BACnet Wiring Guidelines
For Price Controls
BACNET WIRING GUIDELINES

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PRODUCT OVERVIEW

Overview

Typically BACnet controllers are networked using the BACnet MS/TP protocol. BACnet MS/TP is based on a physical RS-485 network. Baud rates officially support by ASHRAE 135 are 9600, 19200, 38400, 76800 (and 115,000 is slowly being adopted).

BACnet MS/TP offers a simple low cost way to connect controllers together and allows them to share data. MS/TP is not intended for very high bandwidth, but offers advantages in being very robust, noise immune and low cost.

Price offers a variety of BACnet controllers that support MS/TP and all Price controllers use a default baud rate of 76,800.

Power (24 VAC)

Price Controllers use 24 VAC as their power source. Each controller has a terminal labeled 24 VAC Hot and Com. Polarity on the power is important and must be observed. Also the 24 VAC common side of the transformer must be Earth grounded. This is for safety and also ensures reliable BACnet communication. If power is reversed the controller will still power up, but the BACnet network will not function. Also any analog signals sent to other devices will be incorrect. Common symptoms of a poorly grounded network can include inconsistent BACnet MS/TP communications, and damage from voltage spikes.
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Network Wire Specifications

For the BACnet MS/TP network specific wire is required. Do not use standard power or “thermostat” wire. This wire does not have the necessary requirements for digital communications. While it’s possible it may work (temporarily) the network will be unreliable and not operating at optimal.

BACnet MS/TP Wire type recommendations

- Use 1 balanced twisted pair
- Low capacitance (17pF or less)
- Plenum rated (FT6, CMP ratings)
- 100-120 ohm, Balanced
- (CAT5, CAT5E, CAT6 network cable has excellent specifications and will work in almost any BACnet MS/TP application.)
- Price recommends using the Orange compliment (A/+) and Orange (B/-) and Brown (NET COM) and Brown Compliment (NET COM) wire pair from a standard CAT5 cable. Also pre-terminated CAT5 cables are available from Price. Model code: NETc35 (35 ft plenum rated cable, terminated with RJ45 plugs, 568-B standard)
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Wire Routing

BACnet MS/TP networks must be wired in a daisy chain configuration. A daisy chain means that there is only one main cable, and every network device is connected directly along its path. This type of network is low bandwidth, but reliable and good for long distance multi-drop runs.

Other methods of wiring a MS/TP BACnet network may give unreliable and unpredictable results. DO NOT use Star, Bus, “T”, or any other type of network configuration. Any of these other network configurations will result in an unreliable network, and make troubleshooting almost impossible.

To create the daisy chain configuration, simply bring 2 network wires to the controller, then using either the pluggable terminal block or the Price RJ45 connection continue to the next controller. Connect A/+ to A/+, B/- to B/- and NET COM to NET COM on up to 30 controllers. As always ensure you maintain polarity on network and power.
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Electrical Noise

Electrical noise can affect both analog signal and digital communications such as BACnet. Therefore do not route high voltage lines next to the BACnet network! Avoid noisy electrical sources such as:

- Variable Frequency Drives
- High current power lines (main panel feeds)
- Fluorescent light fixtures

If you must pass near noisy electrical lines cross at right angles. This will help reduce the amount of noise coupled to the network wires.

Termination

BACnet MS/TP networks must be terminated to ensure proper operation. A network should be terminated twice, once at the beginning and once at the end. Termination helps reduce reflections and noise. The terminating can be done with a 100 ohm resistor across the A/+ and B/- lines. Most Price controllers have the option for enabling termination via a DIP switch #8 or by a software menu selection. Turning on termination via software will enable the resistor across the lines and also turn on a green LED labeled “TRM”.

Tech Tip: The Price BACnet MS/TP to IP Router has built in termination and it is enabled by default (since the router is typically the beginning of the entire MS/TP network). Now you only have to go and find/terminate that last device.
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BACnet MS/TP Speeds

The default speed for Price BACnet MS/TP controls is 76800. The BACnet standard REQUIRES a device to support at least 9600 baud.

BACnet MS/TP supports 4 standard speeds which are:

- 9600
- 19200
- 38400
- 76800 (Price Default)

All controls on the same network segment MUST be set to the SAME speed.

Addressing

Just like phone numbers having 2 that are the same isn’t recommended. Each device on an MS/TP segment must have a unique MAC (media access control) address. (Typically 1 – 99).

The device instance (software address) must be unique for the building network. Addresses (both MAC and SOFTWARE) are typically set in software via an LCD interface/thermostat or computer program.

PRICE BACNET MODULE USED ON THE PIC CONTROLLER ▼
Troubleshooting

1. Check all your 24 VAC HOT/COMMON polarities. While there ensure COMMON is EARTH GROUNDED. I’d bet cash/money this is causing your problem.

2. Ensure all MAC addresses are unique for that MS/TP segment. If you have 2 addresses that are the same that means 2 devices are talking at the same time.

3. Ensure all SOFTWARE (device instances) are unique for that BACnet network.

4. Ensure all devices are running at the same baud rate. The Price default is 76,800. Confirm this someone may have changed it.

5. Chop network in half. Does it start to work? Keep chopping until network comes online. This will help narrow down the problem.

6. Have more than 30 MS/TP devices on one segment? Not recommended. Break up that segment into separate ones with the Price MS/TP BACnet router.

7. Have a MS/TP segment that goes over 1050 feet? Not recommended. Break up that segment.

8. Check termination. Ensure only 2 devices in total are terminated for that MS/TP segment.

9. Do you have other BACnet (non Price) devices on the network? Remove them while troubleshooting. If they are causing issues put them on a separate MS/TP segment.

10. Use the Price BACnet Commissioning Tool (BCT) aka Dr. BACnet to help diagnose the network. Available from your local representative on quick ship.
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