Portable BASrouter — BACnet® Multi-Network Router

The Portable BASrouter is a compact BACnet multi-network router which provides versatile stand-alone routing between BACnet/IP, BACnet Ethernet (ISO 8802-3), and BACnet MS/TP networks. This portable BACnet router is easy to carry, web page configurable and it is powered by any 5 VDC source through it's USB connection, such as the USB port of your laptop computer. It is a great commissioning and/or troubleshooting device with BACnet diagnostic capabilities. BACnet MS/TP *"Status"* webpage with graphical table of present MS/TP device status and network statistics, in addition to a BACnet/IP *"Routing"* webpage with a discoverable routing table become useful when setting up or troubleshooting a BACnet network.

Versatile Routing Between …
- BACnet/IP and BACnet MS/TP
- BACnet Ethernet and BACnet MS/TP
- BACnet/IP and BACnet Ethernet
- BACnet/IP and BACnet Ethernet and BACnet MS/TP
- Two BACnet/IP Networks (between two UDP ports)

IP Network Support
- Web server for commissioning and troubleshooting
- DHCP option to automatically acquire IP address
- Diagnostic web page with graphical MS/TP device status, Network Error count, and BACnet network traffic statistics.
- BACnet Routing Table web page
- BACnet/IP Broadcast Management Device (BBMD)
- Foreign Device Registration (FDR)

Flexible Communications
- 10/100 Mbps Ethernet with auto-negotiation and Auto-MDIX
- Optically isolated MS/TP port
- MS/TP baud rates range from 9.6–76.8 kbps

Convenient Installation
- Powered by USB connection to PC or Laptop
- Compact plastic case can be easily stored
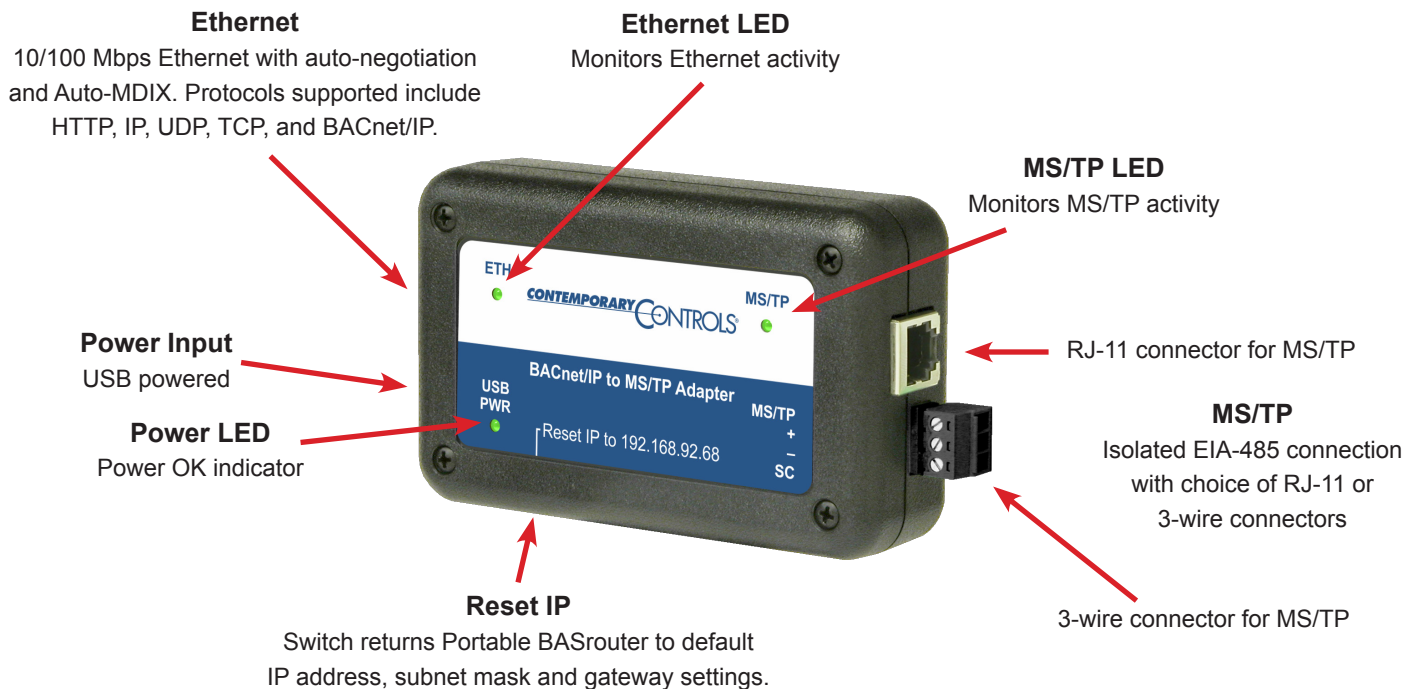- No special Windows driver is needed. Ignore Windows error message, "USB device not recognized."

Portable BASrouter — BACnet® Multi-Network Router

The Portable BASrouter is housed in a compact plastic case that is powered from a USB port on a PC or laptop computer. The Portable BASrouter is equipped with one optically-isolated EIA-485 port used for BACnet MS/TP, an alternative RJ-11 MS/TP port, and one 10/100 Mbps Ethernet Auto-Negotiation and Auto-MDIX port for BACnet IP, BACnet Ethernet, and web page configuration.

The MS/TP port offers an optically-isolated transceiver. It has a removable 3-pin terminal block for the EIA-485 connection or an alternative RJ-11 can be used for MS/TP connection. The Ethernet port offers a shielded RJ-45 connector. Auto-negotiation and Auto-MDIX allow this port to automatically match connections to the attached equipment. Therefore, either straight-through or crossover CAT5/6 cable can be used for hook-up.

A resident web server allows for commissioning, and troubleshooting using a standard web browser. A reset switch is provided on the router to return the unit to the factory default IP address of 192.168.92.68 (/24). Three LEDs are provided: The power LED glows green when proper power is provided. A bicolour Ethernet LED glows green for 100 Mbps, and yellow for 10 Mbps, and indicates activity by flashing. MS/TP LED flashes green when valid MS/TP traffic is received. When flashing continuously and without long interruptions, the MS/TP receive LED is a good indicator that the MS/TP network is operational.

Ethernet
10/100 Mbps Ethernet with auto-negotiation and Auto-MDIX. Protocols supported include HTTP, IP, UDP, TCP, and BACnet/IP.

Ethernet LED
Monitors Ethernet activity

MS/TP LED
Monitors MS/TP activity

Power Input
USB powered

Power LED
Power OK indicator

RJ-11 connector for MS/TP

MS/TP
Isolated EIA-485 connection with choice of RJ-11 or 3-wire connectors

Reset IP
Switch returns Portable BASrouter to default IP address, subnet mask and gateway settings.

3-wire connector for MS/TP

Web Page Configuration

Status Screen

The Status screen is always operational as long as the Portable BASrouter is powered. It consists of *MSTP Device Status* table, *Network Errors* count, and *Statistics* on BACnet networks to which the Portable BASrouter is connected. The *Status* page will automatically refresh every 5 seconds with the updated status on networks and devices — so you can observe the network state changes and gain insight into the condition of the BACnet network (as seen by the Portable BASrouter). These statistics are retained over time, unless the Portable BASrouter is powered off or rebooted from the main web page using the *"Save Changes"* button, then all Status page parameters are reset. The *"Reset Statistics"* button on Status page will reset Network Errors count, and Statistics, but retain the MSTP Device Status table history. For more information on the Status page refer to the Portable BASrouter User Manual.

Routing Table

Multiple networks, possibly employing different physical layer technologies, may be interconnected by BACnet routers to form a BACnet internetwork. The Routing table web page provides a routing table which contains information about the network topology of the surrounding BACnet internetwork such as *Destination Network,* *Network Type, Connecting Network,* and *Network Status*. This table will be blank upon powering the Portable BASrouter. Click the *"Discover Routing Table"* button to discover other routers on the BACnet network which will send a *"Who-Is-Router-To-Network"* message and fill the table with the discovered BACnet routers.

CONTEMPORARY CONTROLS   Configuration   Advanced   Routing   Security   Status   BDT   FDT

BASRTP-B Routing Status

Discover Routing Table

Routing Table

Destination Network	Network Status	Connecting Network	Network Type	Next Router Address
1326	Operational	Direct	MS/TP	N/A
1	Operational	Direct	B/IP1	N/A
9292	Operational	1	B/IP1	10.0.13.33:47808
218	Operational	1	B/IP1	10.0.0.218:47808
221	Operational	1	B/IP1	10.0.3.206:47808
1100	Operational	1	B/IP1	10.0.11.68:47808

Portable BASrouter Parameter Settings

Device Parameters	Default Value	Description
Device Name	BASRT-Bxxxxxx	This must be unique throughout the BACnet network. The unique default value ends with the last 6 characters of the unit's Ethernet MAC address. You can edit it to be up to 20 characters.
Device Instance	0	This must be unique throughout the BACnet network. The router device instance is a 22-bit decimal value (0–4,194,303).
Device Location	Location	The default value can be edited to be up to 20 characters.

BACnet Ethernet Parameter	Default Value	Description
BACnet Ethernet Network	0	16-bit decimal value (1–65534). Each BACnet network, regardless of technology, must have a unique network number. By retaining the default value of 0, BACnet Ethernet routing is disabled.

BACnet/IP Parameters	Default Value	Description
BACnet/IP UDP Port	BAC0	16-bit hex value (0–FFFF) is set to BAC0 as the default value and should be used. All BACnet/IP devices on the same BACnet network must have the same UDP port assignment. For other assignments choose ports in the range from BAC1 to BACF while verifying that these ports are available.
BACnet/IP Network	1	16-bit decimal value (1–65534). Each BACnet network, regardless of technology, must have a unique network number. It is recommended that all subnets of the same BACnet/IP network be given the same BACnet network number as well.
IP Assigned By		The IP address of the Portable BASrouter is FIXED (static) by default (192.168.92.68), but it can be obtained automatically from a DHCP server on the network. To set for DHCP, choose DHCP option from drop-down menu and click "Save Changes" button.
IP Address	192.168.92.68	IP address in dotted decimal format. Select a valid address in the range from 0.0.0.1 through 255.255.255.254.
IP Subnet	24	Decimal value (0–30) in the "slash" notation is the number of bits with a "1" in the mask. The default value of 24 corresponds to 255.255.255.0 in the dotted decimal format. All devices on the same subnet which communicate via BACnet/IP should use the same subnet mask.
IP Gateway	192.168.92.1	IP Gateway address in dotted decimal format. Select a valid address in the range from 0.0.0.1 through 255.255.255.254.

MS/TP Parameters	Default Value	Description
MS/TP MAC Address	0	Decimal value (0–127) represents the MAC address of the router's MS/TP port. Lower MAC address numbers are preferred.
MS/TP Network	2001	16-bit decimal value (1–65535). Each BACnet network, regardless of technology, must have a unique network number.
Max Masters	127	This 8-bit decimal value (1–127) represents the highest master MAC address in the MS/TP network. If the highest value MAC address is unknown or if additional devices are to be added in the future above the current highest MAC address, use the default setting of 127.
Max Info Frames	100	This is the most messages (1–100) that can be routed onto the MS/TP network by the router per token pass. Values above 20 are typical.
MS/TP Baud Rate	38400	The baud rate of the MS/TP network can be 9600, 19200, 38400 or 76800 bps. All MS/TP devices on the same MS/TP network must use the same baud rate. Auto-bauding devices will set their baud rates to that of the BAS Router.
MS/TP Tolerance	Lenient	Affects the degree to which interoperability with devices is successful. Lenient option causes less efficient traffic but optimises interoperability.

BACnet Protocol Implementation Conformance (PIC) Statement

CONTEMPORARY CONTROLS®

Portable BAS Router
Portable BACnet Commissioning Tool

BACnet Protocol Implementation Conformance Statement (Annex A)

Date: 24 July 2017

Vendor Name: Contemporary Controls

Product Name: Portable BAS Router

Product Model Number: BASRTP-B

Applications Software Version: 3.0.1   **Firmware Revision:** 3.0.1   **BACnet Protocol Revision:** 13

Product Description: Device to route between BACnet/IP, ISO 8802-3 and MS/TP networks with BBMD and NAT traversal support.

BACnet Standardized Device Profile (Annex L):
- ☐ BACnet Operator Workstation (B-OWS)
- ☐ BACnet Building Controller (B-BC)
- ☐ BACnet Advanced Application Controller (B-AAC)
- ☒ BACnet Router (B-RTR)
- ☐ BACnet Application Specific Controller (B-ASC)
- ☐ BACnet Smart Sensor (B-SS)
- ☐ BACnet Smart Actuator (B-SA)
- ☒ BACnet Broadband Management Device (B-BBMD)

List all BACnet Interoperability Building Block Supported (Annex K):

DS-RP-B Data Sharing — ReadProperty – B
DS-RPM-B Data Sharing — ReadProperty Multiple – B
NM-RC-B Network Management – Router Configuration – B
DM-DDB-B Device Management — Dynamic Device Binding – B
DM-DOB-B Device Management — Dynamic Object Binding – B

Segmentation Capability:
- ☐ Able to transmit segmented messages   Window Size:
- ☐ Able to receive segmented messages   Window Size:

Standard Object Types Supported:

Object Type Supported	Can Be Created Dynamically	Can Be Deleted Dynamically
Device	No	No

No optional properties are supported. **NOTE:** The above object is directed supported on the router. The router will pass to the appropriate network all BACnet communications not directed to the router.

Data Link Layer Options:
- ☒ BACnet IP, (Annex J)
- ☐ BACnet IP, (Annex J), Foreign Device
- ☒ ISO 8802-3, Ethernet (Clause 7)
- ☐ ANSI/ATA 878.1, EIA-485 ARCNET (Clause 8), baud rate(s):
- ☒ MS/TP master (Clause 9), baud rate(s): 9600; 19,200; 38,400; 76,800
- ☐ MS/TP slave (Clause 9), baud rate(s):
- ☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s):
- ☐ Point-To-Point, modem, (Clause 10), baud rate(s):
- ☐ LonTalk, (Clause 11, medium:
- ☐ Other:

Device Address Binding:
Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.) ☐ Yes   ☒ No

Networking Options:
- ☒ Router, Clause 6 — routing between BACnet/IP, ISO 8802-3, and MS/TP
- ☐ Annex H, BACnet Tunnelling Router over IP
- ☒ BACnet/IP Broadcast Management Device (BBMD)
    Does the BBMD support registrations by Foreign Devices?   ☒ Yes ☐ No

Character Sets Supported:
Indicating support for multiple character sets does not imply that they can all be supported simultaneously.
- ☒ ANSI X3.4
- ☐ ISO 10646 (UCS-2)
- ☐ IBM™/Microsoft™ DBCS
- ☐ ISO 10646 (UCS-4)
- ☐ ISO 8859-1
- ☐ JIS C 6226

If this product is a communication gateway, describe the types of non-BACnet equipment/network(s) that the gateway supports:
No gateway support.

24 July 2017

PI-BASRTPB0-AA1

Wiring Diagrams

The Portable BASrouter features a USB 2.0 Full Speed Device Port that accepts the Type B plug of the USB cable that is included in the box. It takes 5 VDC from a host computer, while typically drawing 300 mA of current. It can operate from a USB hub, if desired, and no driver installation is needed.

The device incorporates a 3-wire optically-isolated EIA-485 interface for the MS/TP connection — allowing better circuit protection and noise immunity. To connect to other 3-wire devices, simply make a one-to-one connection to the other devices. When connecting to

2-wire non-isolated devices, the signal common (SC) on the Portable BASrouter must share the reference used by the 2-wire devices. This can be accomplished by tying the SC pin to COM on the Portable BASrouter and then grounding the low-side of each power supply on all connected devices. In this way, all EIA-485 transceivers share the same earth reference. Notice that the SC pin is signal common and **not a shield pin**.

The Portable BASrouter does not provide any failsafe bias or termination to the EIA-485 bus and can be inserted anywhere on the MS/TP segment.

2-wire MS/TP Bus Wiring
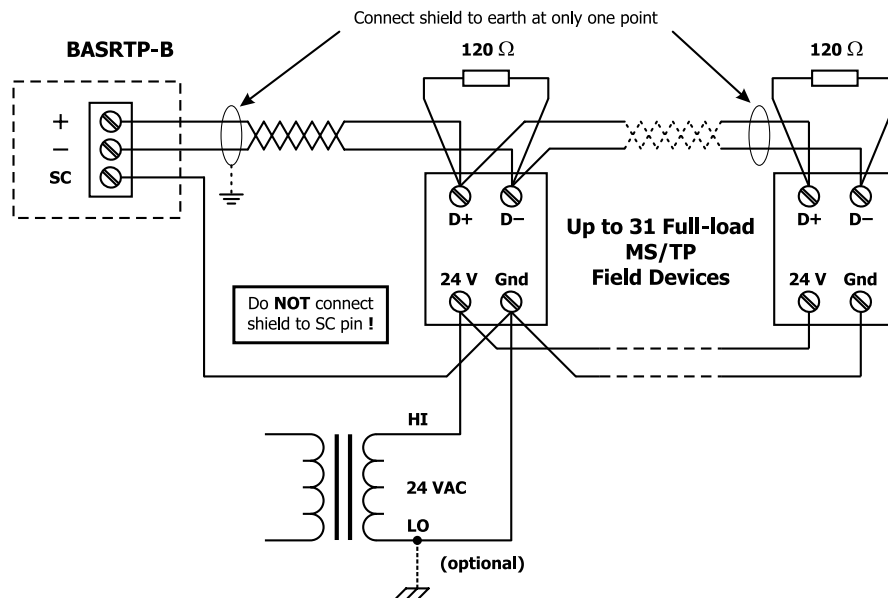
3-wire MS/TP Bus Wiring

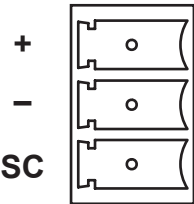DS-BASRTPB3-AB3
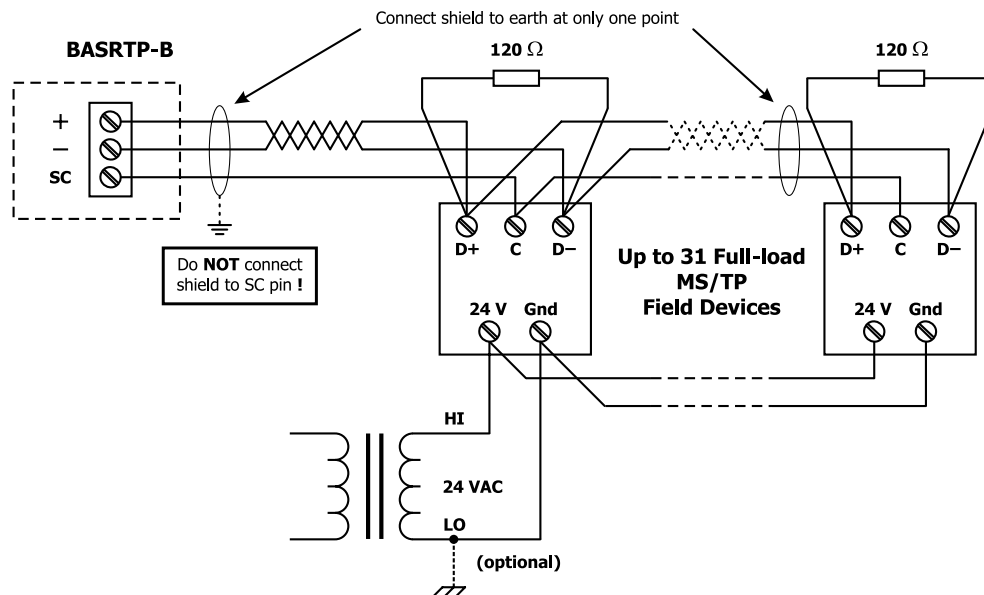
Typical Installation

Logically, 255 devices can be addressed. Physically, the number of devices depends upon device loading. Up to 31 full-load EIA-485 devices can share the same MS/TP bus segment as the Portable BASrouter. For half-load devices, there can be 62. All MS/TP standard baud rates are supported — from 9.6 to 76.8 kbps.
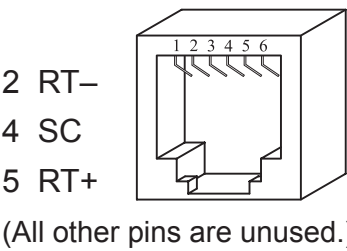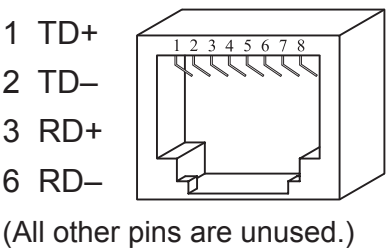

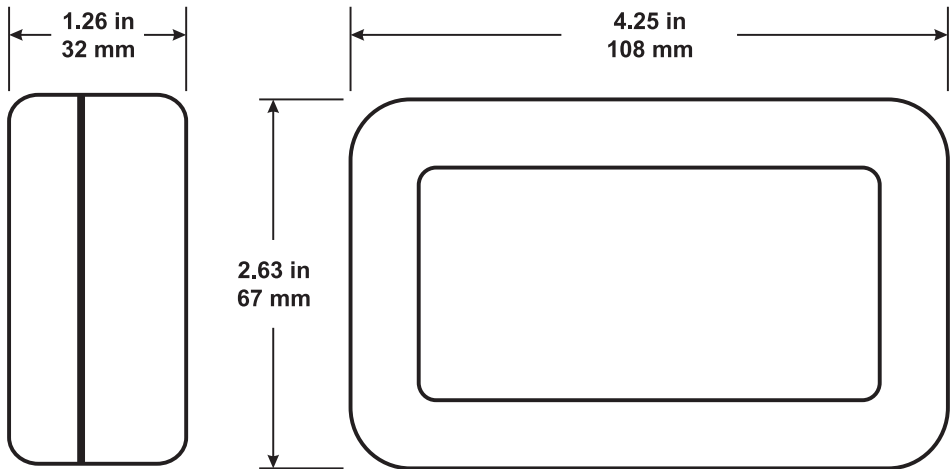## Connector Pin Assignments

3-pin (MS/TP)

+
−
SC

RJ-11 (MS/TP)

2 RT−
4 SC
5 RT+

1 2 3 4 5 6

(All other pins are unused.)

RJ-45 (MDI Ethernet)

1 TD+
2 TD−
3 RD+
6 RD−

1 2 3 4 5 6 7 8

(All other pins are unused.)

Mechanical Drawing

1.26 in
32 mm

4.25 in
108 mm

2.63 in
67 mm

Specifications

Power Requirements	USB power: 5 VDC ±10%, 300 mA, 1.5W
Operating Temperature	0°C to 60°C
Storage Temperature	–40°C to 85°C
Relative Humidity	10–95%, non-condensing
Protection	IP30
Ethernet Communications	IEEE 802.3 10/100 Mbps data rate 10BASE-T, 100BASE-TX physical layer 100 m (max) CAT5 cable length
MS/TP Communications	ANSI/ASHRAE 135 (ISO 16484-5) 9600, 19200, 38400, 76800 bps data rate EIA-485 physical layer 1200 m (max) cable length

LEDs

Power	Green = power OK
Ethernet	Green = 100 Mbps Yellow = 10 Mbps Flash = activity
MS/TP	Flashing green = receive activity

Regulatory Compliance

CE Mark; CFR 47, Part 15 Class A; RoHS
UL508 and C22.2 No. 142-M1987:
   Industrial Control Equipment

Ordering Information

Model	RoHS	Description
BASRTP-B	✔	BASrouter Portable BACnet/IP to MS/TP to Ethernet