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Greentrol Automation, Inc.

Installation, Operation and Maintenance Technical Manual

GA-200-N

Multi-function Analog Input BACnet Alarm with LCD

Document Name: TM_GA-200-N_R1B

Part Number: 960–0050

TM_GA-200-N_R1B

OEM PRODUCT NOTICE

This product is manufactured for specific and approved OEM applications only. The information contained herein is provided only for the intended application for use by the specified OEM. Questions regarding this product and its application should be directed to the OEM for resolution.

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LIST OF EFFECTIVE AND CHANGED PAGES

Insert latest changed pages (**in bold text**); remove and dispose of superseded pages.
Total number of pages in this manual is **20.**

Page No	Revision *	Description of Change	Date
1 through 20	R1A	Initial document release.	06/03/2010
21 through 24	R1B	Added in Appendices A and B (BACnet and Modbus Detail)	09/13/2010

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OVERVIEW

GreenTrol model GA-200-N is a high quality, economical microprocessor controlled programmable alarm solution designed for installation in specified OEM applications where programmable alarm features are required. The GA-200-N includes a simple user interface and an integral LCD display to permit device configuration, selection of features and alarm outputs. The programmable alarm can be configured for low or high limit alarm with hysteresis, or as a dead band alarm with upper/lower triggers as a percentage of set point. The alarm output can be configured as dry relay contacts or as an external alarm LED driver (15mA typical). The GA-200-N accepts analog inputs of 0-10VDC, 0-5VDC, 2-10VDC or 4-20mA and includes a BACnet® MS/TP or Modbus® RTU communications interface for interoperability with virtually all modern controls and building automation systems (BAS).

Figure 1. GA-200-N Airflow Measurement Station

The GA-200-N features an advanced microprocessor that processes the raw analog BAS signal and provides versatile programmable alarm options for local LED and remote LED drive, and normally open or normally closed relay dry contacts. A BACnet® MS/TP or Modbus® RTU communications interface is included. A powerful variable input signal integration feature can be engaged to reduce the effects of transient signal variations. When applied as an airflow alarm, this feature can be used to minimize reported airflow fluctuations due to transient wind gusts when systems are operating at low air flows. A 16 character LCD display and simple push-button user interface allows for simple field configuration and programming.

SPECIFICATIONS

System

• Programmable Alarm Modes:	High limit/Low limit with hysteresis; Deadband alarm with upper/lower limits and hysteresis
• Display Type:	16 character LCD display panel
• Operating Temperature:	-20 to 120°F [-28.9 to 48.9°C]
• Operating Humidity:	0 to 99% non-condensing; Instrument must be protected from precipitation
• Power Requirements:	22.8-26.4VAC, 3.5VA maximum

Input / Output Interface

• Analog Input:	Selectable 0-10VDC, 0-5VDC, 2-10VDC (@20 mA max.) or 4-20 mA
• Input Resolution:	12-bit resolution (0-10VDC range)
• Alarm Types:	1. Dry contacts; 30VDC/24VAC @ 3 amps max. or as direct LED drive (15 mA typ) 2. Front panel red LED indicator indicating alarm activity
• Wiring Interface:	Rugged insulated plug-in terminal blocks for simple field wiring

Microcontroller

• Overview:	32-bit microcontroller operating at 24.576 MHz bus with integral flash, RAM, and internal reset and watchdog features

Power Supply

• Overview:	Internal high efficiency switching power supply; integral short circuit and thermal overload protection, and stable 5VDC linear regulator

Enclosure

Enclosure Material:	Durable electronic housing with removable cover
Enclosure Rating:	UL94-5VA
Enclosure Dimensions (HxWxD):	3.570 x 5.070 x 1.577 in [90.68 x 128.78 x 40.06 mm], with two integral 0.468 in [11.89 mm] mounting flanges. Overall width with flanges 6.006 [152.55 mm]
Mounting:	Two 0.190 in [4.83 mm] diameter holes on left/right mounting flanges

Diagnostics

• Status Indicator:	Board-mounted 'Activity' LED indicating instrument health/status

Warranty

12 months from shipment to OEM.

GA-200-N FEATURES

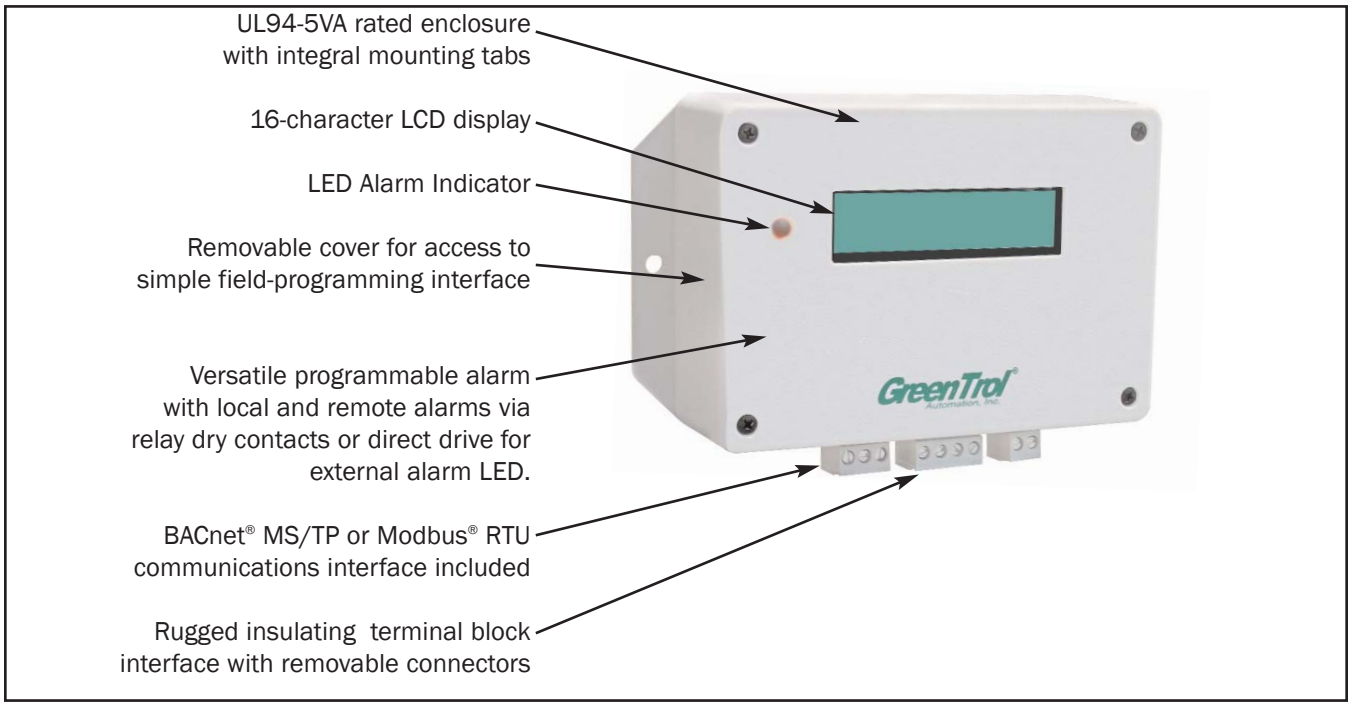

Figure 2. GA-200-N Features

GA-200-N INSTALLATION

The GA-200-N is designed for use in an environment between -20° F to 120° F *(-28.8° C to 48.8° C)* where it will not be exposed to precipitation. A NEMA-4 enclosure must be provided to protect the GA-200-N in locations where precipitation may be encountered.

The GA-200-N must be installed in a field accessible location with sufficient service clearance to permit cover removal. The enclosure accepts signal and power wiring at the bottom of the enclosure. Ensure that the planned location will allow the signal and power wiring to reach the wiring terminal blocks at the bottom of the GA-200-N enclosure.

CAUTION

In locations exposed to precipitation, the GA-200-N must be enclosed in a NEMA4 enclosure.

Provide sufficient clearance around the GA-200-N to permit cover removal.

Locate the GA-200-N in a location that can be reached by the connecting signal and power cables.

Do not drill into the GA-200-N enclosure since doing so may damage the electronics.

1. ☐ Carefully unpack the GA-200-N and inspect for damage. If damage is noted, immediately file a claim with carrier.
2. ☐ Using the engineer's plans, locate where the GA-200-N will be installed.
3. ☐ Refer to Figure 3 and mark the two mounting holes located on each of the enclosure side flanges.
4. ☐ Drill two holes suitable for the hardware that will be used to secure the GA-200-N.
5. ☐ Secure the GA-200-N in two places using suitable hardware.
6. ☐ Connect signal and power cabling to the GA-200-N as outlined in the following GA-200-N WIRING procedure.

POWER TRANSFORMER CONSIDERATIONS

Select a 24 VAC transformer based on the maximum power requirements of the GA-200-N (3.5 VA) to ensure that the operating supply voltage to the GA-200-N (when powered "ON") is not less than 22.8 VAC or greater than 26.4 VAC.

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GA-200-N MECHANICAL DETAIL

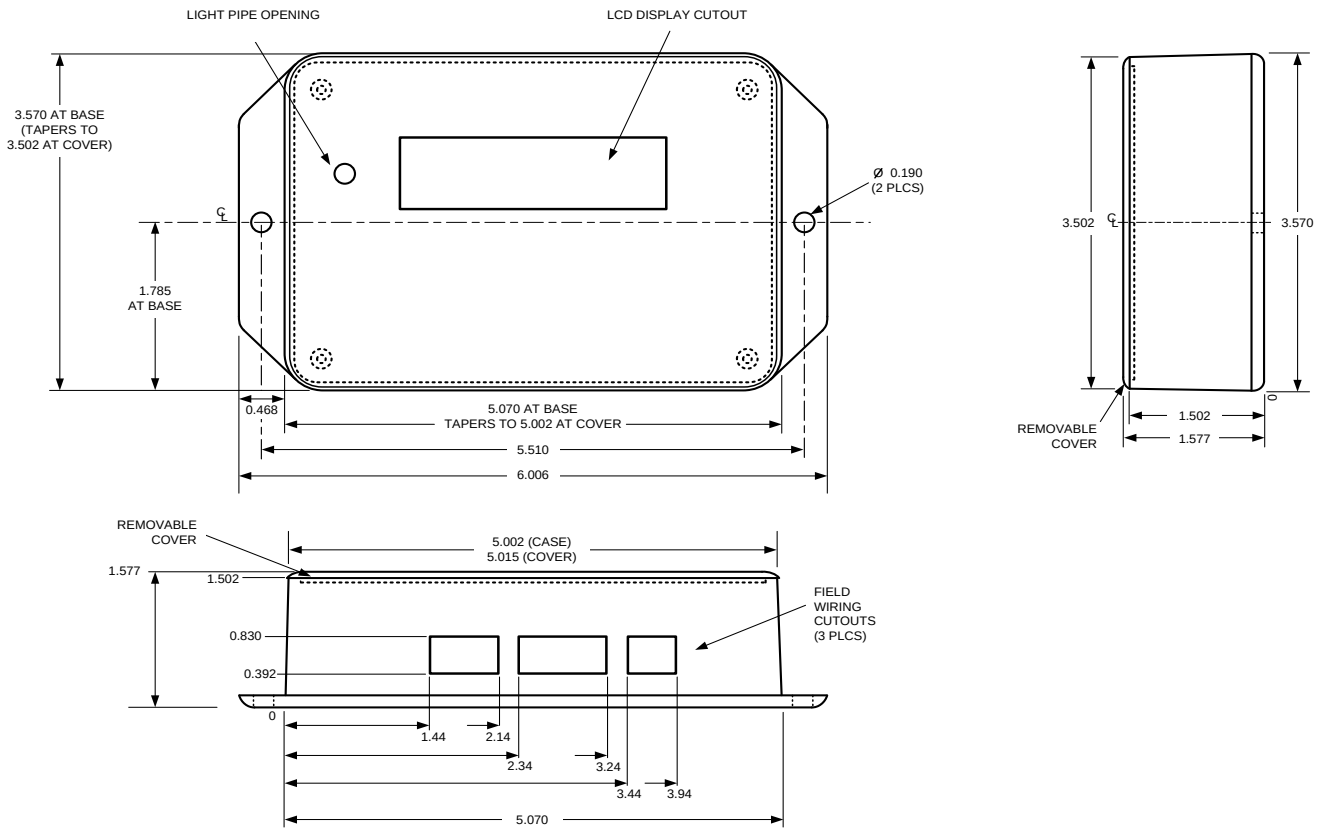

Figure 3. GA-200-N Mechanical Detail Drawing

GA-200-N WIRING

GA-200-N wiring consists of connecting 24VAC input power, BACnet MS/TP or Modbus interface, analog input and the optional alarm output at the GA-200-N. Refer to Figures 4 and 5 for additional detail. Following installation, review and perform any setup options required (other than the default values) as outlined in the GA-200-N Setup Procedure.

Wiring connections to the GA-200-N are accomplished at three removable screw-type terminal block connectors for J2, J3 and J6 at the bottom of the instrument as shown in Figure 4. The connectors are keyed to prevent improper hookup to the instrument.

J6 - POWER CONNECTIONS

1. ☐ Remove the 2 terminal wiring connector from J6.
2. ☐ Connect 24 VAC power to J6 terminal 1, and the 24V ground to J6 at terminal 2 as shown in Figures 4 and 5, observing the following wiring precautions.

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CAUTION

⚠ **To prevent damage to the GA-200-N, deactivate 24 VAC power source until all connections to the instrument are complete.**

⚠ **The 24 VAC input ground (GND) connection at J6 terminal 2 is shared with the analog input signal ground at J3 terminal 2. If isolation is required, a dedicated isolation transformer must be provided to power the GA-200-N.**

⚠ **The GA-200-N is a non-isolated device with a half-wave rectifier on the 24VAC power input terminal at J6-1. Therefore, to prevent equipment damage, multiple devices that are powered by a common 24VAC transformer with the GA-200-N must use common device power connections (e.g. J6-1 24VAC input power to other device power inputs, and J3-2 ground to other device grounds), or independent isolation transformers must be provided for each non-isolated device.**

⚠ **The GA-200-N 24VAC ground and analog input signal returns are common. Therefore it is recommended that the analog input be connected using TWO separate twisted shielded pairs in order to eliminate potential voltage drop on the common (from the 24VAC return) that would otherwise cause inaccurate readings.**

⚠ **To prevent any potential water runoff into the GA-200-N, form "drip loops" with interconnecting wires to the GA-200-N.**

ANALOG INPUT CONNECTIONS

The GA-200-N accepts an analog input signal that can be configured as voltage (0-10VDC, 0-5VDC, 2-10VDC @20mA max.) or as 4-20mA current using the 4-20mA jumper on the main circuit board as shown in Figure 4. The 24VAC return ground connection is shared with the analog input signal ground (GND). If the analog input must be isolated from the 24VAC return, a dedicated isolation transformer must be provided to power the GA-200-N.

1. ☐ Remove the 4 terminal wiring connector from J3.
2. ☐ Connect the analog input signal wire at J3-1, and the signal ground at J3-2 as shown in Figures 4 and 5 while observing the previous wiring precautions.

Setting the 4-20mA Jumper

1. ☐ Remove the four cover retaining screws at each corner of the transmitter cover in order to gain access to the transmitter Wiring Terminal Block on the main circuit board shown in Figure 4.
2. ☐ Remove the cover from the enclosure.

3a. ☐ For an analog input voltage source (0-10VDC, 0-5VDC or 2-10VDC), remove the jumper across the 4-20mA terminals (or place it on only one of the two pins).

OR

3b. ☐ For an analog current source (4-20mA), install the jumper across the 4-20mA terminals.

4. ☐ Set analog input type in the Setup menu to match the 4-20mA jumper selection as detailed later in this manual.

ALARM OUTPUT CONNECTIONS

The GA-200-N alarm output can be configured as relay dry contacts, or as direct drive (15 mA typical) for an external LED indicator. The alarm output type is set using the LED PWR jumper on the GA-200-N main circuit board as shown in Figure 4. With the LED PWR jumper on, alarm output is set to provide an external LED drive (15 mA typical) at J3 terminal 4, with ground return at J6 terminal 2. With the LED PWR jumper OFF, alarm output is set to provide dry relay contacts between J3 terminals 3 and 4 (contacts rated at 30VDC/24VAC 3 amps maximum). The alarm can be set as normally open (contact close on alarm) or normally closed (contacts open on alarm) in the Setup menu.

Setting the LED PWR Jumper

1. ☐ Remove the four cover retaining screws at each corner of the transmitter cover in order to gain access to the transmitter Wiring Terminal Block on the main circuit board shown in Figure 4.
2. ☐ Remove cover from the enclosure.

3a. ☐ For external LED drive alarm output, install LED PWR jumper, and connect LED anode (+) to J3 terminal 4, and cathode (-) at Power Connector J6 terminal 2.

OR

3b. ☐ For relay dry contact alarm output, remove the jumper across the LED PWR terminals (or place it on only one of the two pins), and connect the alarm wires to J3 terminals 3 and 4. Operation of the relay can be set for normally open or normally closed as detailed in the Setup menu later in this manual. Contact rating is 30VDC/24VAC at 3 amps maximum.

4. ☐ Set alarm type in the Setup menu to match the LED PWR jumper selection.

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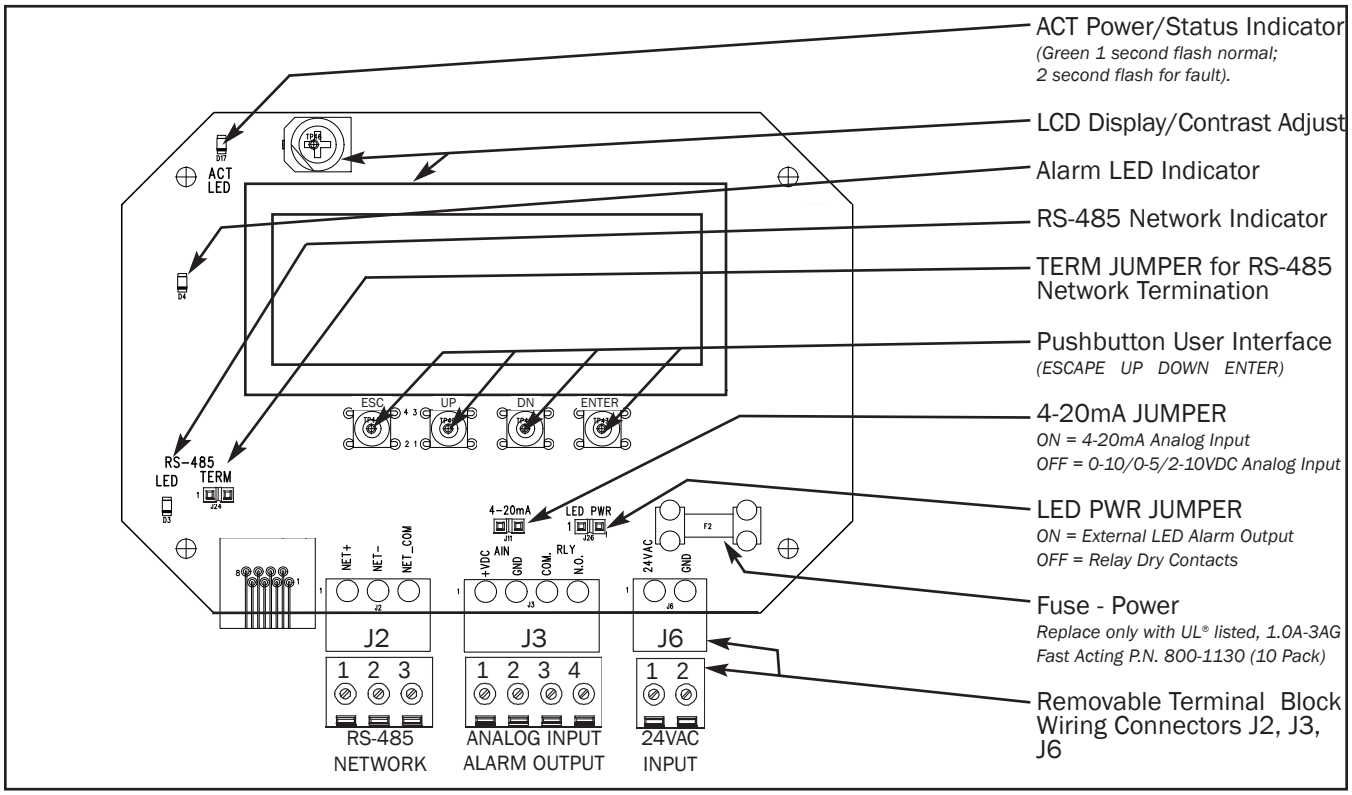
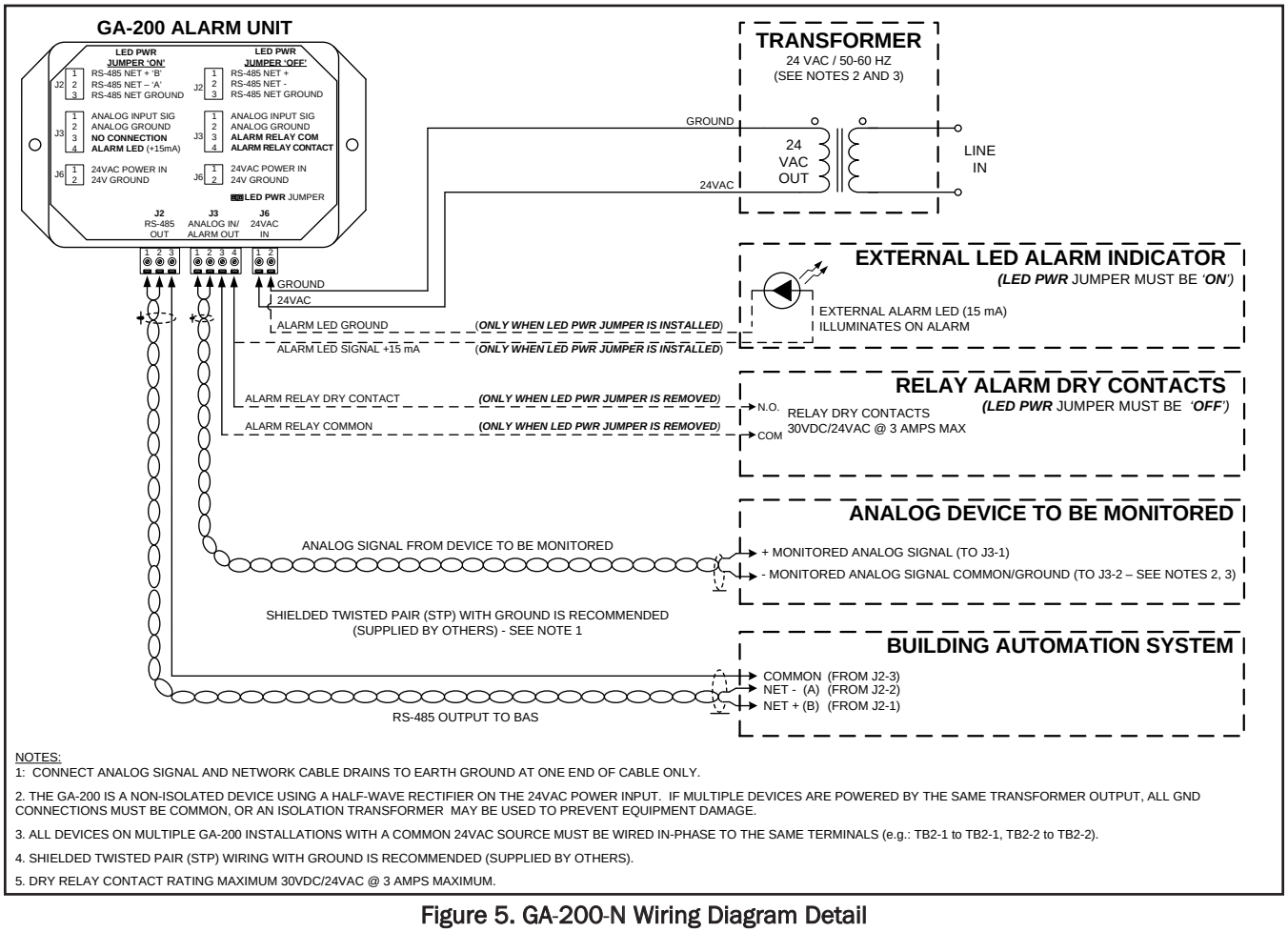


Figure 4. GA-200-N Main Circuit Board Detail



NOTES:
1: CONNECT ANALOG SIGNAL AND NETWORK CABLE DRAINS TO EARTH GROUND AT ONE END OF CABLE ONLY.

2. THE GA-200 IS A NON-ISOLATED DEVICE USING A HALF-WAVE RECTIFIER ON THE 24VAC POWER INPUT. IF MULTIPLE DEVICES ARE POWERED BY THE SAME TRANSFORMER OUTPUT, ALL GND CONNECTIONS MUST BE COMMON, OR AN ISOLATION TRANSFORMER MAY BE USED TO PREVENT EQUIPMENT DAMAGE.

3. ALL DEVICES ON MULTIPLE GA-200 INSTALLATIONS WITH A COMMON 24VAC SOURCE MUST BE WIRED IN-PHASE TO THE SAME TERMINALS (e.g.: TB2-1 to TB2-1, TB2-2 to TB2-2).

4. SHIELDED TWISTED PAIR (STP) WIRING WITH GROUND IS RECOMMENDED (SUPPLIED BY OTHERS).

5. DRY RELAY CONTACT RATING MAXIMUM 30VDC/24VAC @ 3 AMPS MAXIMUM.

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Figure 5. GA-200-N Wiring Diagram Detail

GA-200-N NETWORK SET UP

RS-485 NETWORK CONNECTIONS

The GA-200-N includes an RS-485 communications interface at J2. Network termination for the GA-200-N is selected using the Termination (TERM) jumper on the GA-200-N main circuit board as shown in Figure 4. Termination options are provided for an end of the network or segment, or for any other point on the network or segment.

1. ☐ Remove the 3 terminal wiring connector from J2.
2. ☐ Connect the RS-485 network cable wires to J2 as follows (observe the previous wiring precautions):

   J2-1 NET + (A)
   J2-2 NET - (B)
   J2-3 NETWORK COMMON

3. ☐ After setting the TERM jumper to the desired position below, proceed to the appropriate **GA-200-N BACnet® Configuration** or **GA-200-N MODBUS® Configuration** section of this manual.

Setting the TERM (Termination) Jumper

The GA-200-N network termination selection TERM jumper permits recommended device termination for GA-200-N installation at any point on an RS-485 network. When the GA-200-N is located at either end of an RS-485 network or segment, it is recommended that the jumper be installed across the TERM pins. For installation at any other point on the RS-485 network, no termination is recommended, and the jumper should be removed from the TERM pins.

1. ☐ Remove the four cover retaining screws at each corner of the transmitter cover in order to gain access to the transmitter TERM jumper on the main circuit board shown in Figure 4.
2. ☐ Remove cover from the enclosure.

3a. ☐ For GA-200-N installation at an end of an RS-485 network/segment, install the TERM jumper.

OR

3b. ☐ For GA-200-N installation at any other point on the RS-485 network, no termination is recommended, and the jumper should be removed from the TERM pins (or placed on only one of the two TERM pins).

GA-200-N BACnet® CONFIGURATION

The following are details for initial set up of GA-200-N using BACnet® MSTP. Refer to Appendix A for additional GA-200-N BACnet® device parameters and details. MAC address and Device Instance are available in the COMM SETUP menu.

Protocol

The factory default GA-200-N MAC protocol is BACnet® MSTP. It can be changed in the COMM SETUP menu via the the "PROT=" selection entry to MODBUS or to MSTP-BACnet.

MAC Address

The default GA-200-N MAC Address is set at the factory for a value of 2. It can be changed in the COMM SETUP menu via the the "ADDRESS=" selection entry to any value from 0 to 127.

BACnet® Object Device Instance Number

The BACnet® Device Instance Number is set at the factory to 2 (to match the default MAC address). It can be changed in the COMM SETUP menu via the "DI=" selection entry to any value from 0 to 4194302.

Setting the MS/TP Baud Rate

The GA-200-N is shipped from the factory for BACnet® operation at 76,800bps. The BACnet® baud rate can be changed to 38,400, 19,200 or 9,600bps via the COMM SETUP menu or through the BACnet® interface using Analog Value AV1 (refer to Appendix A for detail).

Restoring Factory Default Network Settings

In the SETUP menu, open the COMM submenu and select the COMM DEFAULT option to restore all GA-200-N network settings to the the factory default BACnet MSTP values.

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GA-200-N MODBUS® CONFIGURATION

The GA-200-N can operate in a MODBUS network. Refer to Appendix B - GA-200-N MODBUS® Device Operating Parameters for additional detail. MAC address and Baud Rate options are available in the COMM SETUP menu. Additional options are available through the network - refer to Appendix B for detail.

Protocol

The factory default GA-200-N MAC protocol is BACnet® MSTP. It can be changed in the COMM SETUP menu via the the "PROT=" selection entry to MODBUS or to MSTP-BACnet.

MAC Address

The default network address is set at the factory for a value of 2. It can be changed in the COMM SETUP menu via the the "ADDRESS=" selection entry to any value from 0 to 255.

Setting the MODBUS® Baud Rate

The default MODBUS® baud rate is 19,200bps. The baud rate can be changed to 9,600bps in the COMM SETUP menu via the "BAUD="sub-menu selection entry.

Restoring Factory Default Network Settings

In the SETUP menu, open the COMM submenu and select the COMM DEFAULT option to restore all GA-200-N network settings to the the factory default BACnet values. For MODBUS operation, the Protocol must be reset to MODBUS.

GA-200-N START UP

General

To ensure successful start-up, verify that the GA-200-N has been installed and wired in accordance with the previous installation and network setup instructions.

Upon application of 24VAC power, the GA-200-N performs a complete self-check that takes approximately 10 seconds, and then enters normal operation. Verify initial operation as follows:

1. ☐ Activate 24VAC power to the GA-200-N.
2. ☐ Verify that during the first 10 second device initialization, the display first indicates a series of dashes followed by "GA200 INIT x.xx" (x's indicate firmware version), and then normal operation. If display does not appear as described, remove power to the GA-200-N and re-check all wiring connections to the device.
3. ☐ For network connected instruments, verify that the readings at the host control system match the operating status of the GA-200-N. If readings do not agree, remove power to the GA-200-N and re-check all wiring connections to the device.
4. ☐ Configure GA-200-N operating and alarm feature options as described in the following paragraphs and detailed in the Setup menu.
5. ☐ The GA-200-N is ready for normal operation.

GA-200-N LCD Display Notifications and Features

Following a brief initialization at power up, the LCD display automatically displays the analog input value in the units chosen as all upper case characters. The LCD provides additional information on system status and alarm conditions as outlined in the Alarm Indications section of this document.

GA-200-N ALARM SETUP

Alarm Indications

Table 2 details the three types of GA-200-N local alarm notifications provided. Remote alarm LED drive or alarm dry relay contacts are also available, and network status of the alarm is provided via object/register status (detailed in Appendices A and B). Alarm type is selected within the Setup menu under "ALR TYP=" entry.

ALARM TYPE	LOCAL ALARM INDICATION	LCD DISPLAY INDICATION
LO LIMIT ALARM	Continuous Red Alarm LED (front panel).	Display continuously alternates between "LOW ALARM" and the actual reading for 2 seconds each.
HI LIMIT ALARM		Display continuously alternates between "HIGH ALARM" and the actual reading for 2 seconds each.
DEADBAND ALARM		Display continuously alternates between "LOW ALARM" or "HIGH ALARM" (depending on input signal) and the actual reading for 2 seconds each.

Table 1. GA-200-N Local Alarm Notifications

Deadband Alarm - "ALR TYP = DEADB"

The deadband alarm is activated when the input value rises above or falls below a percentage of the alarm set point. Set point is established by the "ASP=" value, and the percentage range above/below set point is set by "HYS=" value. Figure 6 shows the deadband alarm, alarm setpoint and alarm hysteresis values. As shown, a full scale range of 10,000 CFM is set ("FS1=10000CFM") and Deadband Alarm is selected ("ALR TYP=DEADB"). An Alarm Set Point of 5,000CFM is set ("ASP= 5000CFM"), and an Alarm Hysteresis value of 20% is set ("ALRM HYS=20%"). The alarm is active when the analog input signal level exceeds 6,000 CFM or falls below 4,000 CFM. It remains active until flow returns to a value within the 4000-6000 CFM range.

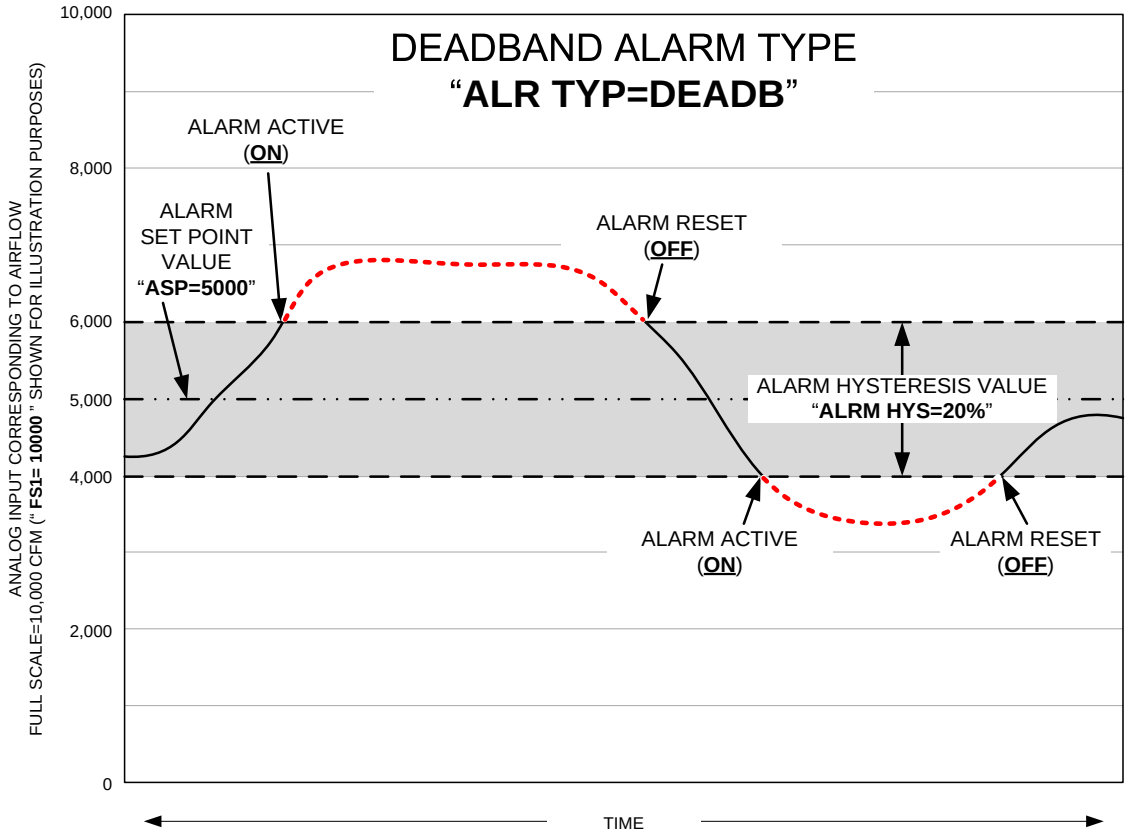

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Figure 6. Deadband Alarm Example

High Limit Alarm - "ALR TYP = HI"

The high limit alarm provides for setting an alarm when the input value rises above a selected set point. The alarm set point is determined by the "ASP=" value, and a range above that point can be set with the "HYS=" value as a percentage of the set point value.

Figure 7 is an example showing the high limit alarm with alarm setpoint and alarm hysteresis values. In this, a full scale range of 10,000 CFM is set ("FS1=10000CFM"), and High Limit Alarm is selected ("ALR TYP=HI"). An Alarm Set Point of 5,000CFM is set ("ASP= 5000CFM"), and an Alarm Hysteresis value of 20% is set ("ALRM HYS=20%").
The alarm is active when the analog input signal corresponding to airflow rises above 5,000 CFM and remains active until airflow falls below 4,000CFM.

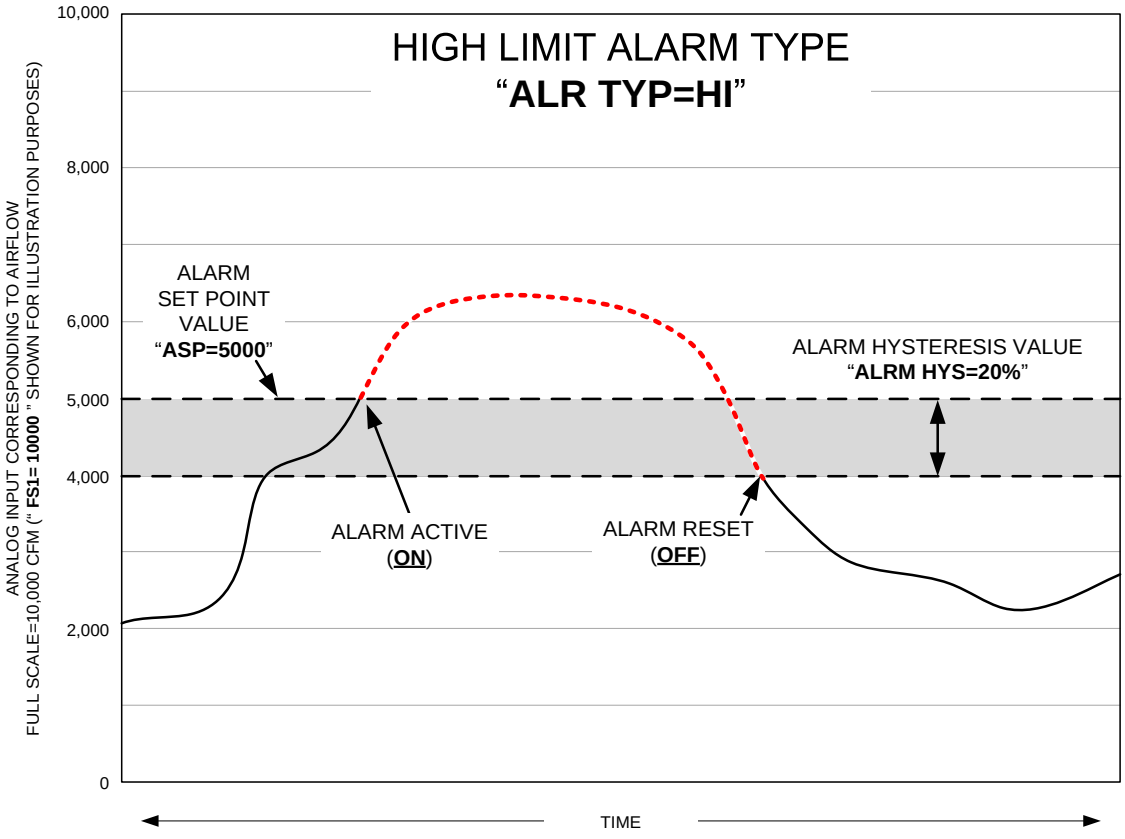

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Figure 7. High Limit Alarm Example

Lo Limit Alarm - "ALR TYP = LO"

The lo limit alarm enables an alarm when the input falls below a selected value. The alarm set point is determined by the "ASP=" value, and a range below that point can be set with the "HYS=" value as a percentage of the set point value.

Figure 8 is an example showing the lo limit alarm with alarm setpoint and alarm hysteresis values. In this airflow monitoring example, a full scale range of 10,000 CFM is set ("FS1=10000CFM"), and Lo Limit Alarm is selected ("ALR TYP=LO"). An Alarm Set Point of 5,000CFM is set ("ASP= 5000CFM"), and an Alarm Hysteresis value of 20% is set ("ALRM HYS=20%"). The alarm is active when the analog input signal corresponding to airflow falls below 5,000 CFM and remains active until airflow rises above 6,000CFM.

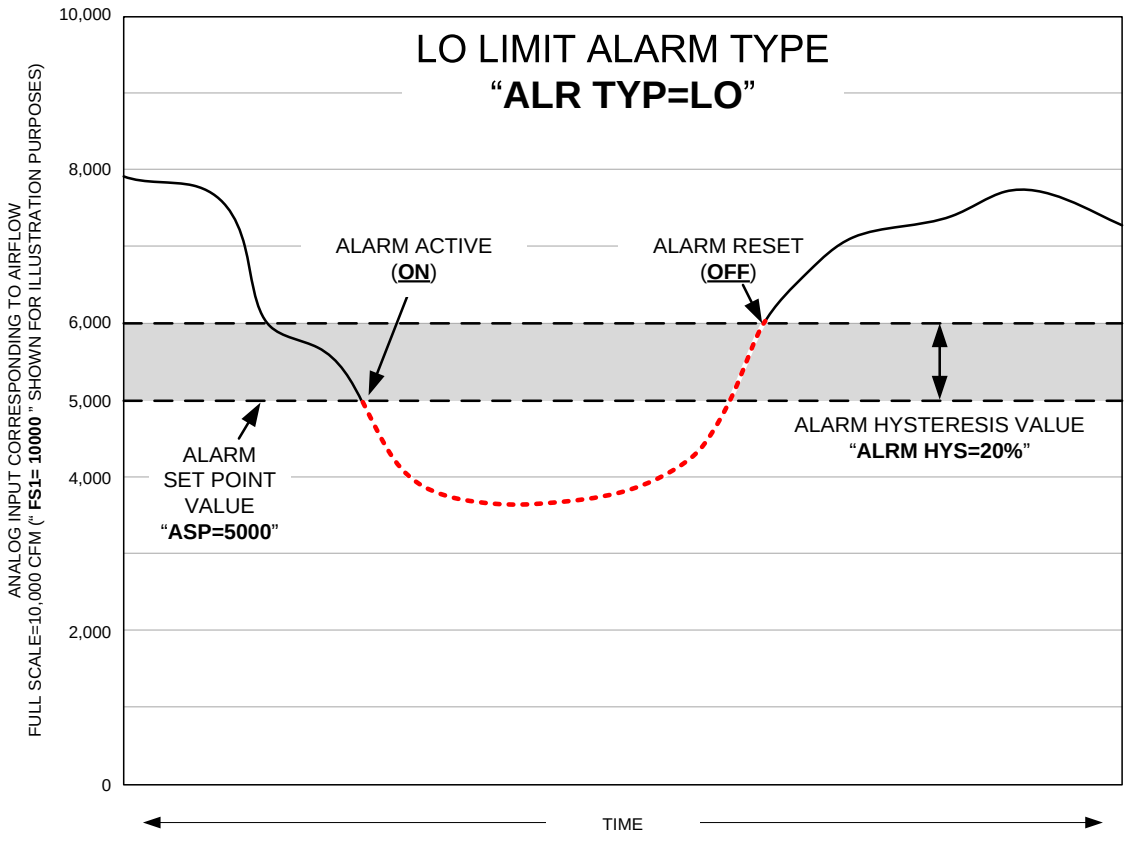

Figure 8. Lo Limit Alarm Example

Alarm Hysteresis - "HYS = %"

As shown in the previous examples, the alarm hysteresis setting "HYS=" allows setting a range of values relative to the absolute set point value. This allows a range of operation, preventing toggling of the alarm at a specific set point. Refer to the preceding alarm type descriptions and illustrations for additional detail. Alarm hysteresis is always expressed as a percentage of the alarm setpoint value with a factory default value of 15%.

GA-200-N FACTORY DEFAULT VALUES AND MENU OPTIONS

The GA-200-N is configured with the factory default values shown in Figure 9. The factory default values and other settings can easily be changed in the field through six major menus, accessible using the 4-pushbutton user interface on the GA-200-N main circuit board. To navigate to the right, or to enter a displayed menu, select the **ENT** pushbutton; to navigate left, or to leave a menu, select the **ESC** button. Use the UP/DOWN arrow buttons to navigate up and down within the menus.

GA200 INIT Menu	Reset factory defaults and LCD	**COMM SETUP** Menu	Select network communications
SYSTEM U/M Menu	Select units of measurement	**DIAGNOSTICS** Menu	Observe input signal and GA-200-N status
SETUP Menu	Select GA-200-N general features and alarm options	**LOCK** Menu	Establish lock code to secure all GA-200-N settings

Display	Description	Default IP Units	Range/ Options	Default SI Units	Range/ Options
*DISPLAY=	LCD Display is ON	ON	ON / OFF	ON	ON / OFF
*SYS U/M=	System units of measure	IP SYS	IP SYS, SI SYS or CUSTOM	SI SYS	IP SYS, SI SYS or CUSTOM
*UNITS= %	Displays "%" or a user entered label for LCD display of analog input (only when CUSTOM units are selected)	%	% or 5 char max	%	% or 5 char max
*LCD U/M=	LCD Display Units of Measure	FPM	FPM/CFM	MPS	MPS/LPS
*IN1=	Analog Input Signal Type and Range	0-10V	0-10V, 0-5V, 2-10V, 4-20mA	0-10V	0-10V, 0-5V, 2-10V, 4-20mA
*FS1=	Analog input full scale value	5000FPM	100-15000FPM 100-999999CFM	25.00MPS	0.50 - 75.00 MPS 1 - 999999 LPS
*AVG BUFF=	Number of calculations used in averaging the analog input	3	3-300	3	3-300
*INT TIM=	Time (seconds) between updating analog input integrations	1S	1-120S	1S	1-120S
*INT NUM=	Number of analog input reading integrations to be acquired	5	1-1000	5	1-1000
*ALR TYP=	Enable and select Alarm feature	OFF	OFF, DEADBAND, HI LIMIT, LO LIMIT	OFF	OFF, DEADBAND, HI LIMIT, LO LIMIT
*ASP=	Alarm set point value	0 FPM	0-999999FPM 0-999999CFM	0 MPS	0 - 999999 MPS 0 - 999999 LPS
*ALRM HYS =	Operating range in % of the *ASP value, which when exceeded, results in alarm activation.	15%	0-100%	15%	0-100%
*ALRM DEL =	Time Alarm condition exists before Alarm output is activated.	5S	1-120S	5S	1-120S
*ALRM POL =	Alarm relay contact configuration (normally open/normally closed)	NO	NO / NC	NO	NO / NC
*PROT=	Network Protocol	MSTP-BAC	MSTP-BAC MODBUS	MSTP-BAC	MSTP-BAC MODBUS
*ADDRESS=	Network Address	2	0 to 127	2	0 to 127
*BAUD=	Baud Rate Setting (19,200 Max for MODBUS)	76,800 for MSTP-BAC 19,200 for MODBUS	9600/19200/ 38400/76800	76,800 for MSTP-BAC 19,200 for MODBUS	9600/19200/ 38400/76800
*DI=	BACnet Device instance (Not visible using MODBUS)	2	0 to 4194302	2	0 to 4194302
*COMM=	Enable/Disable Network Communications	ON	ON / OFF	ON	ON / OFF

Figure 9. GA-200-N Factory Default Values

Initialization Menu (Restore Factory Default Settings)

This menu option permits restoring GA-200-N factory default settings (Figure 9), and also allows for setting the LCD to continuously display "GA-200" instead of displaying readings. The Initialization menu is only available during GA-200-N power up by simultaneously depressing and then releasing the **ENT** and **ESC** pushbuttons as shown in Figure 10.

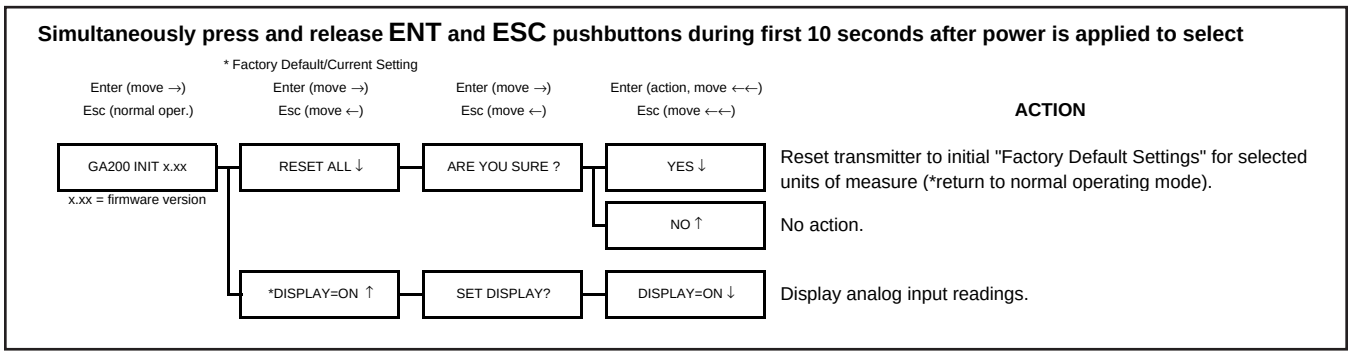

Figure 10. GA-200-N Initialization Menu

SETUP - System Setup Menu

The system SETUP menu permits user selection of GA-200-N operating and alarm feature options. Figure 11 shows the SETUP menu with IP SYS units of measure. Also shown are the SYSTEM U/M, COMM SETUP and DIAGNOSTICS menus, outlined in the following paragraphs:

SYSTEM U/M - System Units of Measurement Menu for IP SYS, SI SYS and CUSTOM

The GA-200-N is shipped with the system of units set to US inch-pound (IP) units, and will display units of measure as shown in the "IP" System of Units column of Table 3. To change to standard international (SI) units, simultaneously press and release the "UP" and "DOWN" arrow pushbuttons during normal operation to enter the SYSTEM U/M menu shown in Figure 11. Using the pushbuttons, navigate to and select the "SYS U/M=SI SYS" option.

When SI System of Units is selected, the units of measure abbreviations shown in the menus changes as shown in the "SI System of Units"column of Table 3.

When "CUSTOM" System of Units is selected, the "FLOW=" LCD characters can be replaced by a custom phrase of up to 5 user defined characters entered as detailed in the menu of Figure 11.

Table 2. Standard "IP" and "SI" Menu System of Units Abbreviations

"IP" System of Units LCD Display	Description	"SI" System of Units LCD Display	Description
FLOW= FPM	Feet per minute	FLOW= MPS	Meters per second
FLOW= CFM	Cubic feet per minute	FLOW= LPS	Liters per second

COMM SETUP MENU

The COMM SETUP menu provides for user selection of GA-200-N network operating features. Figure 11 shows the COMM SETUP menu with options and default selections.

DIAGNOSTICS MENU

The DIAGNOSTICS menu allows for directly monitoring the analog input signal on the GA-200-N LCD display, and also provides device firmware revision data. Figure 11 shows DIAGNOSTICS menu detail.

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Simultaneously press and release ↑/↓ during normal operation to select

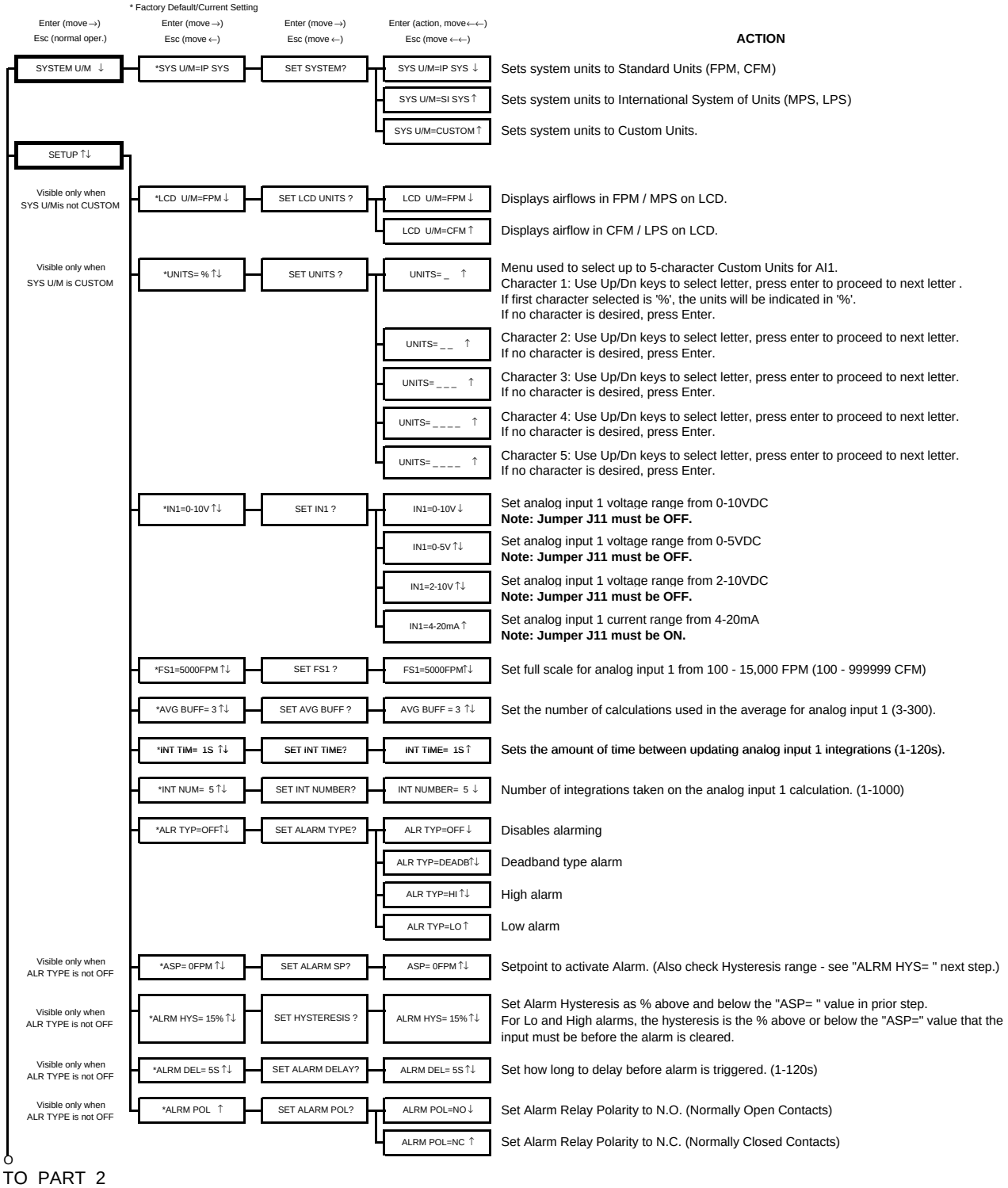

Figure 11. GA-200-N Setup Menu Options (“IP SYS”)
(Part 1 of 2)

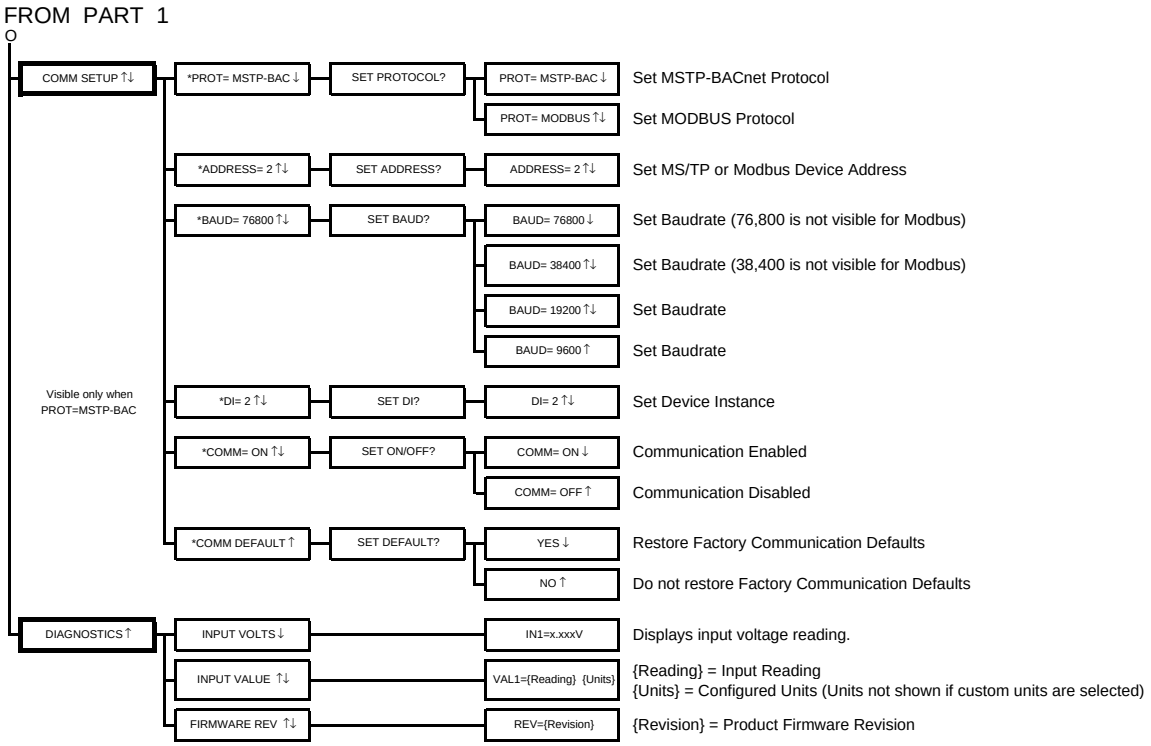

Figure 11. GA-200-N Setup Menu Options ("IP SYS")
(Part 2 of 2)

LOCK MENU

The LOCK menu allows the current configuration settings to be locked to prevent unauthorized changes to GA-200-N settings. Once the user defined lock code from 1 to 9999 is established, all user defined GA-200-N settings can only be altered after the lock code is entered. Figure 12 shows the LOCK menu detail.

When LOCK is enabled, user defined settings can only be changed after entering the user defined LOCK CODE. STORE THE LOCK CODE IN A SAFE LOCATION! To ensure security, lock codes can only be disabled by returning the GA-200-N to the factory.

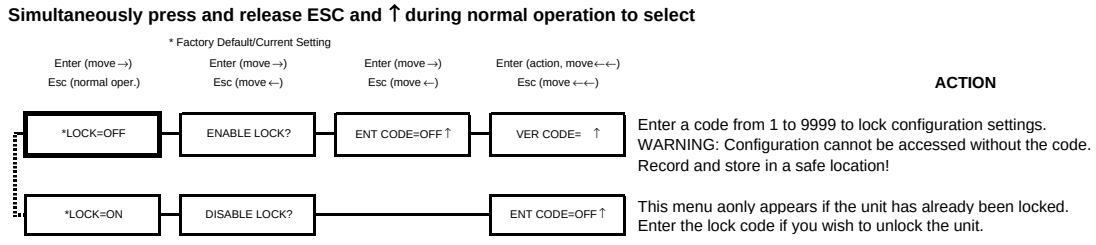

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Figure 12. Lock Menu Settings

VARIABLE INPUT SIGNAL INTEGRATION FILTER

Adjusting the Variable Input Signal Integration Filter

The GA-200-N includes a powerful variable input signal integration filter to reduce the effects of transient signal fluctuations that would otherwise cause unnecessary toggling of the alarm output. This feature permits user selection of the number of input readings for each average calculated (AVG BUFF); the number of averages that are integrated into an overall average (INT NUM); and the time between updating the displayed overall integration average (INT NUM). The following SETUP menu items (Figure 11) and default values are used to determine performance of the Variable Input Signal Integration filter:

*AVG BUFF= 3 Sets the number of calculations performed on the input signal to determines an average reading that will be analyzed by the alarm and displayed on the LCD. Can be set from 3 to 300 averages taken.

*INT TIM= 1S Sets the time in seconds between updating the integration of averages. can be set from 1 to 120 seconds between average integration updates.

*INT NUM= 5 Sets the number of integrations of AVG BUFF readings to determine the displayed average. Can be set from 1 to 1000 integrations of AVG BUFF readings.

This feature is useful on airflow applications with low flow rates where slight changes can be caused by transient wind gusts can result in false alarms, and greatly simplifies control and interpretation of the alarm signals.

MAINTENANCE

When the GA-200-N is installed in accordance with recommended guidelines, instrument difficulties are rare. Issues can be easily resolved by viewing Diagnostic data from the Diagnostic Menu (Figure 11) and by proceeding through the troubleshooting guide of Table 4.

GREENTROL OEM STANDARD LIMITED PARTS WARRANTY

Greentrol OEM Products are warranted for 12 months from shipment to the original equipment manufacturer only. Product will be repaired/replaced free of charge as described in the Terms and Conditions of Sale.

Table 3. GA-200-N Troubleshooting

Problem	Possible Cause	Remedy
No LCD display indication and the green 'ACT' LED on the main circuit board is not illuminated.	Power is not available at GA-200-N.	Apply 24VAC power to the GA-200-N.
	Improper supply voltage to the power input terminal block.	Ensure that 24VAC power is connected at J6 between terminal 1 and ground at terminal 2 of the wiring terminal block, and that the voltage with power applied to the GA-200-N is between 22.8 and 26.4 VAC.
	Blown fuse.	Check power wiring. Ensure that multiple devices wired on a single transformer are wired "in-phase". Replace fuse only with a 1.0 amp, fast-acting fuse after the problem has been identified and corrected.
No LCD display indication and the green 'ACT' LED on the main circuit board is flashing.	LCD contrast too low.	Adjust "LCD Contrast" potentiometer on the main circuit board to improve display.
The LCD display is scrambled or there is no LCD display indication after touching the switches, LCD display or circuit board.	Static electricity.	Touch an earth-grounded object, such as a duct, to discharge static electricity then reset the power. Avoid direct contact with the LCD display or circuit board.
The green 'ACT' LED on the main circuit board is steady "ON", not flashing.	GA-200-N microprocessor not running.	Cycle 24VAC power "OFF" and then back "ON" to the GA-200-N, or remove power connector at J6 and then reconnect it..
The green 'ACT' GA-200-N status LED on the main circuit board is flashing at 1-second intervals.	No problem, normal operation.	No remedy required.
The green 'ACT' LED on the main circuit board is flashing at 2-second intervals.	The fault detection system has detected a malfunction.	Check all cable connections. If connections are OK contact customer service for further assistance.
No analog signal is measured at Analog Input wiring terminal block J3 terminal 1 (+VDC) and terminal 2 (GND).	Improper input wiring.	Verify that 24VAC power is connected at wiring terminal block J6 between pin 1, and ground at pin 2. Verify that all other non-isolated devices that are connected with the same 24VAC power source are correctly wired in-phase (24V power to 24VAC power and ground to ground). The power input of the GA-200-N is a half wave rectifier, and requires that all common devices be wired with common power and ground connections.
The analog input signal from the GA-200-N fluctuates while the airflow and/or temperature readings on the LCD are steady.	Electrical interference from other devices is creating noise in the signal wires to the host control system.	The input signal wiring must be shielded. Individually ground one or more of the following points: the signal wire shield at host controls; the signal wire shield at the GA-200, or power input ground at J6 pin 2 of the GA-200-N.
The LCD display does not match the readings indicated by the host control system.	The scaling in the host control system is incorrect.	Compare GA-200-N configuration with that of the host control system. Compare the minimum and full scale output settings by navigating through the Setup Menu and verify that they agree with the host control system.

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APPENDIX A
GA-200 BACnet Objects

BACnet Services Supported:

- Read Property
- Write Property
- Who-Is
- Who-Has
- Subscribe COV
- Device Communication Control

BACnet Object Types Supported:

- Device
- Analog Input (AI)
- Analog Value (AV)
- Multi-State Value (MV)

Object Type	Object Instance	Object Name	Units	Object Description	Value
Device	[DI] [1]	"GA-200"		"Alarm Unit"	
Analog Input	AI1	"Analog Input"	FPM, CFM, %, Custom (None)	"Analog Input"	Input range scaled according to FS setting in SETUP Menu.
Analog Value	AV1	"Baud Rate"		"BacNet Baud Rate"	9,600, 19,200, 38,400, 76,800 [2].
Multi-State Value	MV1	"Alarm Status		"Alarm Status of AI1"	Alarm Off, Low Alarm, High Alarm.

[1] [DI] reflects the Device Instance setting in COMM Menu.
[2] Baudrate is set in the COMM Menu or written via this object.

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(continued)

APPENDIX A
GA-200 BACnet Objects
(continued)

Device Object:

- Object: DevX ('X' = Device Instance)
- Object Name: GA-200
- Function: Contains all Device Related BACnet Properties.
- Writable Properties:
  - Object Name
  - Object Description
  - Object Location
  - Object Identifier (Device Instance)
  - APDU Timeout (Number of ms to wait for a Confirmed Request to respond)
  - Max Info Frames (Maximum number of frames the device can send each time it's holding the token)
  - Max Master (Specifies the highest allowable address for master nodes (has to be <= 127).

Analog Input Object:

- Object: AI1
- Object Name: Analog Input
- Function: Indicates current airflow or custom reading of the analog input.
- Writable Properties:
  - Present Value
  - Out Of Service Flag
  - COV Increment

Analog Value Object:

- Object: AV1
- Object Name: Baud Rate
- Function: Indicates and allows change of current MS/TP baudrate.
- Writable Properties:
  - Present Value

Multi-State Value Object:

- Object: MV1
- Object Name: Alarm Status
- Function: Indicate Alarm Off / Low Alarm / High Alarm.
- Writable Properties: None

APPENDIX B
GA-200 Modbus Register Map

Function	IEEE Floating Point		Device Address	Length	Units	Point Description	Value
	Low/ high	High/ low					
02			10001	1		Status	0= OK, 1= Alarm
04	30001	30003	30001/ 30003	2	FPM/CFM/ Custom	Analog Input 1	Input range scaled according to FS setting in SETUP Menu.
03			40201	1		Modbus Baudrate (Read Only)	0=9,600, 1=19,200. Baudrate is set in the COMM Menu.
03			40202	1		Alarm Type (Read Only)	0= None, 1= Low-, 2= High-Alarm

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