

# BACnet Introduction

Setra Networking Hardware

## General

BACnet is an international standard and an open protocol used for communication in control networks. It's a model for creating building automation systems which can interoperate.

BACnet defines methods which a control manufacturer can use to make systems that are interoperate with other systems. BACnet is also a tool for specifying what users want (features, performance metrics, etc.)

## Different BACnet Protocols

Protocol	Description	Identifiers
<b>MS/TP</b>	The BACnet MS/TP bus protocol is part of the BACnet® ANSI/ASHRAE™ Standard 135-2008 that uses the EIA-485 (RS-485) physical layer standard for data transmission (called the segment). Multiple segments can be logically tied together.	Network Instance MAC Address Baud Rate Polarity Two/Three Wire Bus
<b>IP</b>	BACnet IP is the preferred communication protocols, allowing systems to talk to each other over a network, like Internet of Things (IoT) technology—cutting out the middle man. Unlike BACnet MS/TP, requiring data to be transferred and stored in a controller, IP software stores through cloud-based software, making it much more secure.	Network Instance IP Address Subnet Mask Gateway Ethernet (CAT5/CAT6)

## MS/TP

### Polarity

BACnet MS/TP segment is polarity sensitive. The polarity of all devices that are connected to the two-wire BACnet MS/TP Segment must be respected. The markings to identify the polarity can vary by manufacturer.

Setra Systems Model	BACnet Polarity (+)	BACnet Polarity (-)
<b>Setra EDGE</b>	+ is Positive	- is Negative
<b>Setra BACnet Router</b>	+ is Positive	- is Negative
<b>FLEX</b>	B is Positive	A is Negative
<b>SRCM</b>	B is Positive	A is Negative
<b>SRPM</b>	A is Positive	B is Negative
<b>SRH</b>	A is Positive	B is Negative

### Baud Rates

Most devices will have a range of baud rate settings, typical baud rates are 9,600, 19,200, 38,400, and 76,800. The baud rate setting determines the rate at which data is sent on the

segment. All devices on the segment must be set to the same baud rate. Therefore, the chosen baud rate must be supported by all devices connected to the segment.

*Setra Systems' devices must be power cycled after changing a baud rate setting for it to take effect*

### Cable Length

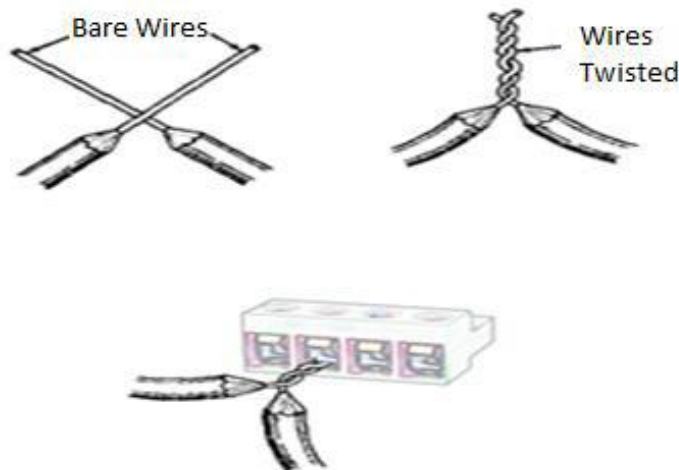
Baud Rate	Maximum Cable Length
9,600	4,000'
19,200	4,000'
38,400	4,000'
76,800	4,000'
115,000	3,280'

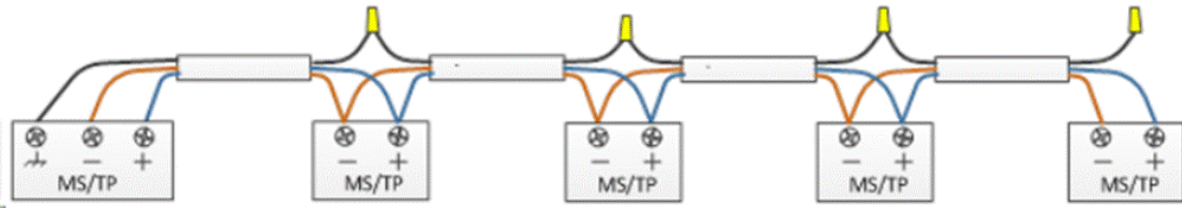
*At higher baud rates above 76,800 the cable length will need to be reduced. Also, the higher the baud rate the more sensitive the cable becomes to quality of installation, such as how much of the wire is untwisted at each device.*

### Daisy Chained Topology

MS/TP uses a *daisy-chained communication segment*. The network itself uses a twisted pair plus shield type of wire. The pair is like the rails of a ladder with individual devices wired across the rails like rungs. The wires that form the rung are called *stubs*. For electrical reasons we want to make the lengths of stubs as short as possible.

That's why MS/TP specifies the use of daisy-chain wiring. Daisy-chaining means landing the network wires on screw terminals that are directly part of the device itself. Other types of topologies are not acceptable such as Star and Ring. The reason for this is the reflection of the signal may not dampen the signal enough with the EOL terminations resistors and cause information to be lost.





## MAC Address

The MAC Address is a number from 0 to 255.

MAC Address Value / Range	Usage	Devices
0	Reserved by Default	Setra BACnet Router
3	Reserved by Default	Setra EDGE
4 - 127	Reserved	Master devices: All Setra Systems' devices are master devices and should be in this MAC Address range
128 - 254	Slave Range	Slave devices and network sensors
255	Broadcast	Do not apply address 255 to any device.

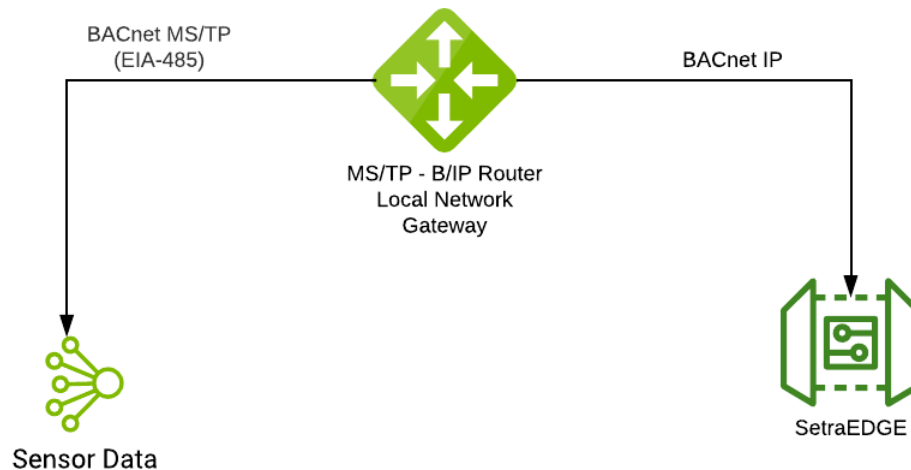
The BACnet MS/TP segment protocol is a peer-to-peer, multiple-master protocol that shares segment bandwidth by passing a token between Master devices on the segment.

The token is passed through a message from device to device on the BACnet MS/TP segment in consecutive order starting from the lowest MAC address (MAC Address = 0) to the next MAC Address. Gaps of unassigned device MAC Addresses should be avoided as this reduces bus performance.

The way MAC Addresses are assigned is not a physical requirement: Devices can be daisy-chained on the segment in any physical order regardless of their MAC Address sequence. The goal is to avoid gaps in the device MAC Address range.

Slave devices cannot accept the token, and therefore can never initiate communications. A Slave can only communicate on the segment to respond to a data request addressed to it from a Master device. Gaps in slave device MAC Addressing have no impact on BACnet MS/TP segment performance.

## Combining BACnet Networks



BACnet Internetworking is required when you need to combine dissimilar physical LAN technologies. This networking is achieved using a device referred to as a BACnet router.

This is a special device that can simultaneously communicate across two dissimilar BACnet LANs. E.G. Both MS/TP and BACnet/IP.

The router listens to both segments and when it hears a message meant for another sub network, it will send that message to that the correct network.

Requires planning, because it requires the assignment of network numbers and unique MAC addresses and BACnet device instances across the entire internetwork.

## COV Lifetime and Poll Rate

Poll Rate is the polling interval for devices that don't support COV (Change of Value). It's how often the Edge will read the value from the device.

COV Lifetime pertains only to devices that support COV notifications. It's the amount of time the Edge will subscribe for notifications. Once that time runs out, the Edge will re-subscribe for that same lifetime. Upon every subscription, the device will provide a value regardless of the change.

The two settings are mutually exclusive and setting either one won't affect the other.

### Poll rate

- Pulling from local data into the cloud
- Slowdown run charts

### COV Lifetime

- Every change in 2 minutes (get a value every 2 minutes regardless of change)