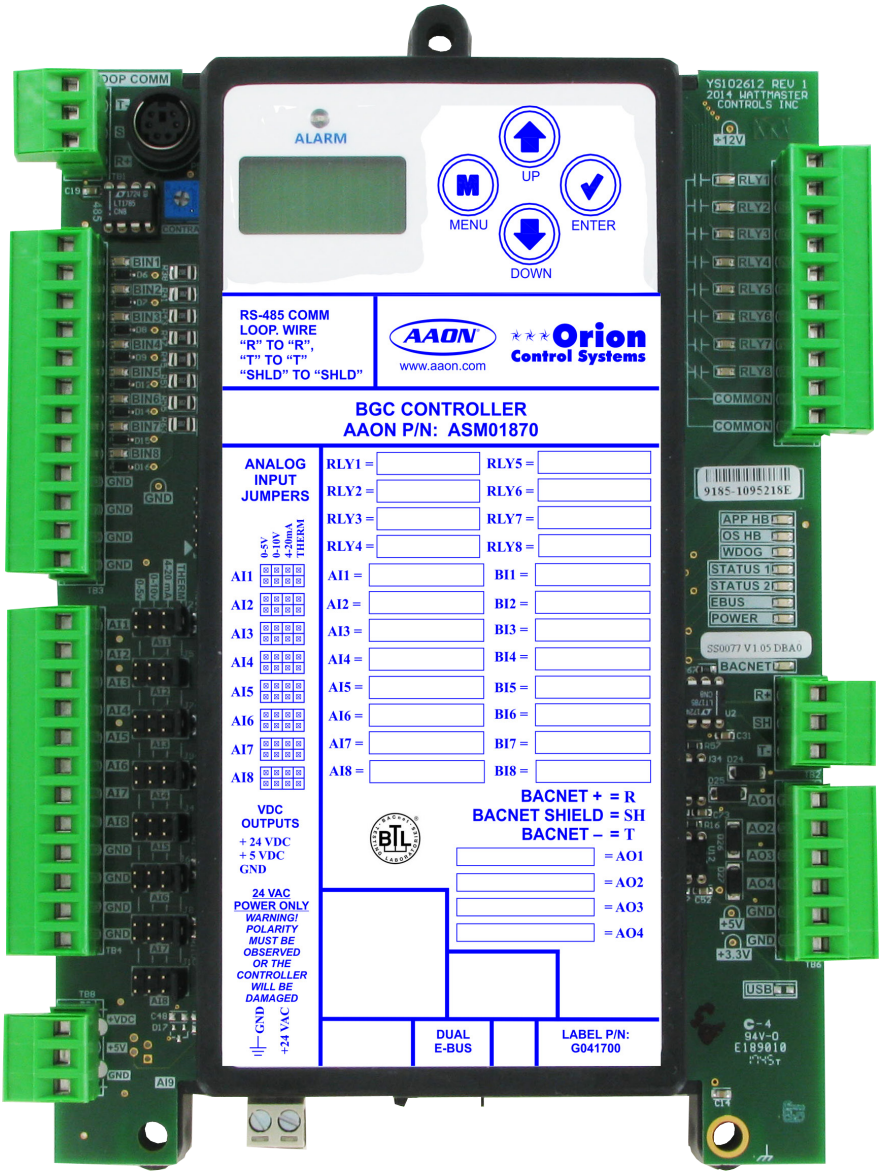
BACnet® General Controller Technical Guide



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General Information

Overview

The BACnet® General Controller (BGC) is an Input/Output module that has BACnet® MS/TP communication capability. The BGC has no internal logic, but allows a BACnet® front end to read its inputs and to command its outputs. The BGC has (8) analog inputs, (8) wet contact binary inputs, (8) relay outputs and (4) analog outputs.

Features

The BGC Controller:

- Operates as a stand-alone controller connecting to a BACnet® Bus
- Contains a 2 x 8 LCD character display and 4 buttons that allow for status display and BACnet® configuration settings

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

Environmental Requirements

The BGC needs to be installed in an environment that can maintain a temperature range between -30°F and 150°F and not exceed 95% RH levels (non-condensing).

Mounting

The BGC is housed in a plastic enclosure. It is designed to be mounted by using the 3 mounting holes in the enclosure base. It is important to mount the module in a location that is free from extreme high or low temperatures, moisture, dust, and dirt. Be careful not to damage the electronic components when mounting the module. **See Figure 1, page 5** for Controller dimensions (in inches).

Power Supply

The BGC requires an 18-30 VAC power connection with a minimum rating of 15 VA.

WARNING: Observe polarity! All boards must be wired GND-to-GND and 24 VAC-to-VAC. Failure to observe polarity could result in damage to the board.

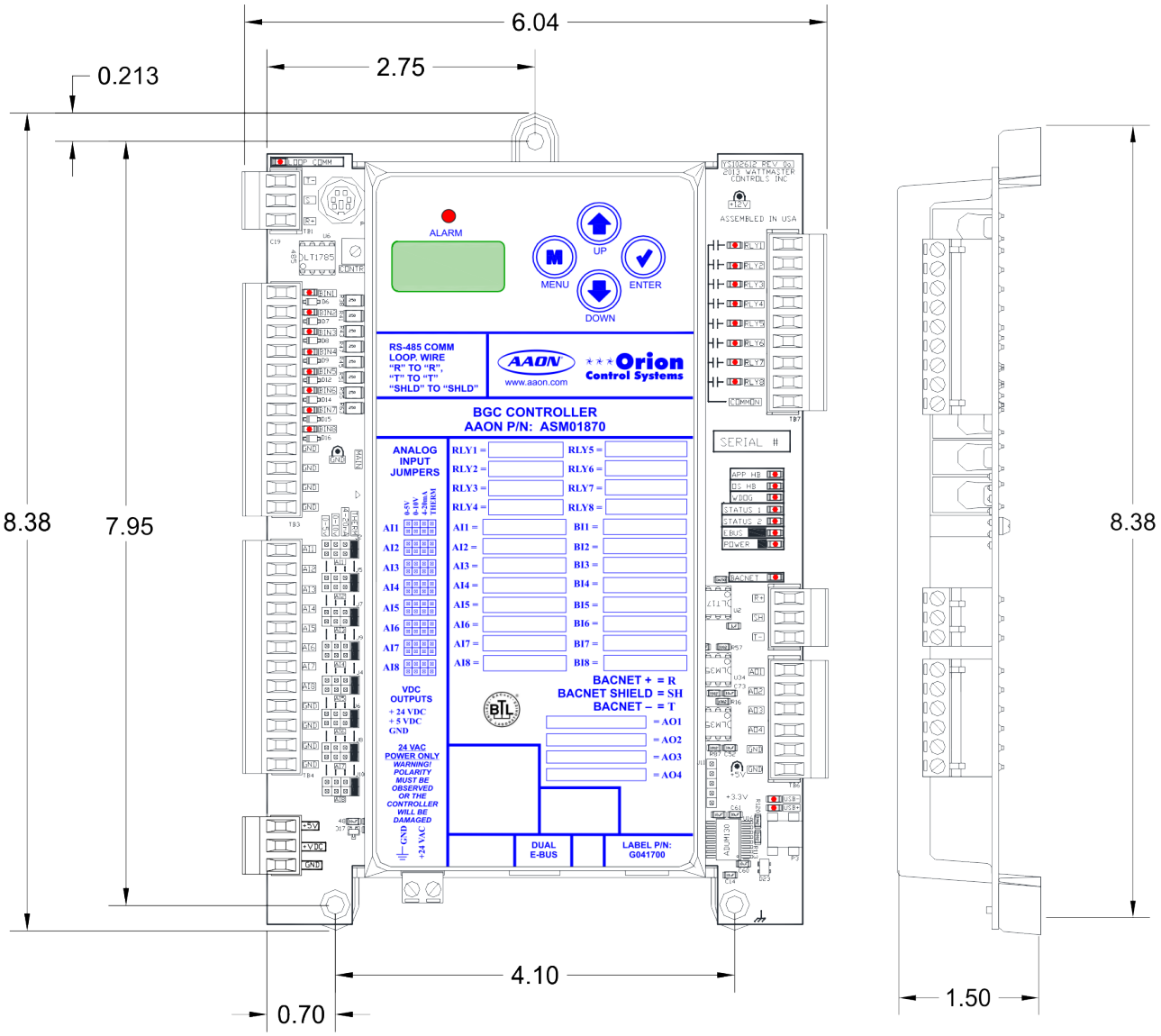


Figure 1: BACnet® General Controller Dimensions (In Inches)

Important Wiring Considerations

Important Wiring Considerations

Please read carefully and apply the following information when wiring the BGC. The BGC requires the following electrical connections:

1. 18 gauge minimum wire unless otherwise noted.
2. 24 VAC power connection with an appropriate VA rating.
3. 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 module and connected devices.
4. All wiring is to be in accordance with local and national electrical codes and specifications.
5. Check all wiring leads at the terminal block for tightness. Be sure that wire strands do not stick out and touch adjacent terminals. Confirm that all transducers required for your system are mounted in the appropriate location and wired into the correct terminals.

WARNING: Observe polarity! All boards must be wired GND-to-GND and 24 VAC-to-VAC. Failure to observe polarity could result in damage to the board.

POWER LED Operations

When the BGC is first powered up, the POWER LED (See **Figure 5, page 15** for location) 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 Technical Support for assistance.

Inputs and Outputs Wiring

See **Figure 2** below for wiring.

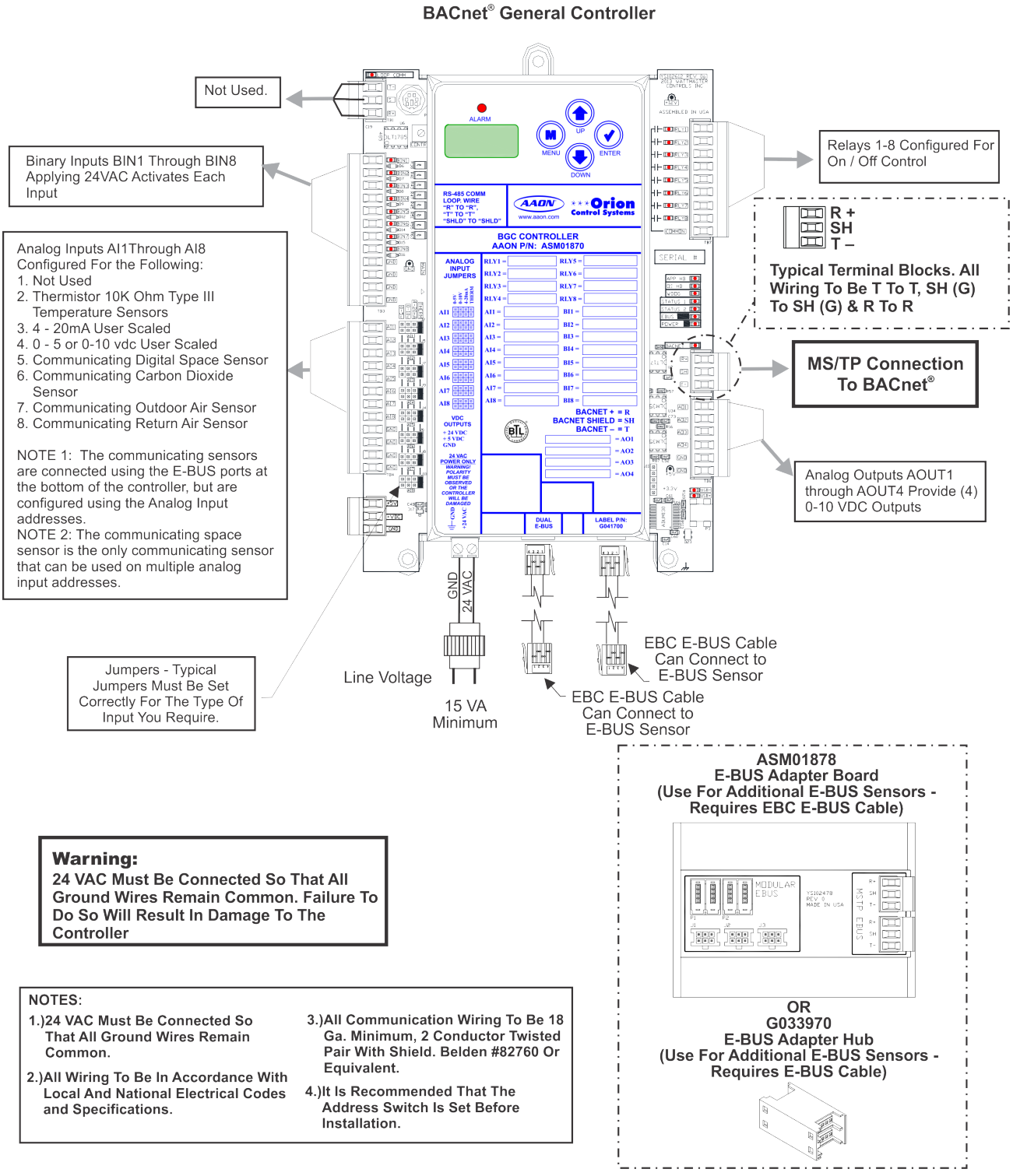


Figure 2: BGC Wiring Diagram

Inputs and Outputs

Analog Inputs (Hard-Wired)

The analog inputs can be configured for 10K ohm, Type III thermistor sensors or for user-scaled 0-5 VDC, 0-10 VDC, or 4-20 mA inputs. Orion communicating temperature sensors, communicating combination temperature/humidity sensors, or communicating CO_2 sensors can also be used as analog inputs. These communicating sensors require the use of pre-terminated Orion E-BUS modular cables. See the next section for details.

The initial configuration of the analog inputs is accomplished using points AV:5 through AV:12. AV:5 is associated with analog input #1, AV:6 with analog input #2, etc. For each point (AV:5 through AV:12), a bit value can be entered to configure that input for the type of sensor or signal that will be used on that input. See the BACnet® Parameters Table for the available options.

The jumpers next to each input must be set to match the selected configuration for that input.

Once the Analog Input types have been selected, any of those inputs configured for 0-5 VDC, 0-10 VDC, or 4-20 mA signals can be scaled using points AV:13 through AV:20 to set the maximum scaled value and points AV:21 through AV:28 to set the minimum scaled value for each input.

Analog Inputs Using Communicating Sensors

In addition to hard-wired inputs, different types of E-BUS communicating sensors may be used as analog inputs with the BGC Controller. If multiple communicating sensors are used, it may require the use of an E-BUS Adapter Board or an E-BUS Adapter Hub in order to provide additional E-BUS connection ports. An E-BUS cable is required to connect either device to the BGC as well as to connect the sensors to these devices.

The following Orion E-BUS communicating sensors are available to use with the BGC:

- ASM01819 - Space Temperature Sensor with Digital Display
- ASM01820 - Combination Space Temperature/ Humidity Sensor with Digital Display
- ASM02221 - Combination Space Temperature/ Humidity Sensor without Digital Display
- ASM01836 - Combination Outdoor Air Temperature/ Humidity Sensor
- ASM01840 - Combination Return Air Temperature/ Humidity Sensor
- ASM01829 - Wall Mount CO_2 Sensor
- ASM01831 - Duct Mount CO_2 Sensor

The temperature value of a communicating sensor will be displayed on the appropriate analog input (AI:2 through AI:9). If a combination temperature/humidity sensor is used, the humidity value of that sensor will be displayed on the corresponding analog input (AI:10 through AI:17).

A communicating CO_2 sensor value will be displayed on the appropriate analog input (AI:2 through AI:9).

The Communicating Sensor Technical Guides can be downloaded from www.aaon.com/controlsmanuals under Sensors.

NOTE: The communicating space sensor (temperature only with display or combination temperature/humidity with display) is the only communicating sensor that can be used on multiple analog input addresses. If multiple space sensors are used, they can be addressed as address 1 through 8 via the display on the sensors. Then, using points AV:29 through AV:36, those sensors can be addressed accordingly on the BGC. All other communicating sensors can only be used once per BGC, and can be left at address 1 on the appropriate point, AV:29 through AV:36.

Binary Inputs

The (8) wet contact (24 VAC) binary inputs can be read as Open (Off) or Closed (On) using points BI:1 through BI:8. See the **Appendix A: BACnet® Parameters Table** for the configuration options.

Analog Outputs

The (4) analog outputs can be commanded to a voltage value between 0.0 VDC to 10.0 VDC using points AV:1 through AV:4. See **Appendix A: BACnet® Parameters Table** for the selection options.

Relay Outputs

The (8) relay outputs can be commanded On or Off using points BV:1 through BV:8. See **Appendix A: BACnet® Parameters Table** for the selection options.

LCD Display Screen & Navigation & Editing Keys

The BGC allows you to make configuration changes, view status, change setpoints, create force modes, and perform diagnostics using the keypad next to the LCD display. See **Figure 3, below** and refer to **Table 1** for Navigation Key functions. The keys also have editing functions. Refer to **Table 2** for Editing functions.

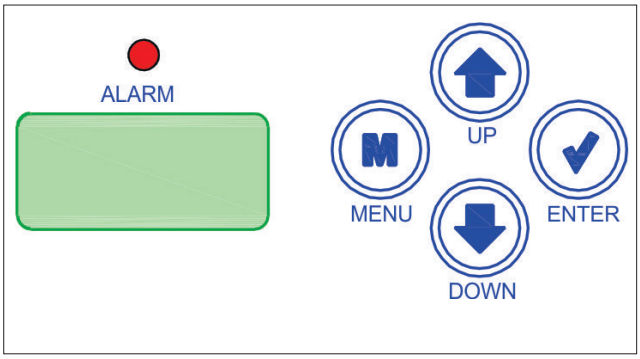


Figure 3: LCD Display and Navigation Keys

NAVIGATION KEY	KEY FUNCTION
MENU	Use the MENU key to return to a Main Menu Screen.
UP	Use this key to move through Main Menu Screens and adjust Settings.
DOWN	Use this key to move through Main Menu Screens and adjust Settings.
ENTER	Use the Enter key to move through screens within Main Menu categories.

Table 1: Navigation Key Functions

EDITING 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. **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 under-score will disappear. A second press of the MENU key will return you to the Main Menu.

Table 2: Editing Key Functions

Main Screens Map

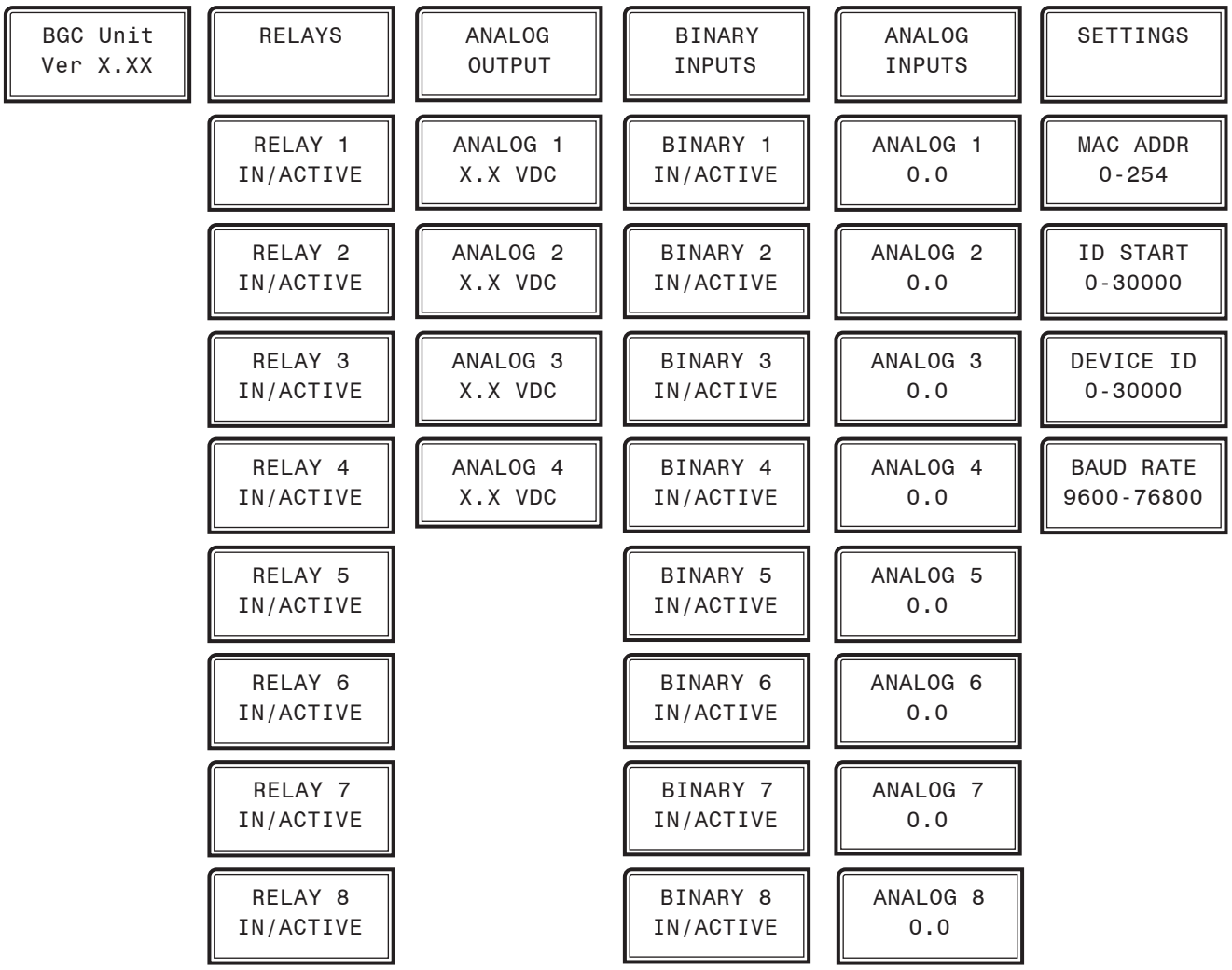
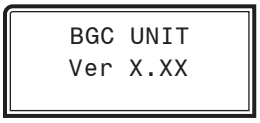


Figure 4: BGC Main Screens Map

BGC Main Screens

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 **<DOWN ARROW>** button.



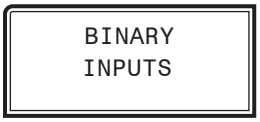
Press ⬇ to go to the RELAYS Screen.

Press ✓ to scroll through RELAY Screens.

Press ⬇ to go to the ANALOG OUTPUT Screen.

Press ✓ to scroll through the ANALOG OUTPUT Screens.

Press ⬇ to go to the BINARY INPUTS Screen.



Press ✓ to scroll through the BINARY INPUT Screens.

Press ⬇ to go to the ANALOG INPUTS Screen.

Press ✓ to scroll through ANALOG INPUT Screens.

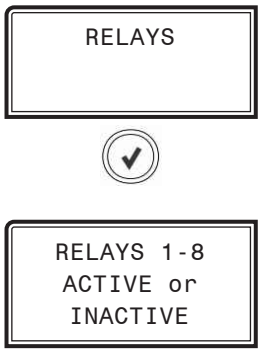
Press ⬇ to go to SETTINGS Screen.

Press ✓ to scroll through SETTINGS Screens.

Status Screens

RELAYS Status Screens

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

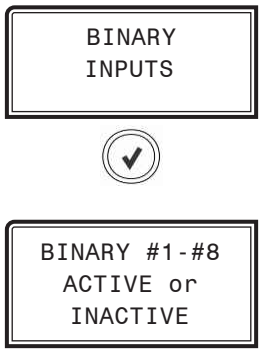


RELAYS 1-8

The 8 Relay Screens display the status of each relay - either ACTIVE or INACTIVE

BINARY INPUT Status Screens

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

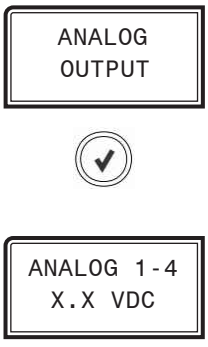


BINARY INPUTS #1-#8

The 8 Binary Input Screens display the status of each Binary Input - either ACTIVE or INACTIVE

ANALOG OUTPUT Status Screens

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

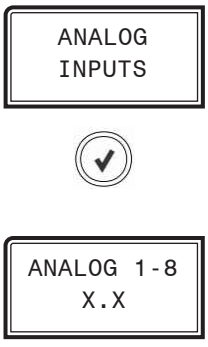


ANALOG OUTPUTS 1-4

The 4 Analog Output screens display the current voltage of each Analog Output.

ANALOG INPUT Status Screens

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

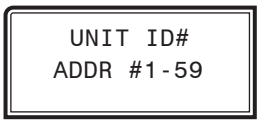


ANALOG INPUTS 1-8

The 8 Analog Input screens display the current value of each Analog Input.

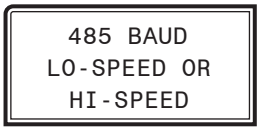
SETTINGS Screens

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



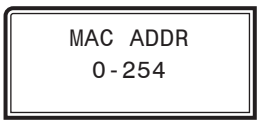
UNIT ADDRESS

Unit Address. Valid range is 1-59. Default is 59.



BAUD RATE SPEED

485 baud rate speed. Valid randge is Lo-Speed or Hi-Speed. Default is Hi-Speed.

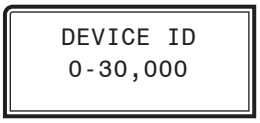


BACnet® - CURRENT MAC ADDRESS

Valid range is 0 to 254. Default is 0.

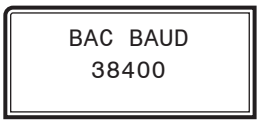
BACnet® - CURRENT ID Start

Range is 0-30,000 in increments of 1000. Default is 15,000.



BACnet® - CURRENT DEVICE ID

The actual Device ID is the ID Start # plus whatever is added or subtracted from this screen. Range is 0-30,000 in increments of 1.



BACnet® - CURRENT BAUD RATE

9600, 19200, 38400, 57600, 76800. Default is 38400.

LED Diagnostics & Troubleshooting

BGC LEDs

The BGC 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 BGC Controller has 25 LEDs—9 used for operation & status, 8 used for relays, and 8 used for binary inputs. See **Figure 5, page 15** for the LED locations. The LEDs associated with these inputs and outputs allow you to see what is active without using a voltmeter. The LEDs and their uses are as follows:

Operation LEDs - Factory Troubleshooting

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

APP HB - This green LED will light up and blink continuously to indicate the application software is working properly.

OS HB - This green LED will light up and blink continuously to indicate the operating system is working properly.

WDOG - This green LED will light up and stay lit to indicate the operating system is working properly.

Diagnostic LEDs

STATUS 1 - This red LED is a diagnostic blink code LED. If the software is running, this LED should blink at a rate of 1 blink every 10 seconds.

STATUS 2 - This red LED is a diagnostic blink code LED. Under normal operation, it should not be blinking. If the LED is blinking non-stop along with Status 2 LED, the controller is resetting factory defaults.

Communication LEDs

EBUS - This yellow LED will blink to signal E-BUS communications.

BACNET - This yellow LED will light up and blink continuously to indicate BACnet communications.

Relay LEDs

RLY1 - RLY8 - These green LEDs will light up when the relays are enabled and will stay lit as long as they are active.

Binary Input LEDs

BIN1 - BIN8 - These green LEDs will light up when each contact is closed.

POWER LED Operation

When the BGC is 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 Technical Support for assistance.

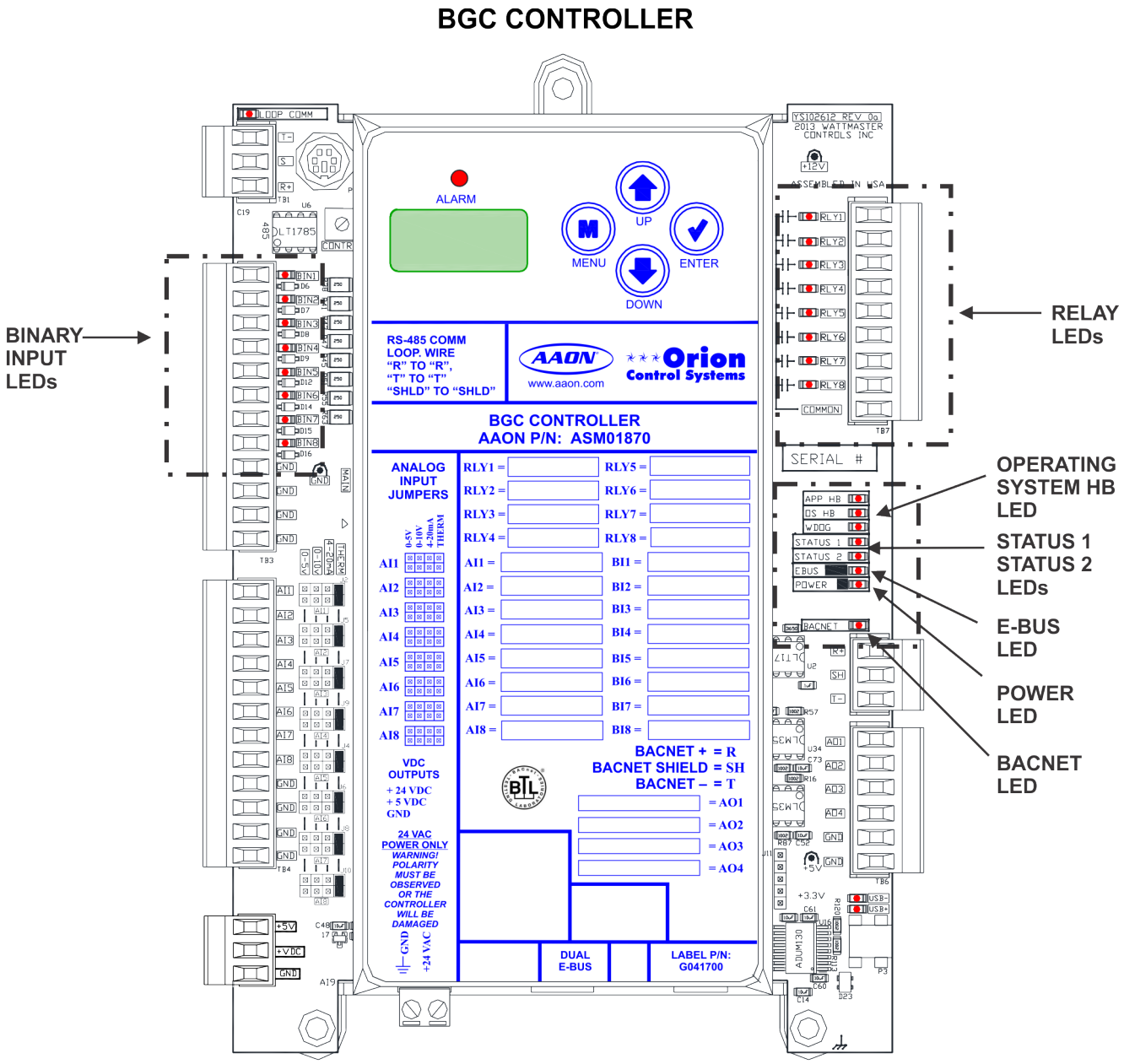


Figure 5: BGC LED Locations and Descriptions

BGC BACnet® Points

BACnet® Properties for the BGC			
PARAMETER	OBJECT	DESCRIPTION	LIMITS
Application Software Version	AI: 1	Current version of the software in the unit.	
Analog Input #1	AI:2	Analog Input #1 Value	
Analog Input #2	AI: 3	Analog Input #2 Value	
Analog Input #3	AI: 4	Analog Input #3 Value	
Analog Input #4	AI: 5	Analog Input #4 Value	
Analog Input #5	AI:6	Analog Input #5 Value	
Analog Input #6	AI:7	Analog Input #6 Value	
Analog Input #7	AI:8	Analog Input #7 Value	
Analog Input #8	AI:9	Analog Input #8 Value	
Humidity Input #1	AI:10	Digital Humidity Sensor #1 Reading	Requires Associated Digital Temperature on AI:2
Humidity Input #2	AI:11	Digital Humidity Sensor #2 Reading	Requires Associated Digital Temperature on AI:3
Humidity Input #3	AI:12	Digital Humidity Sensor #3 Reading	Requires Associated Digital Temperature on AI:4
Humidity Input #4	AI:13	Digital Humidity Sensor #4 Reading	Requires Associated Digital Temperature on AI:5
Humidity Input #5	AI:14	Digital Humidity Sensor #5 Reading	Requires Associated Digital Temperature on AI:6
Humidity Input #6	AI:15	Digital Humidity Sensor #6 Reading	Requires Associated Digital Temperature on AI:7
Humidity Input #7	AI:16	Digital Humidity Sensor #7 Reading	Requires Associated Digital Temperature on AI:8
Humidity Input #8	AI:17	Digital Humidity Sensor #8 Reading	Requires Associated Digital Temperature on AI:9

BACnet® Properties for the BGC				
PARAMETER	OBJECT	DESCRIPTION	LIMITS	
Binary Input #1	BI: 1	Binary Input #1 Open/Close Status	0 = Off	1 = On
Binary Input #2	BI: 2	Binary Input #2 Open/Close Status	0 = Off	1 = On
Binary Input #3	BI: 3	Binary Input #3 Open/Close Status	0 = Off	1 = On
Binary Input #4	BI: 4	Binary Input #4 Open/Close Status	0 = Off	1 = On
Binary Input #5	BI: 5	Binary Input #5 Open/Close Status	0 = Off	1 = On
Binary Input #6	BI: 6	Binary Input #6 Open/Close Status	0 = Off	1 = On
Binary Input #7	BI: 7	Binary Input #7 Open/Close Status	0 = Off	1 = On
Binary Input #8	BI: 8	Binary Input #8 Open/Close Status	0 = Off	1 = On
Relay #1	BV: 1	Relay #1 On/Off Command	0 = Off	1 = On
Relay #2	BV: 2	Relay #2 On/Off Command	0 = Off	1 = On
Relay #3	BV: 3	Relay #3 On/Off Command	0 = Off	1 = On
Relay #4	BV: 4	Relay #4 On/Off Command	0 = Off	1 = On
Relay #5	BV: 5	Relay #5 On/Off Command	0 = Off	1 = On
Relay #6	BV: 6	Relay #6 On/Off Command	0 = Off	1 = On
Relay #7	BV: 7	Relay #7 On/Off Command	0 = Off	1 = On
Relay #8	BV: 8	Relay #8 On/Off Command	0 = Off	1 = On
Analog Output #1	AV: 1	Analog Output #1 Voltage Command	0 vdc	10 vdc
Analog Output #2	AV: 2	Analog Output #2 Voltage Command	0 vdc	10 vdc
Analog Output #3	AV: 3	Analog Output #3 Voltage Command	0 vdc	10 vdc
Analog Output #4	AV: 4	Analog Output #4 Voltage Command	0 vdc	10 vdc

BGC BACnet® Points

BACnet® Properties for the BGC				
PARAMETER	OBJECT	DESCRIPTION	LIMITS	
Analog Input #1 Type	AV: 5	Analog Input #1 Type Configuration	See Enumerated values this page.	
Analog Input #2 Type	AV: 6	Analog Input #2 Type Configuration	See Enumerated values this page.	
Analog Input #3 Type	AV: 7	Analog Input #3 Type Configuration	See Enumerated values this page.	
Analog Input #4 Type	AV: 8	Analog Input #4 Type Configuration	See Enumerated values this page.	
Analog Input #5 Type	AV: 9	Analog Input #5 Type Configuration	See Enumerated values this page.	
Analog Input #6 Type	AV: 10	Analog Input #6 Type Configuration	See Enumerated values this page.	
Analog Input #7 Type	AV: 11	Analog Input #7 Type Configuration	See Enumerated values this page.	
Analog Input #8 Type	AV: 12	Analog Input #8 Type Configuration	See Enumerated values this page.	
Maximum Scaling #1	AV: 13	Maximum Scaling for User Scaled Configuration	-3000	3000
Maximum Scaling #2	AV: 14	Maximum Scaling for User Scaled Configuration	-3000	3000
Maximum Scaling #3	AV: 15	Maximum Scaling for User Scaled Configuration	-3000	3000
Maximum Scaling #4	AV: 16	Maximum Scaling for User Scaled Configuration	-3000	3000
Maximum Scaling #5	AV: 17	Maximum Scaling for User Scaled Configuration	-3000	3000
Maximum Scaling #6	AV: 18	Maximum Scaling for User Scaled Configuration	-3000	3000
Maximum Scaling #7	AV: 19	Maximum Scaling for User Scaled Configuration	-3000	3000
Maximum Scaling #8	AV: 20	Maximum Scaling for User Scaled Configuration	-3000	3000
Minimum Scaling #1	AV: 21	Minimum Scaling for User-Scaled Configuration	-3000	3000
Minimum Scaling #2	AV: 22	Minimum Scaling for User-Scaled Configuration	-3000	3000
Minimum Scaling #3	AV: 23	Minimum Scaling for User-Scaled Configuration	-3000	3000
Minimum Scaling #4	AV: 24	Minimum Scaling for User-Scaled Configuration	-3000	3000

BACnet® Properties for the BGC				
PARAMETER	OBJECT	DESCRIPTION	LIMITS	
Minimum Scaling #5	AV: 25	Minimum Scaling for User-Scaled Configuration	-3000	3000
Minimum Scaling #6	AV: 26	Minimum Scaling for User-Scaled Configuration	-3000	3000
Minimum Scaling #7	AV: 27	Minimum Scaling for User-Scaled Configuration	-3000	3000
Minimum Scaling #8	AV: 28	Minimum Scaling for User-Scaled Configuration	-3000	3000
Sensor #	AV: 29	Analog Input #1 Communicating Sensor #	1	8
Sensor #	AV: 30	Analog Input #2 Communicating Sensor #	1	8
Sensor #	AV: 31	Analog Input #3 Communicating Sensor #	1	8
Sensor #	AV: 32	Analog Input #4 Communicating Sensor #	1	8
Sensor #	AV: 33	Analog Input #5 Communicating Sensor #	1	8
Sensor #	AV: 34	Analog Input #6 Communicating Sensor #	1	8
Sensor #	AV: 35	Analog Input #7 Communicating Sensor #	1	8
Sensor #	AV: 36	Analog Input #8 Communicating Sensor #	1	8

BGC BACnet® Property Identifier

BACNETPropertyIdentifier :

AnalogInputTypeConfigurationBits ::= ENUMERATED {

Not Used	(0),
Thermistor Temp (Fahrenheit)	(1),
Thermistor Temp (Celsius)	(2),
4-20ma User Scaled	(3),
0-5vdc or 0-10vdc User Scaled*	(4),
Communicating Digital Space Sensor	(5),
Communicating Carbon Dioxide Sensor	(6),
Communicating Outdoor Temp Sensor	(7),
Communicating Return Temp Sensor	(8)

* Set jumper for 0-5 VDC or 0-10 VDC operation.

BGC Controller Technical Guide

G042460 · Rev. F · 221012

AAON Factory Technical Support: 918-382-6450

techsupport@aaon.com

AAON Controls Support: 866-918-1100
Monday through Friday, 7:00 AM to 5:00 PM
central standard time

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 So. Yukon Ave • Tulsa, OK • 74107-2728
Ph: (918) 583-2266 • Fax: (918) 583-6094
AAON® Part No.: G042460 Rev. F