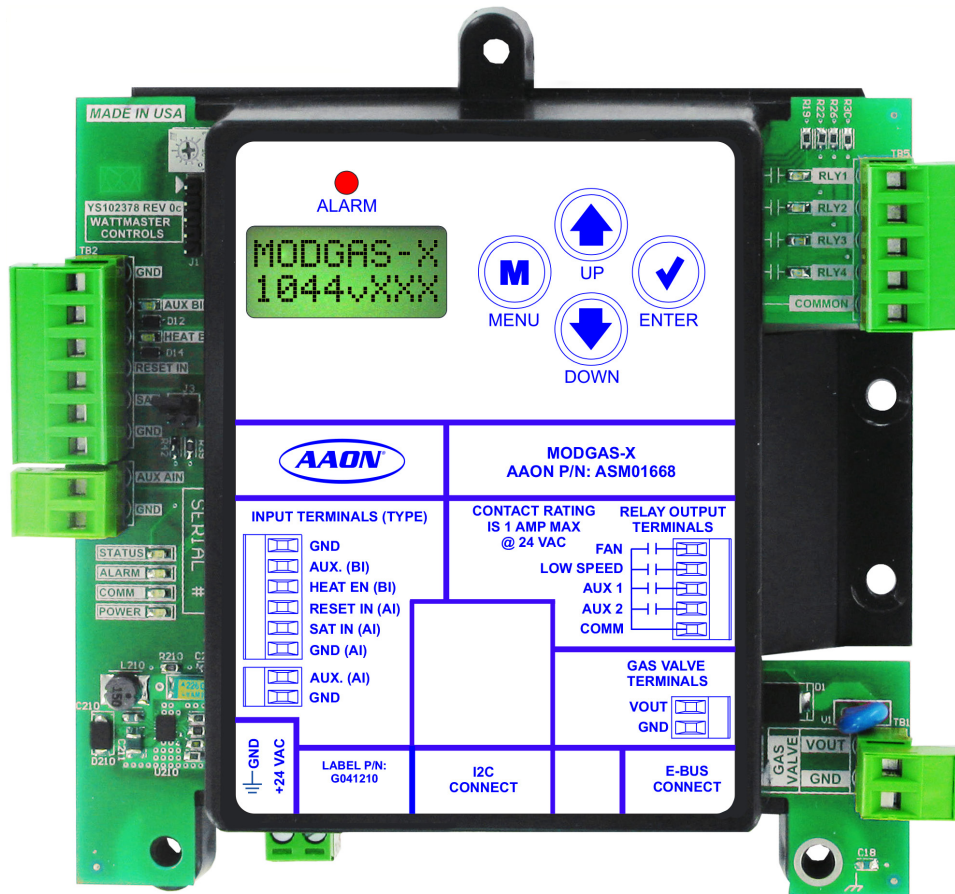




# MODGAS-X Module Technical Guide



## MODGAS-X REVISION LOG

REVISION AND DATE	CHANGE
Rev. J, June 14, 2021	Added Min Mode to Sequence of Operations, Updated part numbers, alarms and alarm history, and labels. Added Figure/Table content pages, and Fahrenheit/Celsius temperature conversion. Corrected cosmetic errors.

## MODGAS-X PARTS REFERENCE

PART DESCRIPTION	PART NUMBER
MODGAS-X Module	ASM01668
MODGAS-X Low Turn Down Module	ASM01669
MHGRV-X Module	ASM01670
MHGRV II Module	replaced by ASM01670
MHGRV III Module	replaced by ASM01670
Duct Temperature Sensor	G051240 (6 in.), G051250 (12 in.)
VCCX2 Controller	ASM01698
VCB-X Controller	ASM01862
VCM-X E-BUS Controller	V07151
12 Relay Expansion Module	ASM01873
E-BUS Cable Assembly E-BUS Power and Comm 1.5 ft., 3 ft., 10 ft., 25 ft., 50 ft., 75 ft., 100 ft., 150 ft., 250 ft., and 1,000 ft. spool	G029440 (1.5 ft.), G012870 (3 ft.), G029460 (10 ft.), G045270 (25 ft.), G029510 (50 ft.), G029530 (75 ft.), G029450 (100 ft.), G029470 (150 ft.), V36590 (250 ft.), G018870 (1,000 ft. spool)



[www.aaon.com](http://www.aaon.com)

**All manuals are also available for download from  
[www.aaon.com/controlsmanuals](http://www.aaon.com/controlsmanuals).**

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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.

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## Overview

The MODGAS-X Module is designed to modulate up to two gas valves to maintain a desired Discharge Air Temperature. The MODGAS-X also controls the speed of the induced draft fan to maintain proper combustion in the heat exchanger. See **Figure 1, page 6** for dimensions.

The module can be used in Stand-Alone Mode or Communications Mode with an AAON unit controller. The MODGAS-X connects to an AAON unit controller or expansion module via a modular cable. Depending on the type of AAON unit controller, this connection will utilize an I<sup>2</sup>C connection or an E-BUS connection. See **page 9** for wiring details.

The MODGAS-X can be configured at the factory for one of the following configurations:

- One modulating valve
- Two staged modulating valves
- One or two modulating with multiple fixed staged valves (Stand-Alone Mode only)

The MODGAS-X can be configured at the factory for the MAXITROL<sup>®</sup> 0-20 volt valve(s) or the MAXITROL<sup>®</sup> EXA STAR 0-10 volt stepper valve(s). See **Appendix C, page 36** for depiction.

When using the MODGAS-X to replace an existing MODGAS II, see **Appendix B, page 35** for details.

## Features

The MODGAS-X provides the following:

- Monitors Supply Air Temperature and Supply Air Reset and modulates gas valve(s) to maintain Setpoint
- Provides proper control of the Induced Draft Fan
- Provides additional options for Stand-Alone control
- Contains a 2 x 8 LCD character display and four buttons that allow for status display, setpoint changes, and force modes

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**NOTE:** The MODGAS-X contains no user-serviceable parts. Contact qualified technical personnel if your MODGAS-X is not operating correctly.

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# OVERVIEW

## Dimensions

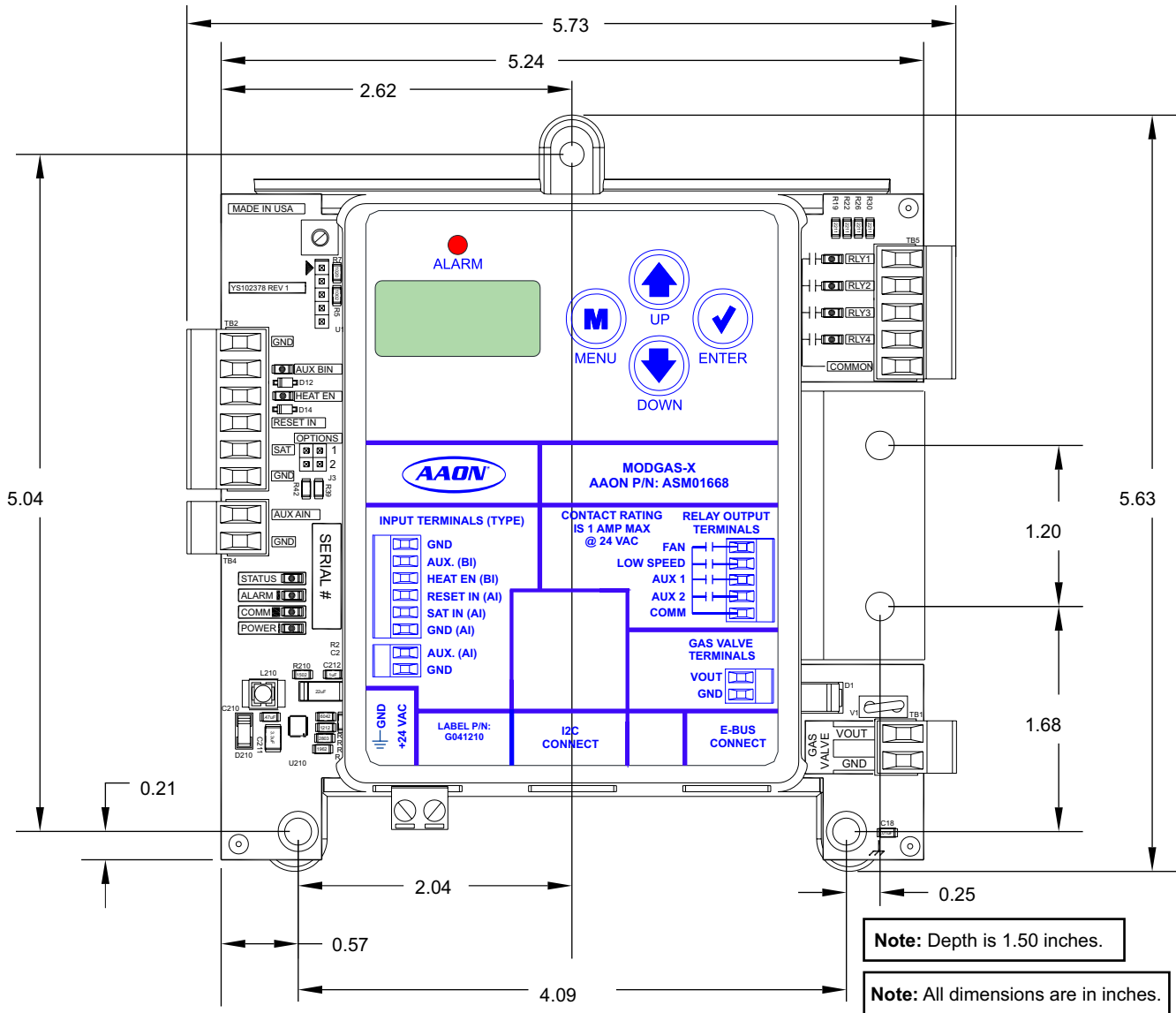


Figure 1: MODGAS-X Module Dimensions

**Important Wiring Considerations**

**Wiring**

The modules must be connected to an 18-30 VAC power source of the proper size for the calculated VA load requirements. All transformer sizing should be based on the VA ratings listed in **Table 1, this page.**

Control Device	Voltage	VA Load	Operating Temperature	Humidity (Non-Condensing)
MODGAS-X	18-30 VAC	18	-22°F to 158°F* -30°C to 70°C*	0-95% RH
	Inputs		Resistive Inputs require 10KΩ Type III Thermistor	
	Outputs		24 VAC Inputs provide 4.7KΩ Load	
			Relay Outputs: 1 amp maximum per output.	

**Table 1: Electrical and Environmental Requirements**

**NOTE:** If the temperature at the MODGAS-X is below -4°F (-20°C), the display refresh rate could be less responsive.

**WARNING:** When using a single transformer to power more than one controller or expansion module, the correct polarity must always be maintained between the boards. Failure to observe correct polarity will result in damage to the AAON unit controller, MODGAS-X, and any associated module.

Please carefully read and apply the following information when wiring the AAON unit controller, MODGAS-X and any associated module.

1. All wiring is to be in accordance with local and national electrical codes and specifications.
2. 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.
3. Minimum wire size for 24 VAC wiring should be 18-gauge.
4. Minimum wire size for all sensors should be 24-gauge. Some sensors require two-conductor wire and some require three-or four-conductor wire.
5. Minimum wire size for 24 VAC thermostat wiring should be 22-gauge.
6. 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.
7. When communication wiring is to be used to interconnect AAON unit controllers together or to connect to other communication devices, all wiring must be plenum-rated, minimum 18-gauge, two-conductor, twisted-pair with shield. AAON can supply communication wire that meets this specification and is color coded for the network or local loop. Please consult your AAON distributor for information. If desired, Belden #82760 or equivalent wire may also be used.
8. Before applying power to the AAON unit controller, MODGAS-X, and any associated modules, be sure to recheck all wiring connections and terminations thoroughly.

**Powering Up**

When the controller and modules are first powered up, the POWER LED should light up and stay on continuously. If it does not light up, check to be sure that you have 24 VAC connected to the controller, that the wiring connections are tight, and that they are wired for the correct polarity. The 24 VAC power must be connected so that all ground wires remain common. If after making all these checks, the POWER LED does not light up, please contact AAON Controls Support for assistance.

# WIRING

## Single Modulating Valve No Staging - Stand-Alone Wiring

### Single Modulating Valve No Staging - Stand-Alone Wiring

This configuration can use either the MAXITROL® 0-20 volt valve(s) or the MAXITROL® EXA STAR 0-10 volt stepper valve(s)—configured at the factory. See Appendix C, page 36 for depiction.

If using a MHGRV-X Module along with the MODGAS-X module in Stand-Alone Mode, the SAT Sensor always connects to the MODGAS-X.

**WARNING:** Do not connect power to VOUT/Ground terminal block.

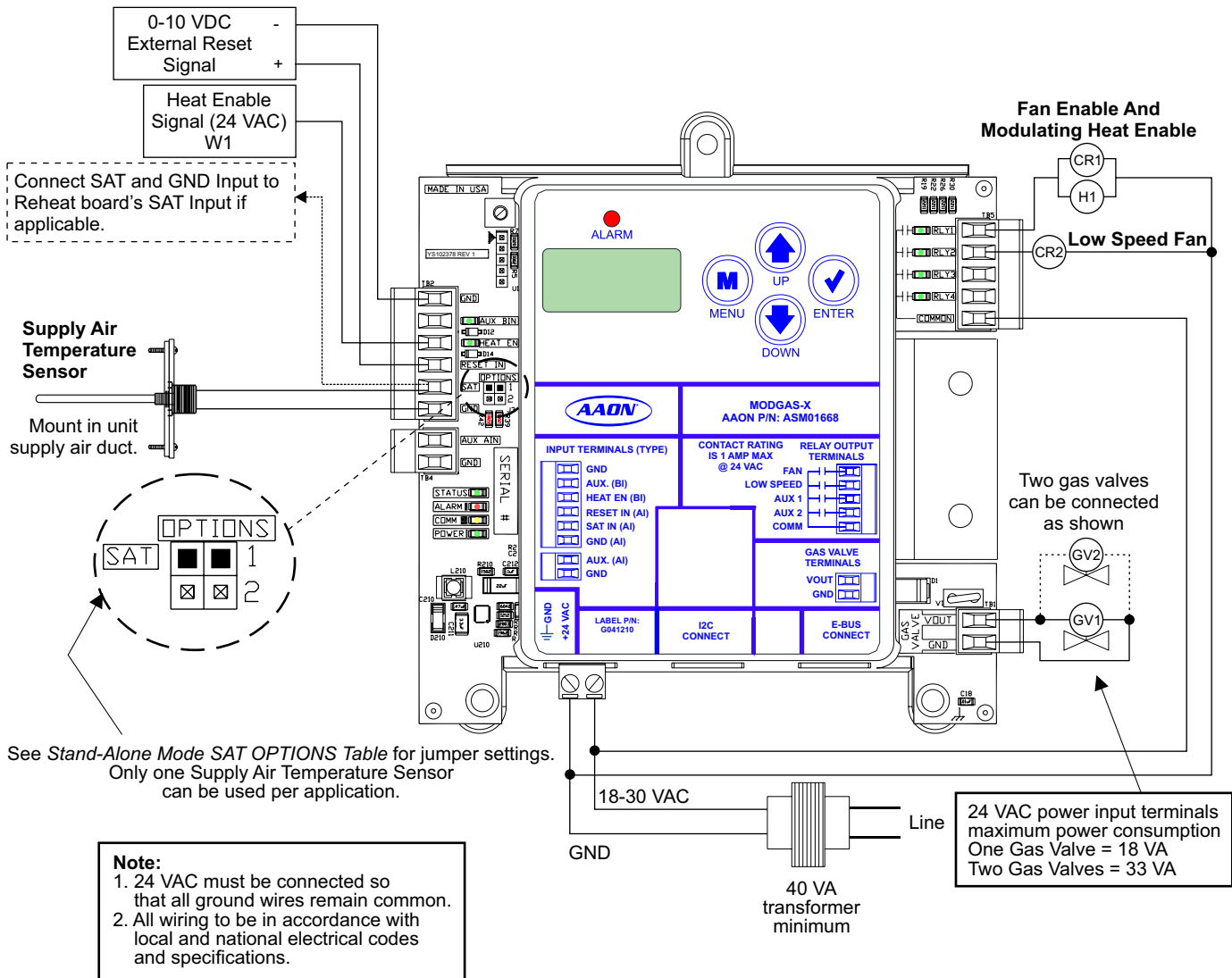


Figure 2: Single Modulating Valve No Staging Stand-Alone Wiring



**Single Modulating Valve No Staging - Communicating Wiring**

**Single Modulating Valve No Staging - Communicating Wiring**

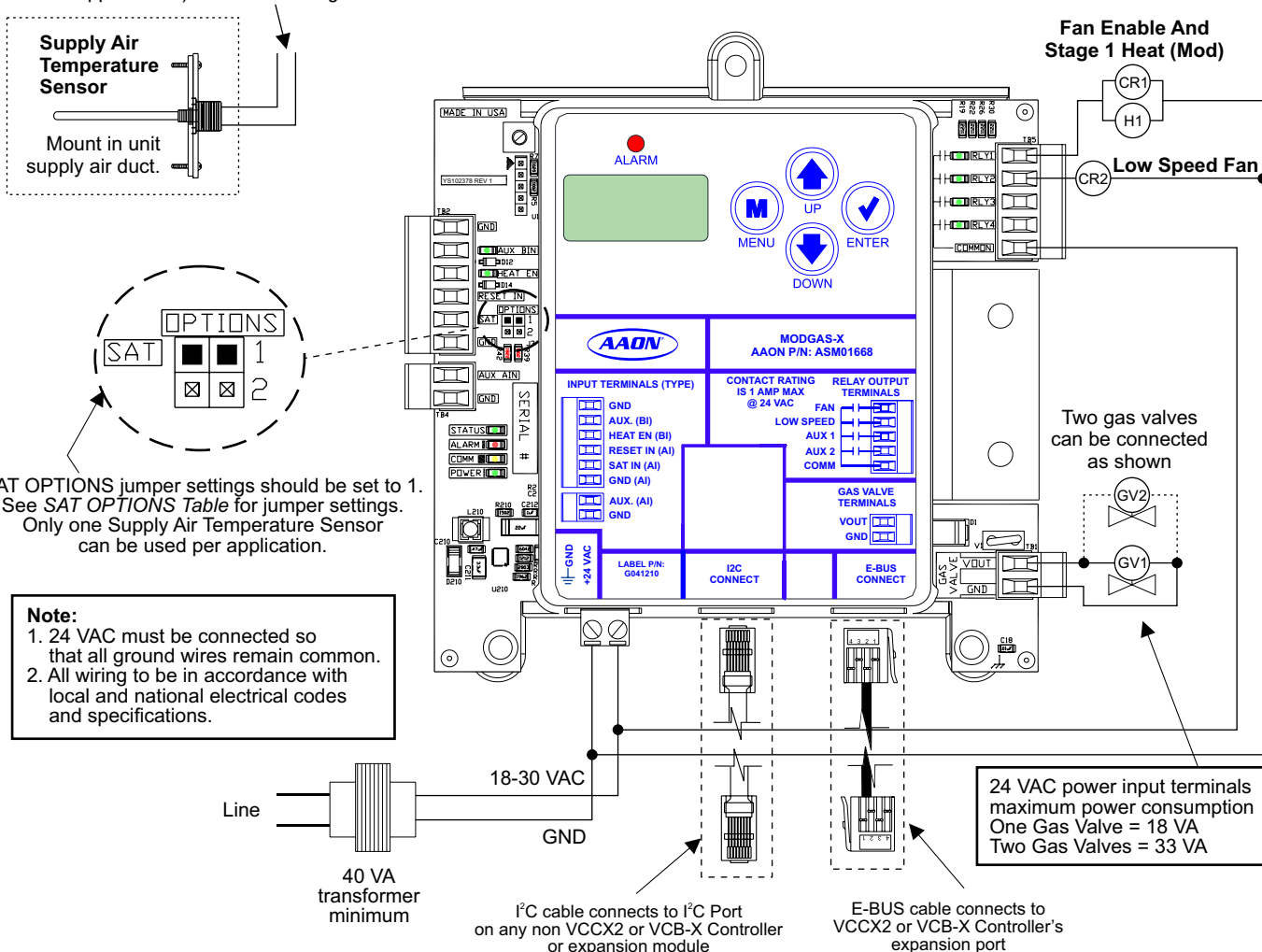
For connection to a VCCX2 Controller, VCB-X Controller, VCCX Expansion Module, or VCB-X Expansion Module, use an E-BUS cable connecting to the appropriate E-BUS ports. For all other controllers, including VAV/CAV, MUA, VCM, VCM-X, SA, and RNE Controllers, use an I<sup>2</sup>C cable connecting to the appropriate I<sup>2</sup>C ports.

This configuration can use either the MAXITROL® 0-20 volt valve(s) or the MAXITROL® EXA STAR 0-10 volt stepper valve(s)—configured at the factory. See Appendix C, page 36 for depiction.

**WARNING:** Do not connect power to VOUT/Ground terminal block.

**NOTE:** If additional fixed stages are required, these should be configured and wired to the AAON unit controller's relays.

Connect Supply Air Temperature Sensor to AI2 and GND or AI3 and GND on main controller. (This does not apply to retrofit applications). See SAT Wiring Conditions Table.



**Figure 3: Single Modulating Valve No Staging Communicating Wiring**

# WIRING

## Single Modulating Valve and up to 14 Stages of Fixed Heat Stand-Alone

### One Modulating Valve with up to 14 Additional Stages of Fixed Heat Stand-Alone Wiring

This configuration only applies to a Stand-Alone Mode (Figure 4, this page) and can be factory-configured.

If using a MHGRV-X Module along with the MODGAS-X Module in Stand-Alone Mode, the SAT Sensor always connects to the MODGAS-X.

The first two fixed stages use AUX1 (RLY3) and AUX2 (RLY4) relays to enable them (Figure 4, this page). Additional fixed stages can be added by using the 12 Relay E-BUS Expansion Module. (Figure 5, page 11).

This configuration can use either the MAXITROL® 0-20 volt valve(s) or the MAXITROL® EXA STAR 0-10 volt stepper valve(s) (configured at the factory). See Appendix C, page 36 for depiction.

**WARNING:** Do not connect power to VOUT/Ground terminal block.

If communication is lost to the 12 Relay E-BUS Expansion Module, the 12 Relay E-BUS Expansion Module will turn off its relays and the MODGAS-X will alarm and fall back to using only its onboard stages. If communications is restored, the MODGAS-X will begin staging up if needed.

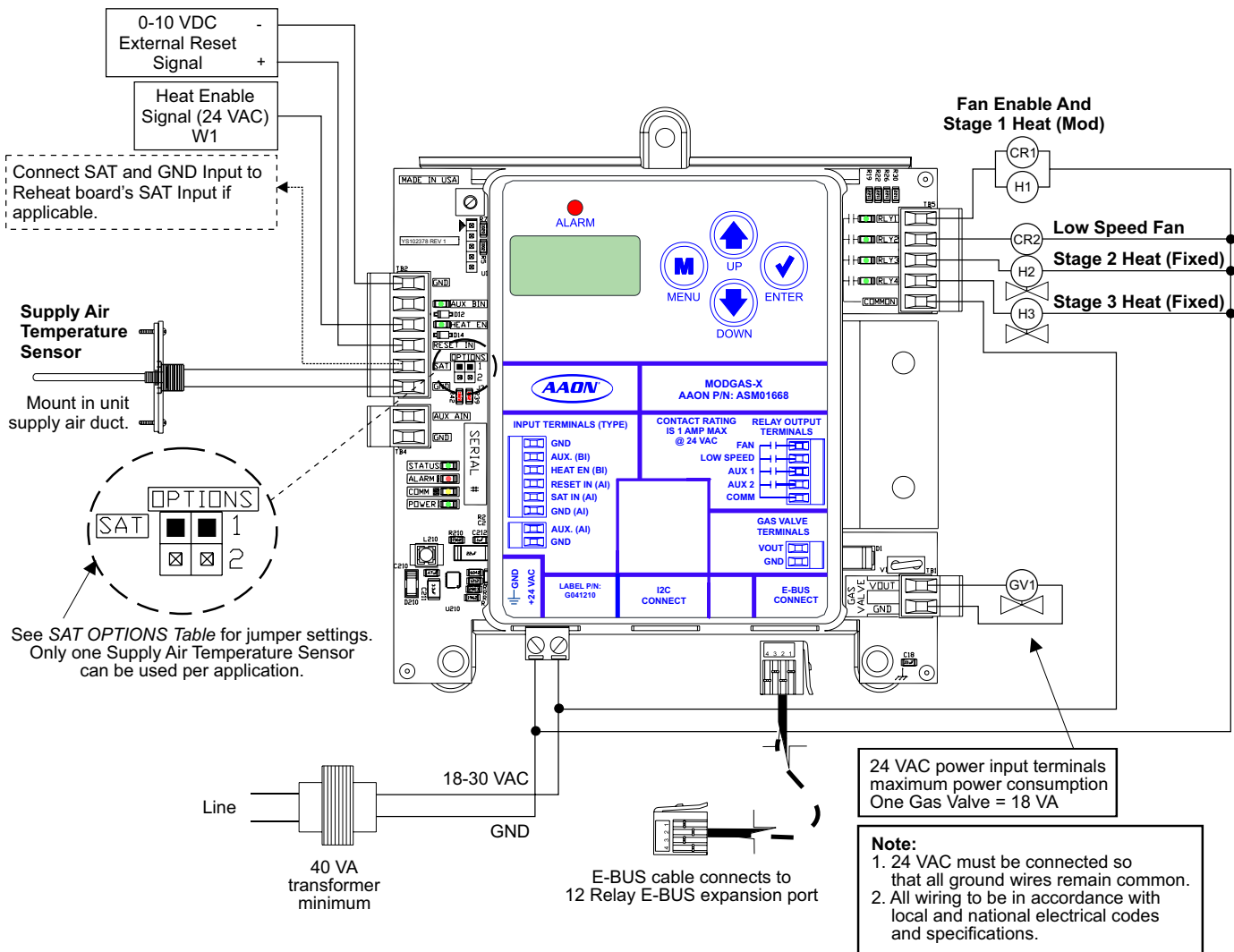
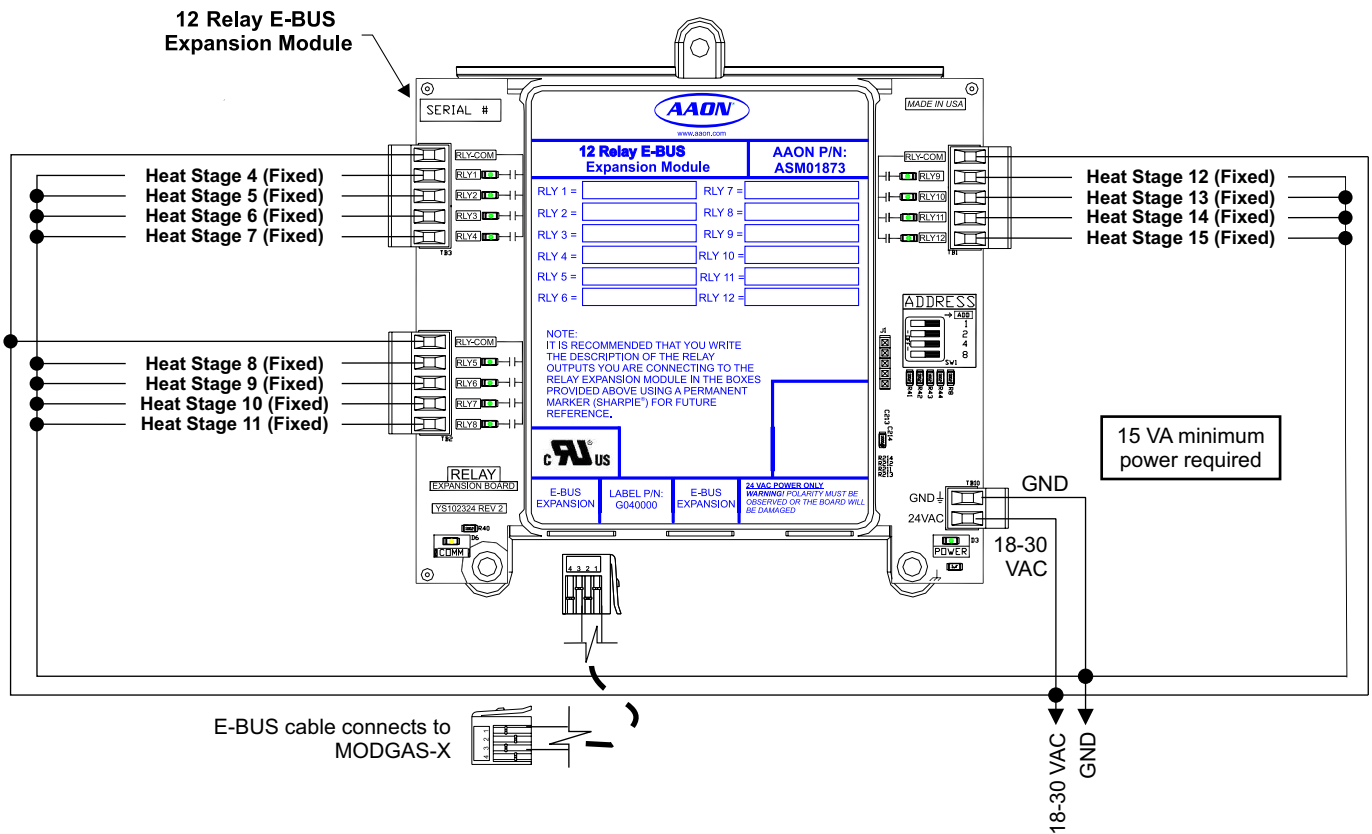


Figure 4: Single Modulating Valve - Stand-Alone Wiring

**Single Modulating Valve and up to 14 Stages of Fixed Heat Stand-Alone**

**WARNING:** Observe Polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity will result in damage to one or more of the boards. Expansion modules must be wired in such a way that the expansion modules and the controller are always powered together. Loss of power to the expansion module will cause the controller to become inoperative until power is restored to the expansion module.

**NOTE:** All relay outputs are normally open and rated for 24 VAC power only. 1 amp maximum load.



**Figure 5: Single Modulating Valve and 14 Stages of Fixed Heat - 12 Relay E-BUS Expansion Module**

## Two Modulating Valves and up to 13 Stages of Fixed Heat Stand-Alone

### Two Modulating Valves with up to 13 Additional Stages of Fixed Heat Stand-Alone Wiring

This configuration only applies to Stand-Alone Mode (Figure 6, this page) and is factory-configured.

In this configuration, the first Modulating Valve is enabled by the FAN Relay (RLY1). The second Modulating Valve is enabled by the AUX1 Relay (RLY3). The fixed stage uses the AUX2 (RLY4) relay to enable it (Figure 6, this page). Additional fixed stages can be added by using the 12 Relay E-BUS Expansion Module. (Figure 7, page 13).

If using a MHGRV-X Module along with the MODGAS-X in Stand-Alone, the SAT Sensor always connects to the MODGAS-X.

This configuration can use either the MAXITROL® 0-20 volt valve(s) or the MAXITROL® EXA STAR 0-10 volt stepper valve(s) (configured at the factory). See Appendix C, page 36 for depiction.

**WARNING:** Do not connect power to VOUT/Ground terminal block.

If communication is lost to the 12 Relay E-BUS Expansion Module, it will turn off its relays and the MODGAS-X will alarm and fall back to using only its onboard stages. If communications is restored, the MODGAS-X will begin staging up if needed.

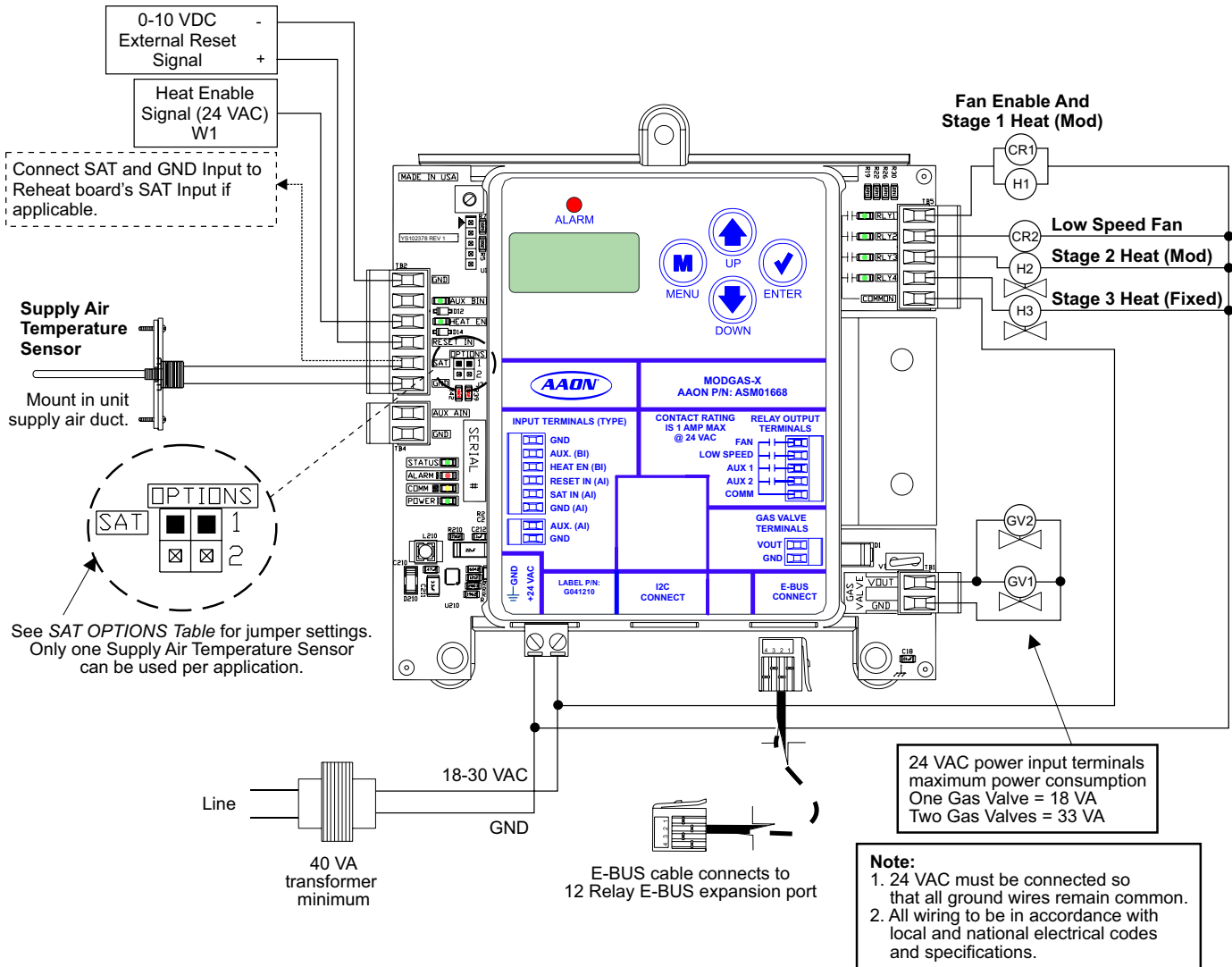
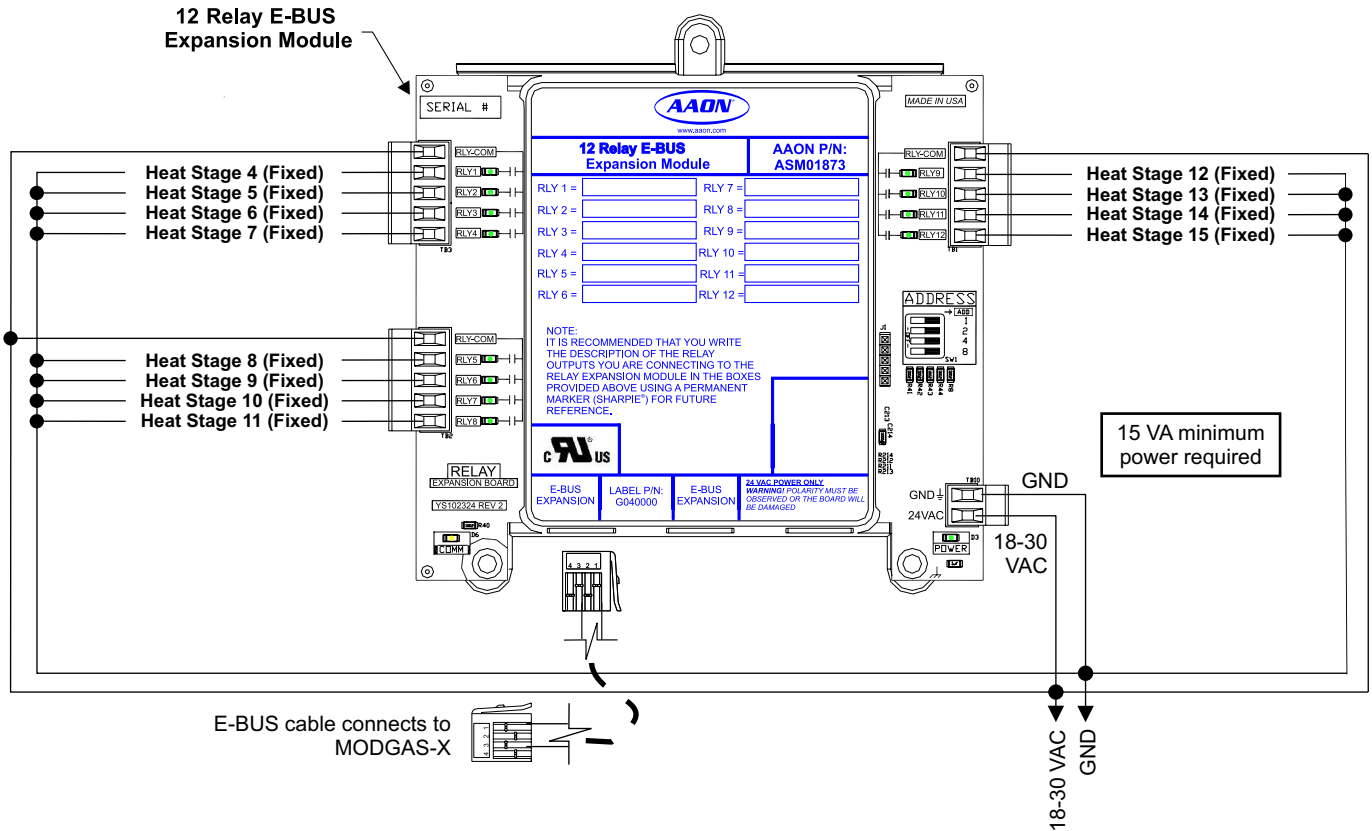


Figure 6: Two Modulating Valves - Stand-Alone

**Two Modulating Valves and up to 13 Stages of Fixed Heat Stand-Alone**

**WARNING:** Observe Polarity! All boards must be wired with GND-to-GND and 24 VAC-to-24 VAC. Failure to observe polarity will result in damage to one or more of the boards. Expansion modules must be wired in such a way that the expansion modules and the controller are always powered together. Loss of power to the expansion module will cause the controller to become inoperative until power is restored to the expansion module.

**NOTE:** All relay outputs are normally open and rated for 24 VAC power only. 1 amp maximum load.



**Figure 7: Two Modulating Valves and 13 Stages of Fixed Heat - 12 Relay E-BUS Expansion Module**

# WIRING

## Two Modulating Staged Valves - Stand-Alone Wiring

### Two Modulating Staged Valves Wiring

In this configuration, the first Modulating Valve is enabled by the FAN Relay (RLY1). The second Modulating Valve is enabled by the AUX1 Relay (RLY3).

If using a MHGRV-X Module along with the MODGAS-X in Stand-Alone Mode, the SAT Sensor always connects to the MODGAS-X.

This configuration can use either the MAXITROL® 0-20 volt valve(s) or the MAXITROL® EXA STAR 0-10 volt stepper valve(s)—configured at the factory. See Appendix C, page 36 for depiction.

**WARNING:** Do not connect power to VOUT/Ground terminal block.

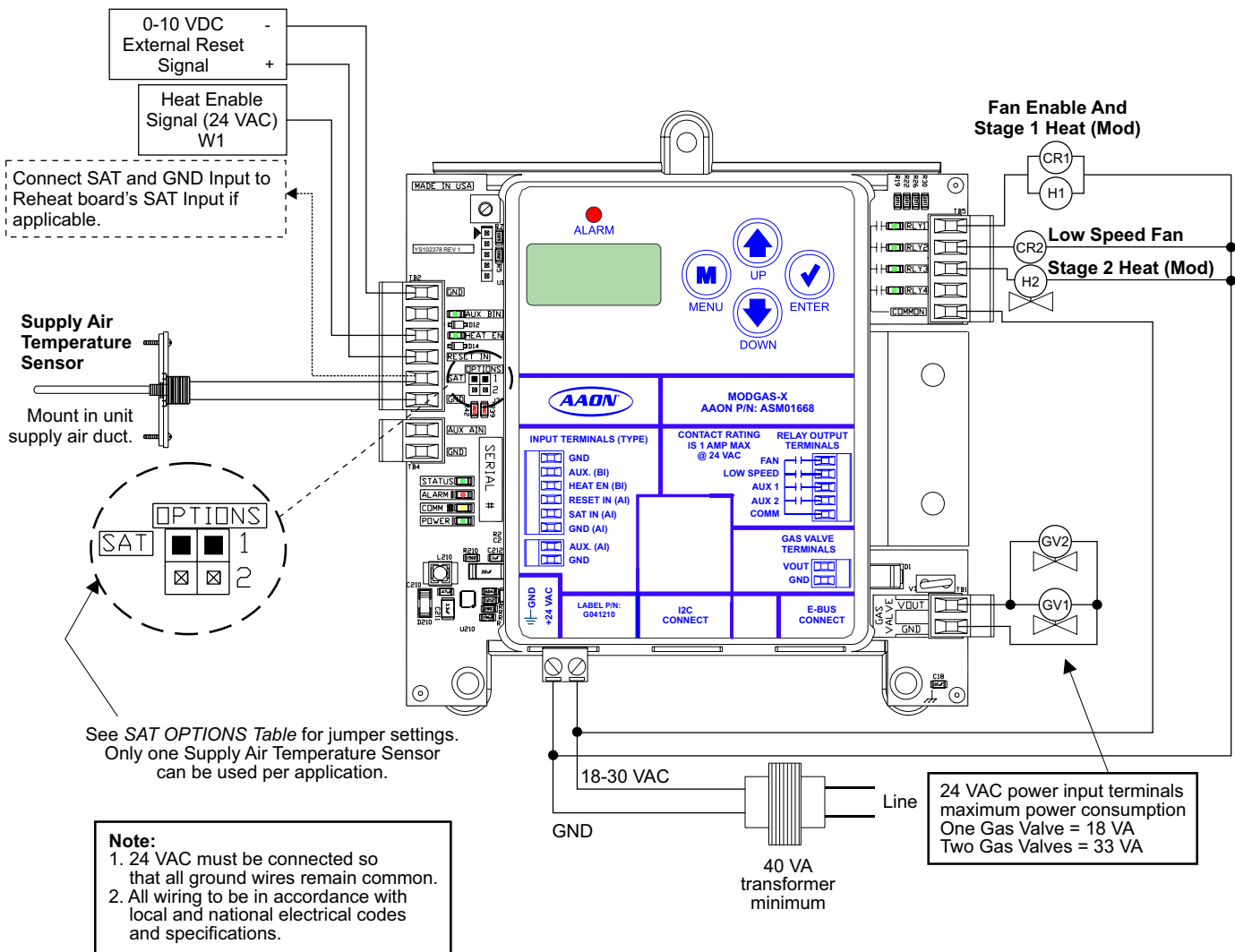


Figure 8: Two Modulating Staged Valves Stand-Alone Wiring

**Two Modulating Staged Valves - Communicating Wiring**

**Two Modulating Staged Valves - Communicating Wiring**

For connection to a VCCX2 Controller, VCB-X Controller, VCCX2 Expansion Mode, or VCB-X Expansion Module, use an E-BUS cable connecting to the appropriate E-BUS ports.

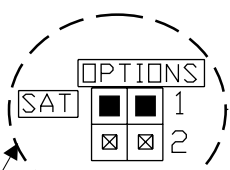
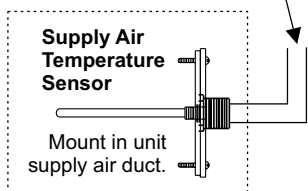
For all other controllers, including VAV/CAV, MUA, VCM, VCM-X, SA, and RNE Controllers, use an I<sup>2</sup>C cable connecting to the appropriate I<sup>2</sup>C ports.

If using the VCM-X Controller, extra fixed stages can be added by using the VCM-X Expansion Module.

This configuration can use either the MAXITROL® 0-20 volt valve(s) or the MAXITROL® EXA STAR 0-10 volt stepper valve(s) (configured at the factory). See Appendix C, page 36 for depiction.

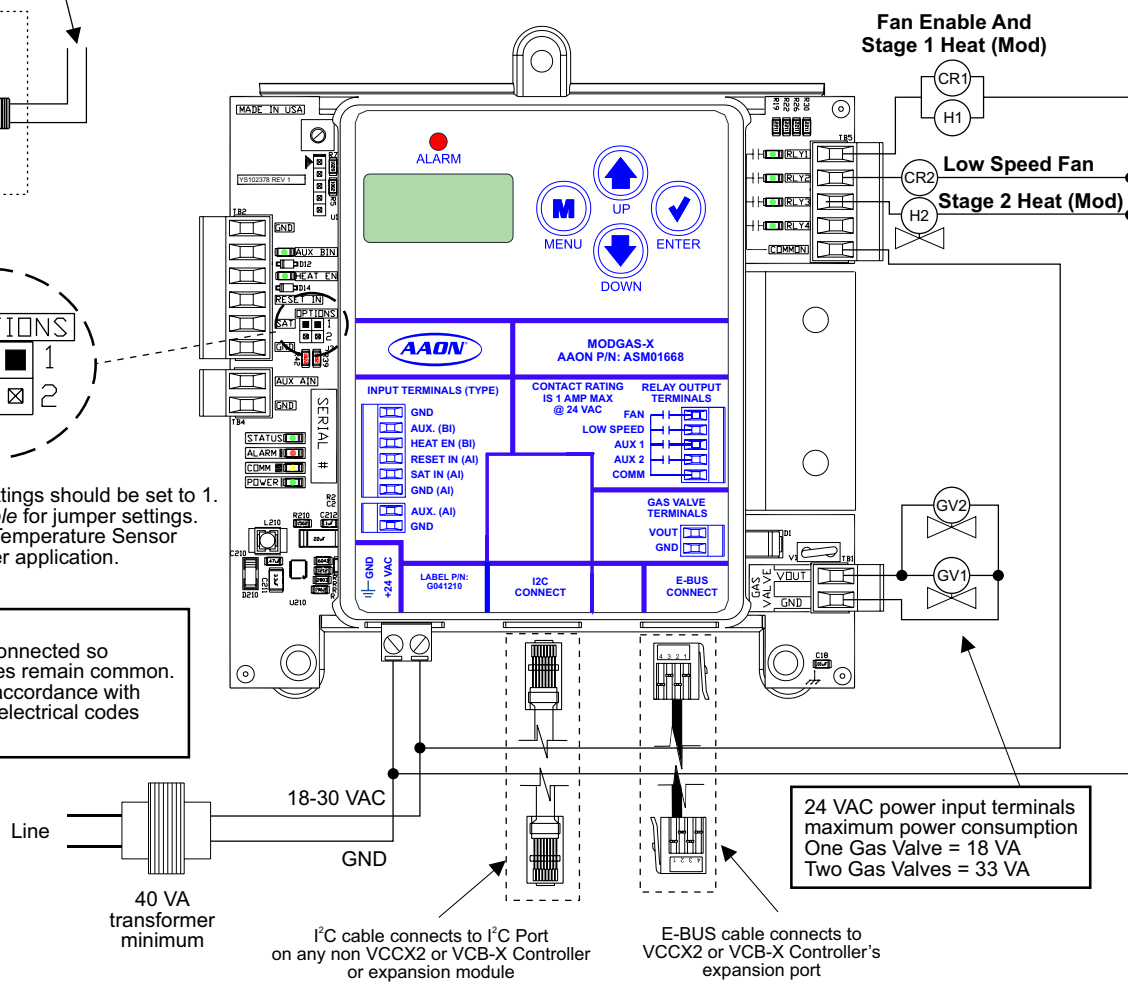
**WARNING:** Do not connect power to VOUT/Ground terminal block.

Connect Supply Air Temperature Sensor to AI2 and GND or AI3 and GND on main controller. (This does not apply to retrofit applications). See SAT Wiring Conditions Table.



SAT OPTIONS jumper settings should be set to 1. See SAT OPTIONS Table for jumper settings. Only one Supply Air Temperature Sensor can be used per application.

**NOTE:**  
 1. 24 VAC must be connected so that all ground wires remain common.  
 2. All wiring to be in accordance with local and national electrical codes and specifications.



24 VAC power input terminals maximum power consumption  
 One Gas Valve = 18 VA  
 Two Gas Valves = 33 VA

**Figure 9: Two Modulating Staged Valves Communicating Wiring**

# INPUTS AND OUTPUTS

## Inputs and Outputs

### I/O Map

See **Table 2, this page** to reference the inputs and outputs that are available on the MODGAS-X Module.

Analog Inputs	
1	(RST IN) Reset Signal
2	(SAT) Supply Temperature
3	(AUX AI) Not Used
Binary Inputs	
1	(AUX BI) Not Used
2	(HEAT EN) Heat Enable
Analog Outputs (0-10 VDC)	
1	(FAN) Fan and Stage 1 Heat (Modulating)
2	(LOW SPEED) Low Speed Fan
3	(AUX 1) Stage 2 Heat (Fixed or Modulating)
4	(AUX 2) Stage 3 Heat (Fixed or Modulating)

**Table 2: MODGAS-X Inputs and Outputs**

### Analog Inputs

#### Reset Input (RST IN)

Used only in Stand-Alone Mode. The Discharge Temperature Setpoint can be reset by supplying a 0-10 VDC signal to the RST IN low voltage terminal block. This reset signal is optional and need only be used if you require resetting of the discharge air temperature.

#### Supply Air Temperature Sensor (SAT)

Used in Stand-Alone Mode and when MODGAS-X is connected to a CAV/VAV or MUA Controller. The Supply Air Temperature Sensor is the control source. This sensor has to be installed for the unit to operate. The Supply Air Sensor is located in the discharge air stream and monitors Discharge Air Temperature to maintain the Discharge Air Temperature Setpoint.

### Binary Inputs

#### Heat Enable Contact (HEAT EN)

This input is only required when the MODGAS-X is used in Stand-Alone Mode. The Heat Enable Input is activated by a 24 VAC signal supplied from a building automation system to enable the MODGAS-X. The MODGAS-X will not operate without 24 VAC being applied to this input terminal when used in a Stand-Alone Mode. When the Heat Enable Signal is lost or turned off, all stages deactivate immediately.

This enable input can be used in Communications Mode for special circumstances. Heat Enable can be activated by either communications or this enable input. Heat enable will be deactivated when both signals from communications and the enable input are turned off.

### Analog Output

#### Gas Valve Output (VOUT)

Depending on the type of valve used, this output will supply a 0-20 VDC or 0-10 VDC output signal for control of the modulating gas valve. With a 0-20 VDC valve, the operation is reverse acting, so high voltage means closed and low voltage means open. With a 0-10 VDC valve, the operation is direct acting.

**WARNING:** For 0-20 VDC valves, the maximum number that can be connected/configured is two. For 0-10 VDC valves, the maximum number that can be connected/configured is eight.

### Relay Outputs

#### FAN (RLY1) - Fan and Stage 1 Heat Modulating

When the MODGAS-X has heat enabled, this relay closes to bring the induced draft blower on at high speed. The module will activate the Low Speed Fan Relay to reduce the induced draft blower speed as the gas valve modulates closed. This relay is also used to enable Modulating Heat Valve 1.

#### LOW SPEED (RLY2) - Low Speed Fan

Depending on the gas valve position, this relay will close to switch the induced draft blower to low speed. The module automatically switches the blower to low speed as the gas valve modulates closed in order to maintain the proper fuel-to-air ratio.

#### AUX 1 (RLY3) - Stage 2 Heat (Fixed or Modulating)

If configured for two or more stages of heat, this relay would enable the second stage of heat if the first modulating valve cannot maintain the configured Supply Air Temperature Setpoint. This stage and any additional stages of heat will stage up and down as required to maintain the Supply Air Temperature Setpoint. The Stage Up Delay default is three minutes. The Stage Down Delay default is one minute.



**AUX 2 (RLY4) - Stage 3 Heat  
(Fixed or Modulating)**

If configured for three or more stages of heat, this relay would enable the 3rd stage of heat as needed to maintain the configured Supply Air Temperature Setpoint. This stage and any additional stages of heat will stage up and down as required to maintain the Supply Air Temperature Setpoint. The Stage Up Delay default is three minutes. The Stage Down Delay default is one minute.

**12 Relay E-BUS Expansion Module  
(Stages 4-15 Fixed Heat)**

These relays should only be used in Stand-Alone Mode when more than three stages of heat are configured. These relays will successively stage up based on the Stage Up Delay to maintain the configured Supply Air Temperature Setpoint. This stage and any additional stages of heat will stage up and down as required to maintain the Supply Air Temperature Setpoint. The Stage Up Delay default is three minutes. The Stage Down Delay default is one minute.

# SEQUENCE OF OPERATION

## Operating Modes

### Operating Modes

#### Stand-Alone Mode

When used in Stand-Alone Mode, the MODGAS-X will modulate the gas valve(s) and stage any additional fixed stages to maintain the Discharge Setpoint configured on the MODGAS-X LCD display. The MODGAS-X is activated by a 24 VAC signal to the HEAT EN Input.

The following are available in Stand-Alone Mode using the LCD display on the MODGAS-X:

- Status
- Supply Air Temperature Setpoint Adjustment
- Supply Air Reset Temperature Setpoint
- Adjustment
- Force Mode ON/OFF
- Force Valve Position
- Force Relays
- Alarms

#### Communications Mode

When the MODGAS-X is connected and communicating with an AAON unit controller via a modular cable, the necessary information will be passed between the MODGAS-X and the AAON unit controller to properly operate in the Heating Mode.

If the communication is interrupted between the MODGAS-X and the AAON unit controller, both boards will show an alarm. When communication is restored, the alarms will go away.

In this configuration, the Supply Air Temperature Setpoint is set using the AAON unit controller and the Supply Air Temperature Reset is calculated by the AAON unit controller.

The following menu screens are available in Communications Mode using the LCD display on the MODGAS-X:

- Status
- Force Mode ON/OFF
- Force Valve Position
- Force Relays
- Alarms

### Normal Operation

The MODGAS-X modulates up to two gas valves (for 0-20 volt valves) or eight gas valves (for 0-10 volt valves) to maintain a desired Discharge Air Temperature. It also controls the speed of the induced draft fan to maintain proper combustion in the heat exchanger.

### Off Mode

1. If the Heating is disabled, the unit will be in the Off Mode.
2. In this mode, the unit will be completely shut off.
3. The Heat Valve Output will be set to 100%.
4. Once the unit enters the Off Mode, it will stay in this mode for at least one minute.

### High Fire Mode

1. When Heat is activated, the unit will first go to High Fire Mode.
2. In this mode, the valve will be forced to 100%—for a 0-20 volt valve, that would be 0 VDC and for a 0-10 volt valve, that would be 10 VDC—and the Fan Relay will be activated.
3. The unit will stay in this mode for at least 10 seconds.
4. After the initial 10 seconds, the unit will look for a 3°F temperature rise from the initial Supply Air Temperature during Stage 1 and will look for a 5°F temperature rise from the Supply Air Temperature during additional Modulating Heat stages to exit the High Fire Mode.
5. The unit could stay in High Fire Mode indefinitely if it does not see the temperature rise. This is important because it means that the unit has not seen proof of fire and starting modulation without proof could cause damage to the equipment.
6. The Low Speed relay will not be activated during High Fire Mode.

### Mechanical Failure Alarm

**NOTE:** This alarm was removed in version 3.06.

1. The Mechanical Failure Alarm will be enabled when the unit stays in High Fire Mode for more time than the Mechanical Failure Delay Setpoint—setpoint default is four minutes.
2. The Alarm is disabled when the failed Heat Stage goes to Off Mode.

### Min Mode

1. The Min Mode will attempt to initialize after the first stage of heat and any subsequent stage of heat.
2. If the Supply Air Temperature is below the Supply Air Temperature Setpoint and within the Min Mode Deadband. Min Mode will run for a user defined interval set on the MinPosTP screen on **page 27**.
3. After the runtime, it will continue into Heating Mode.
4. If the Min Mode Deadband is set to zero, this mode will not be active and continue to Heating Mode.

### Heating Mode

1. Once the module finalizes High Fire Mode, it will go to Heating Mode.
2. In this mode, a unit with a 0-20 volt valve will modulate between 25% (15 VDC) to 75% (5 VDC) of the value range (which is displayed as 0-100%) to maintain the desired Supply Air Setpoint. See **Table 3, this page**.
3. The Supply Air Setpoint is sent by the AAON unit controller when in Communications Mode, or is set in the Setpoint screens through the LCD display when in Stand-Alone Mode.
4. Once the unit enters the Heating Mode, it will stay in this mode for the minimum runtime—default is one minute.
5. The unit will exit the Heating Mode when the 24 VAC Heat Enable Signal is removed or the Heat command from the AAON unit controller is removed.

0-20 Volt Valve		
LCD Display	Voltage	Signal
0%	15 Volts	25%
100%	5 Volts	75%
0-10 Volt Stepper Valve		
LCD Display	Voltage	Signal
0%	0 Volts	0%
100%	10 Volts	100%

**Table 3: Heating Mode Voltage/Signal**

### Low Speed Relay Operation

- 0-20 Volt Valve
  1. If the valve modulates below 54.5% (9.1 VDC) for five seconds, the Low Speed Relay will be activated.
  2. The Low Speed relay will be deactivated if the valve modulates above 55.5% (8.9 VDC) for five seconds.

- 0-10 Volt Valve

1. If the valve modulates below 33% (3.3 VDC) for five seconds, the Low Speed Relay will be activated.
2. The Low Speed relay will be deactivated if the valve modulates above 34% (3.4 VDC) for five seconds.

### Additional Stages of Heat

If the MODGAS-X is controlling more than one Stage of Heat, it will use the following staging sequence:

1. If the ModGas Valve Signal is at 100% for three minutes (adjustable), the Aux Relays will stage up. If the Supply Air Temperature is 32°F or less, the stage up delay will reset to one minute.
2. If the ModGas Valve Signal is at 0% for one minute (adjustable), the Aux Relays will stage down.
3. As the Aux Relays stage up/down, the ModGas Valve will modulate as necessary to maintain setpoint.

### Supply Air Setpoint Reset

1. In Stand-Alone Mode, the module will look at the voltage of the Reset Signal to provide a setpoint reset mechanism. This input is expecting a 0-10 VDC signal.
2. When the Signal is at 0 VDC, the setpoint will be equal to the SAT setpoint set in the LCD display.
3. When the Signal is a 10 VDC, the setpoint will be equal to the Reset setpoint set in the LCD display.
4. The setpoint value will be reset proportionally from the value set in the LCD display as the signal goes from 0 to 10 VDC.
5. The Reset Setpoint can be above or below the Supply Air Temperature Setpoint.

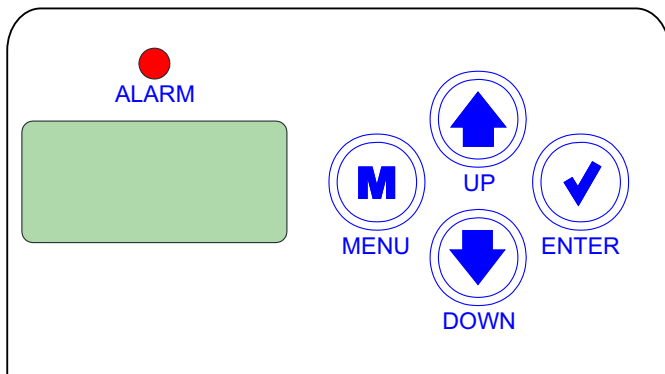
### Cutoff Mode

1. If the Supply Air Temperature rises above 200°F, the MODGAS-X will enter the Cutoff Mode.
2. In this mode, the MODGAS-X will completely shut off.
3. This mode has higher priority than any other mode of operation and needs to be cleared before the unit can enter another mode.
4. The Cutoff Mode will be cleared if the Supply Air Temperature drops below 190°F.
5. The Cutoff Mode will last at least five minutes.

## Navigation Keys

### LCD Display Screen and Navigation Keys

The LCD display screens and buttons allow you to view status and alarms, and enable force modes. See **Figure 10, this page** and refer to **Table 4 and 5, this page** for descriptions.



**Figure 10: LCD Display and Navigation Keys**

Navigation Key	Key Function
MENU 	Use the MENU key to move through screens within Main Menu categories and return to the Main Menu while at other screens.
UP 	Use this key to adjust setpoints and change configurations.
DOWN 	Use this key to adjust setpoints and change configurations.
ENTER 	Use the ENTER key to navigate through the Main Menu Screen categories.

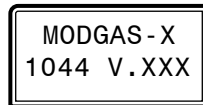
**Table 4: Navigation Key Functions**


Editing Key	Key Function
UP or DOWN 	Use the UP or DOWN key to enter editing mode on a user-adjustable screen. Edit Mode is indicated by the underscore appearing on the screen.  <b>NOTE:</b> Entering Edit Mode will also adjust the value up one (UP key) or down one (DOWN key), so you may have to readjust the value.
ENTER 	Use the ENTER key to move through the digits in the screen when editing a numeric value. An extended press of the ENTER key saves your edits no matter the location of the editing cursor within the digits.  Press the ENTER key to save a non-numeric value such as Hi Speed Network.
MENU 	The MENU key cancels editing when in Edit Mode. The screen you were editing will return to its original value and the underscore will disappear.  A second press of the MENU key will return you to the Main Menu.


**Table 5: Editing Key Functions**

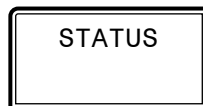
## Main Screens Map


Refer to the following map when navigating through the LCD Main Screens. The first screen is an initialization screen. To scroll through the rest of the screens, press the **<MENU>** button.




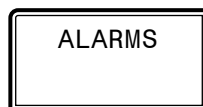
Press  to scroll through the MODGAS-X Screens.


Press  to go to the STATUS Screens.




Press  to scroll through the STATUS Screens.


Press  to go to the ALARMS Screens.




Press  to scroll through the ALARMS Screens.


Press  to go to the SETPOINT Screens.



Press  to scroll through the SETPOINT Screens.

Press  to go to the FORCE VALVES Screens.



Press  to scroll through the FORCE VALVES Screens.

## MODGAS-X Screens

### MODGAS-X Screens

From the MODGAS-X Screen, press <ENTER> to scroll through the screens.

MODGAS - X  
1044 V. XXX



S/A MODE

In Stand-Alone Mode, the screen will display S/A MODE or S/A MODE LOCKED. In Communications Mode, the screen will display COMM MODE and the items below will scroll through the screen:

1. Number of good packets being received. Example: +XXXX.
2. Number of checksum errors. Example: C-XXXX
3. Number of packet length errors. This will stop at 9999 until power is cycled. Example: P-XXXX.
4. Number of initialization errors if communication is I<sup>2</sup>C. Example: I-XXXX.



SOFTWARE  
1044 V. XXX

#### CURRENT SOFTWARE VERSION



ADDRESS  
1 (138)

#### CURRENT BOARD ADDRESS

Number in parenthesis is E-BUS address.



VALV CONFG  
0-20 VLT

#### VALVE CONFIGURATION

0-20 Volt (standard MODGAS-X Module)  
0-10 Volt (10-to-1 ratio)



# STAGES  
T=2 M=2

#### NUMBER OF STAGES CONFIGURED

T = Total stages fixed and modulating. M = Total modulating stages.

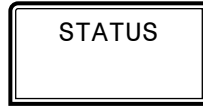


EBUSTEST  
XX

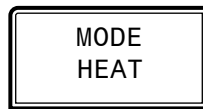
#### EBUS TEST

### Status Screens

Refer to the following map when navigating through the Status Screens. From the STATUS Screen, press **<ENTER>** to scroll through the screens.



Status Screens shown below will scroll automatically if LCD display is left on this screen for 20 seconds.



**MODE**

This screen displays the current operating mode of the MODGAS-X. The mode options are:

**OFF:** This mode will display when there is no call for heat and heating has been disabled.

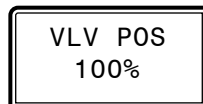
**HIGH FIRE:** Each time Heat is activated, the unit will first go into High Fire Mode. During this mode, the unit will remain at maximum fire. The unit will leave this mode once proof of fire has been established.

**HEAT:** After High Fire, the unit will enter the Heat Mode and will begin to modulate the gas valve to maintain the Heating Supply Air Setpoint (SAT). The unit must remain in this mode for a minimum run time of one minute. While in Heat Mode, the screen will display the staging status—HEAT STAGE 1 to STAGE 15. If Modulating Staged Heat, the screen will display MOD HEAT. Once the call for heat goes away, the unit will leave the Heat Mode.

**CUTOFF:** The Cutoff Mode occurs if the SAT rises above 200°F. During Cutoff Mode, the Heat will be disabled for a fixed delay period. If the SAT falls below 200°F and the delay period has expired, the unit will re-enter the Heat Mode.

**FORCE:** Force Mode.

**SAT FAIL:** The Supply Air Temperature Sensor has been disconnected for more than 60 seconds. This alarm will be disabled when the sensor is reconnected.

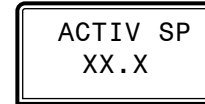


**VALVE POSITION**  
0 to 100%



**SUPPLY AIR TEMPERATURE**  
40°F to 200°F (5°C to 93°C)

If no sensor is detected, screen will display "NO SENSR".



**ACTIVE SUPPLY AIR SETPOINT**

Calculated from SAT Setpoint and Reset Signal in Stand-Alone Mode. In Communications Mode, the AAON unit controller sends the setpoint.



**FAN SPEED**  
OFF, HIGH, LOW

### Alarm Screens

Refer to the following map when viewing Alarm Screens. These screens will display automatically when alarms are present. For alarm troubleshooting, see [page 30](#).



**ALARMS**

The alarms are as follows:

**NO ALARMS:** This will be shown if there are no current alarms.

**SAT CUTOFF:** This indicates a Supply Air Temperature Cutoff Alarm condition which is activated if the SAT has risen above 200°F. The alarm will go away if after a fixed delay period the SAT has dropped below 200°F.

**SAT FAIL ERROR:** The Supply Air Temperature sensor has been disconnected for more than 60 seconds. This alarm will be disabled when the sensor is reconnected.

**COMM T/O ERROR:** Communications have been lost with the AAON unit controller. This alarm will disable when communications resume.

## Setpoint and Force Screens

### Setpoint Screens

Refer to the following map when navigating through the Setpoint Screens. From the SETPOINTS Screen, press **<ENTER>** to scroll through the screens and change setpoints. Use the **<UP>** and **<DOWN>** arrow keys to change your selections. Then press **<ENTER>** to save the new setpoint.

**NOTE:** When the MODGAS-X Module is operating in Communications Mode, these setpoint screens will not appear on the LCD display because they are controlled by the AAON unit controller.

SET  
POINTS



SAT SP  
40 - 200 °F

#### HEATING SUPPLY AIR TEMPERATURE SETPOINT

This is the target temperature while the heating is enabled. If you are using the reset signal, this is the setpoint it will calculate to at zero volts. Will display only in Stand-Alone Mode.

The SAT Setpoint is set by the LCD Display in Stand-Alone Mode and is set by the AAON unit controller in Communications Mode.

Minimum	Default	Maximum
40°F	120°F	200°F
5°C	49°C	93°C



RESET SP  
40 - 200 °F

#### RESET HEATING SUPPLY AIR SETPOINT

This is the maximum temperature at which the Supply Air Temperature will reset to. It will only display in Stand-Alone Mode.

The Reset Setpoint is set by the LCD Display in Stand-Alone Mode and is set by the AAON unit controller in Communications Mode.

Minimum	Default	Maximum
40°F	120°F	200°F
5°C	49°C	93°C



### Force Screens

Refer to the following map when navigating through the Force Screens. From the FORCE Screen, press **<ENTER>**.

FORCE  
VALVES



FORCE  
MODE ON/OFF

Press the **<UP>** button to turn the Force Mode on.  
Press the **<DOWN>** button to turn the Force Mode off.



FRC VALV  
X%

#### FORCE VALVE PERCENTAGE

This screen only appears when Force Mode is on.

Press the **<UP>** button to increase the percentage.

Press the **<DOWN>** button to decrease the percentage

**NOTE:** When you turn the Force Mode back off or after one hour has elapsed, the valve will reinitialize to zero.



The next 15 screens are for relays only.

STAGE 1  
MODULATING

This relay cannot be forced.

STAGE 2 - 14  
FORCE ON

Press the **<UP>** button to turn the Force Relay on.

Press the **<DOWN>** button to turn the Force Relay off.

FORCE  
TIMEOUT

#### FORCE MODE TIMEOUT

This screen will appear when the Force Mode times out after one hour.



## Protected and Diagnostic Screens

### Protected Screens Map

From the MODGAS-X Screen, press **<ENTER>** twice until you get to the SOFTWARE Screen. Then hold the **<UP>** button for five seconds. To scroll through the rest of the screens, press the **<MENU>** button.

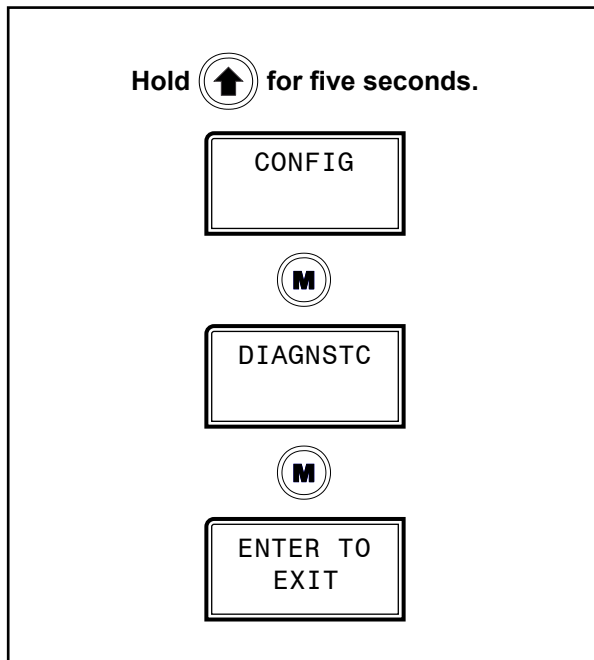
MODGAS - X  
1044 V. XXX



S/A MODE



SOFTWARE  
1044 V. XXX



### Diagnostic Screens

Refer to the following map when navigating through the Diagnostic Screens. From the DIAGNSTC Screen, press **<ENTER>** to scroll through the screens.

DIAGNSTC



VLV VOLT  
X. XX

**GAS VALVE VOLTAGE**  
0-20 Volts



WDOG CNT  
#

**WATCHDOG TIMER**

Displays the number of times the board has been reset due to watchdog timer overflow.



PWER CNT  
#

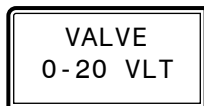
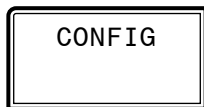
**POWER LOSS COUNT**

Displays the number of times the board has been reset due to power loss.

## Configuration Screens

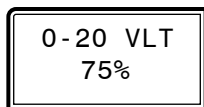
### Configuration Screens

Refer to the following map when navigating through the Configuration Screens. From the CONFIG Screen, press **<ENTER>** to scroll through the screens and change setpoints. Use the **<UP>** and **<DOWN>** arrow keys to change your selections. Press **<ENTER>** to save any changes.



#### VALVE TYPE

0-20 (default): Regular Analog Maxitrol Valve  
0-10: Maxitrol Stepper Valve

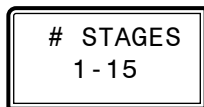


#### 0-20 VLT VALVE ADJUSTMENT

75% = 5 Volts Output    100% = 0 Volts Output

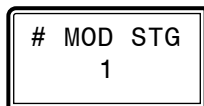
Allows Adjustment of maximum valve position during Heat Mode.

**NOTE:** This screen is only displayed if 0-20 VLT is selected on previous screen.



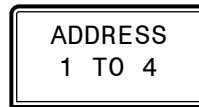
#### If Staging with Fixed was selected - # of STAGES

Select number of stages (1-15). You must press the **<ENTER>** key in order to save the configuration, so that when any power cycles, the unit will run with the saved settings.



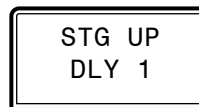
#### NUMBER OF MODULATING STAGES

0-20 Volt - Range is 1 or 2. Default is 1.  
0-10 Volt - Range is 1 to 8. Default is 1.



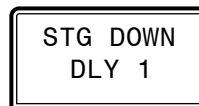
#### CURRENT ADDRESS OF THE BOARD

The address is only used in Communications Mode. Default = 1



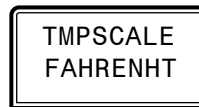
#### STAGE UP DELAY

Range is 1 to 10 minutes. Default is 3.



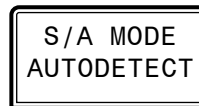
#### STAGE DOWN DELAY

Range is 1 to 10 minutes. Default is 1.



#### TEMPERATURE SCALE

Fahrenheit (default) or Celsius.  
This setting is only used in Stand-Alone Mode.

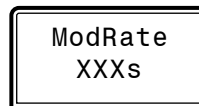


#### S/A MODE FORCED

S/A Mode Autodetect (default) or Locked.

Forces the module to be in Stand-Alone Mode only.

If there is a 12 Relay board with additional Heat Stages on a Stand-Alone unit, this must be set to locked.



#### MOD RATE

Range: 1-120 seconds



ModRate2  
XXXs

**MOD RATE 2**

Controls the Mod Rate of the second and subsequent stages of heat.  
Range: 1-120 seconds.



St@MinDb  
XX°

**MIN MODE DEADBAND**

Range: 0-30 degrees.

**NOTE:** If it is set to 0, Min Mode will not initialize and the sequence will continue to Heating Mode.



MinPosTP  
XXXs

**MIN MODE RUN TIME**

Range: 0-500 seconds.

## LED Diagnostics

### LED Diagnostics

The MODGAS-X is equipped with LEDs that can be used to verify operation and perform troubleshooting. There are LEDs for communication, operation modes, and diagnostic codes. The module has 10 LEDs—eight used for operation and status, and two used for alarms. See **Figure 11, page 29**.

#### Operation LEDs

**POWER** - This green LED will light up to indicate that 24 VAC power has been applied to the MODGAS-X.

**STATUS** - This green LED will light up and blink the board address at startup. It will then blink every 10 seconds according to the current mode. See **Table 6, this page**.

No. of Blinks	STATUS LED
1	Off Mode
2	High Fire Mode
3	Heating Mode
4	Force Mode

**Table 6: STATUS LED Blink Codes**

#### Diagnostic LEDs

**ALARM** - This red LED located on the MODGAS-X cover above the LCD display will light up to indicate an alarm. The type of alarm(s) will be shown on the LCD display. The ALARM LED also blinks when the expansion valve is initializing at startup.

The ALARM LED on the MODGAS-X will blink an alarm code when an alarm(s) occurs. The highest priority failure code will be indicated first. You must correct the highest priority alarm before other problems will be indicated. See **Table 7, this page**.

No. of Blinks	ALARM LED
1	Mechanical Failure
2	Supply Air Temperature Sensor Failure
3	SAT Cutoff Mode
4	Communications Time Out Error

**Table 7: STATUS LED Blink Codes**

#### Communication LED

**COMM** - This yellow LED will light up and blink when communications are detected.

#### Relay LEDs

**RLY1** - This green LED will light up and stay lit as long as the Fan Relay is active.

**RLY2** - This green LED will light up and stay lit as long as the Low Speed Fan Relay is active.

**RLY3** - This green LED will light up and stay lit as long as the Auxiliary Heat 1 Relay is active.

**RLY4** - This green LED will light up and stay lit as long as the Auxiliary Heat 2 Relay is active.

#### Binary Input LEDs

**AUX BIN** - Not Used.

**HEAT EN** - This green LED will light up when Heat is enabled.

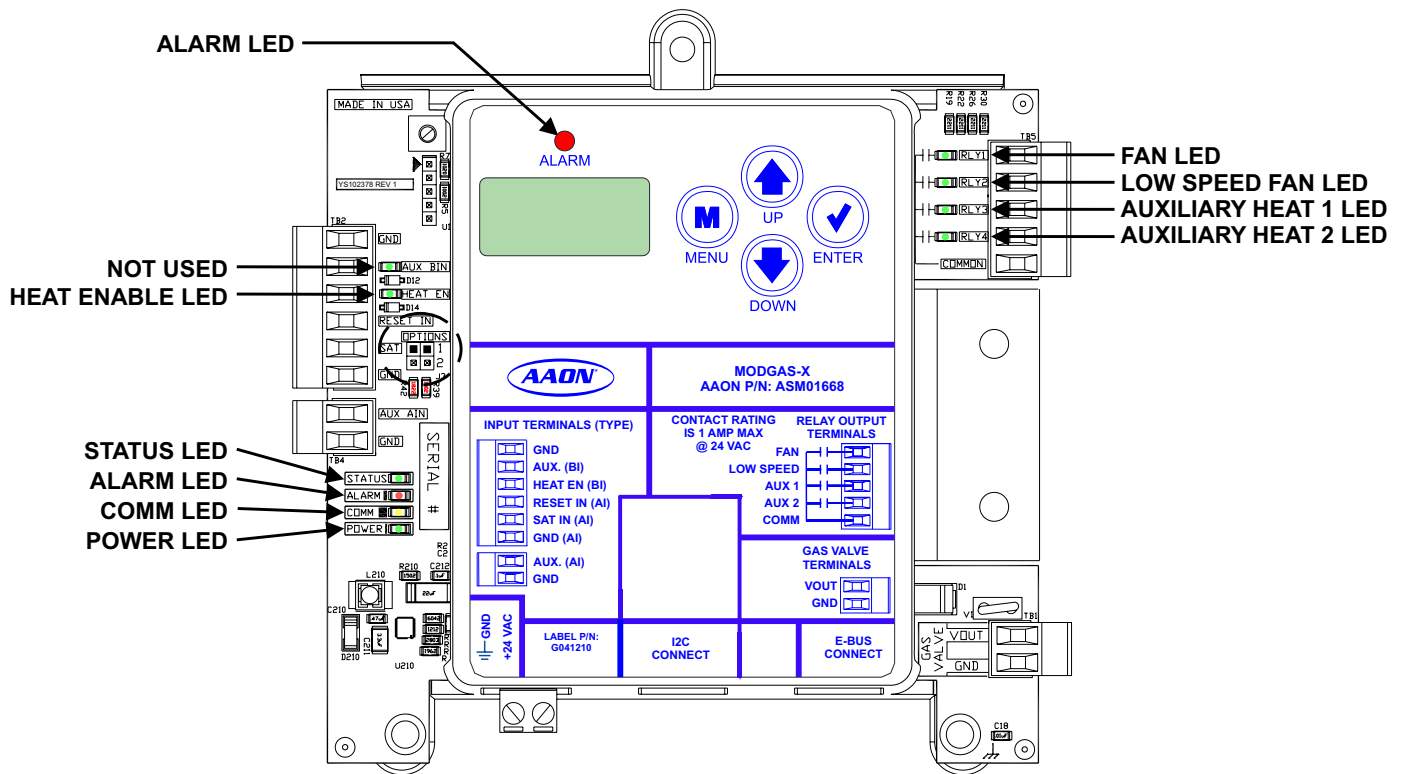


Figure 11: MODGAS-X LED Locations and Descriptions

## Alarms

### Troubleshooting Alarms

#### Mechanical Failure:

**NOTE:** This alarm was removed in version 3.06.

- Check relay outputs on the MODGAS-X for 24 VAC output.
- Verify the SAT OPTIONS jumper settings on the MODGAS-X for Supply Air Temperature Sensor.
- Verify output voltage (VOUT and GND) to gas valve.
- Try forcing valves (refer to the Force Screens, **page 24**).
- Verify that the Supply Air Temperature Sensor is connected to SAT and GND on the MODGAS-X (Stand-Alone Mode and when using VAV/CAV or MUA controller) or to AI2 and GND or AI3 and GND on the AAON unit controller (Communications Mode).
- Verify Supply Air Temperature Sensor probe is mounted correctly in supply duct.
- Remove SAT and GND wiring from the MODGAS-X and ohm the sensor out (this may indicate open or failed wiring). Refer to **Table 8, page 31** and **Table 9, page 32**.

#### Supply Air Temperature Failure:

- Verify that the Supply Air Temperature Sensor is connected to SAT and GND on the MODGAS-X (Stand-Alone Mode or when using retrofit applications) or to AI2 and GND or AI3 and GND on specific AAON unit controllers (Communications Mode).
- Remove SAT and GND wiring from MODGAS-X and ohm the sensor out (this may indicate open or failed wiring). Refer to **Table 8, page 31** and **Table 9, page 32**.
- Verify the SAT OPTIONS jumper settings on the MODGAS-X for the Supply Air Temperature Sensor. See **Table 11, page 34**.

#### Sat Cutoff Mode:

- Remove SAT and GND wiring from the MODGAS-X and ohm the sensor out (this may indicate open or failed wiring). Refer to chart in back of guide for readings.
- With Supply Air Sensor disconnected from the MODGAS-X, set volt meter to DC volts and measure voltage between SAT and GND on board. Refer to **Tables 8 and 9, pages 31 and 32** for readings.
- Verify Supply Air Temperature Sensor reading in duct with third-party temperature testing device.

#### Communications Loss:

- Check COMM LED on MODGAS-X.
- Verify 24 VAC power to all interconnected AAON unit controllers and modules.
- Verify connection between the MODGAS-X and associated AAON unit controllers.
- In Communications Mode (connected to an AAON unit controller with modular cable), confirm the AAON unit controller's MODGAS-X Status Screen displays MODGAS-X's Supply Air Temperature and the Main MODGAS-X Screens show COMM MODE.

### Other Checks

#### 0-3V (SAT OPTIONS Jumper Setting 1) and 0-5V (SAT OPTIONS Jumper Setting 2) Supply Air Temperature Sensor

If you suspect the Supply Air Temperature Sensor is not reading correctly, make sure the wiring terminal connections are tight and that any wiring splices are properly connected. You can check the operation of the Supply Air Temperature Sensor by measuring the resistance or voltage using a digital multimeter. Set the meter to DC volts. Place the positive probe on the AI terminal and the negative probe on the GND terminal. Read the DC volts and find that voltage in **Table 8, this page** and **Table 9, page 32**.

Read the temperature corresponding with that voltage and determine if this is close to the actual temperature the sensor is exposed to. If the temperature from the chart is different by more than a few degrees, you probably have a defective or damaged sensor.

You can also check the sensor resistance to determine correct operation. To read the resistance, set the meter to ohms. Unplug the sensor connector from the board and measure the resistance across the disconnected wires. This resistance should match the corresponding temperature from **Table 8, this page** and **Table 9, page 32**.

#### 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.

Temperature to Resistance/Voltage Chart							
Temp (°F)	Temp (°C)	Resistance (Ohms)	Voltage @ Input (VDC)	Temp (°F)	Temp (°C)	Resistance (Ohms)	Voltage @ Input (VDC)
-10	-23.3	93333	2.98	72	22.2	11136	1.74
-5	-20.6	80531	2.94	73	22.8	10878	1.72
0	-17.8	69822	2.89	74	23.3	10625	1.70
5	-15	60552	2.83	75	23.9	10398	1.68
10	-12.2	52500	2.77	76	24.4	10158	1.66
15	-9.4	45902	2.71	78	25.6	9711	1.63
20	-6.6	40147	2.64	80	26.7	9302	1.59
25	-3.9	35165	2.57	82	27.8	8893	1.55
30	-1.1	30805	2.49	84	28.9	8514	1.52
35	1.7	27140	2.41	86	30	8153	1.48
40	4.4	23874	2.33	88	31.1	7805	1.45
45	7.2	21094	2.24	90	32.2	7472	1.41
50	10	18655	2.15	95	35	6716	1.33
52	11.1	17799	2.11	100	37.8	6047	1.24
54	12.2	16956	2.08	105	40.6	5453	1.16
56	13.3	16164	2.04	110	43.3	4923	1.09
58	14.4	15385	2.00	115	46.1	4449	1.02
60	15.6	14681	1.96	120	48.9	4030	.95
62	16.7	14014	1.93	125	51.7	3656	.88
64	17.8	13382	1.89	130	54.4	3317	.82
66	18.9	12758	1.85	135	57.2	3015	.76
68	20	12191	1.81	140	60	2743	.71
69	20.6	11906	1.79	145	62.7	2502	.66
70	21.1	11652	1.78	150	65.6	2288	.61
71	21.7	11379	1.76				

**Note:** 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 8: 0-3V Temperature Sensor - Voltage and Resistance for Type III Sensors**

# TROUBLESHOOTING

## SAT Sensor Testing

### 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.

Temperature to Resistance/Voltage Chart

Temp (°F)	Temp (°C)	Resistance (Ohms)	Voltage @ Input (VDC)	Temp (°F)	Temp (°C)	Resistance (Ohms)	Voltage @ Input (VDC)
-10	-23.3	93333	4.620	72	22.2	11136	2.695
-5	-20.6	80531	4.550	73	22.8	10878	2.665
0	-17.8	69822	4.474	74	23.3	10625	2.635
5	-15	60552	4.390	75	23.9	10398	2.607
10	-12.2	52500	4.297	76	24.4	10158	2.577
15	-9.4	45902	4.200	78	25.6	9711	2.520
20	-6.6	40147	4.095	80	26.7	9302	2.465
25	-3.9	35165	3.982	82	27.8	8893	2.407
30	-1.1	30805	3.862	84	28.9	8514	2.352
35	1.7	27140	3.737	86	30	8153	2.297
40	4.4	23874	3.605	88	31.1	7805	2.242
45	7.2	21094	3.470	90	32.2	7472	2.187
50	10	18655	3.330	95	35	6716	2.055
52	11.1	17799	3.275	100	37.8	6047	1.927
54	12.2	16956	3.217	105	40.6	5453	1.805
56	13.3	16164	3.160	110	43.3	4923	1.687
58	14.4	15385	3.100	115	46.1	4449	1.575
60	15.6	14681	3.042	120	48.9	4030	1.469
62	16.7	14014	2.985	125	51.7	3656	1.369
64	17.8	13382	2.927	130	54.4	3317	1.274
66	18.9	12758	2.867	135	57.2	3015	1.185
68	20	12191	2.810	140	60	2743	1.101
69	20.6	11906	2.780	145	62.7	2502	1.024
70	21.1	11652	2.752	150	65.6	2288	0.952
71	21.7	11379	2.722				

Note: If the voltage is above 5.08 VDC the sensor or wiring is “open.” If the voltage is less than 0.05 VDC, the sensor or wiring is shorted.

Table 9: 0-5V Temperature Sensor - Voltage and Resistance for Type III Sensors



### Mounting the Supply Air Temperature Sensor

The Supply Air Temperature (SAT) Sensor should be located in the duct-work downstream of the unit supply air connection.

Locate the sensor in the center of the widest part of the duct. Use the supplied template and a 5/16" drill to make a hole for the sensor.

Install the gasket over the probe and mount securely to the duct using the supplied sheet metal screws. Be sure the gasket is compressed to provide an air tight seal.

For best accuracy, apply insulation on the outside of the duct, over the sensor. This will help prevent thermal gradients from affecting the sensor.

**WARNING:** Make sure your Supply Air Temperature Sensor is mounted and wired according to these instructions prior to testing the unit or else the modulating valve will not control properly and may damage your equipment.

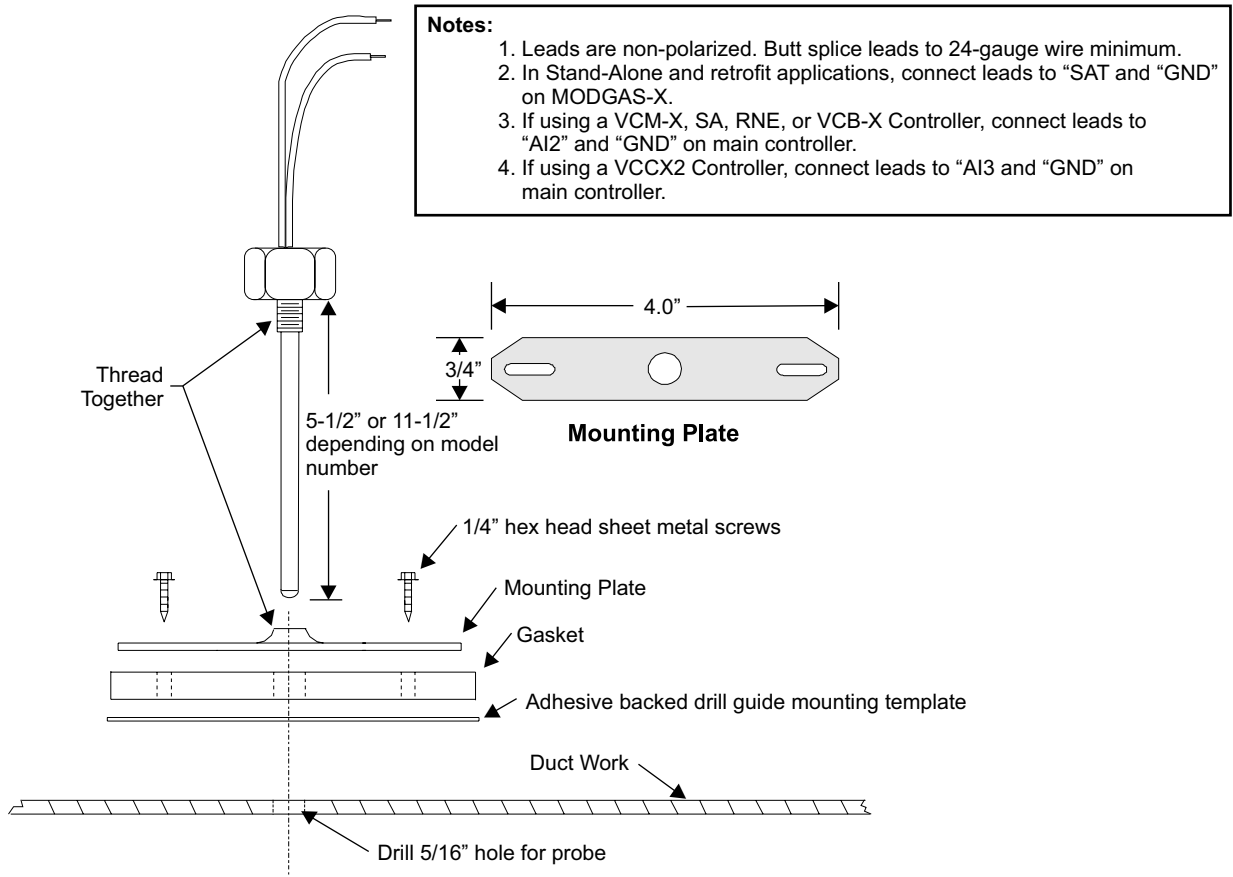
### Stand-Alone Mode

In Stand-Alone Mode, the SAT Sensor is connected to the MODGAS-X. If, in Stand-Alone Mode, the MODGAS-X is used in conjunction with a Stand-Alone MHGRV-X module, the SAT sensor is shared between the two modules and always attaches to the MODGAS-X.

See **Table 11, page 34** for SAT Options Jumper Settings and see **Figures 2,4,5,6,7, and 8** for wiring. See **Table 10, page 34** for details about retrofit applications.

### Communications Mode

When communicating with AAON unit controllers, the SAT Sensor will be connected to the AAON unit controller. The exception would be in retrofit applications with older controllers. See **Table 12, page 34** for SAT Options Jumper Settings and see **Figure 3, page 9** and **Figure 9, page 15** for wiring. See **Table 10, page 34** for details about retrofit applications.



**Figure 12: Supply Air Temperature Sensor Installation**

# APPENDIX A: SAT SENSOR

## SAT Sensor Wiring Guide and Jumper Settings

	MODGAS-X ONLY	MHGRV-X ONLY	MODGAS-X and MHGRV-X
<b>Stand-Alone</b>	Install Supply Air Sensor on MODGAS-X.	Install Supply Air Sensor on MHGRV-X. Set "SAT Options" Jumpers to "Normal".	Install sensor on MODGAS-X and daisy-chain it to the MHGRV-X. Set "SAT Options" Jumpers to "MODGAS X". If connected to a MODGAS II Retrofit, Set "SAT Options" Jumpers to "MODGAS".
<b>VCCX2 VCB-X</b>	Install Supply Air Sensor on VCCX2 or VCB-X. Connect to VCCX2 or VCB-X using E-BUS cable.	Install Supply Air Sensor on VCCX2 or VCB-X. Connect to VCCX2 or VCB-X using E-BUS cable.	Install Supply Air Sensor on VCCX2 or VCB-X. Connect to VCCX2 or VCB-X using E-BUS cable.
<b>VCM-X, SA, RNE</b>	Install Supply Air Sensor on AAON unit controller. Connect to AAON unit controller using I <sup>2</sup> C cable.	Install Supply Air Sensor on AAON unit controller. Connect to main controller using I <sup>2</sup> C cable.	Install Supply Air Sensor on AAON unit controller. Connect to AAON unit controller using I <sup>2</sup> C cable.
<b>VCM, VAV/ CAV, MUA, MUA II, MUA IID</b>	Install Supply Air Sensor on MODGAS-X. Connect to AAON unit controller using I <sup>2</sup> C cable.	Install Supply Air Sensor on MHGRV-X. Connect to AAON unit controller using I <sup>2</sup> C cable.	Install Supply Air Sensor on MODGAS-X. Connect to AAON unit controller using I <sup>2</sup> C cable.

Table 10: SAT Wiring Conditions

STAND-ALONE MODE SAT OPTIONS JUMPER SETTINGS*	
Condition	Jumper Setting
MODGAS-X only	1
MODGAS-X with MHGRV-X**	1
MODGAS-X with MHGRV-II***	2
MODGAS-X with MHGRV-III	2
* For SAT Sensor testing, use <b>Table 8, page 31</b> for jumper setting 1 and <b>Table 9, page 32</b> for jumper setting 2.	
** In this situation, also set MHGRV-X SAT Option to MODGAS-X. See the <i>MHGRV-X Technical Guide</i> for more information.	
*** The MHGRV-II must have PU resistor installed.	

Table 11: Stand-Alone Mode SAT OPTIONS Jumper Settings

Communications Mode SAT OPTIONS JUMPER SETTINGS*	
Condition	Jumper Setting
VCM-X/RNE/SA*	1
VCM, MUA, MUA II, MUA IID VAV/ CAV **	1
VCCX2, VCB-X*	1
* For SAT Sensor testing, use <b>Table 8, page 31</b> for Jumper Setting 1. SAT Sensor should be connected to the AAON unit controller.	
** For SAT Sensor testing, use <b>Table 9, page 32</b> for Jumper Setting 1. SAT Sensor should be connected to the MODGAS-X.	

Table 12: Communications Mode SAT OPTIONS Jumper Settings

## MODGAS-X Replacement of MODGAS II

### Replacing the MODGAS II with the MODGAS-X

The retrofit replacement involves a few easy steps. Refer to Figure 13, this page.

**WARNING:** Do not connect power to VOUT/Ground terminal block.

#### Stand-Alone Mode Operation

- Step 1:** Disconnect power from the MODGAS II Module.
- Step 2:** Disconnect the Supply Air Temperature Sensor from the MODGAS II and wire it to the MODGAS-X. If the Supply Air Temperature Sensor is being shared with a Stand-Alone MHGRV Module, maintain the same wiring with the MHGRV Module.

- Step 3:** Wire other inputs and outputs per Figure 2, page 8.
- Step 4:** Set the SAT Options Jumper per Table 11, page 34.
- Step 5:** Connect power to the MODGAS-X Module.

#### Communications Mode Operation

- Step 1:** Disconnect power from the MODGAS-X Module.
- Step 2:** The Supply Air Temperature Sensor needs to remain installed on whatever controller or module it is currently on. If it is currently installed on the MODGAS II module, then reinstall it on the MODGAS-X.
- Step 3:** Set the SAT Options Jumper per Table 12, page 34.
- Step 4:** Connect power to the MODGAS-X.

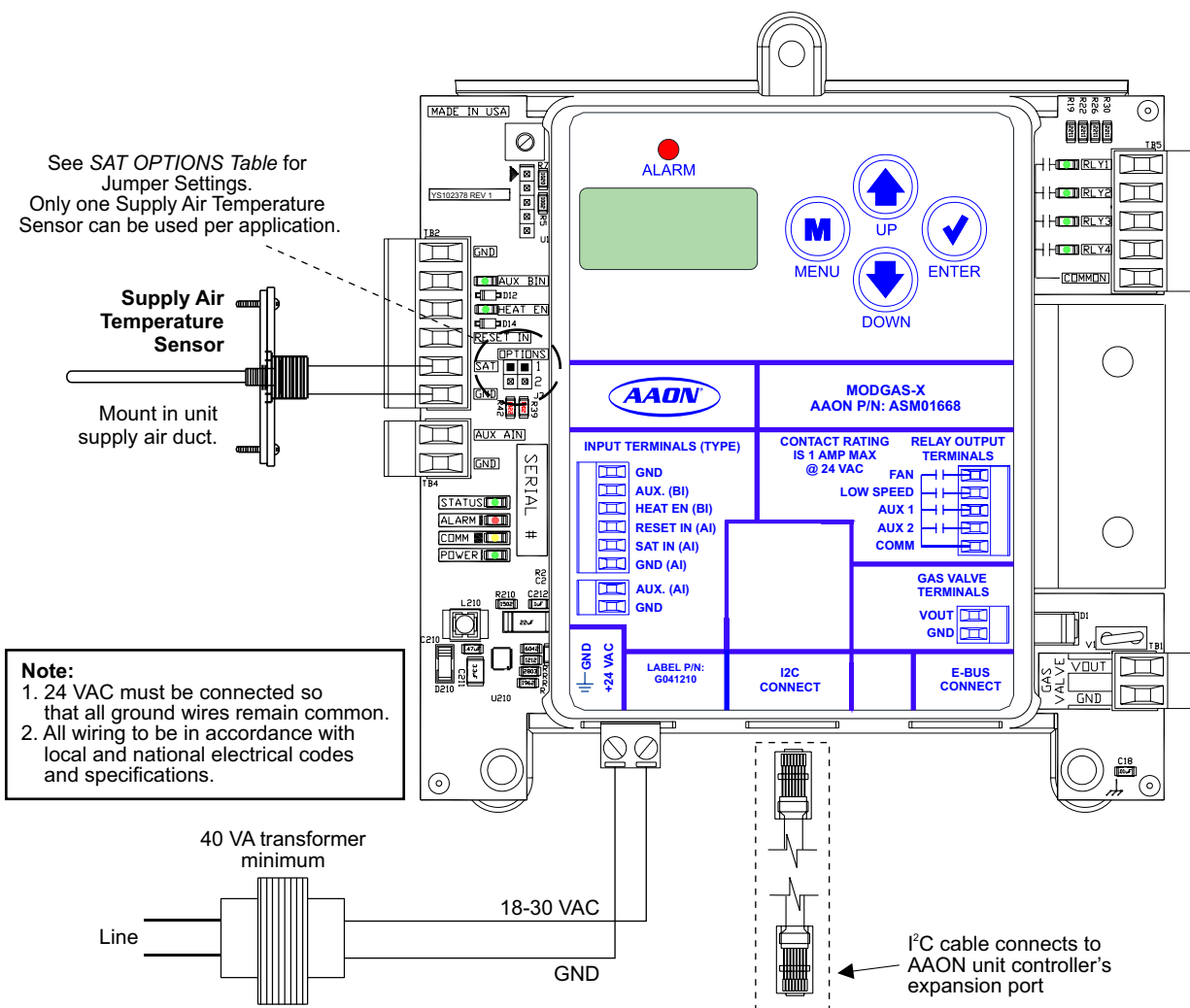


Figure 13: MODGAS-X Module

## APPENDIX C: MAXITROL® VALVES

### MAXITROL® Stepper Valve Types



Figure 14: Two-Wire 0-20 Volt Reverse-Acting MAXITROL® Selectra Stepper Valve



Figure 15: Four-Wire 0-10 Volt Directing-Acting MAXITROL® EXA STAR Stepper Valve



**MODGAS-X Technical Guide**  
**V16940 · Rev. J · 210617**

**AAON Controls Support: 866-918-1100**  
Monday through Friday, 7:00 AM to 5:00 PM  
Central Standard Time

**Controls Support website:**  
[www.aaon.com/controlstechsupport](http://www.aaon.com/controlstechsupport)

**AAON Factory Technical Support: 918-382-6450**  
**techsupport@aaon.com**

**NOTE:** Before calling Technical Support, please have the model and serial number of the unit available.

**PARTS:** For replacement parts, please contact your local AAON Representative.



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