<ENTER>** to continue to the next screen.

Bad Room Temp

```
Bad Room Temp
NO
```

Line #2 displays “YES” if Space Temperature control has been configured and the Space Temperature Sensor has failed. Press **<ENTER>** to continue to the next screen.

Program Date

```
Program Date
03/24/09
```

Line #2 displays the Date the current Software in the controller was created. Press **<ENTER>** to continue to the next screen.

Program Time

```
Program Time
11:23:39
```

Line #2 displays the Time of Day the current Software in the controller was created. Press **<ENTER>** to continue to the next screen.

Program Version

```
Program Version
  X.XX
```

Line #2 displays the Version of Software in the controller. Press **<ENTER>** to continue to the next screen.

Reset Count

```
Reset Count
  XXX
```

Line #2 displays the number of times the controller has had its power cycled or has restarted. Press **<ENTER>** to continue to the next screen.

Press **<ESC>** to return to the *Main Selection Screens*.

HB Processor Setpoint Screens

The *HB Processor Setpoints Screens* are accessed by navigating to the *Setpoints Screen*. Press the down arrow key until “Setpoints” is on the top line of the screen and then press **<ENTER>**. Press the up and down arrow keys to move forward and backward through the *HB Processor Setpoint Screens*. Some of the Setpoint screens require passcode clearance.

```
Main Status
Setpoints
```

Please see the **Appendix** in the back of this manual for tables listing the minimum, maximum, and default setpoints for all of the setpoint screens.

FRC Schedule

```
Frc Schedule
No FRC
```

Use the **<DEC>** or **<MINUS>** key to adjust for FRC Occupied, FRC Unoccupied, or No FRC, and press **<ENTER>**. If you need 24-hour continuous operation, toggle to FRC Occupied and then press **<ENTER>**.

Space Sensor Control

```
Space Sensr Ctrl
NO
```

Use the **<DEC>** key to adjust for “YES” if a Space Temperature Sensor will be used to activate the HVAC Modes of Operation and then press **<ENTER>**.

Cooling Setpoint

```
Cooling Setpoint
  XX  F
```

Use the **<DEC>** or **<MINUS>** key to adjust for the desired Space Cooling Setpoint and then press **<ENTER>**.

PROGRAMMING

HB Processor Setpoint & Week Schedule Screens

Heating Setpoint

Heating Setpoint
XX F

Use the **<DEC>** or **<MINUS>** key to adjust up or down for the desired Space Heating Setpoint and then press **<ENTER>**.

Cooling Setback

Cooling Setback
XX F

Use the **<DEC>** or **<MINUS>** key to adjust up or down for the desired Night Setback for Cooling and then press **<ENTER>**.

Heating Setback

Heating Setback
XX F

Use the **<DEC>** or **<MINUS>** key to adjust up or down for the desired Night Setback for Heating and then press **<ENTER>**.

HVAC Mode Deadband

HVAC Mode Dbd
X.X F

Use the **<DEC>** or **<MINUS>** key to adjust up or down for the desired HVAC Mode activation point above the Cooling Setpoint and below the Heating Setpoint and then press **<ENTER>**.

Fan Cycle Config

Fan Cycle Config
NO

Use the **<DEC>** key for "YES" if the Supply Fan should only run during a call or Heating or Cooling and then press **<ENTER>**.

Override Time

Override Time
X Hr

Use the **<DEC>** or **<MINUS>** key to adjust up or down for the desired Override Duration when using the push-button on the Space Temperature Sensor and then press **<ENTER>**.

Slide Adjust

Slide Adjust
X F

Use the **<DEC>** or **<MINUS>** key to adjust up or down for the desired Heating and Cooling Setpoints Adjustment when using the slide adjustment on the Space Temperature Sensor and then press **<ENTER>**.

Space Sensor Calibration

Space Sensr Cal
XX.X F

Use the **<DEC>** or **<MINUS>** key to adjust up or down for the desired Space Temperature Sensor Calibration Offset and then press **<ENTER>**.

Press **<ESC>** to return to the *Main Selection Screens*.

HB Processor Week Schedule Screens

Access the *HB Processor Week Schedule Screens* by navigating to the *Week Schedule* in the *Main Selection Screens* and pressing **<ENTER>**. You must have passcode clearance to access these screens.

Day of Week

Sunday
Monday

Using the arrow keys, toggle for the desired day to enter the occupied schedule and then press **<ENTER>**.

Start Time

Mon Start Time 1
08:00

Press the left arrow key once for the hours and the right arrow key once for the minutes. Use the **<DEC>** or **<MINUS>** key to adjust up or down for the correct Start Time for Event #1 and then press **<ENTER>**.

NOTE: Time must always be entered in 24-Hour format. The example shows how an 8:00 A.M. (08:00 Hrs) start time for Event One on Monday would be set.

Stop Time

Mon Stop Time 1
17:00

Press the left arrow key once for the hours and the right arrow key once for the minutes. Use the **<DEC>** or **<MINUS>** key to adjust up or down for the correct Stop Time for Event #1 and then press **<ENTER>**.

NOTE: Start Time #1 and Stop Time #1 are used only when you have one Start/Stop event per day. In most cases, this is all that will be needed. If a second Start/Stop Event is required for any day(s), follow the same procedure as you did for Start/Stop Event #1, but advance to the Start or Stop Time #2 for the day(s) that require the second event.

HB Processor Real Time Clock Screens

HB Processor Real Time Clock Screens

Access the *HB Processor Real Time Clock Screens* by navigating to the *Real Time Clock* in the *Main Selection Screens* and then pressing **<ENTER>**. You must have passcode clearance to access these screens.

Day of Week

Week Day

Monday

Using the arrow keys, toggle for the correct Day of the week and then press **<ENTER>**.

Hour

Hour

15

Use the **<DEC>** and **<MINUS>** keys to adjust up or down for the correct Hour for the time of day and then press **<ENTER>**. As explained earlier, time is always entered in 24-hour format, so 3:00 P.M. would be entered as 15 as shown. Press **<ENTER>** to proceed to the next screen.

Minute

Minute

19

Use the **<DEC>** and **<MINUS>** keys to adjust up or down for the correct Minutes for the time of day and then press **<ENTER>**.

Month

Month

1

Use the **<DEC>** and **<MINUS>** keys to adjust up or down for the correct Month and then press **<ENTER>**.

Day

Day

16

Use the **<DEC>** and **<MINUS>** keys to adjust up or down for the correct Day of the week and then press **<ENTER>**.

Year

Year

17

Use the **<DEC>** and **<MINUS>** keys to adjust up or down for the correct year and then press **<ENTER>**.

Press **<ESC>** to return to the *Main Selection Screens*.

NOTE: To view the new current time and date after setting the real time clock, you will need to navigate back to the *HB Processor Status Screens*. The *Date and Time Screen* will be displayed after selecting *Main Status* for the HB Processor board and pressing **<ENTER>**.

MHGR Controller Status Screens

Hot Gas Reheat Controller

Hot Gas Reheat Status Screens

If your HB Controller is equipped with the HGR Controller board, you can access the Status Screens by using the programming directions that follow. Setpoints and Factory settings are only accessible by the factory.

At the *Device Address Screen* with the default 064 address, use the **<DEC>** key to change the device address to 065 to access the MHGR screens.

Device Address:
065

Press **<ENTER>** and the HB Service Tool will check all current parameters. When it has finished this checking procedure, the *Device Name Screen* will be displayed.

Device Name
HGR

Line #2 displays the HGR controller name. Press **<ENTER>** to advance. The following screen will then appear:

Status
Setpoints

Setpoints are only accessible by the factory for the HGR. Select Status by pressing **<ENTER>**, and the following screen will be displayed. Press the up and down SELECT arrow keys to move forward and backward through the HGR Status screens.

Activate Reheat

Activate Reheat
NO

Line #2 displays “YES” when the HB Controller has requested the Hot-Gas Reheat Controller to run.

HGR Valve Position

HGR Valve Pos
XXX.XX %

Line #2 displays the current opening position of the Hot Gas Reheat Valve from 0 to 100%.

Supply Air Temperature

SAT
XXX F

Line #2 displays the current Supply Air Temperature.

HGR Supply Air Temperature Setpoint

SAT Setpoint
XXX F

Line #2 displays the active Supply Air Temperature setpoint set on the Modulating Hot Gas Reheat controller. During some modes, the SAT Setpoint will be higher or lower than the DIP switch settings.

HGR Supply Air Temperature Reset Signal

SAT Setpoint Rst
XX.X V

Line #2 displays the current 0-to-10 VDC Supply Air Temperature Reset Input Signal.

HGR Program Date

Program Date
XX/XX/XX

Line #2 displays the Month, Day, and Year that the HGR Controller Software was created.

HGR Program Time

Program Time
XX:XX:XX

Line #2 displays the time that the HGR Controller Software was created in military time or 24-hour format.

HGR Controller Program Version

Program Version
X.XX

Line #2 displays the HGR Controller software version number that is currently installed on the controller.

HGR Controller Reset Count

Reset Count
XXXX

Line #2 displays the total number of times the HGR Controller has been reset or has had its power cycled.

Optional MHGRV Module Settings

Supply Air Temperature

You can set the desired Discharge Air Temperature Setpoint using the DIP Switch labeled SETPOINT on the MHGRV Module. See **Figure 12** for location and DIP Switch setting instructions. The MHGRV Module will allow you to set a Supply Air Temperature Setpoint between 50°F and 100°F. If a value of less than 50°F is set, the controller will default to a 50°F Supply Air Temperature Setpoint. A value greater than 100°F will cause the unit to default to a 100°F Supply Air Temperature Setpoint.

Supply Air Temperature Reset Limit

You can reset the Supply Air Temperature Setpoint by supplying a 0-10 VDC control signal to the Reset Input (MHGRV RESET) terminal on the HB controller board. The reset range is determined by the setting configured on the DIP Switch labeled “RESET LIMIT.” See **Figure 12** for location and setting instructions. The controller will reset the Supply Air Temperature Setpoint from the value set on the SETPOINT DIP Switch to the value set on the RESET LIMIT DIP Switch as the Reset Input (RST IN) signal is increased from 0 Volts to 10 Volts.

Example:

We want the Discharge Air Temperature Setpoint to increase from 55°F when the Reset Input signal is at 0 Volts to 75°F when the Reset Input signal is at 10 Volts.

- Set the SETPOINT DIP Switch to 55°F
- Set the RESET LIMIT DIP Switch to 75°F

The discharge air temperature will now increase from 55°F to 75°F as the Reset Input voltage signal ramps from 0 Volts to 10 Volts.

NOTE: It is possible to create a “reverse acting” control sequence. Using the temperatures from the example above by setting the SETPOINT DIP Switch to 75°F and the RESET LIMIT DIP Switch to 55°F, the reset would be reverse acting. In this case, the controller will maintain a 75°F discharge temperature when the Reset Input signal is at 0 Volts and will reduce to 55°F when the Reset Input signal is at 10 Volts.

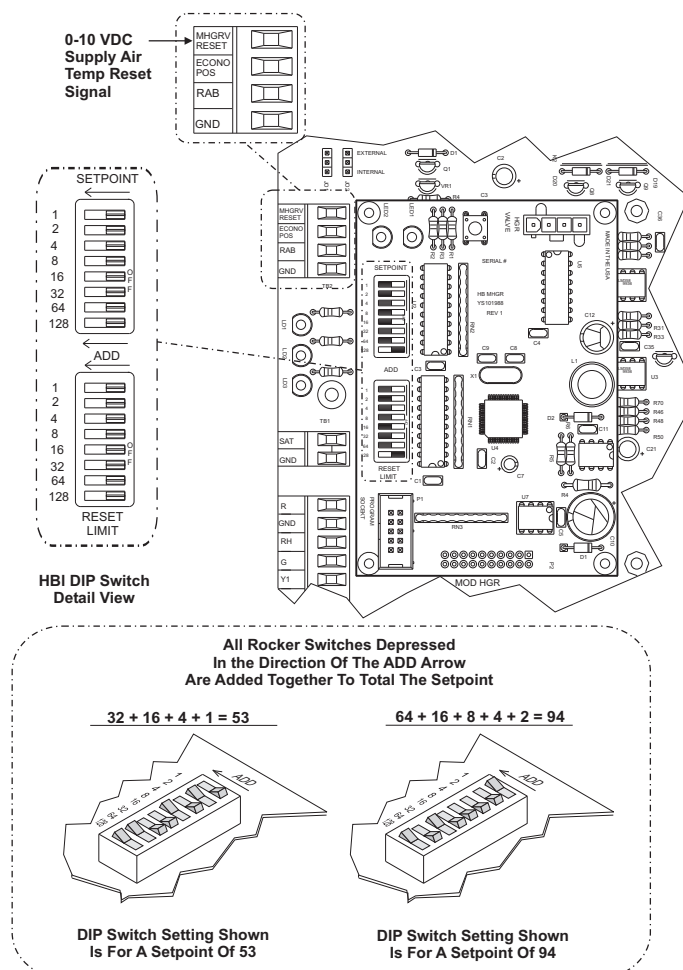


Figure 12: MHGRV DIP Switch Setting Instructions

MHGRV MODULE SETTINGS

Optional MHGRV Module Settings

When a change is made to the DIP Switch settings for either the setpoint or reset, power does not have to be cycled in order for the controller to read their values. The DIP Switch settings and their corresponding setpoints can be changed while power is applied, and the new settings will be accepted. The same is true for entering or leaving the force mode DIP Switch settings.

The modulating reheat system on the HB Unit is comprised of two valves, one for the condenser coil and one for the reheat coil. The valves operate directly opposite of each other. The MHGRV Controller will move the valves to the full Cooling position on power up after valve calibration. The condenser valve will be fully opened, and the reheat valve will be fully closed. This is the default configuration when no reheat is required.

For field-testing purposes, the modulating hot-gas valves can be forced to full Cooling or full Reheat via DIP Switch settings on the MHGRV Controller. See **Table 3** for mode of operation and valve position during force modes.

MHGRV Valve - Position & Operation			
Setpoint Value	Reset Limit Value	Mode of Operation	HGR Valve Position
1	3	Full Cooling	100% Closed
3	1	Full Reheat	100% Open
3	3	Half Reheat/Cool	50% Open/Close

Table 3: MHGRV Valve Position & Operation

NOTE: For a value of 1, only turn on DIP Switch labeled 1. For a value of 3, turn on DIP Switches 1 and 2. The DIP Switches are added together to complete a specific value.

WARNING: When force mode testing is complete, reset the DIP Switch settings to a valid temperature setting. Do not leave the MHGRV DIP Switches set in force mode when leaving the job site.

Using LEDs To Verify Operation

The HB controller is equipped with LEDs that can be used as very powerful troubleshooting tools. The HB controller circuit board has three differently colored LEDs. See **Figure 13** for the various LED locations. The Red LED is used to indicate fault conditions. The Yellow LED indicates the mode of operation the HB controller is currently operating in. The Green LED indicates the power and communications status of the HB controller.

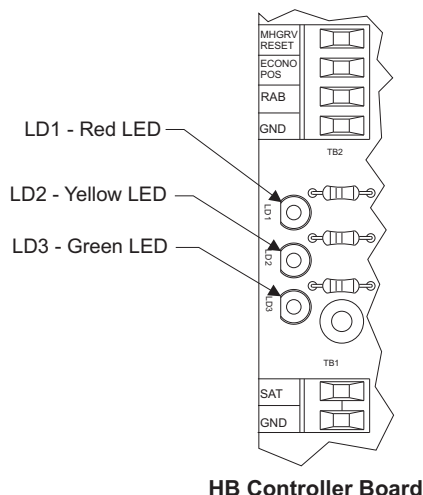


Figure 13: HB Board LED Locations

One LED blink is defined as a 1-second LED ON period immediately followed by a 1-second LED OFF period. After each series of blinks is completed, the LED will power off for 3 seconds and then repeat the series of blinks. The various blink codes and their meanings are defined in the tables that follow.

Red LED	
LED Blinks	Fault Condition Description
1	Heat Safety Lockout
2	High Pressure Fault
3	Low Pressure Lockout
4	Bad Supply Air Temperature Sensor
5	Bad Outdoor Air Temperature Sensor
6	Bad Liquid Line Temperature Sensor
7	Clogged Filter Switch
Notes: 1. When no fault exists, the red LED will be off. 2. Heat Safety Lockout (1 blink) is the highest priority. Clogged Filter Switch (7 blinks) is the lowest priority.	

Table 4: Red LED Blink Codes

HB Controller Fault Condition Operation

If the Red LED indicates a Bad Outdoor Air Temperature Sensor, Heating Mode will operate, but Cooling Mode will be disabled until the sensor problem is fixed.

If the Red LED indicates a Bad Supply Air Temperature Sensor, Heating and Cooling Modes will continue to operate, but all Reheat functions will be disabled during Dehumidification and Economizer Modes.

If the Red LED indicates a Bad Liquid Line Temperature Sensor, the Condenser Fan will run continuously any time the Cooling Relays are energized.

Yellow LED	
LED Blinks	Mode Indication Description
1	Vent Mode (Fan Only)
2	Heating Mode
3	Cooling Mode
4	Economizer Mode
5	Dehumidification Mode
6	Economizer Dehumidification Mode

Table 5: Yellow LED Blink Codes

Green LED	
LED Blinks	Power/Communications Description
1	Power Indicator (No Communications)
2	HSS Communications
3	MHGRV Communications
4	MHGRV/HSS Communications

Table 6: Green LED Blink Codes

HB Controller Setpoint Ranges

The HB controller has many setpoints that are user-adjustable. This adjustability allows the installer complete control of all major unit operating characteristics during the setup and commissioning phase of the HB unit installation. It also gives a service technician the ability to change setpoints in order to monitor and record unit operation to determine if the unit is functioning as specified. The tables that follow show the available setpoints for each classification or control group provided on the HB controller.

HB Controller Setpoint Ranges

Supply Fan Control Setpoints			
Description	Min.	Default	Max.
Adj. Two-Speed Fan		-	
Two-Speed Fan		-	
Low-Speed Fan Signal	1.0 VDC	3.0 VDC	10.0 VDC
High-Speed Fan Signal	1.0 VDC	10.0 VDC	10.0 VDC

Table 7: Supply Fan Control Setpoints

Cooling Control Setpoints			
Description	Min.	Default	Max.
Cooling Stages	1	2	2
Minimum Off Time	180 Sec	180 Sec	900 Sec
Minimum On Time	300 Sec	300 Sec	900 Sec
Staging Up Delay Interval	180 Sec	180 Sec	900 Sec
Staging Down Delay Interval	60 Sec	60 Sec	900 Sec
Low Pressure Delay Period	5 Sec	30 Sec	60 Sec
Low Pressure Safety	5 Sec	5 Sec	30 Sec
Low Pressure Max. Trip Point	1	3	5
Fan Off Delay Period	1 Sec	45 Sec	120 Sec
Auto Staging Up Delay	180 Sec	600 Sec	900 Sec
Dehumidify Staging Up Delay	180 Sec	600 Sec	900 Sec

Table 8: Cooling Control Setpoints

Heating Control Setpoints			
Description	Min.	Default	Max.
Heating Stages	1	3	3
Minimum Off Time	60 Sec	60 Sec	900 Sec
Minimum On Time	120 Sec	120 Sec	900 Sec
Staging Up Delay Interval	180 Sec	180 Sec	900 Sec
Staging Down Delay Interval	60 Sec	60 Sec	900 Sec
Heat Safety Maximum Count	1	3	5
Fan Off Delay Period	1 Sec	120 Sec	180 Sec
Auto Staging Up Delay	180 Sec	600 Sec	900 Sec

Table 9: Heating Control Setpoints

Temperature Control Setpoints			
Description	Min.	Default	Max.
Cooling Lockout Temperature	32°F	40°F	80°F
Heating Lockout Temperature	40°F	80°F	120°F
Supply Air High Temperature Limit Cutoff	120°F	150°F	170°F
Supply Air Low Temperature Limit Cutoff	32°F	40°F	80°F

Table 10: Temperature Control Setpoints

Economizer Control Setpoints			
Description	Min.	Default	Max.
Econo Config		No Economizer	
Max. CO ₂	0 PPM	1100 PPM	2000 PPM
Min. CO ₂	0 PPM	900 PPM	2000 PPM
Outdoor Air Enable Temp	33°F	55°F	65°F
ECS OAT Enable Temp	55°F	65°F	75°F

Table 11: Economizer Control Setpoints

Exhaust Fan Control Setpoints			
Description	Min.	Default	Max.
Low-Speed Supply Fan	0%	50%	100%
High-Speed Supply Fan	0%	30%	100%

Table 12: Exhaust Fan Control Setpoints

Min. Damper Reset Position Setpoints For Adjustable Two-Speed Fan/CO ₂			
Description	Min.	Default	Max.
Max. with Low-Speed Fan	0%	50%	100%
Min. with Low-Speed Fan	0%	10%	100%
Max. with High-Speed Fan	0%	30%	100%
Min. with High-Speed Fan	0%	5%	100%

Table 13: Minimum Damper Reset Setpoints

Condenser Fan Control Setpoints			
Description	Min.	Default	Max.
Liquid Line Cut Out Temperature	75°F	85°F	95°F
Liquid Line Cut In Temperature	95°F	105°F	115°F

Table 14: Condenser Fan Control Setpoints

Miscellaneous Control Setpoints			
Description	Min.	Default	Max.
Force Mode Timer	1 Min	60 Min	240 Min

Table 15: Miscellaneous Control Setpoints

Temperature to Resistance Voltage Chart

Temperature to Resistance/Voltage Chart		
Temp (°F)	Resistance (Ohms)	Voltage @ Input (VDC)
-10	93333	2.98
-5	80531	2.94
0	69822	2.89
5	60552	2.83
10	52500	2.77
15	45902	2.71
20	40147	2.64
25	35165	2.57
30	30805	2.49
35	27140	2.41
40	23874	2.33
45	21094	2.24
50	18655	2.15
52	17799	2.11
54	16956	2.08
56	16164	2.04
58	15385	2.00
60	14681	1.96
62	14014	1.93
64	13382	1.89
66	12758	1.85
68	12191	1.81
69	11906	1.79
70	11652	1.78
71	11379	1.76
72	11136	1.74
73	10878	1.72
74	10625	1.70
75	10398	1.68
76	10158	1.66
78	9711	1.63
80	9302	1.59
82	8893	1.55
84	8514	1.52
86	8153	1.48
88	7805	1.45
90	7472	1.41
95	6716	1.33
100	6047	1.24

Temperature to Resistance/Voltage Chart		
Temp (°F)	Resistance (Ohms)	Voltage @ Input (VDC)
105	5453	1.16
110	4923	1.09
115	4449	1.02
120	4030	.95
125	3656	.88
130	3317	.82
135	3015	.76
140	2743	.71
145	2502	.66
150	2288	.61

Table 16, continued: Temperature Sensor - Voltage & Resistance for Type III Sensors

Thermistor Sensor Testing Instructions

- 1.) Use the resistance column to check the thermistor sensor while disconnected from the controllers (not powered).
- 2.) Use the voltage column to check sensors while connected to powered controllers. Read voltage with meter set on DC volts. Place the “-” (minus) lead on GND terminal and the “+” (plus) lead on the sensor input terminal being investigated.

If the voltage is above 3.3 VDC, the sensor or wiring is “open.” If the voltage is less than 0.05 VDC, the sensor or wiring is shorted.

Table 16: Temperature Sensor - Voltage & Resistance for Type III Sensors

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AAON® Part No.: G000760

WM Form: AA-HB-TGD-01G

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WattMaster Controls, Inc. • 8500 NW River Park Drive • Parkville, MO • 64152