EBTRON®
Thermal Dispersion Airflow Measurement

Model **GTN116**
Quick Installation Guide

Gold Series Thermal Dispersion Airflow Measurement Technology

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INSTALLATION GUIDE

Quick Installation Guide

GTN116

RS-485 Output Transmitter

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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Insert latest changed pages (in bold text); remove and dispose of superseded pages.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 **10.**

Page No	Revision *	Description of Change	Date
1, 2	**R1C**	**Updated document revision and List of Effective Pages**	**02/11/2010**
3 through 9	**R1C**	**Added Overview, LCD Display Notifications and edited for consistency**	**02/11/2010**
10	**R1C**	**Added Wiring Diagram**	**02/11/2010**
9	R1B	Corrected references to model GTN116	03/20/2009
1 through 10	R1A	Initial Document Release	02/25/2009

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OVERVIEW

This document provides only the instructions necessary to install the GTN116 Transmitter. Transmitter installation consists of mounting the transmitter, installing output/network cables, connecting the sensor probes cables and preparing the transmitter for operation. For complete setup and operating instructions refer to the GTx116 Installation, Operation and Maintenance technical manual, TM_GTx116 under separate cover.

Observe the following precautions during installation:

CAUTION

In locations exposed to direct rain and/or snow, the transmitter must be enclosed in a NEMA4 enclosure.

Leave at least 10 in. (254.0 mm) above, and 2 in. (50.8 mm) to each side and bottom, of unobstructed space around the transmitter to allow for heat dissipation and cover removal.

Locate the transmitter in a location that can be reached by all connecting cables from the sensor probes.

Do not drill into the transmitter enclosure since metal shavings could damage the electronics.

GTA116 TRANSMITTER INSTALLATION

The GTA116 transmitter 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 rain or snow. The transmitter shall be mounted upright in a field accessible location such that all power, network and sensor probe cables can reach the connections on the transmitter enclosure. The enclosure is designed to accept 3/4 in. *(19.0 mm)* conduit fittings for signal and power wiring at the top left and right sides as shown in Figure 1. Mount the transmitter using suitable hardware at the four 0.188 in (4.76 mm) diameter holes on the left and right mounting tabs.

Mechanical Dimensions

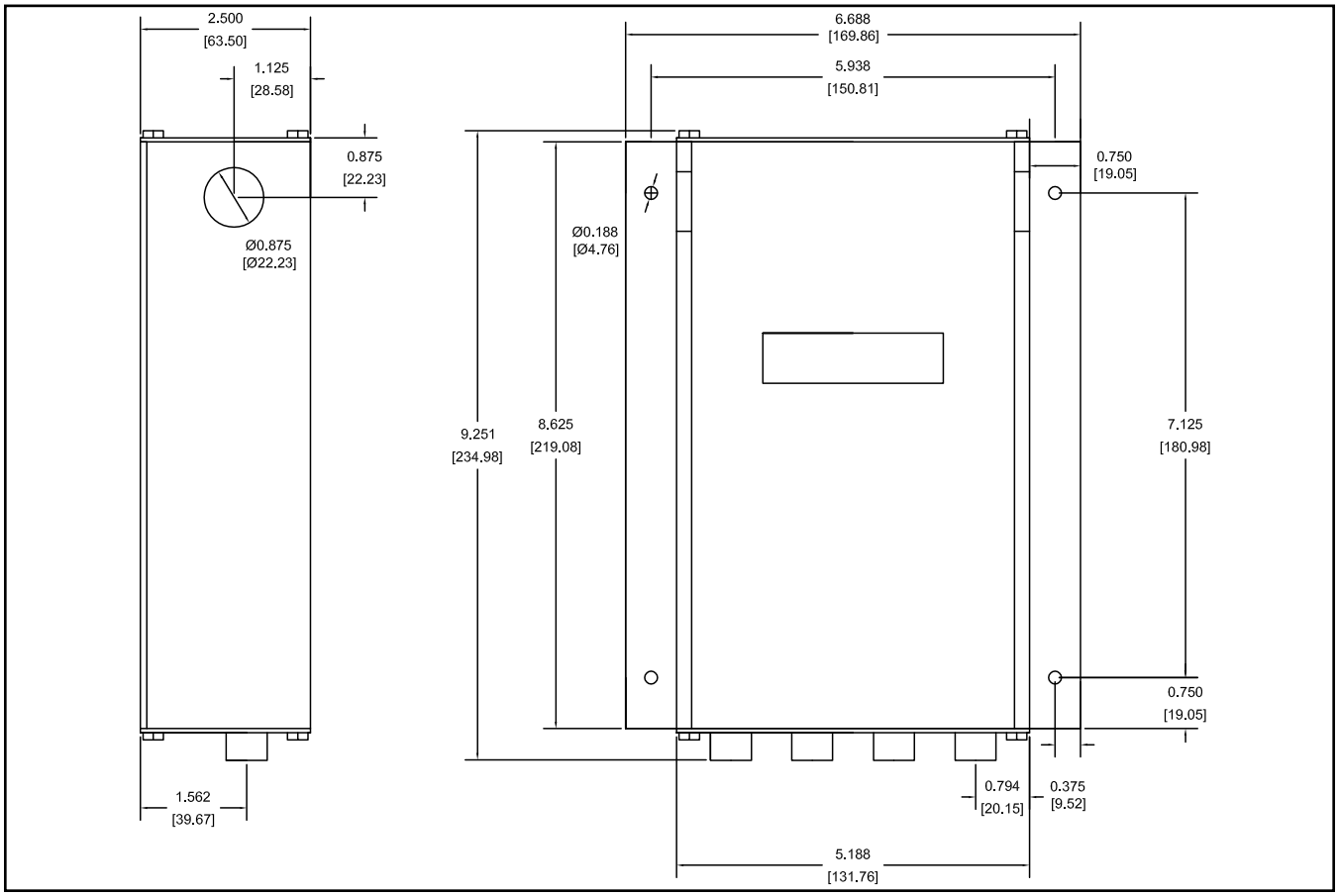

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Figure 1. GTN116 Transmitter Mechanical Detail Drawing

GTN116 POWER TRANSFORMER SELECTION

Select a 24 VAC transformer based on the maximum power requirements indicated on the transmitter label (20 VA) or from the table below. The operating supply voltage (transmitter power "ON" with all sensor probes connected) should not be less than 22.8 VAC or greater than 26.4 VAC.

Table 1. GTN116 Power Transformer Selection Guide

Total Sensors	Minimum VA Req.	Total Sensors	Minimum VA Req.	Total Sensors	Minimum VA Req.	Total Sensors	Minimum VA Req.
1	12	5	14	9	17	13	19
2	13	6	15	10	17	14	19
3	13	7	15	11	18	15	20
4	14	8	16	12	18	16	20

GTN116 POWER CONNECTIONS

Slide the cover plate up and off of the transmitter enclosure, and ensure that the power switch is in the "OFF" position before connecting the 24 VAC power source.

Connect 24 VAC power to the large, two position power input terminal labeled "POWER" on the upper right hand side of the main circuit board as shown below and in detail in the Wiring Diagram of Appendix A. Since the output signals are isolated from the power supply, it is not necessary to provide an isolated (secondary not grounded) power source.

Multiple GTx116 transmitters wired to a single transformer must be wired "in-phase" (L1 to L1, L2 to L2).

Sensor probes must be connected to the transmitter before turning the power switch to the "on" position to properly "flash" sensor calibration data to the transmitter.

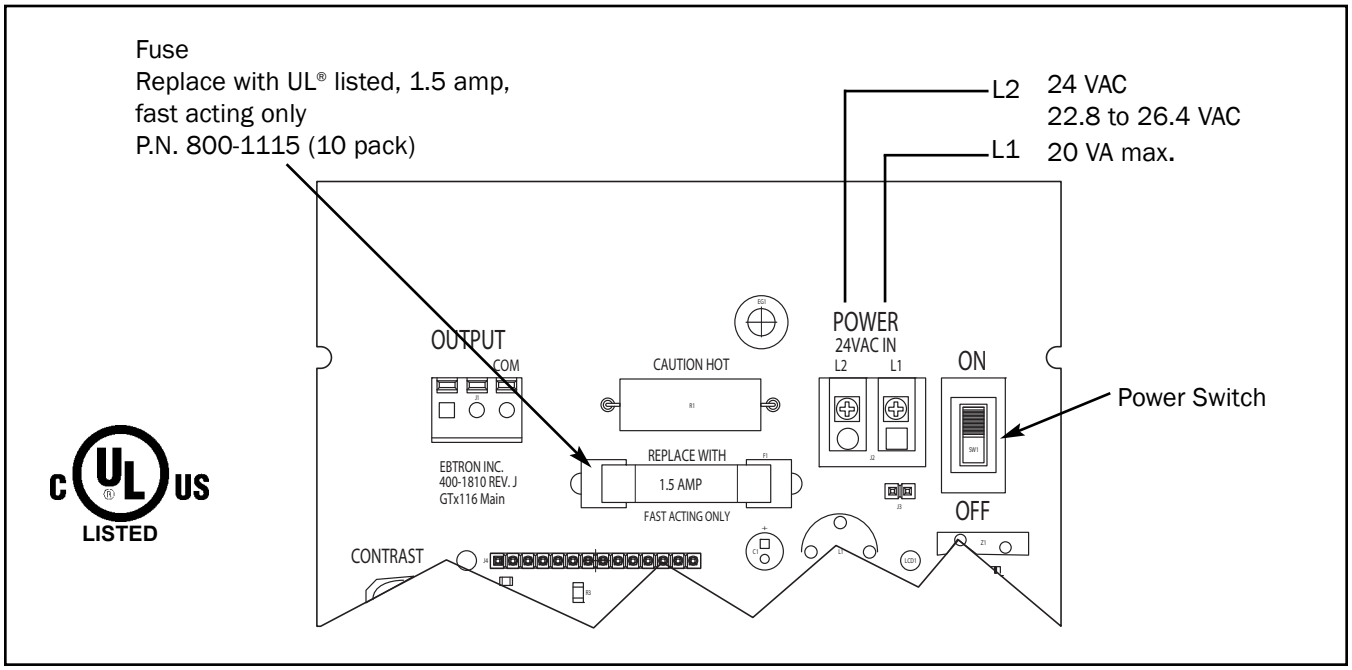

Figure 2. GTN116 Power Connections

CONNECTING SENSOR PROBES TO THE TRANSMITTER

After mounting the sensor probes and transmitter, connect one or more sensor probe cable plugs to the circular receptacles located at the bottom of the GTN116 transmitter enclosure. Probes are *"Plug and Play"* and do not have to be connected to a specific receptacle on the transmitter. Transmitters can accept GP1, GF1 or GB1 sensors. Mixing sensor types on a single transmitter is not permitted. Match probes to transmitter by type (A or B) as indicated on the tags on the transmitter and sensor probes as shown below.

Provide a "drip loop" at the transmitter if there will be the potential for water runoff or condensation along the sensor probe cable(s).

Sensor probe cable plugs are "keyed" as shown in the connector detail below. Line up plug with receptacle and push straight on to receptacle. DO NOT TWIST. Squeeze cable plug "ribs" towards receptacle when removing. Forcing the cable plug in or out of the receptacle will damage the connectors and void warranty.

If traverse data is desired, the probes should be installed and connected to the transmitter using the mounting convention specified in the separate GP1 sensor probe manual. Proper installation simplifies sensor location decoding during data analysis.

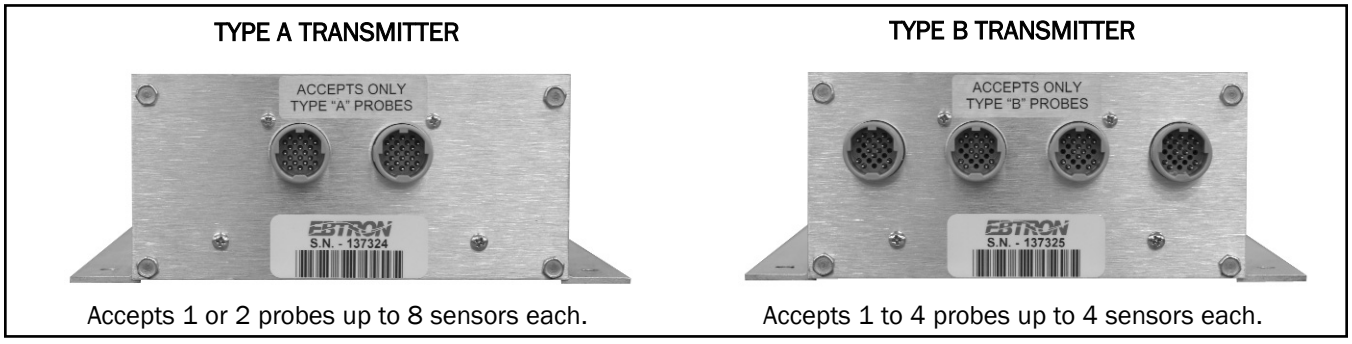

Figure 3. GTN116 Type A and Type B Transmitter Detail

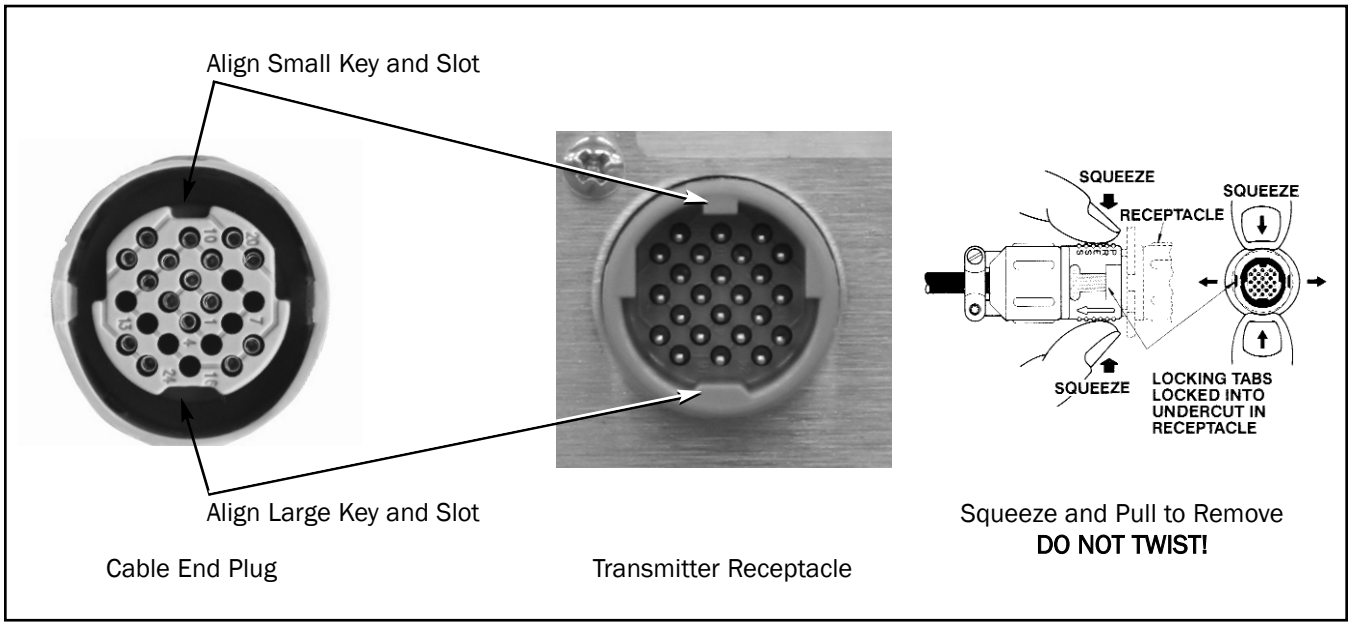

Figure 4. GTN116 Connector Detail

LCD Display and Menu Item Keys

Following a brief initialization at power up, the GTN116 LCD display automatically displays airflow and temperature when duct/plenum probes (**GP1**), fan inlet probes (**GF1**) or 'bleed' air flow sensors (**GB1**) have been connected. Refer to the menus and descriptions which appear in the separate GTx116 Transmitter Technical Manual for a complete description of programming features.

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GTN116 TRANSMITTER OUTPUT WIRING AND SET UP

The GTN116 features field selectable firmware menu options for address and protocol selection, and a termination DIP switch (as shown in Figure 5) for line termination selection to integrate with various network topologies. An advanced differential bus/line transceiver designed to meet RS-485 standards for multipoint data transmission provides protection for over-current and over-voltage bus contention/wiring faults, as well as automatic thermal shutdown protection.

RS-485 Network Cable Specifications

The RS-485 network cable shall be shielded twisted pair with a characteristic impedance of 100 to 130 ohms. Distributed capacitance between conductors shall be less then 100 pF per meter. Distributed capacitance between conductors and shield shall be less then 200 pF per meter. The maximum recommended length of a network segment is 1200 meters with AWG 18 cable. A detailed wiring diagram is provided in Appendix A. Before making network connections, set network protocol, termination and address as follows:

GTN116 RS-485 Network Connections

The GTN116 RS-485 network circuitry is isolated from the 24VAC power and "floats" with respect to ground by default. This allows for the GTN116 to be interfaced with both isolated and non-isolated networks. To wire the output signal, slide the cover plate up and off of the enclosure. Ensure that the power switch is in the "OFF" position. Determine whether the RS485 network requires an isolated or non-isolated interface to the GTN116, and connect cables as outlined in the appropriate paragraph that follows. Pay particular attention to the network common connection and termination DIP switch requirements for each type of connection. Connections are made at the three position terminal block labeled "RS-485" on the RS-485 output card as shown in Figure 5. **Do NOT use analog OUTPUT connections at the upper left hand side of the main circuit board for RS-485!** For additional detail, refer to the HTN104 Wiring Diagram of Appendix A.

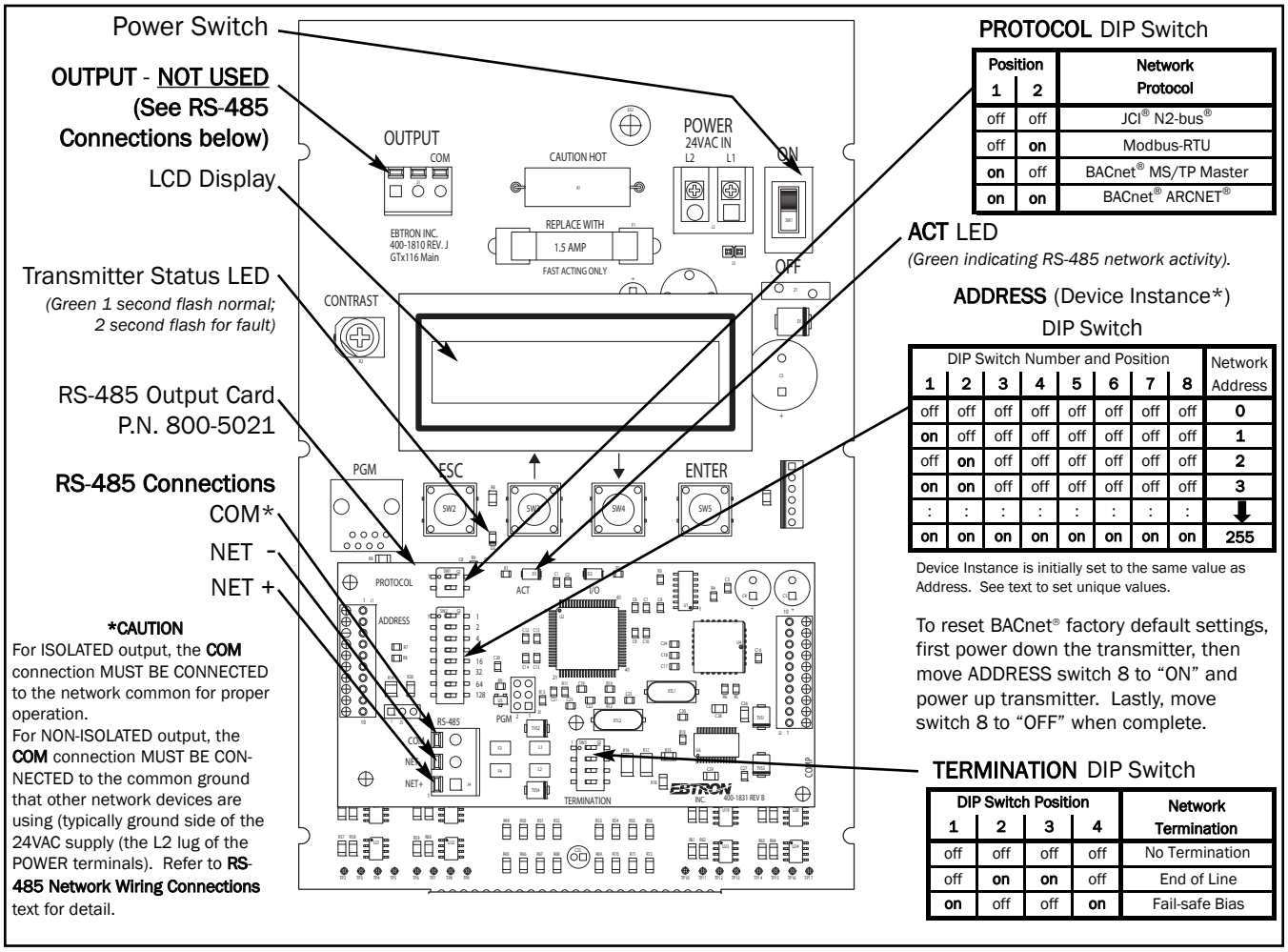

Figure 5. GTN116 Transmitter Interior Detail

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Connecting to an Isolated RS-485 Network:

Connect the NET+, NET- and COM terminals to the network as shown in Appendix A using shielded twisted pair cable (meeting specs as previously described). When using 2-pair cable, typical connections use one pair for the +/-, and both wires in the other pair for GND. The connection to the network must be made in a "daisy chain" configuration. "T" connections and stubs are NOT permitted. The shield should be terminated at one end on the network only. Set proper termination as outlined in the separate paragraph below.

***CAUTION**

For ISOLATED output, the **COM** connection MUST BE CONNECTED to the network common for proper operation.

Connecting to a Non-Isolated RS-485 Network:

Connect the NET+ and NET- terminals to the network with shielded twisted pair cable meeting the specifications previously described. The connection to the network must be made in a "daisy chain" configuration. No "T" connections or stubs are permitted. The shield should be terminated at one end on the network only. Because the GTN116 output is isolated, the COM terminal must be connected to the "common ground" that the other devices on the network are using as their ground reference. This is typically the ground side of the 24VAC supply (L2 on the GTN116 POWER terminals).

***CAUTION**

For NON-ISOLATED output, the **COM** connection MUST BE CONNECTED to the common ground used by the other network devices (typically the ground side of the 24VAC supply; the L2 terminal at the POWER connector block as shown in Figure 5).

GTN116 Setting Network Options

The transmitter must be configured for proper protocol address and termination prior to power up. The transmitter is shipped from the factory with the protocol set to BACnet® MS/TP Master, **address 1** and **no termination.** (Termination DIP switch is located on the circuit card - see Figure 5.) Refer to separate Technical Manual TM_GTx116 for COMM Setup Menu options.

GTN116 - Setting the Network Protocol

The GTN116 transmitter is shipped with factory default protocol set to BACnet® MS/TP (Master). Network protocol can be changed by powering the transmitter OFF, and then setting the PROTOCOL Dip switch to the desired protocol as shown in Figure 5. When changing protocol, ensure that the network wiring, address selection, baud rate and network termination options have been properly set as required for the new protocol. When the transmitter is powered ON, the new network protocol will become effective.

If the DIP switches are changed after power up, the transmitter must be turned "OFF" and then "ON" for the new switch positions to be recognized and stored.

GTN116 - Setting Transmitter Termination Option

The GTN116 includes termination selection options permitting appropriate termination depending upon where in the network or network segment the transmitter is connected. Options for NO TERMINATION (default setting), END OF LINE TERMINATION (120 ohms), or FAIL SAFE BIAS are available by setting the DIP switch labeled "TERMINATION" (interior detail view) on the circuit card. To ensure reliable network operation, only one network device on each network segment should be terminated with either of the following methods:

An END OF LINE termination resistance of 120 ohms (nominal) can be installed at only **one** device located at **either end** of the network segment between the NET+ and NET- (A and B) communication lines.

As an alternative, any **one** device that is connected on the network segment that is equipped to provide a FAIL SAFE BIAS between the NET+ and NET- (A and B) communication lines will guarantee that the entire bus segment is in a known state during idle-line conditions (when no device is driving the bus). This is the preferred termination method.

If the network or network segment is already terminated properly as described above, then set the TERMINATION dip switch for the NO TERMINATION option to ensure that the transmitter communicates properly on the network.

NOTE: Verify that the network/network segment contains only 1 device that is terminated with either termination method. If multiple devices are terminated as described above, network segment operation will be adversely affected.

GTN116 - Setting the Network Address

The ADDRESS DIP switch performs differently for BACnet and for N2 and Modbus protocols. When the GTN116 is set for N2 and Modbus protocols, the ADDRESS switch is read constantly by the transmitter during operation. The address can therefore be changed at any time without the need to reset transmitter POWER. All eight switches are used to allow a maximum address of 255. However, for BACnet, the setting of ADDRESS DIP switch number 8 at initial transmitter POWER ON determines the BACnet device instance and address as described in the following paragraphs.

GTN116 - Set BACnet Factory Defaults, BACnet Address and Device Instance Number at First Startup

For BACnet MS/TP and BACnet ARCNET protocols, each device on the network segment must be assigned a **unique** address between 1 and 127 for the network segment it will be connected to prior to power up. ***EBTRON*** provides a method to set the BACnet address and the Device Instance Number by setting the ADDRESS DIP switches 1-8 on the GTN116 Network Card (interior detail view).

The following procedure will reset all GTN116 transmitter BACnet objects to their factory default values, and will also set the transmitter BACnet address and Device Instance Number to the same value: (Refer to the following 2 paragraphs to change the address and device instance number independently).

a. Ensure that the POWER switch is in the OFF position.
b. Set the ADDRESS dip switches 1-7 to the desired BACnet address (1-127).
c. Set the ADDRESS dip switch number 8 ON (default switch).
d. Set the POWER switch to the ON position.
e. Wait at least 10 seconds.
f. Return ADDRESS dip switch number 8 OFF. The BACnet Address and Device Instance are now set to the number selected by the ADDRESS dip switches 1-7 in step b.

GTN116 - Changing the BACnet Address without changing the Device Instance Number

The following procedure is only effective for BACnet MS/TP and BACnet ARCNET protocols. To change the BACnet address and permit the Device Instance Number to remain unchanged from the value previously selected:

a. Ensure that the POWER switch is in the OFF position.
b. Set ADDRESS switches 1-7 to the desired BACnet address (1-127).
c. Set ADDRESS dip switch number 8 to OFF (default switch).
d. Set the POWER switch to the ON position. The BACnet address is now set to the value set in step b, and the Device Instance Number remains at the previous value.

GTN116 - Changing the BACnet Device Instance Number without changing the Address

The following procedure is only effective for BACnet MS/TP and BACnet ARCNET protocols. The Device Instance Number can be changed to any number between 1 and 4,194,302 by writing to the Device Object's Object Identifier Property over the network, without affecting the BACnet address.

GTN116 - Setting the MS/TP Baud Rate

The GTN116 transmitter is set at the factory for an MS/TP baud rate of 76,800 baud. The MS/TP baud rate can be changed if necessary over the network, or at the GTN116 transmitter as follows:

a. Allow transmitter to start up with correct MS/TP address set in prior paragraph.
b. Record MS/TP ADDRESS DIP switch settings (shown in Figure 5) so that this address can be restored later.
c. Set ADDRESS DIP switches 1-4 to the desired MS/TP baud rate as shown in Table 2.
d. Set ADDRESS DIP switch 8 to ON for at least 1 second, then to OFF. This will select and store the new value.
e. Restore ADDRESS DIP switches 1-4 to the address setting recorded in step b. MS/TP Baud rate is now set.

NOTE

These switches **only affect MS/TP baud rate**, **not any other network protocols**. ARCNET runs at 156.25k baud; N2 runs at 9600 baud; Modbus defaults to 9600 baud, but can be changed to 19.2k baud over the network (see “Function 06” in the **GTN116 RS-485 Modbus Register Map of** Table 4).

Tables 3 to 5 list the specific values provided for each supported communication protocol.

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Table 2. GTN116 MS/TP Baud Rate Selection

(Use ADDRESS DIP Switch)

ADDRESS DIP Switch Number/Position								MS/TP Baud Rate
1	2	3	4	5	6	7	8	
off	off	off	off	X	X	X	X	Auto Baud
on	off	off	off	X	X	X	X	76,800
off	on	off	off	X	X	X	X	38,400
off	off	on	off	X	X	X	X	19,200
off	off	off	on	X	X	X	X	9,600

Only Address Switches 1-4 are used to set the Baud Rate - See text.

Table 3. GTN116 RS-485 BACnet Object List

BACnet® ARCNET®
BACnet® MS/TP

Baud Rates: 9.6, 19.2, 38.4, 76.8, 156.25* Kbps

Type, Instance	Description	Default Units
Device, 1	Device Object	
Analog Input, 1	Airflow	FPM
Analog Input, 2	Differential Pressure	in.w.c.
Analog Input, 3	Temperature	°F
Analog Value, 1	Area	sq.ft.
Analog Value, 2	Baud Rate	None
Analog Value, 3	Airflow Traverse	FPM
Analog Value, 4	Temp Traverse	°F
Binary Value, 1	Auto Baud Rate Detection	None

* 156.25 Kbps on GTN116 using BACnet® ARCNET® only.

User Executed Services Supported: Subscribe COV, Read Property, Write Property, Device Communication Control, and Who-Is

Table 4. GTN116 RS-485 Modbus Register Map

Modbus

Modbus RTU

Baud Rate: 9,600 or 19,200 bps

	IEEE Floating Point		Binary				
Function	low/high word	high/low word		Length	Units	Point Description	Range/Value
02			10001	1		Status	0:OK, 1:Trbl.
04	30001	30007		2	FPM	Airflow	0 to 15,000
04	30003	30009		2	in.w.c.	Differential Pressure	-2.5 to +2.5
04	30005	30011		2	°F	Temperature	-20 to +160
04			30013	1		Sensor Type	1 = Probe, 2 = Bleed, 255 = Fan
04			30014	1		Connector C1 Sensors	0 to 8
04			30015	1		Connector C2 Sensors	0 to 8
04			30016	1		Connector C3 Sensors	0 to 8
04			30017	1		Connector C4 Sensors	0 to 8
04	30018- 30049	30082 - 30113		32	FPM	Airflow Traverse	0 to 15,000
04	30018	30082		2	FPM	Insert 1 Flow	0 to 15,000
04	30049	30113		2	FPM	Insert 16 Flow	0 to 15,000
04	30050 - 30081	30114 - 30145		32	°F	Temperature Traverse	-20 to +160
04	30050	30114		2	°F	Insert 1 Temp	-20 to +160
04	30081	30145		2	°F	Insert 16 Temp	-20 to +160
06			40201	1		Modbus Baud Rate	0=9,600 1=19,200

Table 5. GTN116 RS-485 JCI N2® -Bus Point Map

JCI® N2-Bus®

Baud Rate: 9600 bps

NPT[1]	NPA[2]	Units	Point Description	Range/Value
AI	1	FPM	Airflow	0 to 15,000
AI	2	in.w.c.	Differential Pressure	-2.5 to +2.5
AI	3	°F	Temperature	-20 to +160
BI	1		Status	0:OK, 1:Trbl.

[1]Network Point Type

[2]Network Point Address

GTx116 LCD Display Notifications

Following a brief initialization at power up, the LCD display automatically displays airflow and temperature as all upper case (caps) characters. The display provides additional information on system status and alarm conditions as follows:

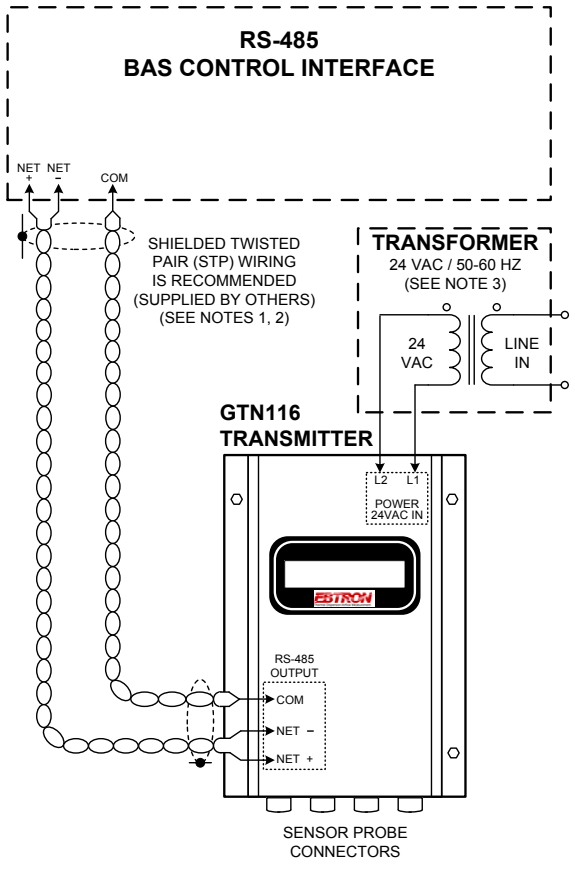
Last LCD Character Shown in Lower Case (Probe Malfunction)

If the last character of the flow rate units on the LCD display is shown in lower case (for example **FPm** or **CFm**), this indicates an improper or malfunctioning probe is connected to the transmitter. (Refer to Tables 19 through 23 of technical manual TM_GTx116 under separate cover for additional troubleshooting detail).

All LCD Characters Shown in Lower Case (Field Cal Wizard Engaged)

If all characters of the flow rate units on the LCD display are in lower case (for example fpm or cfm), this indicates that the transmitter is operating in the Field Calibration Wizard mode (see FIELD ADJUSTMENTS - Field Calibration Wizard section contained in technical manual TM_GTx116 under separate cover).

APPENDIX A - GTN116 WIRING DIAGRAM



NOTES:
1: CONNECT OUTPUT SIGNAL CABLE DRAINS TO EARTH GROUND AT ONE END OF EACH CABLE ONLY.
2. COM CONNECTION MAY BE WIRED USING A SINGLE CONDUCTOR.
3. ON MULTIPLE GTN116 TRANSMITTER INSTALLATIONS WITH A COMMON 24VAC SOURCE, WIRE 24 VAC POWER IN-PHASE TO THE SAME TERMINALS ON ALL TRANSMITTERS (e.g.: L1 to L1, L2 to L2).

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