Troubleshooting BACnet Networks with the Expanded BASrouter/BASrouterSX Status Screen

The BASrouter/BASrouterSX *Status Screen* is accessed via a button on the right side of the unit's main configuration page. This screen lists a variety of parameters that are updated each time the page refreshes (about once per second). Some parameters are for use by our engineers and are displayed only so you can take a screen capture of these values to send to us for study. Other parameters in the list can help you even if you have little or no knowledge of the BACnet standard. Let's take a look these and discuss how they can help you gain insight into your network performance.

The first eight lines of the *Status Screen* report packet counts. Obviously, the number and frequency of messages received and transmitted for each supported network can tell you that data is successfully passing through the router, this is the fundamental benefit of these packet reports. Rarely will an *Incoming* and *Outgoing* packet count equal each other, but certain counts should be similar, as shown in our example and discussed below.

The primary *BACnet/IP* port is abbreviated *BIP 1,* and the secondary port is *BIP 2*. *BIP 2* is only used in the uncommon situation in which the router must pass data between two *BACnet/IP networks*. However, if that is the case, *BIP 1* and *BIP 2* packet counts should both be considered. In most situations these counts are similar, but sometimes they are not. If you are routing from *BIP 1* to *BIP 2*, then most messages will be routed from one BIP network to the other. Some messages may be sent only to the router (for example, to read its properties) and are not destined for the other network. If your system is not reading the router properties, but you still see a large count discrepancy, then you may have an issue with your BACnet client and routing. Some clients discover MS/TP devices via our router, but then they **fail to use this routing information** and try to read a discovered device's properties directly from our router. Our router does not retain properties for any other devices.

Most BACnet communication over Ethernet employs the *BACnet/IP* protocol. Although rare, there are still instances in which the older *BACnet/Ethernet* protocol (ISO 8802-3) is used. Our routers allow these two protocols to communicate. *BACnet/Ethernet* uses Ethernet MAC addresses for station addressing, while *BACnet/IP* which targets stations by their Internet Protocol (IP) addresses.

BIP 1 Incoming Packets=73824
BIP 1 Outgoing Packets=29566
BIP 2 Incoming Packets=0
BIP 1 Outgoing Packets=0
BACnet/Ethernet Incoming Packets=0
BACnet/Ethernet Outgoing Packets=0
MS/TP Incoming Packets=29554
MS/TP Outgoing Packets=36906
Silence Timer=0
EventCount=54
Flag = Not Set
RFSM state=00 Idle
MNSM state=01 Idle
Next Station=1
Poll Station=0
Available Memory=29504
TX PFM count=67
RX PFM count=1
TX Token Count=381721
Clear Silence Time=0

*Status Screen with Typical Values
when Routing between
MS/TP and BACnet/IP Networks*

Troubleshooting — continued

If the *BACnet/Ethernet* network number is left at its default value of 0, the *BACnet/Ethernet* function will be disabled and both *BACnet/Ethernet* counts for *Incoming* and *Outgoing* packets should be 0. *BACnet/Ethernet* and *BACnet/IP* devices use unique network numbers and the two cannot communicate unless their messages pass through a router.

NOTE: To prevent erratic traffic due to message loops, an IP subnet must have only one router enabled for *BACnet/ Ethernet*. If you are routing between *BACnet/IP* and *BACnet/ Ethernet*, the *BIP 1* and *BACnet/Ethernet* packet counts should be similar. If they are **not** similar, a server device may not be responding to messages, or the client may be ignoring routing information.

The most common use of the router is to route between a *BACnet/IP* network and an *MS/TP* network. In such cases, the *BIP 1* and *MS/TP* packet counts should be similar. If they are **not** similar, a server device may not be responding to messages, or the client may be ignoring routing information.

Available Memory is the amount of RAM remaining after buffers have been allocated. If a network is temporarily offline and another attempts to communicate with it, the available memory may drop very low until the offline network returns to an online state. This value should reflect minimal change each time the screen is refreshed.

The remaining reports deal with the instantaneous *MS/TP* state of the router and are explained in the BACnet standard. *These reports are mainly for our engineers*, but you can observe changes and sometimes gain insight into the *MS/TP* network condition (as seen by the BASrouter/ BASrouterSX). These reports are:

SilenceTimer should count up and then reset to 0. If the count exceeds 500, the router must think it is the only device on the network.

The *EventCount*, *Flag* and *RFSM state* reports *are only for study by our engineering group*.

MNSM (*Master Node State Machine*) *state* can give some information about what is occurring. The states are:

- Idle
- Answer Data Request

- Wait for Reply
- Use Token
- Done with Token
- Poll For Master
- Pass Token
- No Token

MNSM will cycle through these states as the screen is refreshed. Usually the state is *Idle*, but you should periodically see one of the four token messages, confirming the router is passing the token to other masters. However, if you only see *Idle* and *Poll For Master*, the router must think there are no other masters. If other *MS/TP* master devices are present, check for one of the following possibilities:

- mismatched data rates
- bad wiring
- the router SC pin is not properly connected
- improper termination at either end of the network

  NOTE: By default the BASrouter/BASrouterSX terminates one end, but you must terminate the opposite end.

- unresponsive MS/TP devices
- only MS/TP slaves are present (which do not participate in the token pass)

Next Station is the *MS/TP* MAC address of the device to which the router will next pass the token. This can change when the router searches for devices and if devices leave or enter the network. Once the network is stable, this value normally does not change. If it does change, then the device next in sequence after the router (its neighbor) is having an issue and is dropping out of the token pass. You may see this value report the router's neighbor, then the router's *neighbor's* neighbor and then back to the router's neighbor as the neighbor leaves and rejoins the token pass. Once out of the token pass, a device cannot be discovered, but communications with it may still be possible if your client supports such communication.

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Troubleshooting — concluded

Poll Station is the next MAC address the BASrouter/BASrouterSX will invite into the network. If there is a gap between the router's MAC address and the next logical MAC address on the network, the router will send a *Poll For Master* to the nonexisting MAC address. It will try every address in this gap. For example, if the router is at 0 and the next device has an address of 10, you will see the Poll Station increment from 1 through 9. If the *Poll Station* value equals that of a device on the network, then this device has fallen out of the token pass.

TX PFM count is the number of *Polls For Master* transmitted.

RX PFM count is the number of *Poll For Master* received.

TX Token Count is the number of tokens transmitted.

RX Token Count is the number of tokens received.

Invalid long Frames is the number of frames received that have a length exceeding 1024. If this count is high, there could be a bias or termination issue.

Clear Silence Time is the number of times the Silence resets because its value is too large.