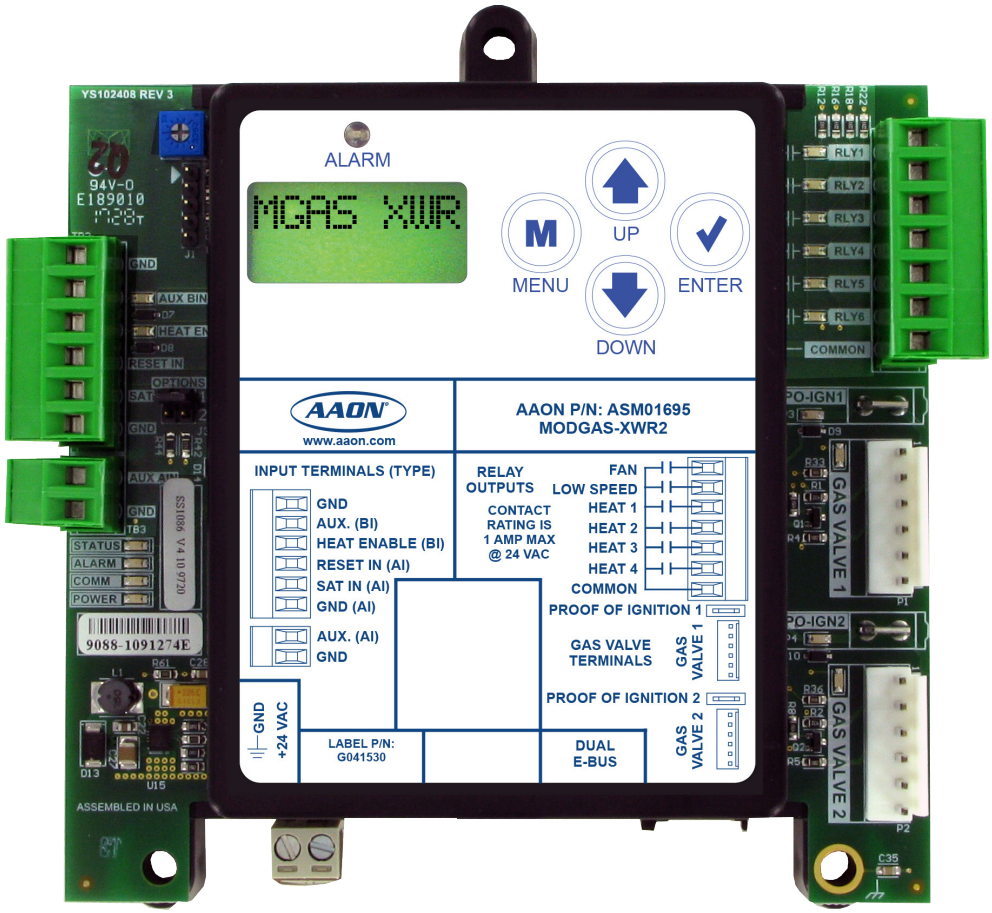
MODGAS-XWR2 Module Technical Guide



MODGAS-XWR2 REVISION LOG	
REVISION AND DATE	
Rev. 01C, January 2020	Previous revision
Rev. D, November 01, 2021	Updated part numbers and labels. Added Figure/Table content pages, and Fahrenheit/Celsius temperature conversion. Corrected cosmetic errors.
Rev. E, July 26, 2022	Updated format
Rev. F, February 24, 2023	Added information for software version SS3002 to support the RP2040 processor. Removed references to I²C and VCM-X Controllers.

MODGAS-XWR2 PARTS REFERENCE	
PART DESCRIPTION	**PART NUMBER**
MODGAS-XWR2 Module	ASM01695
12 Relay E-BUS Expansion Module	ASM01873
VCCX2 Controller	ASM01698
MHGRV-X Module	ASM01670
MHGRVX-A1 Module (PIC32 processor, no I²C connections)	ASM07265
MHGRVX-A2 Module (PIC32 processor with Sanhua EBV05H valve only)	ASM06926
Supply Air Temperature Sensor (6 in and 12 in.)	G051240 (6 in.) and G051250 (12 in.)

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All manuals are also available for download from www.aaon.com/library

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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.

AAON P/N: G112860, Rev. F

TABLE OF CONTENTS

TABLE OF CONTENTS

FIGURES AND TABLES

FIGURES

TABLES

General Information

Overview

The MODGAS-XWR2 Module (previously referred to as the MODGAS-XWR-1) is designed to be used with White-Rogers® valves only. It will modulate up to two White-Rogers® gas valves to maintain a desired Supply Air Temperature (up to four modulating gas valves may be controlled when a second MODGAS-XWR2 is configured as a slave module). The MODGAS-XWR2 also controls the speed of the induction motors in combustion air blowers. See **Figure 1, page 7**.

NOTE: The MODGAS-XWR2 provides two more relays than the MODGAS-XWR and can replace the MODGAS-XWR. See **page 43** for replacement instructions.

The MODGAS-XWR2 can be used in Stand-Alone Mode or connected to a VCCX2 Controller or VCB-X Controller using a modular or E-BUS cable.

The MODGAS-XWR2 can have the following configurations:

- One modulating valve with one ignitor as one stage.
- Two modulating valves with one ignitor as one stage.
- Two modulating valves with two ignitors as one stage.
- Two modulating valves, with two ignitors as two stages.

NOTE: The MODGAS-XWR2 does not support the VCM-X Controller or I^2C connections. Please contact your local Sales Representative to learn about AAON's Xtend Program and an appropriate upgrade path.

The MODGAS-XWR2 uses either a PIC32 processor or a RP2040 processor. The PIC32 processor requires software version SS1086; the RP2040 processor requires software version SS3002. The software version is identified on the software label near the Status LED or using the Software Version screen. There is no functional difference between the two types of boards.

WARNING: The correct software version must be used for all software upgrades. Loading the incorrect software could result in malfunction. Contact Controls Technical Support for assistance, if required.

Features

The MODGAS-XWR2 provides the following:

- Can control two gas valves and monitors proof of ignition.
- A second MODGAS-XWR2 can be added to allow control of four modulating gas valves.
- Inputs for Stand-Alone Supply Air Temperature and Supply Air Reset
- E-BUS communication to compatible unit controller for Supply Air Temperature and Supply Air Reset
- Modulates gas valves to maintain the active Supply Air Temperature Setpoint.
- Binary Outputs for Combustion Fan Enable, Combustion Fan Low Speed, and Heat Stage Enable 1-4.
- Controls up to four stages of Heat with one module.
- 2 x 8 LCD character display and four buttons that allow for status display, setpoint changes, and configuration changes.

Two MODGAS-XWR2 Modules (Primary/Secondary) may be configured to control four modulating valves as one stage - two valves with one ignitor on each board. In addition, two modules may be configured to control four modulating valves with two ignitors on each board. The first valve on each board is stage one and the second valve on each board is stage two.

The MODGAS-XWR2 can also control additional fixed valves for additional stages of heat by using the additional heat relays on the board itself. When the MODGAS-XWR2 is attached to one of the listed AAON unit controllers, these additional stages are controlled through the AAON unit controller. Additional fixed heat stages can be increased by attaching a 12 Relay E-BUS Expansion Module.

NOTE: The MODGAS-XWR2 contains no user serviceable parts. Contact qualified technical personnel if your MODGAS-XWR2 is not operating correctly.

Dimensions

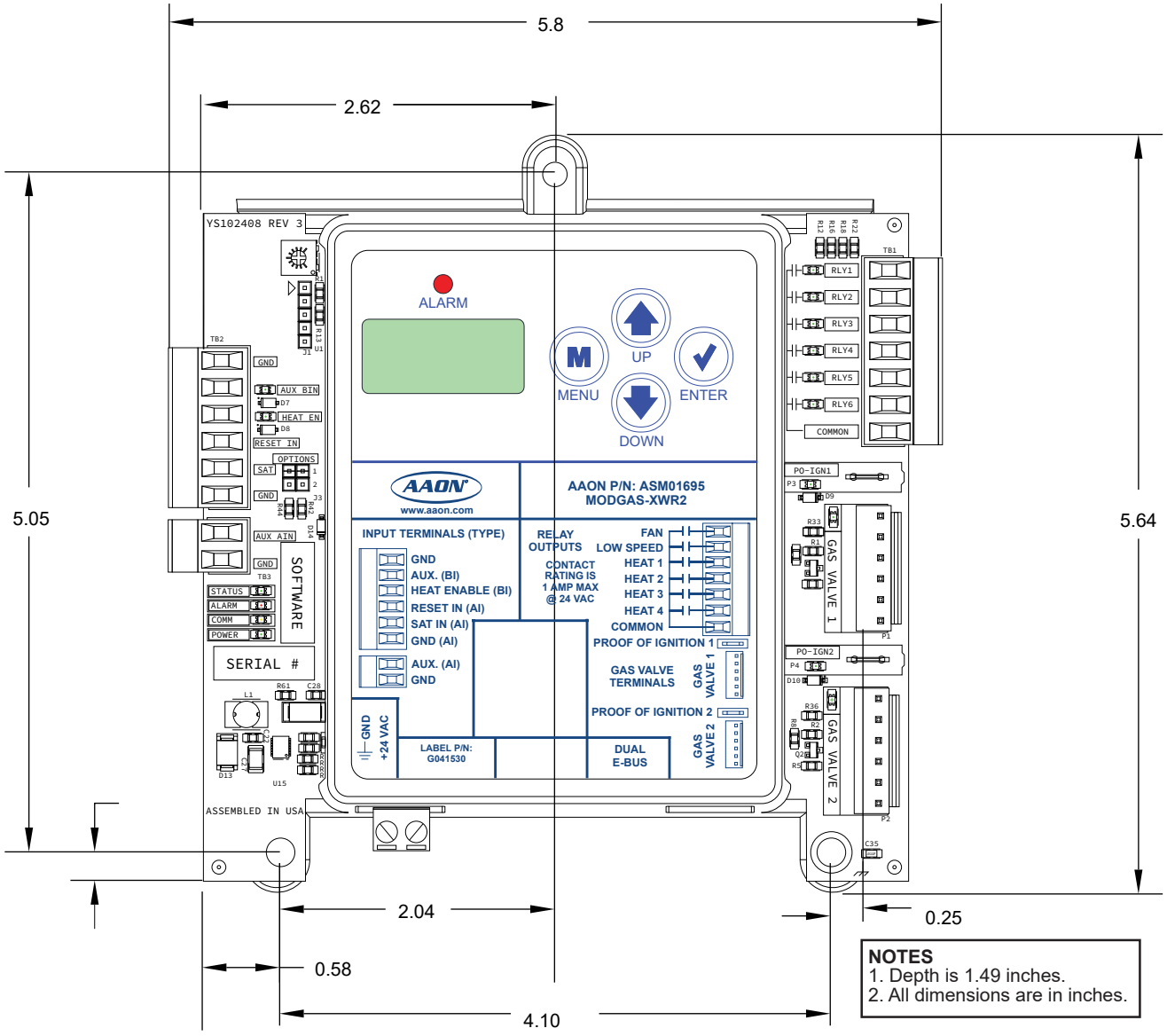


Figure 1: MODGAS-XWR2 Module Dimensions

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-XWR2	18-30 VAC	18	-22°F to 158°F -30ºC to 70ºC	0-95% RH
	Inputs		Resistive Inputs require 10KΩ Type III Thermistor	
			24 VAC Inputs provide 4.7KΩ Load	
	Outputs		Relay Outputs: 1 amp maximum per output.	

Table 1: Electrical and Environmental Requirements

NOTE: If the temperature at the MODGAS-XWR2 is below -4ºF (-20ºC), 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-XWR2, and any associated module.

Please carefully read and apply the following information when wiring the AAON unit controller, MODGAS-XWR2 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-XWR2, 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.

One Modulating Valve, One Ignitor, One Stage (1V1IGN1S)

This configuration is used to control one modulating valve, which must be placed on Gas Valve 1 (attached to Heat 1 (RLY3)).

If using an MHGRV-X series module along with the MODGAS-XWR2 in Stand-Alone Mode, the SAT Sensor always attaches to the MODGAS-XWR2.

NOTE: Up to three additional fixed heat stages can be configured by using Heat 2 (RLY4), Heat 3 (RLY5) and Heat 4 (RLY6). Up to 12 additional fixed stages can be added by using the 12 Relay E-BUS Expansion Module. (**Figure 8, page 15**).

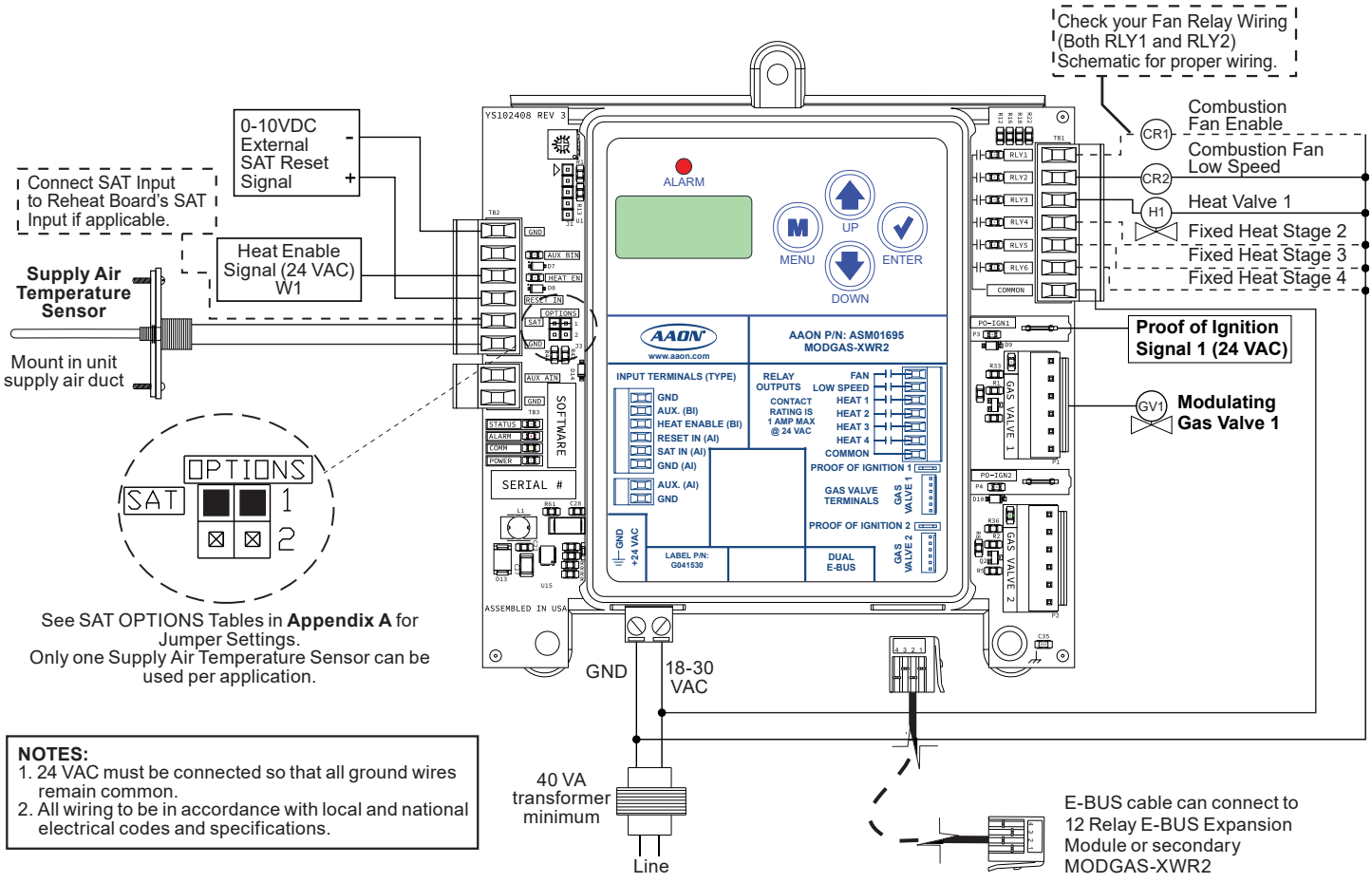


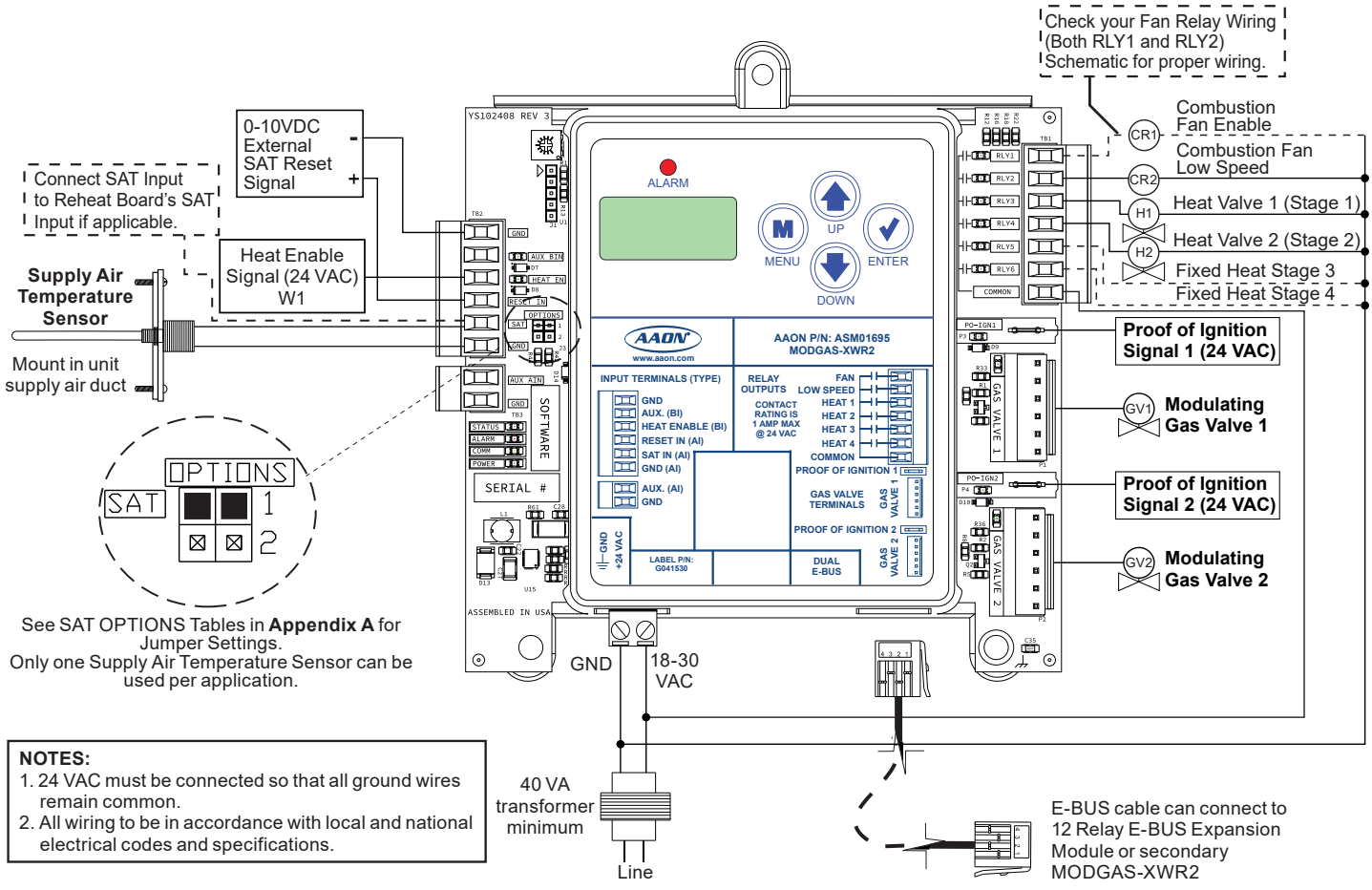
Figure 2: Stand-Alone Wiring - One Modulating Valve, One Ignitor, One Stage

Two Modulating Valves, Two Ignitors, Two Stages (2V2IGN2S)

This configuration is used to control two modulating gas valves. The first valve is modulating stage 1 (Gas Valve 1) and the second valve is modulating stage 2 (Gas Valve 2).The first valve is attached to Heat 1 (RLY3) and the second valve is attached to Heat 2 (RLY4).

If using an MHGRV-X series module along with the MODGAS-XWR2 in Stand-Alone Mode, the SAT Sensor always attaches to the MODGAS-XWR2.

NOTE: Up to two additional fixed heat stages can be configured by using Heat 3 (RLY5) and Heat 4 (RLY6). Up to 12 additional fixed stages can be added by using the 12 Relay E-BUS Expansion Module. (**Figure 8, page 15**).



NOTES:
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.

Figure 3: Stand-Alone Wiring - Two Modulating Valves, Two Ignitors, Two Stages

Secondary Board - Four Modulating Valves, Two Ignitors, Two Stages (2V2IGN2S)

In this configuration, the wiring on **Figure 3, page 10** is the primary portion and **Figure 4, this page** is the secondary portion, creating four modulating valves as two stages.

If using an MHGRV-X series module along with the secondary MODGAS-XWR2 in Stand-Alone Mode, the SAT Sensor always attaches to the Primary MODGAS-XWR2.

NOTE: Up to two additional fixed heat stages can be configured by using Heat 3 (RLY5) and Heat 4 (RLY6). Up to 12 additional fixed stages can be added by using the 12 Relay E-BUS Expansion Module. (**Figure 8, page 15**).

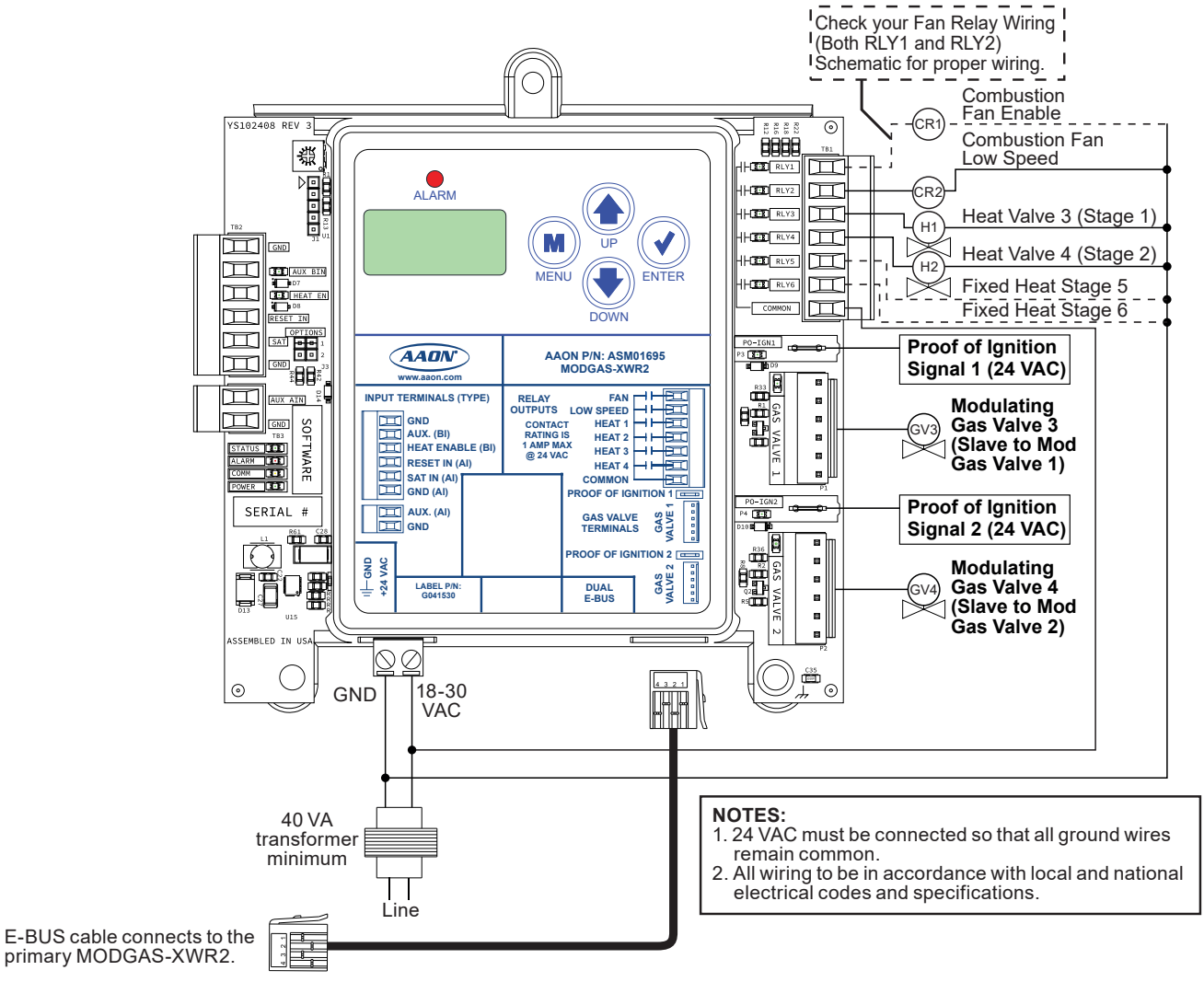


Figure 4: Stand-Alone Wiring - Secondary Board 2V2IGN2S

Two Modulating Valves, One Ignitor, One Stage (2V1IGN1S)

This configuration is used to control two modulating gas valves (one on each terminal connector), in which the first and second valves operate together for one modulating stage. Both valves are connected to Heat 1 (RLY3).

If using an MHGRV-X series module along with the secondary MODGAS-XWR2 in Stand-Alone Mode, the SAT Sensor always attaches to the primary MODGAS-XWR2.

NOTE: Up to three additional fixed heat stages can be configured by using Heat 2 (RLY4), Heat 3 (RLY5) and Heat 4 (RLY6). Up to 12 additional fixed stages can be added by using the 12 Relay E-BUS Expansion Module. (**Figure 8, page 15**).

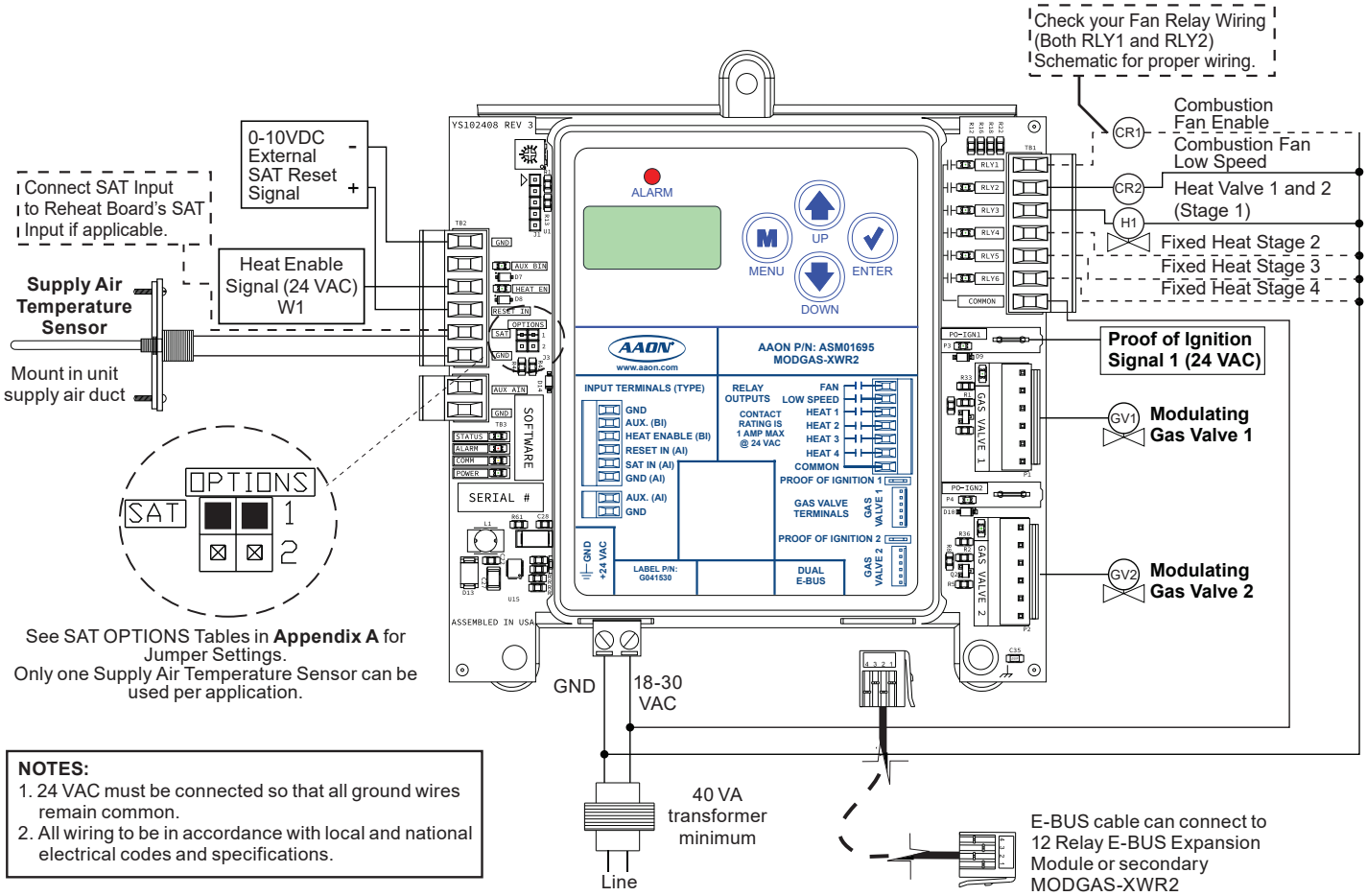


Figure 5: Stand-Alone Wiring - Two Modulating Valves, One Ignitor, One Stage

Secondary Board - Four Modulating Valves, One Ignitor, One Stage (2V1IGN1S)

In this configuration, the wiring on **Figure 5, page 12** is the primary portion and **Figure 6, this page** is the secondary portion, creating four modulating valves as one stage.

If using an MHGRV-X series module along with the secondary MODGAS-XWR2 in Stand-Alone Mode, the SAT Sensor always attaches to the Primary MODGAS-XWR2.

NOTE: Up to three additional fixed heat stages can be configured by using Heat 2 (RLY4), Heat 3 (RLY5) and Heat 4 (RLY6). Up to 12 additional fixed stages can be added by using the 12 Relay E-BUS Expansion Module. (**Figure 8, page 15**).

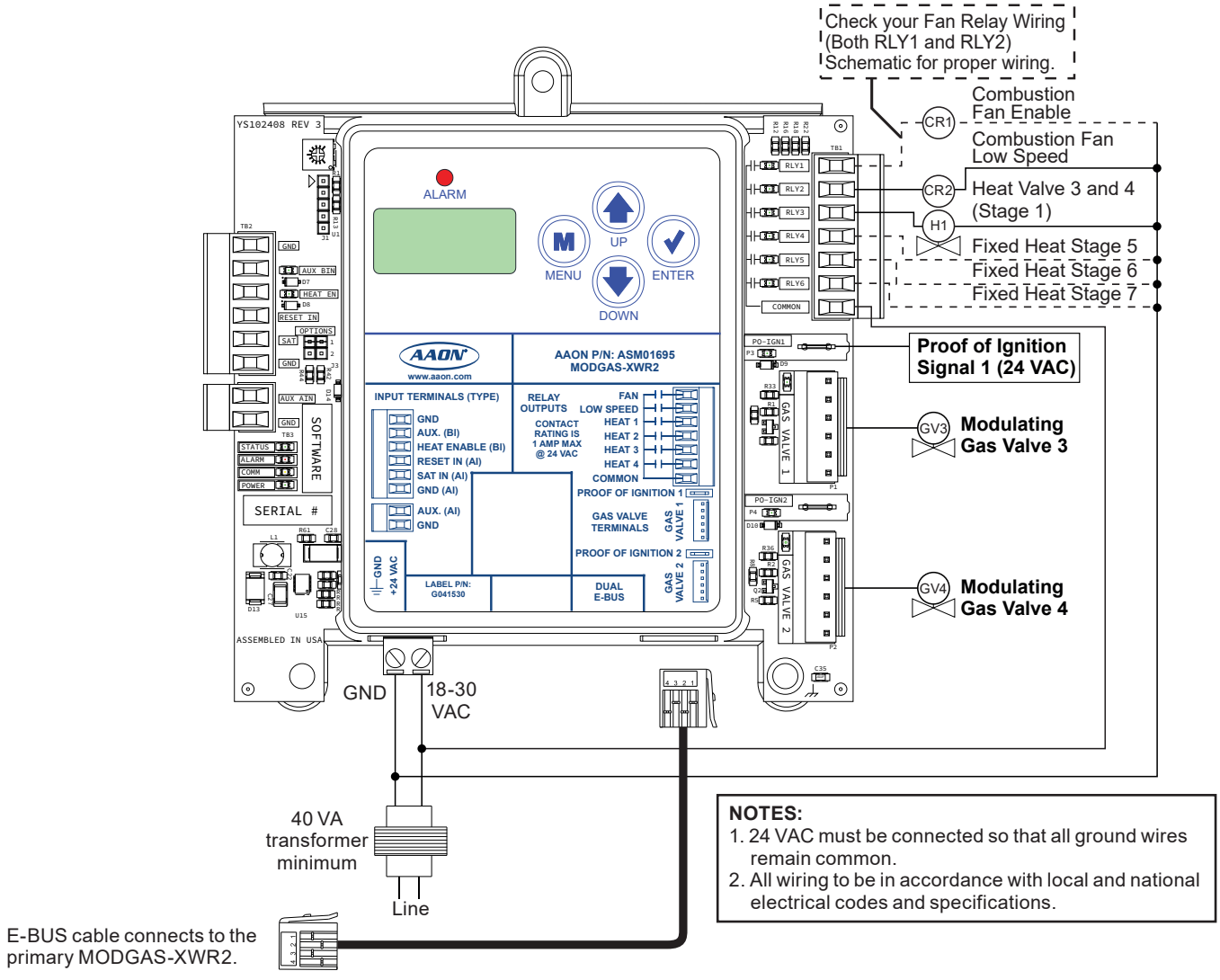


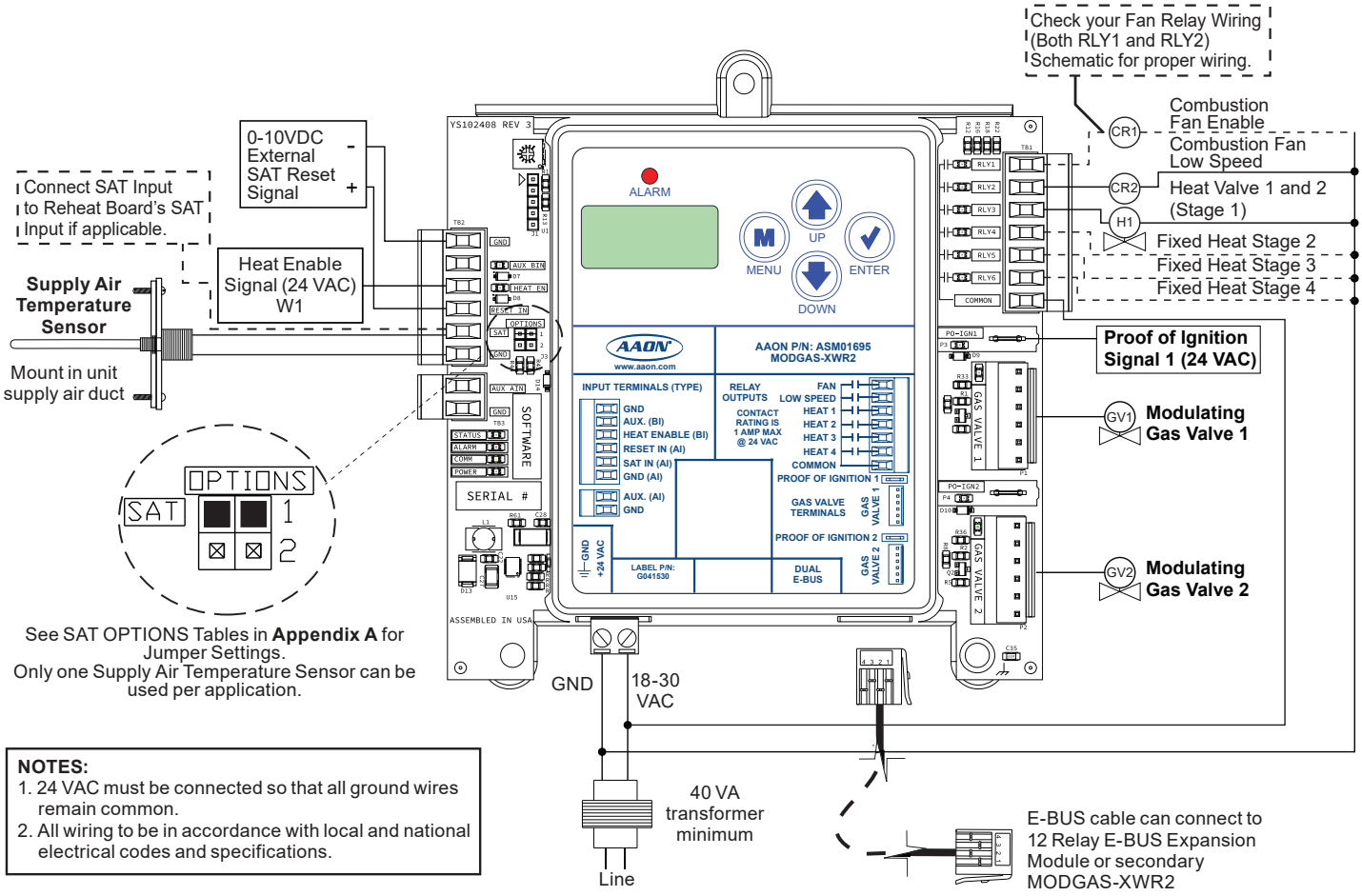
Figure 6: Stand-Alone Wiring - Secondary Board 2V1IGN1S

Two Modulating Valves, Two Ignitors, One Stage (2V2IGN1S)

This configuration is used to control two modulating gas valves (one on each terminal connector), in which the first and second valves operate together for one modulating stage. One valve is connected to Heat 1 (RLY3) and the second valve is connected to Heat 2 (RLY4).

If using an MHGRV-X series module along with the secondary MODGAS-XWR2 in Stand-Alone Mode, the SAT Sensor always attaches to the Primary MODGAS-XWR2.

NOTE: Up to two additional fixed heat stages can be configured by using Heat 3 (RLY5) and Heat 4 (RLY6). Up to 12 additional fixed stages can be added by using the 12 Relay E-BUS Expansion Module. (**Figure 8, page 15**).



NOTES:
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.

Figure 7: Stand-Alone Wiring - Two Modulating Valves, Two Ignitors, One Stage

12 Relay E-BUS Expansion Module

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.

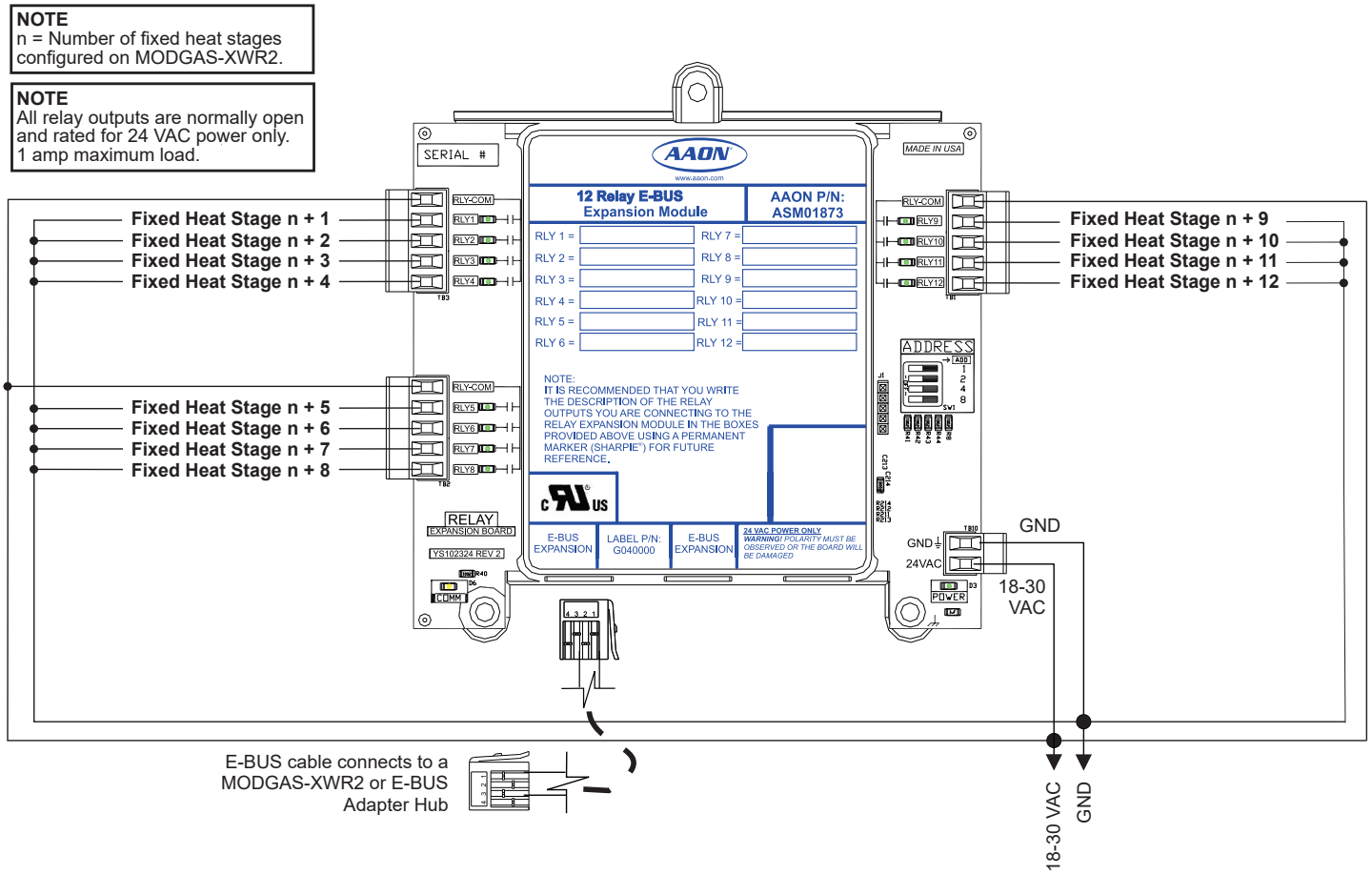


Figure 8: Stand-Alone Wiring - 12 Relay E-BUS Expansion Module

One Modulating Valve, One Ignitor, One Stage (1V1IGN1S)

This configuration is used to control one modulating valve, which must be placed on Gas Valve 1 (attached to Heat 1 (RLY3)).

Use an E-BUS cable connecting to an E-BUS port on the controller.

NOTE: Up to three additional fixed heat stages can be configured by using Heat 2 (RLY4), Heat 3 (RLY6), and Heat 4 (RLY6). If additional fixed stages are required, these should be configured and wired to the AAON unit controller's relays.

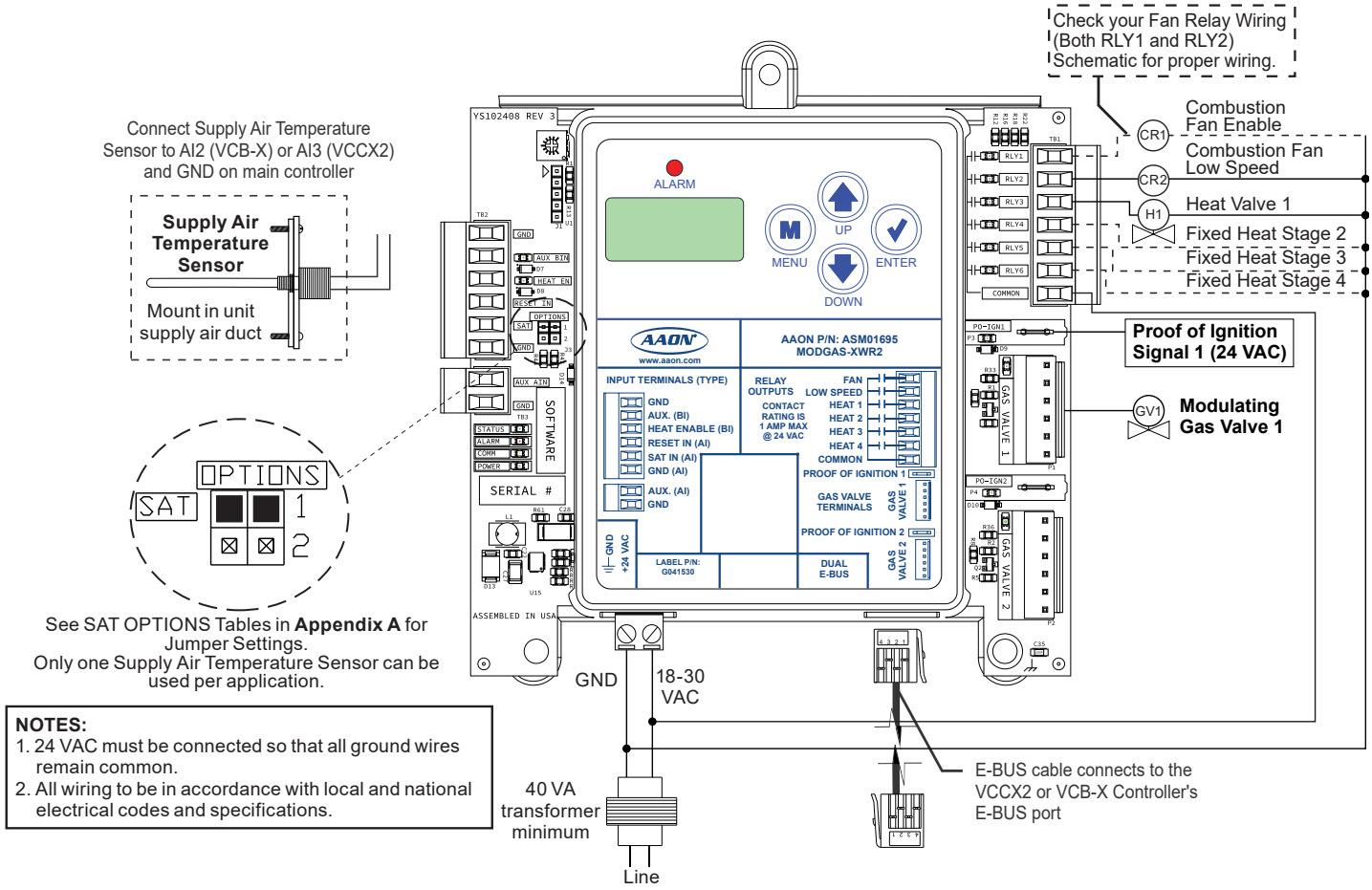


Figure 9: Communications Wiring - One Modulating Valve, One Ignitor, One Stage

Two Modulating Valves, Two Ignitors, One Stage (2V2IGN1S)

This configuration is used to control two modulating gas valves (one on each terminal connector), in which the first and second valves operate together for one modulating stage. One valve is connected to Heat 1 (RLY3) and the second valve is connected to Heat 2 Relay.

Use an E-BUS cable connecting to an E-BUS port on the controller.

NOTE: Up to two additional fixed heat stages can be configured by using Heat 3 (RLY5) and Heat 4 (RLY6). If additional fixed stages are required, these should be configured and wired to the AAON unit controller's relays.

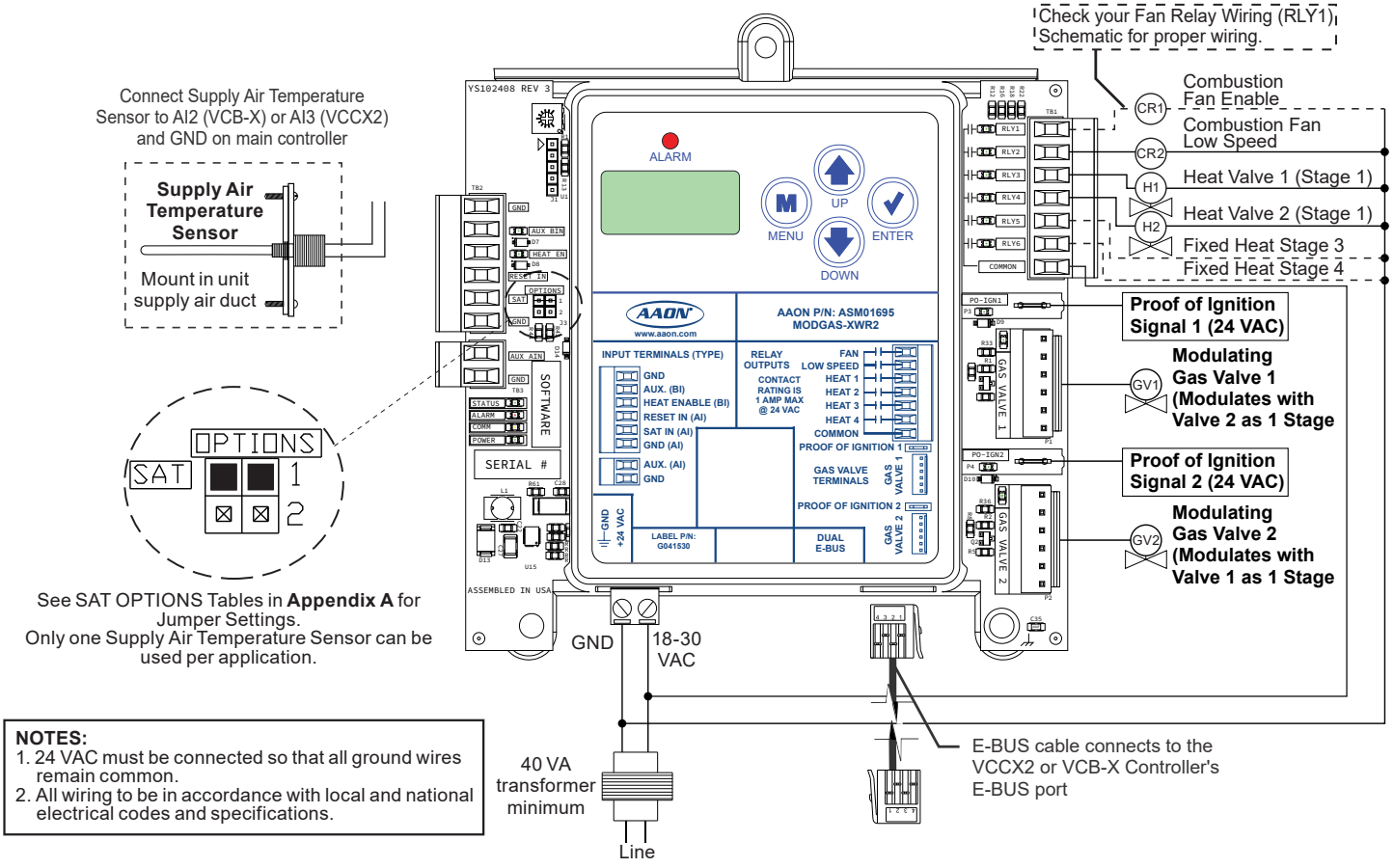


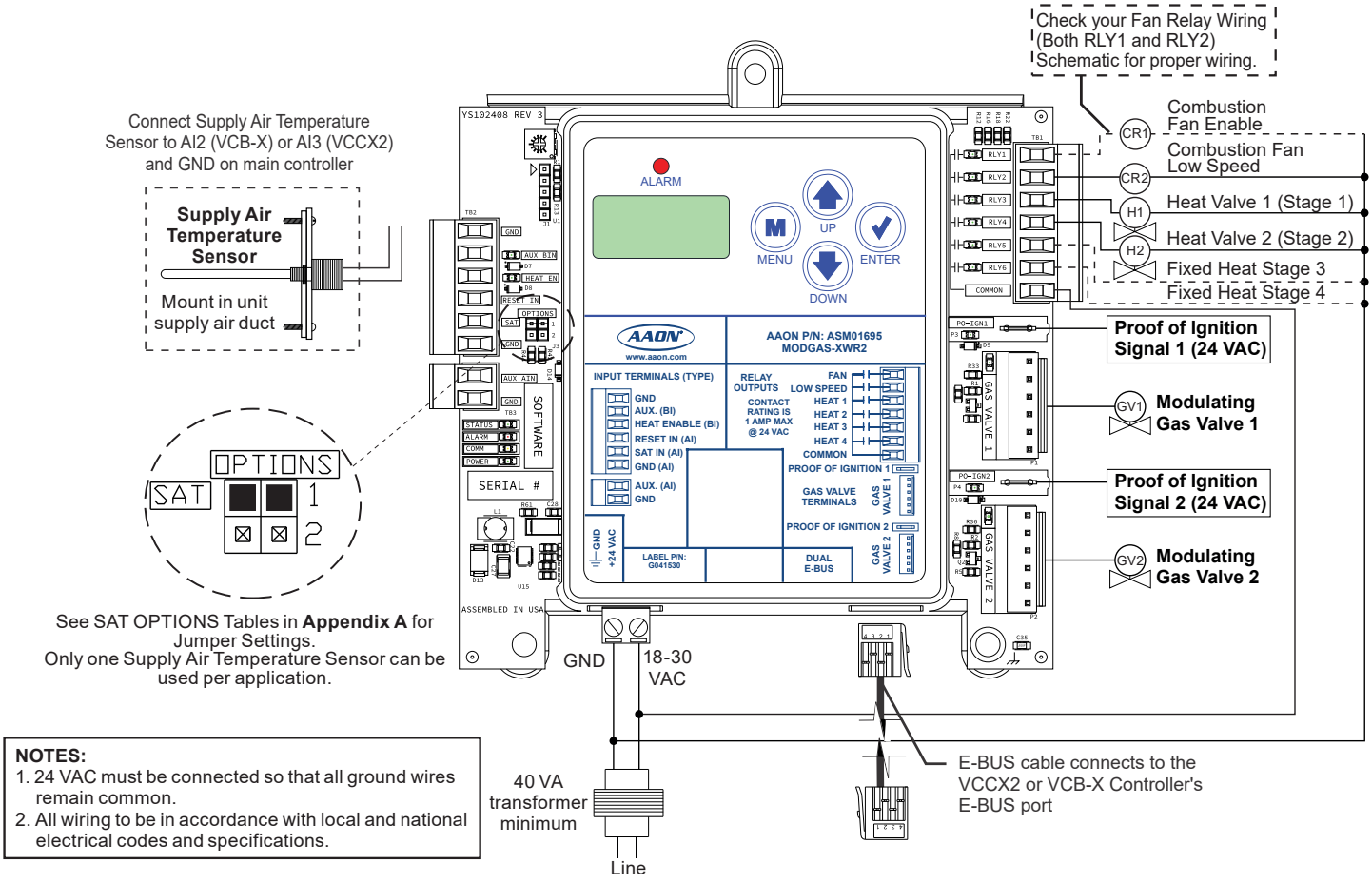
Figure 10: Communications Wiring - One Modulating Valve, Two Ignitors, One Stage

Two Modulating Valves, Two Ignitors, Two Stages (2V2IGN2S)

This configuration is used to control two modulating gas valves (one on each terminal connector), in which the first valve is modulating stage 1 (Gas Valve 1) and the second valve is modulating stage 2 (Gas Valve 2).The first valve is attached to Heat 1 (RLY3) and the second valve is attached to Heat 2 (RLY4).

Use an E-BUS cable connecting to an E-BUS port on the controller.

NOTE: Up to two additional fixed heat stages can be configured by using Heat 3 (RLY5) and Heat 4 (RLY6). If additional fixed stages are required, these should be configured and wired to the AAON unit controller's relays.



NOTES:
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.

Figure 11: Communications Wiring - Two Modulating Valves, Two Ignitors, Two Stages

Secondary Board - Four Modulating Valves, Two Ignitors, Two Stages (2V2IGN2S)

In this configuration, the wiring on **Figure 11, page 18** is the primary portion and **Figure 12, this page** is the secondary portion, thus creating four modulating valves as two stages.

NOTE: Up to two additional fixed heat stages can be configured by using Heat 3 (RLY5) and Heat 4 (RLY6). If additional fixed stages are required, these should be configured and wired to the AAON unit controller's relays.

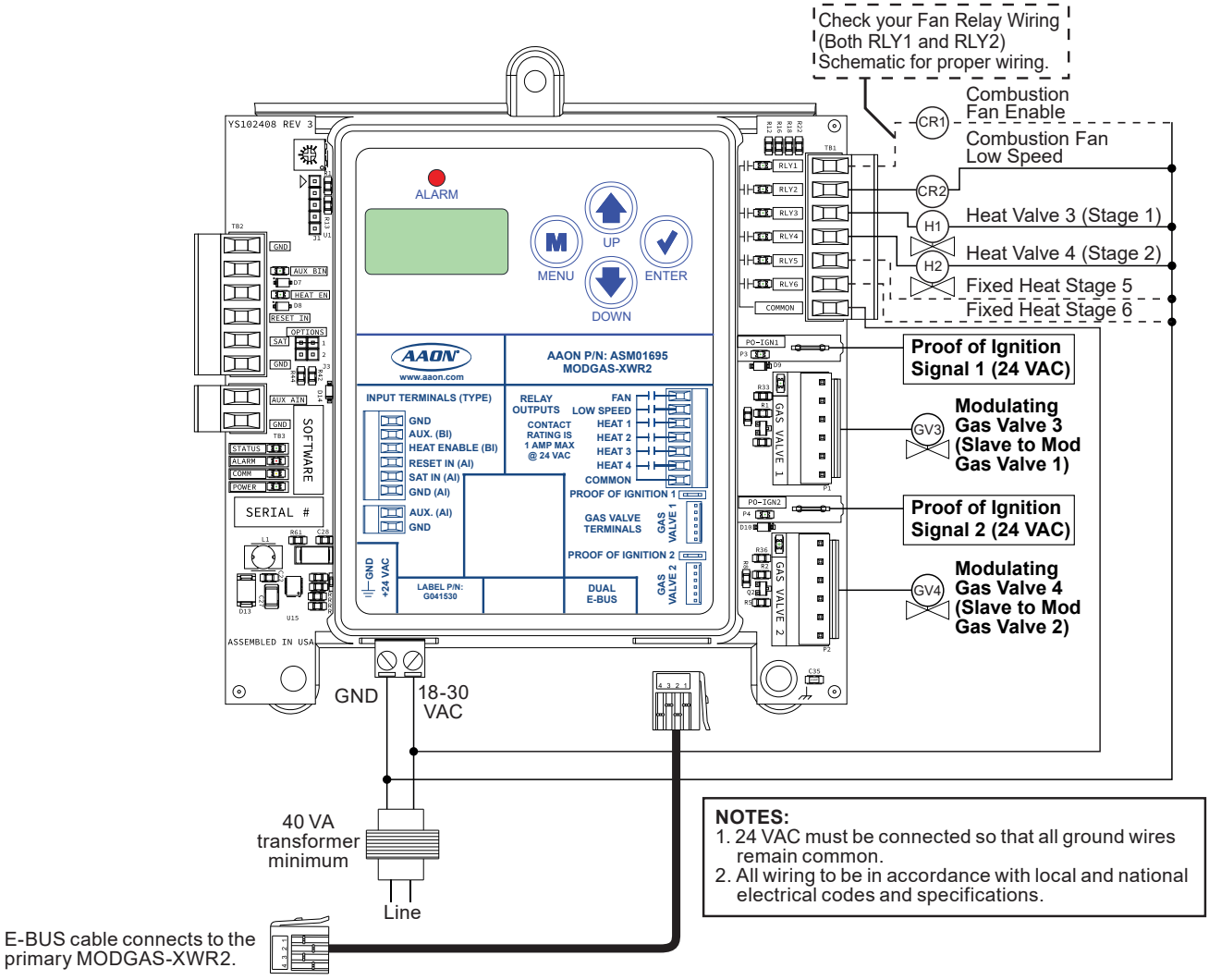


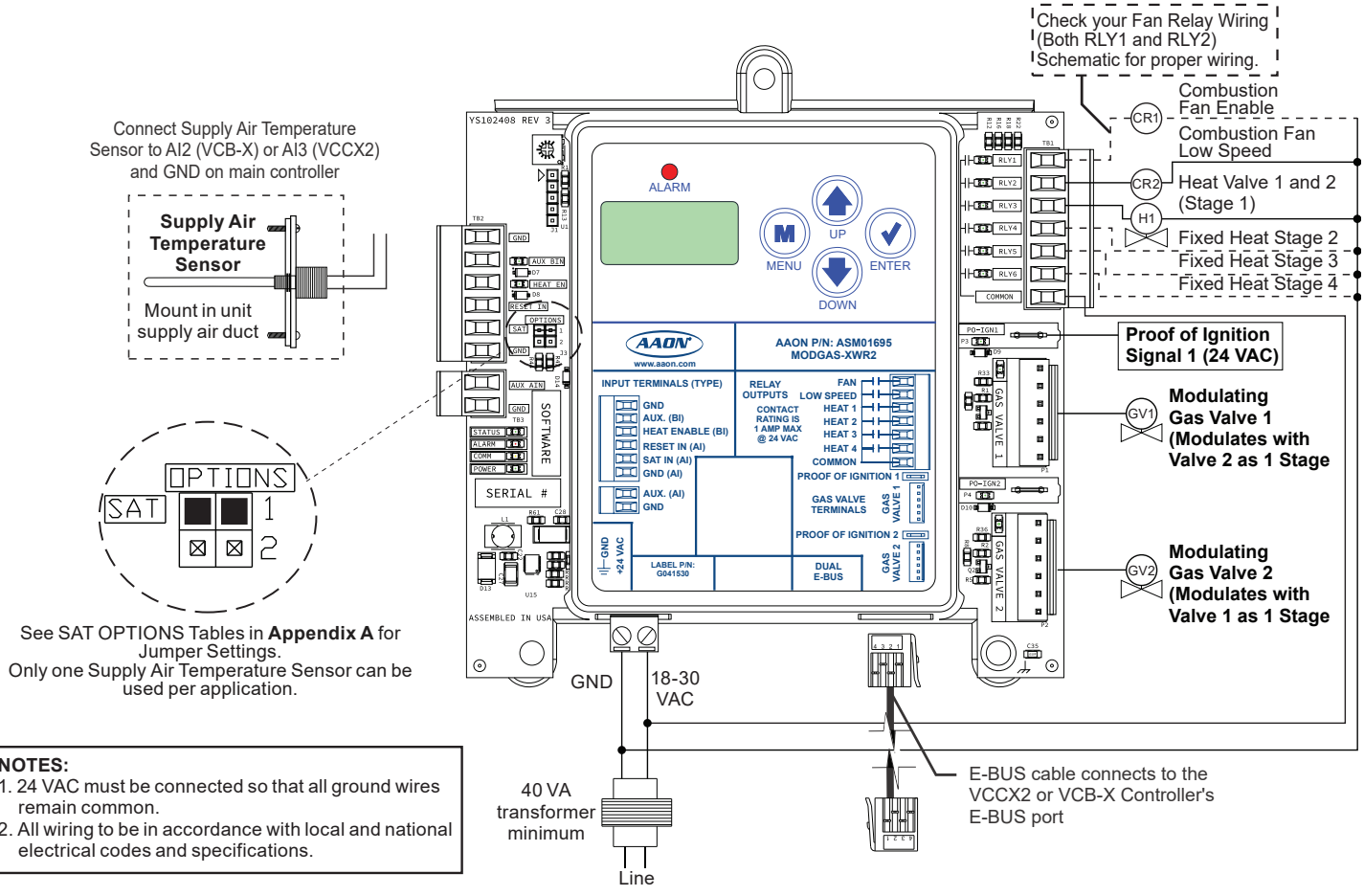
Figure 12: Communications Wiring - Secondary Board 2V2IGN2S

Two Modulating Valves, One Ignitor, One Stage (2V1IGN1S)

This configuration is used to control two modulating gas valves (one on each terminal connector), in which the first and second valves operate together for one modulating stage. Both valves are connected to Heat 1 (RLY3).

Use an E-BUS cable connecting to an E-BUS port on the controller.

NOTE: Up to three additional fixed heat stages can be configured by using Heat 2 (RLY4), Heat 3 (RLY6), and Heat 4 (RLY6). If additional fixed stages are required, these should be configured and wired to the AAON unit controller's relays.



NOTES:
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.

Figure 13: Communications Wiring - Two Modulating Valves, One Ignitor, One Stage

Secondary Board - Four Modulating Valves, One Ignitor, One Stage (2V1IGN1S)

In this configuration, the wiring on **Figure 13, page 20** is the primary portion and **Figure 14, this page** is the secondary portion, thus creating four modulating valves as one stage.

NOTE: Up to three additional fixed heat stages can be configured by using Heat 2 (RLY4), Heat 3 (RLY6), and Heat 4 (RLY6). If additional fixed stages are required, these should be configured and wired to the AAON unit controller's relays.

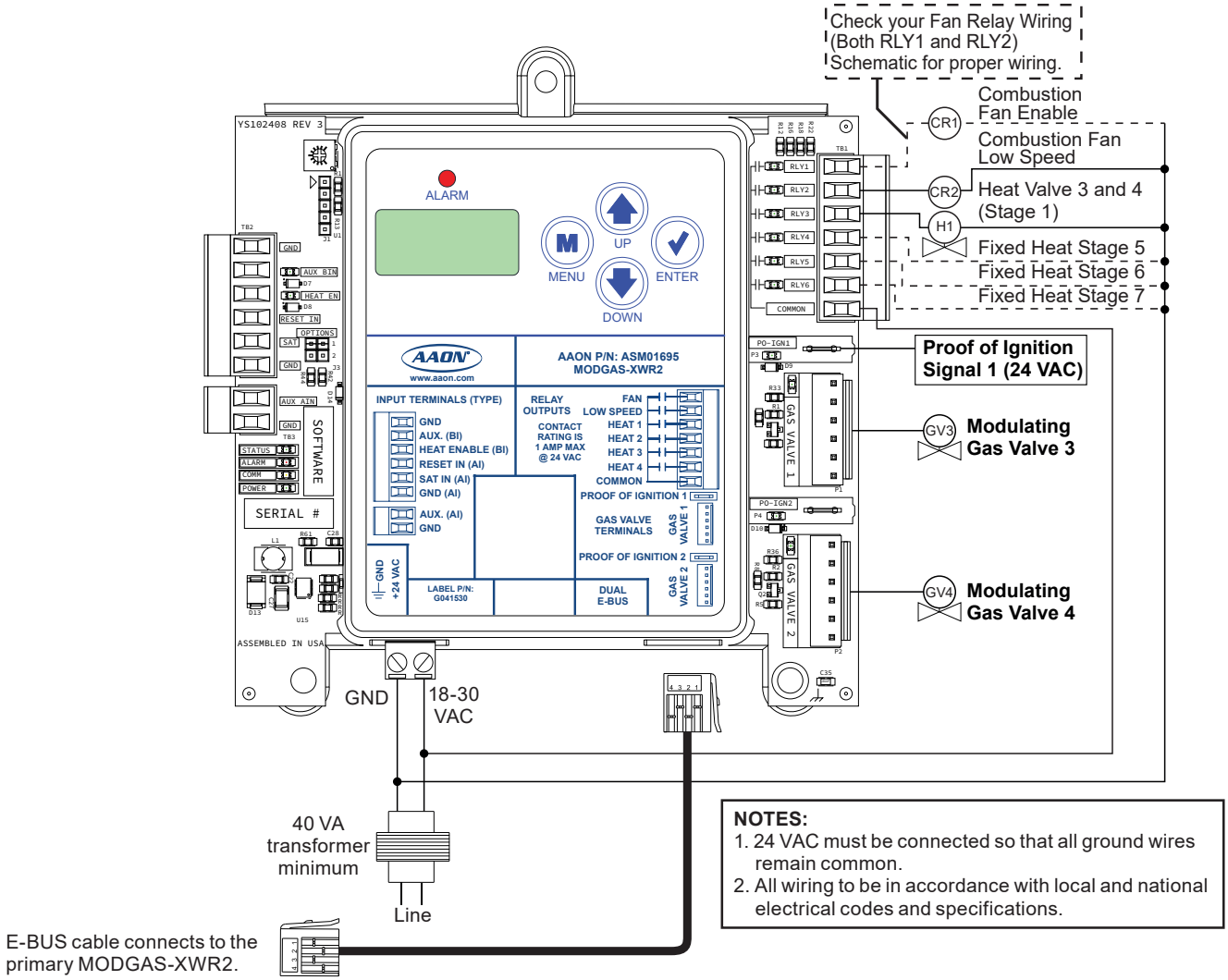


Figure 14: Communications Wiring - Secondary Board 2V1IGN1S

I/O Map

See **Table 2, this page** to reference the inputs and outputs that are available on the MODGAS-XWR2 Module.

Analog Inputs	
1	Reset Signal (RST IN)
2	Supply Temperature (SAT)
3	Not Used (AUX AI)
Binary Inputs	
1	Not Used (AUX BI)
2	Heat Enable (HEAT EN)
3	Proof of Ignition 1 (PO-IGN1)
4	Proof of Ignition 2 (PO-IGN2)
Analog Outputs (0-10 VDC)	
1	Combustion Fan Enable (FAN)
2	Combustion Fan Low Speed (LOW SPEED)
3	Heat 1
4	Heat 2
5	Heat 3
6	Heat 4

Table 2: MODGAS-XWR2 Inputs and Outputs

Analog Inputs

Reset Input (RST IN)

This input is only required when the module is in Stand-Alone Mode. The Supply Air 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 is only used if you require resetting of the Supply Air Temperature.

Supply Air Temperature Sensor (SAT)

This input is only required when the module is in Stand-Alone Mode. The Supply Air Temperature Sensor is the control source. This sensor has to be installed for the unit to operate. The Supply Air Temperature Sensor is located in the discharge air stream and monitors temperature to maintain the Supply Air Temperature Setpoint.

Binary Inputs

Heat Enable Contact (HEAT EN)

This input is only required when the module is in Stand-Alone Mode; it is not required when used as an expansion board to other AAON unit controllers. The Heat Enable input is activated by a 24 VAC signal. The module will not operate without 24 VAC being applied to this input terminal when used in a Stand-Alone Mode.

Proof of Ignition 1 (PO-IGN1)

The Proof of Ignition input is activated by a 24 VAC signal supplied from the ignition module to enable the modulating Gas Valve 1 (and the modulating Gas Valve 2 in the 2V1IGN1S configuration). If the flame does not ignite, the ignition module will turn off this enable and the MODGAS-XWR2 will turn on the "No Proof of Flame" Alarm.

Proof of Ignition 2 (PO-IGN2)

The Proof of Ignition input is activated by a 24 VAC signal supplied from the ignition module to enable the modulating Gas Valve 2. If the flame does not ignite, the ignition module will turn off this enable and the MODGAS-XWR2 will turn on the "No Proof of Flame" Alarm.

Communicating Outputs

Gas Valve Output 1

This communicating output will control the modulating gas valve. It can detect if the valve is connected and can verify the valve position.

Gas Valve Output 2

This communicating output will control the modulating gas valve. It can detect if the valve is connected and can verify the valve position.

Relay Outputs

RLY1 - Combustion Fan Enable (FAN)

This relay works in conjunction with the Combustion Fan Low Speed Relay (RLY2 - LOW SPEED) to control the speed of the combustion fan. When the MODGAS-XWR2 has heat enabled, this relay closes to bring the blower on at high speed. The module will activate RLY2 to reduce the combustion fan speed as the gas valve modulates closed.

RLY2 - Combustion Fan Low Speed (LOW SPEED)

The module automatically switches the combustion fan to low speed as the gas valve modulates closed in order to maintain proper fuel to air ratios.

RLY3 - Heat 1

Once the MODGAS-XWR2 heating mode is enabled, Heat 1 (RLY3) is the first stage of heat.

RLY4 - Heat 2

Once the MODGAS-XWR2 heating mode is enabled, Heat 2 (RLY4) is the second stage of heat if the MODGAS-XWR2 is configured for two stages of heat. This can either be a modulating heat stage or fixed heat stage.

NOTE: In the 2V2IGN1S configuration, Heat 1 (RLY3) and Heat 2 (RLY4) are one stage.

RLY5 - Heat 3

Once the MODGAS-XWR2 heating mode is enabled, Heat 3 (RLY5) is the second or third stage of heat if the MODGAS-XWR2 is configured for three stages of heat and will be a fixed heat stage.

RLY6 - Heat 4

Once the MODGAS-XWR2 heating mode is enabled, Heat 4 (RLY6) is the third or fourth stage of heat if the MODGAS-XWR2 is configured for four stages of heat and will be a fixed heat stage.

Operating Modes and Min Mode

Operation Modes

The MODGAS-XWR2 can be used in Stand-Alone Mode or connected to a AAON unit controller using an E-BUS or modular cable.

Stand-Alone Mode

When used in Stand-Alone Mode (not connected to a AAON unit controller), the MODGAS-XWR2 will modulate the gas valve(s) to maintain the Supply Air Temperature Setpoint configured on the MODGAS-XWR2. The MODGAS-XWR2 is activated by a 24 VAC signal to the HEAT EN input.

The following setpoints are adjustable on the LCD display in Stand-Alone Mode:

- Supply Air Temperature Setpoint
- Supply Air Reset Temperature Setpoint

Communications Mode

When the MODGAS-XWR2 is being used with an AAON unit controller, information will be transferred between them via a modular or E-BUS cable, depending on the type of unit controller used.

In this configuration, the MODGAS-XWR2 uses the Supply Air Temperature from the AAON unit controller for control. The Supply Air Temperature Setpoint and Supply Air Temperature Reset values are set by the AAON unit controller.

If communication is interrupted between the MODGAS-XWR2 and the AAON unit controller, both boards will indicate an alarm. The alarm condition will be cleared once communication is restored.

Min Mode

Min Mode is used to help eliminate overshoot of the Supply Air Temperature Setpoint as additional stages of heat are activated.

When Min Mode is active, the modulating valves are commanded to Min Position until the interval timer has expired. To disable Min Mode, set the Min Mode deadband to zero.

The Min Mode works in the following order:

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.
3. After the interval, the valve will modulate normally to maintain the Supply Air Setpoint.

Heating Mode

Ignition Sequence for each Valve Configuration

After heat is enabled, the modulating valve(s) will move into the ignition sequence. As long as there is a call for heat, at least one stage will be on. Despite the Supply Air Temperature relation to the Supply Air Temperature Setpoint, the MODGAS-XWR2 will continue heating as long as Heat is enabled (through either binary enable or Modbus enable).

1V1IGN1S/ 2V2IGN2S: Valve 1 moves to the valve start position (set in the hidden screen configuration and defaulted to 70% modulation) and Heat 1 (RLY3) is on. The valve will remain at this position until the proof of ignition time is satisfied. In order to establish proof of ignition, the binary input used for the proof of ignition must remain high for 20 seconds.

2V1IGN1S: Valve 1 and 2 move to the valve start position (set in the hidden screen configuration and defaulted to 70% modulation) and Heat 1 (RLY3) is on. Both valves are connected to the same relay. The valve will remain at this position until the proof of ignition time is satisfied. In order to establish proof of ignition, the binary input used for the proof of ignition must remain high (24 VAC signal) for 20 seconds.

2V2IGN1S: Valve 1 and 2 move to the valve start position (set in the hidden screen configuration and defaulted to 70% modulation) and Heat 1 (RLY3) and Heat 2 (RLY4) are on. The valve will remain at this position until the proof of ignition time is satisfied. In order to establish proof of ignition, the binary input used for the proof of ignition must remain high (24 VAC signal) for 20 seconds.

Modulating Modes for each Valve Configuration

After a configuration has completed its ignition sequence, then it moves into a modulating mode.

1V1IGN1S: The PID loop runs every 10 seconds and determines the modulation percentage and commands the valve accordingly. The valve will not close more than the minimum position while the heating is enabled. During the modulation sequence, if the valve position is below 55%, the combustion fan low speed relay (RLY2 - LOW SPEED) will energize. Once it goes above 55%, the relay will de-energize and move the fan back into high speed.

2V2IGN2S: The PID loop runs every 10 seconds and determines the modulation percentage and commands the valve accordingly. The valve will not close more than the minimum position while the heating is enabled. Only after the stage up delay requirement has been met will the board stage up and open the second valve. Then both valves will move to the same position. During the modulation sequence, if the valve position is below 55%, the combustion fan low speed relay (RLY2 - LOW SPEED) will energize. Once it goes above 55%, the relay will de-energize and move the fan back into high speed.

2V1IGN1S/2V2IGN1S: The PID loop runs every 10 seconds and determines the modulation percentage for both valves. During the modulation sequence, if the valve position is below 55%, the combustion fan low speed relay (RLY2 - LOW SPEED) will energize. Once it goes above 55%, the relay will de-energize and move the fan back into high speed.

Additional Staging Information for each Valve Configuration

During the heating sequence, if it is determined that there is currently not enough/too many stages, then a stage up/down will occur, respectively. For a stage up to occur, the valves that are currently in modulating mode must be fully open (100% modulation) for the stage up time, and the current Supply Air Temperature must be at least 2ºF below the Supply Air Temperature Setpoint. For a stage down to occur, the valves must be at their minimum position (35% modulation) and the current Supply Air Temperature must be at least 6ºF above the Supply Air Temperature Setpoint. Additionally, all stages will stage down in the reverse order they staged up (i.e. the first one to stage down is the last one to stage up). Below is additional staging information for each of the configurations:

1V1IGN1S/2V1IGN1S: Additional stages of fixed heat will be turned on using Heat 2 (Rly 4) through Heat4 (Rly 6). Stage 3 would be configured on Heat 3 (RLY5) and Stage 4 on Heat 4 (RLY6). Additional stages must be off board.

2V2IGN2S: Both on-board heat relays are used for modulating valves, so the first stage up (i.e. turning on Stage 2) turns on the second modulating valve. Stage 3 would be configured on Heat 3 (RLY5) and Stage 4 on Heat 4 (RLY6). Additional stages must be off board.

2V2IGN1S: Both on-board heat relays are used for modulating valves (Stage 1), Stage 2 would be configured on Heat 3 (RLY5) and Stage 3 on Heat 4 (RLY6). Additional stages must be off board.

Valve Failure, Force Mode and Master vs. Normal

Valve Failure

If a valve failure occurs, the board fails that stage and then continues to the next available stage. This is to make sure that if there is a call for heat, heat is being supplied. A valve failure consists of either a Valve No Detect or a Proof of Flame Fail.

1V1IGN1S/2V1IGN1S: If the modulating valve fails, Heat 1 (RLY3) is turned off and the board then moves to the fixed stages (if available). If the valve fails when there is first a call for heat, then the first fixed stage will come on immediately. Every ignition retry period (set in the hidden configurations menu), the board will re-attempt to detect the valve(s) and retry the ignition process.

2V2IGN2S: If the first stage (the first modulating valve) fails when there is first a call for heat, Heat 1 (RLY3) is turned off and the board immediately moves to the second stage (the second modulating valve). If the first stage fails when the board is in MODULATE_ MODE, then normal board operation continues.

If the second stage fails, Heat 2 (RLY4) is turned off and the board continues normal operation and moves to the next fixed stages. Every ignition retry period (set in the hidden configurations menu), the board will re-attempt to detect the valve(s) and retry the ignition process.

Force Mode

This mode is used to test that the valve firing sequence is functioning. This mode is NOT meant to replace heating mode by any means. There is no staging in this mode, and there is no PID Loop running in this mode. Once a stage is forced on through the Force Screen, the board will enter Force Mode and will not leave this mode until all the stages that were forced on have been turned off or 10 minutes pass with no user input to the board.

The following options are the Force Mode configurations.

1V1IGN1S: Forcing Stage 1 on forces Heat 1 (RLY3) on, and then the next screen allows the option to decide the modulation percentage for the valve. Forcing stages 2-4 on forces Heat 2-4 (RLY4-RLY6) on, respectively.

2V2IGN2S: Forcing Stage 1 and 2 on forces Heat 1 (RLY3) and Heat 2 (RLY4) on, respectively, and the screens following each force screen allow you to select the percent modulation for each valve.

NOTE: Configuring one stage below the low speed cutoff and the other above it will cause combustion fan low speed relay (RLY2 - LOW SPEED) difficulties.

Forcing stages 2-4 on forces Heat 2-4 (RLY4-RLY6) on.

2V1IGN1S: Forcing Stage 1 on forces Heat 1 (RLY3) on, and the next screen allows the option to select the modulation percentage (since both valves are one stage, they both modulate at the same percentage). Forcing Stages 2-4 on forces Heat 2-4 (RLY4-RLY6) on.

2V2IGN1S: Forcing Stage 1 on forces Heat 1 (RLY3) and Heat 2 (RLY4) on, and the screens following allow you to select the modulation percentage for the respective valve. Even though both valves are considered one stage, since they operate on separate relays, the option to modulate them at different percentages is available.

NOTE: Configuring one stage below the low speed cutoff and the other above it will cause combustion fan low speed relay (RLY2 - LOW SPEED) difficulties.

Forcing stages 3 and 4 on force on Heat 3 (RLY5) and Heat 4 (RLY6), respectively.

Master vs. Normal

In order to help clarify operating modes, master and normal are used to denote two MODGAS-XWR2 boards that are communicating with one another. With one MODGAS-XWR2, the maximum number of modulating valves is two, but with two boards the maximum is four (two for each board). In a master/normal operation, the secondary board is slaved to the master board.

- To configure a master board, put the “S/A MODE” for the board to “FORCED” and put “OPERATION” to “MASTER” (both configurations found in the hidden screens).
- To configure a secondary board, put “OPERATION” to “NORMAL” (found in the hidden screens).

The following options are the Master/Normal configurations.

2V2IGN2S: In this configuration, both boards utilize both heat relays for a modulating gas valve. Stage 1 is the valve attached to Heat 1 (RLY3) for both boards, and Stage 2 is the valve attached to Heat 2 (RLY4) for both boards. The valves on both boards are always modulated to the same position, and both boards stage up (i.e. turn on Heat 2 (RLY3)) at the same time.

2V1IGN1S: In this configuration, both boards utilize Heat 1 (RLY3) to turn on two modulating gas valves (a total of four for the two boards). This means that each board has an open relay (Heat 2 (RLY4)) for an additional on board fixed stage. The two valves on both boards (i.e. all of the four valves) are always at the same modulation position. The first stage up (i.e. Stage 2) will energize Heat 2 (RLY4) on the master board, and the second stage up (i.e. Stage 3) will energize the Heat 2 (RLY4) on the secondary board.

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 15, this page** and refer to **Table 3 and 4, this page** for descriptions.

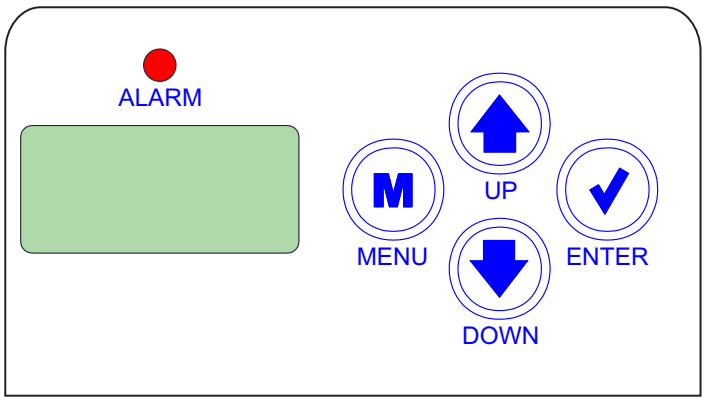


Figure 15: LCD Display and Navigation Keys

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.

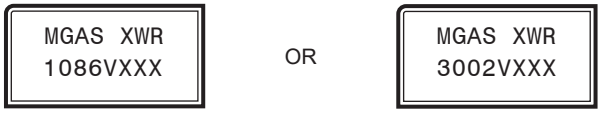
Table 3: Navigation Key Functions

Editing Key	Key Function
UP or DOWN 	Use the UP or DOWN key to enter Edit Mode on a user-adjustable screen. Edit Mode is indicated by the underscore appearing on the screen. **NOTE:** 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 4: 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 MODGAS Screens.

Press M to go to STATUS Screens.

Press ✓ to scroll through STATUS Screens.

Press M to go to ALARMS Screens.

Press ✓ to scroll through ALARMS Screens.

Press M to go to SLAVE ALARMS Screens.

Press ✓ to scroll through SLAVE ALARMS Screens.

NOTE: This screen only displays if a secondary MODGAS XWR2 is present.

Press M to go to SETPOINT MENU Screens.

Press ✓ to scroll through FORCE VALVES Screens.

Press M to go to FORCE VALVES Screens.

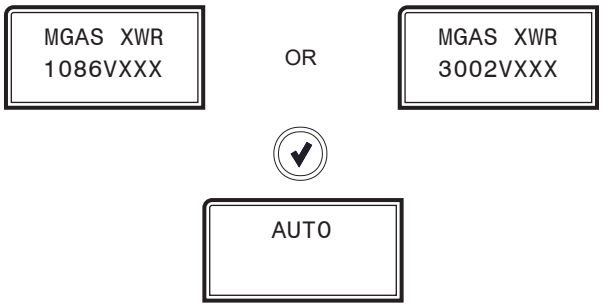
Press ✓ to scroll through FORCE VALVES Screens.

The MODGAS-XWR2 uses either a PIC32 processor or a RP2040 processor. The PIC32 processor requires software version SS1086; the RP2040 processor requires software version SS3002. The software version is identified on the software label near the Status LED or using the Software Version screen. There is no functional difference between the two types of boards.

WARNING: The correct software version must be used for all software upgrades. Loading the incorrect software could result in malfunction. Contact Controls Technical Support for assistance, if required.

Main Screens

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



CONTROL STATE

This screen displays the communications control state of the MODGAS-XWR2 Module. The control states are:

AUTO_STAND_ALONE: This is the automatic stand-alone mode that the board moves into on startup. While in this mode, the module listens to the E-BUS communication lines. If communication is detected, it moves to COMM E-BUS. In the AUTO_STAND_ALONE mode, a Supply Air Temperature Sensor is connected to the board.

COMM_E-BUS: After startup, if there are requests via E-BUS for data, then the module moves from STAND_ALONE into COMM_E-BUS. In this mode, the module continually accepts communication via E-BUS to obtain status information and setpoints (e.g. supply air temperature and supply air temperature setpoint). It will not move out of this mode without specific configuration changes or a power cycle.

COMM_TIMEOUT: If there is a loss of communication (master or slave), the module moves into this mode. This state re-initializes communications and then puts the module into COMM_RECOVER mode. Normal board operations do not continue when in this mode (e.g. you cannot go into Heat mode).

COMM_RECOVER: After the module moves into COMM_TIMEOUT, the module is then put into this mode. The module will not leave this mode until E-BUS communication returns. Normal module operations do not continue when in this mode (e.g. you cannot go into Heat mode). If communication resumes, the module moves into the previous communication state.

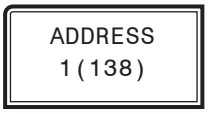
FORCED_STAND_ALONE: In this mode, the module acts as the master communicating to either another MODGAS-XWR2 Module or a 12 Relay Module for additional fixed stages. The only way to leave this control state is to change the “S/A MODE” configuration from “FORCED” to “AUTO” in the configuration screens.

SLAVE_MODE: If the module is acting as a secondary module to another MODGAS-XWR2 Module, then it operates in this control state. This mode limits many Module operations (e.g. the PID Loop does not run in this mode). In this mode, the board essentially mimics the operation of the MASTER MODGAS-XWR2 board.

FAIL STATE: This mode occurs when the Supply Air Temperature rises above the high temperature cutoff in any of the operating modes or when the Supply Air Temperature Sensor cannot be detected while in either Stand-Alone Mode. The mode will exit FAIL STATE when the Supply Air Temperature drops 10ºF below the Supply Air Temperature Setpoint or when the Supply Air Temperature Sensor is reattached or detected again. Heat Mode cannot be entered while in this state.

CURRENT SOFTWARE VERSION

You can access the protected screens from this screen by holding the **<UP>** button for five seconds and then releasing the button.

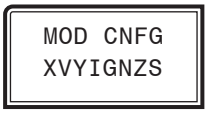


CURRENT BOARD ADDRESS

Number in parentheses is E-BUS address.

TOTAL # OF STAGES CONFIGURED

Total number of fixed and modulating stages

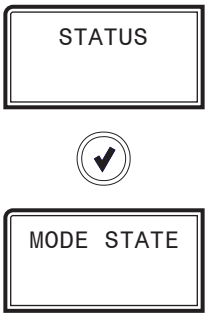


MODULATION CONFIGURATION

Values are in the format xVyIGNzS, where x is the number of valves (V), y is the number of ignitors (IGN) and z is the number of stages (S). Values are 1V1IGN1S, 2V2IGN2S, 2V1IGN1S, and 2V2IGN1S. Default is 1V1IGN1S.

Status Screens

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



This screen displays the current mode of operation. They are as follows:

OFF_MODE: This mode will display when there is no call for Heat and Heating has been disabled. All relays are off, all fixed stages are off, and the valves are moved to the home position. This is the default mode.

IGNITE_MODE: Each time Heat is activated, the unit will first go into Ignition Mode. During this mode, the valve moves to the start position and Stage 1 is ignited. Once Proof of Flame (POF) is established, the unit will go into Heat. Proof of Flame is established when the POF signal has been present for the ignition hold time. The ignition position and proof of flame time can both be set in the hidden configuration screen.

FORCE_MODE: If the valves are being forced for testing, the board moves into this mode. This mode maintains the normal heating sequence for each modulation configuration, but instead of using the PID Loop it uses the forced position (set from either the Force Menu or through Modbus). After 10 minutes of no keypad input, the Force Mode will disengage.

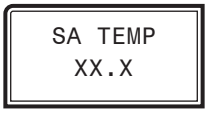
MOD HEAT STAGE ##: After Ignition Mode, the unit will enter the Heat Mode and will begin to modulate the gas valve(s) to maintain the Heating Supply Air Setpoint. Once the call for heat goes away, the unit will leave the Heat Mode.

SLAVE_HEATING: If the module is secondary to another MODGAS-XWR2, then this mode replaces Modulate Mode. If the board is in this mode, then that means there is a MASTER XWR2 board running the PID Loop control. A secondary module in this mode simply mimics the operation of the MASTER XWR2 board.

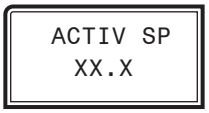
TEST_MODE: If the module is being tested through Prism, the module will move into this mode to operate (e.g. turn relays on/off).

VALVE 1 POSITION
0% to 100% or Closed

VALVE 2 POSITION
0% to 100% or Closed



SUPPLY AIR TEMPERATURE
40ºF to 150ºF or 4ºC to 65ºC.
If no sensor is detected, screen will display “NO SENSR”



ACTIVE SUPPLY AIR SETPOINT
Calculated from SAT Setpoint and Reset Setpoint in Stand-Alone Mode.
In Communications Mode, the main controller sends the setpoint.
The SAT Setpoint is set by the LCD Display in Stand-Alone Mode and is set by the main controller in Communications Mode.

FAN SPEED STATUS
Low, High, Off

Alarms Menu and Slave Alarms

The alarm screens will display automatically when alarms are present.

NOTE: The Slave Alarms Screen will only display on the primary board if a secondary board is present.

ALARMS

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

V1 NO DETECT: Gas Valve 1 is not detected.

V2 NO DETECT: Gas Valve 2 is not detected.

V1 NO PO FLAME: No Proof of Flame Ignition Module input is detected.

V2 NO PO FLAME: No Proof of Flame Ignition Module input is detected.

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

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

COMM LOSS: Communications have been lost with the main controller. This alarm will disable when communications resume.

12 RELAY BOARD COMM LOSS: Communications have been lost with the 12 Relay Expansion Board. This alarm will disable when communications resume.

STAGE 1 FAILURE: Indicates a failure to ignite Stage 1 Heat.

STAGE 2 FAILURE: Indicates a failure to ignite Stage 2 Heat.

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.

WARNING: The **<ENTER>** key must be pressed after changing setpoints for your entries to be saved for subsequent power-ups.

NOTE: When the MODGAS-XWR2 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.

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
40ºF	120ºF	200ºF
5ºF	49ºC	93ºC

RESET HEATING SUPPLY AIR SETPOINT

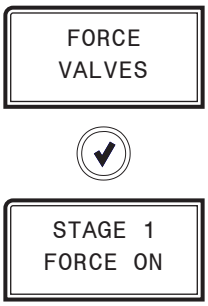
This is the maximum temperature at which the Supply Air Temperature will reset to. It will only display in Stand-Alone Mode.

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

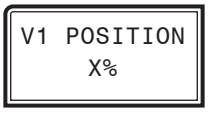
Minimum	Default	Maximum
40ºF	120ºF	200ºF
5ºF	49ºC	93ºC

Force Valves Screens

Refer to the following map when navigating through the Force Valve Screens. From the FORCE VALVE Screen, press **<ENTER>**. At the V1 and V2 FORCE ON/OFF screens, press the **<UP>** arrow key to turn the FORCE MODE on and press the **<DOWN>** arrow key to turn the FORCE MODE off. Use the **<UP>** and **<DOWN>** arrow keys to increase and decrease the percentage.

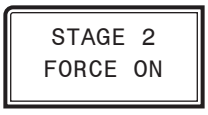


STAGE 1 FORCE ON/OFF
Press the **<UP>** button to turn the Force Mode on. Press the **<DOWN>** button to turn the Force Mode off.

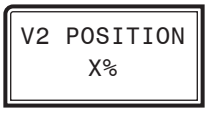


FORCE VALVE 1 PERCENTAGE
This screen only appears when Force Mode is on.
Press the **<UP>** button to increase the percentage.
Press the **<DOWN>** button to decrease the percentage

NOTE: When you turn the Force Mode back off or after 10 minutes of no keypad input, the valve will reinitialize to zero and the relays will turn off.

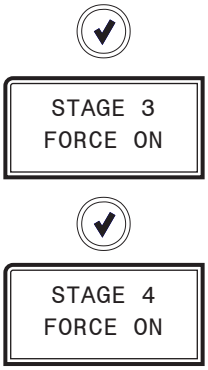


STAGE 2 FORCE ON/OFF
Press the **<UP>** button to turn the Force Mode on. Press the **<DOWN>** button to turn the Force Mode off. If the screen says DISABLED, the ON/OFF selection is not possible.



FORCE VALVE 2 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 10 minutes of no keypad input, the valve will reinitialize to zero and the relays will turn off.

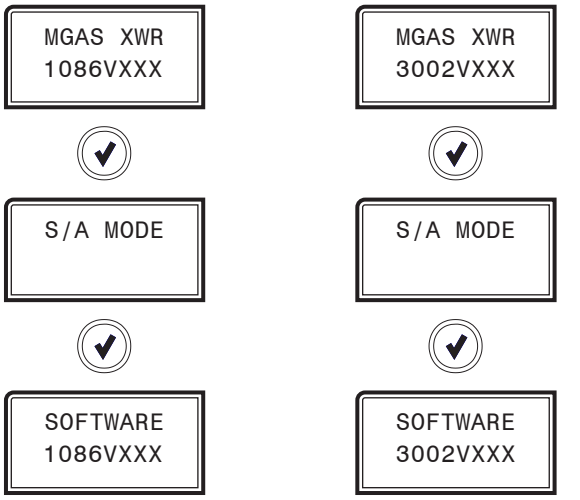


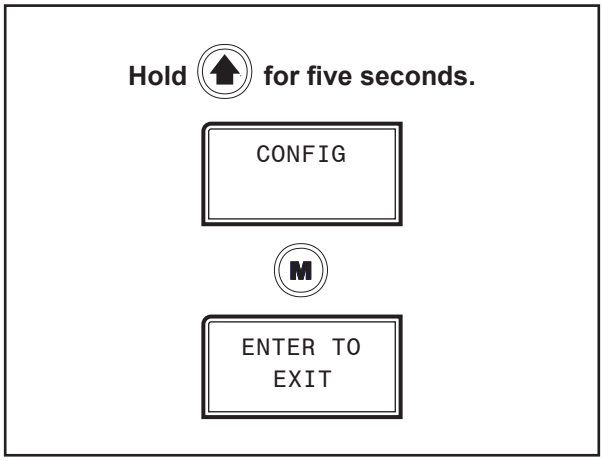
STAGES 3 and 4 FORCE ON/OFF
These screens allow each stage to be forced on or off. Press the **<UP>** button to turn the Force Mode on. Press the **<DOWN>** button to turn the Force Mode off.

Protected and Configuration Screens

Protected Screens Map

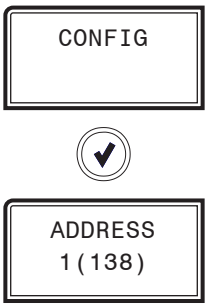
From the MODGAS Screen, press **<ENTER>** twice to get to the SOFTWARE Screen. Then hold the **<UP>** button for five seconds. To scroll through the rest of the screens, press the **<MENU>** button.





Configuration Screens

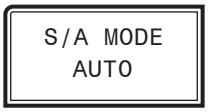
Refer to the following map when navigating through the Configuration Screens. From the CONFIG Screen, press **<ENTER>** to scroll through the screens and change setpoints. Use the **<UP>** and **<DOWN>** arrow keys to change your selections. Press **<ENTER>** to save any changes.



CURRENT BOARD ADDRESS
The first number is the board address. The number in parentheses is the E-BUS address. Use this screen to set the address for a Slave board. Set the address to 2 for a slave board. Default is 1(138).

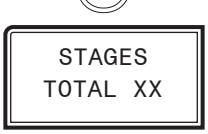
OPERATION MODE
Normal or Master. Default is Normal.

This screen is used to set a Primary MODGAS-XWR2 board as a master board. If only using one MODGAS-XWR2 board, this should be set to normal.



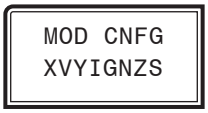
STAND ALONE MODE
Auto or Forced. Default is Auto.

In order for the MODGAS-XWR2 to communicate with another MODGAS-XWR2 or 12 Relay Expansion board, the MODGAS-XWR2 must be put in Forced Stand-Alone Mode.



NUMBER OF TOTAL STAGES
Range is 1 to 19. Default is 2.

Configuration Screens



MODULATION CONFIGURATION

Values are in the format xVyIGNzS, where x is the number of valves (V), y is the number of ignitors (IGN) and z is the number of stages (S). Values are 1V1IGN1S, 2V2IGN2S, 2V1IGN1S, and 2V2IGN1S. Default is 1V1IGN1S.

The four configurations are explained in detail as follows:

1V1IGN1S: Valve configuration used to control one modulating gas valve, which must be placed on the gas valve 1 header (attached to Heat 1 Relay). Additional stages may be added to Heat Relays 2, 3 and 4, or off board if in a communication mode.

2V1IGN1S: Valve configuration used to control two modulating gas valves (one on each header), in which the first and second valves operate together for one modulating stage. Both valves are connected to Heat 1 Relay, therefore, an additional fixed stage may be added on board at the Heat 2 Relay. Additional stages may be added on Heat Relays 3 and 4 or off board for this configuration if it is in a Communications Mode. NOTE: Since both valves are attached to Heat 1 Relay, only one proof of flame is required for both valves.

2V2IGN1S: Valve configuration used to control two modulating gas valves (one on each header), in which the first and second valves operate together for one modulating stage. One valve is connected to Heat 1 Relay and the second valve is connected to Heat 2 Relay. Additional stages may be added to Heat Relays 3 and 4 or off board if it is in a Communications Mode.

2V2IGN2S: Valve configuration used to control two modulating gas valves (one on each header), in which the first valve is modulating stage 1 (valve 1 header) and the second valve is modulating stage 2 (valve 2 header). Additional stages may be added to Heat 3 and 4 Relays or off board if it is in a Communications Mode.

STAGE DOWN DELAY

Range is 1 to 10 minutes. Default is 1.

STAGE UP DELAY

Range is 1 to 10 minutes. Default is 3.

IGNITION RETRY DELAY

Range is 1-60 minutes. Default is 30

TEMPERATURE SCALE

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

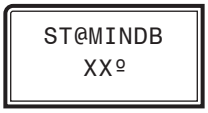
VALVE START POSITION

Range is 55-100% in 5% increments. Default is 70%.

LOW SUPPLY AIR TEMPERATURE START-UP

Range is 0ºF-45ºF. Default is 40ºF

If the Supply Air Temperature is less than the defined value, the stage up delay is reduced from three minutes to one minute.



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.

MIN MODE RUN TIME

Range: 0-500 seconds.

LED Diagnostics

The MODGAS-XWR2 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 14 LEDs—12 used for operation and status, and two used for alarms. (**Figure 16, page 37**).

Operation LEDs

POWER: This green LED will light up to indicate that 24 VAC power has been applied to the module.

STATUS: This green LED blinks every five seconds according to what mode the module is in. See **Table 5, this page**.

No. of Blinks	STATUS LED
1	Off Mode
2	Heating Mode (Heat Enable Signal and No Alarms)

Table 5: STATUS LED Blink Codes

Diagnostic LEDs

ALARM: This red LED located on the MODGAS-XWR2 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-XWR2 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 6, this page**.

No. of Blinks	ALARM LED
1	Valve 1 Proof of Flame Failure
2	Valve 1 Not Detected
3	Valve 2 Proof of Flame Failure
4	Valve 2 Not Detected
5	SAT Not Detected (Stand-Alone Mode)
6	SAT Cutoff
7	Relay 12 Communication Failure
8	Communication Failure
9	Stage 1 Failure
10	Stage 2 Failure

Table 6: ALARM 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 Heat Enable 1 relay is active.

RLY4: This green LED will light up and stay lit as long as the Heat Enable 2 relay is active.

RLY5: This green LED will light up and stay lit as long as the Heat Enable 3 relay is active.

RLY6: This green LED will light up and stay lit as long as the Heat Enable 4 relay is active.

Binary Input LEDs

AUX BIN: Not Used.

HEAT EN: This green LED will light up when Heat Enable signal is activated.

PO-IGN1: This green LED will light up when the Proof of Flame input from the first ignition module is enabled.

PO-IGN2: This green LED will light up when the Proof of Flame input from the second ignition module is enabled.

Analog Output LEDs

GAS VALVE 1 and GAS VALVE 2: These red LEDs will do the following:

- If the valve is detected and not modulating, then the valve LED is solid.
- If the valve is modulating, then it will blink while it is moving.
- If the valve is not detected, the valve LED will continuously blink.
- If there shouldn't be a modulating valve attached to the valve header, then the valve LED remains off.

LED Diagnostics

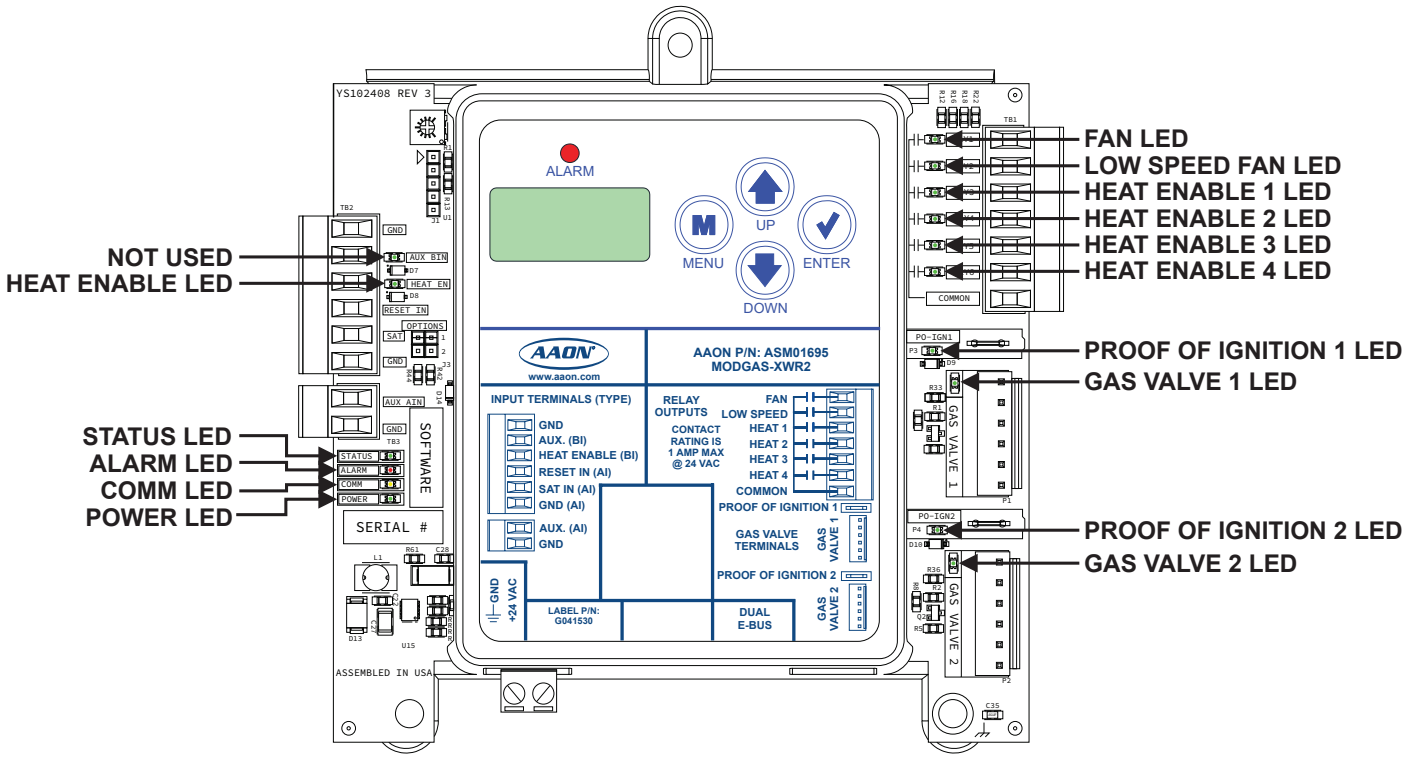


Figure 16: MODGAS-XWR2 LED Locations and Descriptions

Troubleshooting Alarms

Mechanical Failure

- Check relay outputs on the MODGAS-XWR2 for 18-30 VAC output.
- Verify the SAT OPTIONS jumper settings on the MODGAS-XWR2 for Supply Air Temperature Sensor.
- Verify gas valve LED is solid. Try forcing valves (refer to **Force Screens, page 32**).
- Verify that the Supply Air Temperature Sensor is connected to SAT and GND on the MODGAS-XWR2 (Stand-Alone Mode) or to AI2 (VCB-X) or to AI3 (VCCX2) and GND on the main controller (Communications Mode).
- Verify Supply Air Temperature Sensor probe is mounted correctly in supply duct.
- Remove SAT and GND wiring from the MODGAS-XWR2 and ohm sensor out (this may indicate open or failed wiring).

Fail Mode - Supply Air Temperature Sensor Failure

- Verify that the Supply Air Temperature Sensor is connected to the SAT and GND on the MODGAS-XWR2 (Stand-Alone Mode) or to AI2 (VCB-X) or to AI3 (VCCX2) and GND on the main controller (Communications Mode).
- Remove SAT and GND wiring from MODGAS-XWR2 and ohm sensor out (this may indicate open or failed wiring).
- Verify the SAT OPTIONS jumper settings on the MODGAS-XWR2 for the Supply Air Temperature Sensor.

Fail Mode - SAT Cutoff

- Remove SAT and GND wiring from the MODGAS-XWR2 and ohm sensor out (this may indicate open or failed wiring).
- With Supply Air Sensor disconnected from the MODGAS-XWR2, set volt meter to DC volts and measure voltage between SAT and GND on board.
- Verify Supply Air Temperature Sensor reading in duct with 3rd party temperature testing device.

Communications Loss

- Check COMM LED on MODGAS-XWR2.
- Verify 18-30 VAC power to all interconnected AAON unit controllers.
- Verify E-BUS connection between the MODGAS-XWR2 and associated AAON unit controllers.
- In Communications Mode, confirm the main MODGAS-XWR2 screens shows COMM MODE and the main controller's MODGAS status screen displays MODGAS-XWR2's Position %.

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 **Tables 7 and 8, this page and on page 40**.

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

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 **Tables 7 and 8, this page and on page 40**.

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 7: 0-3V Temperature Sensor - Voltage and Resistance for Type III Sensors

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 8: 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: Ensure the 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-XWR2. If, in Stand-Alone Mode, the MODGAS-XWR2 is used in conjunction with a Stand-Alone MHGRV-X series module, the SAT sensor is shared between the two modules and always attaches to the MODGAS-XWR2.

See **Table 10, page 42** for SAT Options Jumper Settings and reference the appropriate figure for wiring. See **Table 9, page 42** for details about retrofit applications.

Communication 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 11, page 42** for SAT Options Jumper Settings and see the appropriate figure for wiring. See **Table 9, page 42** for details about retrofit applications.

Installation Notes

- Leads are non-polarized. Butt splice leads to 24-gauge wire minimum.
- In Stand-Alone and retrofit applications, connect leads to "SAT" and "GND" on MODGAS-XWR2.
- If using a VCB-X Controller, connect leads to "AI2" and "GND" on main controller.
- If fusing a VCCX2 Controller, connect leads to "AI3" and "GND" on main controller.

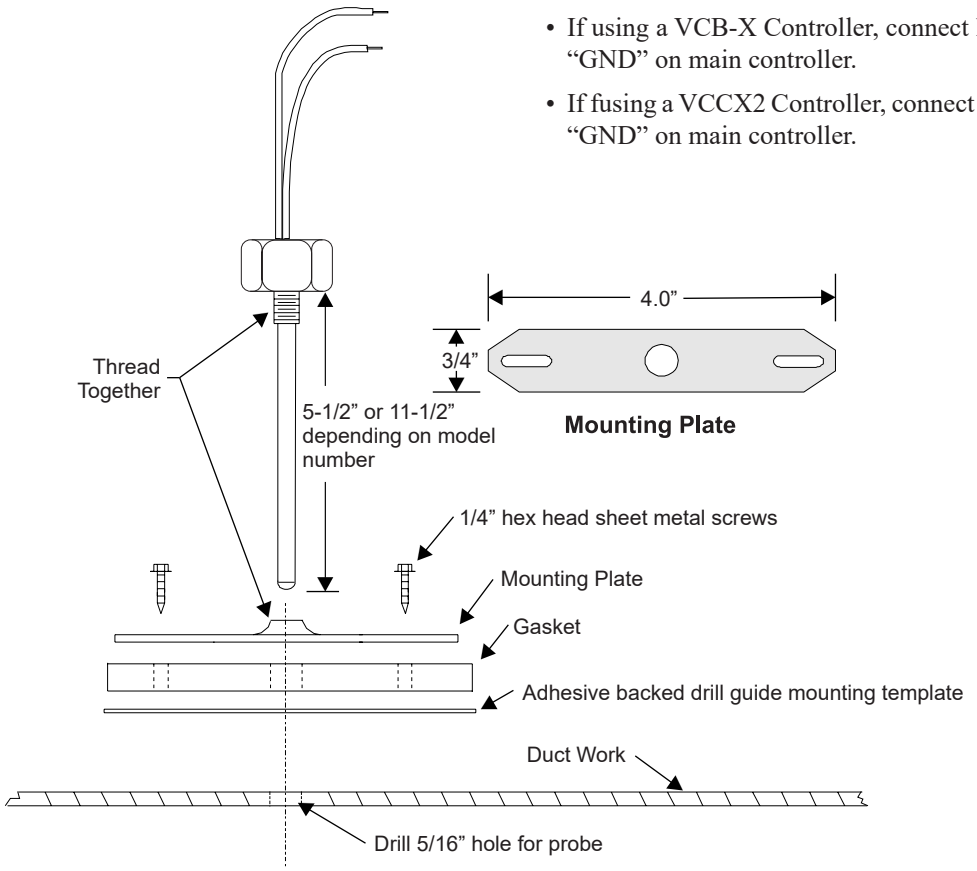


Figure 17: Supply Air Temperature Sensor Installation

APPENDIX A: SAT SENSOR

SAT Sensor Wiring Guide and Jumper Settings

	MODGAS-XWR2 ONLY	MHGRV-X SERIES ONLY	MODGAS-XWR2 AND MHGRV-X
Stand-Alone	Install Supply Air Sensor in MODGAS-XWR2.	Install Supply Air Sensor in MHGRV-X series module. Set “SAT Options” Jumpers to Normal”.	Install sensor in MODGAS-XWR2 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”.
VCCX2 VCB-X	Install Supply Air Sensor in VCCX2 or VCB-X. Connect to VCCX2 or VCB-X using E-BUS cable.	Install Supply Air Sensor in VCCX2 or VCB-X. Connect to VCCX2 or VCB-X using E-BUS cable.	Install Supply Air Sensor in VCCX2 or VCB-X. Connect to VCCX2 or VCB-X using E-BUS cable.

Table 9: SAT Wiring Conditions

STAND-ALONE MODE SAT OPTIONS JUMPER SETTINGS*	
Condition	**Jumper Setting**
MODGAS-XWR2 only	1
MODGAS-XWR2 with MHGRV-X**	1
MODGAS-XWR2 with MHGRV-II***	2
MODGAS-XWR2 with MHGRV-III	2
* For SAT Sensor testing, use **Table 7, page 38** for jumper setting 1 and **Table 8, page 39** for jumper setting 2.	
** Set MHGRV-X SAT Option to MODGAS-XWR2. See the *MHGRV-X Technical Guide* for more information.	
*** The MHGRV-II must have PU resistor installed.	

Table 10: Stand-Alone Mode SAT OPTIONS Jumper Settings

COMMUNICATION MODE SAT OPTIONS JUMPER SETTINGS*	
Condition	**Jumper Setting**
VCCX2, VCB-X*	1
* For SAT Sensor testing, use **Table 7, page 38** for jumper setting 1. SAT should be connected to the AAON unit controller.	

Table 11: Communication Mode SAT OPTIONS Jumper Settings

MODGAS-XWR2 Replacement of MODGAS-XWR

Replacing the MODGAS-XWR with the MODGAS-XWR2

The retrofit replacement involves a few easy steps. Refer to **Figure 18, this page**.

Step 1: Disconnect power from the MODGAS-XWR module.

Step 2: Set the SAT Options Jumper to the same settings as before.

Step 3: The Supply Air Temperature Sensor needs to remain installed on whatever controller it is currently on.

Step 4: Unplug the TB2 input terminal block from the MODGAS-XWR and replug it into the MODGAS-XWR2 board.

Step 5: Unplug the Ignition blocks and Valve headers from the MODGAS-XWR and replug them into the MODGAS-XWR2 board.

Step 6: Wire the MODGAS-XWR2 relays according to the valve configuration you will be using.

Step 7: Connect power to the MODGAS-XWR2.

Step 8: Configure the MODGAS-XWR2 using the LCD Display Screens.

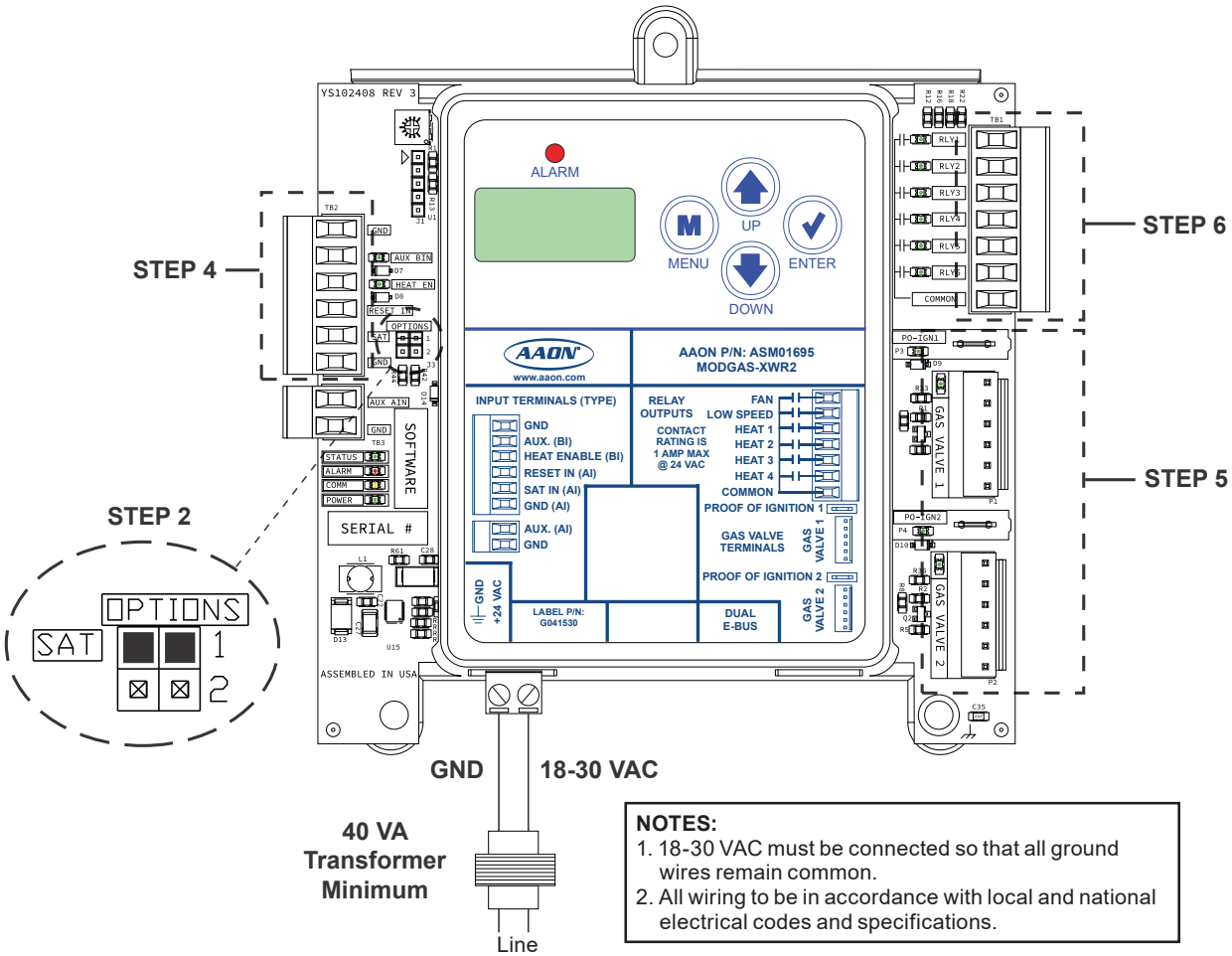


Figure 18: MODGAS-XWR2 Module

MODGAS-XWR2 Technical Guide

G112860 · Rev. F · 230224

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

Controls Support website:
www.aaon.com/aaon-controls-technical-support

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.

2425 South Yukon Ave • Tulsa, OK • 74107-2728
Ph: (918) 583-2266 • Fax: (918) 583-6094
AAON P/N: **G112860**, Rev. F