

data SHEET



BASrouterLX — High-Performance BACnet® Router with Diagnostic Capabilities

The BASrouterLX is a high-performance BACnet router providing stand-alone routing between BACnet networks such as BACnet/IP, BACnet Ethernet, and BACnet MS/TP. Besides its high-speed processor, it has advanced features such as MS/TP slave proxy support (allowing auto-discovery of MS/TP slaves) and MS/TP frame capture and

storage for use with Wireshark®. As a BBMD, up to 50 BDT and 147 FDR entries can be supported. The BASrouterLX has two physical communication ports — a 10/100 Mbps BACnet/IP Ethernet port and an optically-isolated EIA-485 port for MS/TP. Router configuration is accomplished via web pages.

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

IP Network Support

- Web server for commissioning and troubleshooting
- MS/TP capture using Wireshark®
- BACnet/IP Broadcast Management Device (BBMD)
- Foreign Device Registration (FDR)

Flexible Communications

- 10/100 Mbps Ethernet with auto-negotiation and Auto-MDIX
- Supports MS/TP slave auto-discovery and proxy
- Optically-isolated MS/TP port
- MS/TP baud rates range from 9.6–115.2 kbps

Convenient Installation

- 24 VAC/VDC ($\pm 10\%$), 47–63 Hz input voltage
- Din-rail mounted



BASautomation®

BASrouterLX — High-Performance BACnet® Router

The BASrouterLX is housed in a metal case that mounts on 35-mm DIN-rail and it is powered from a 24 VAC/VDC ($\pm 10\%$) source. Its half-wave rectified power supply allows sharing of power with other half-wave devices. There are two ports on the unit — one Ethernet and one EIA-485.

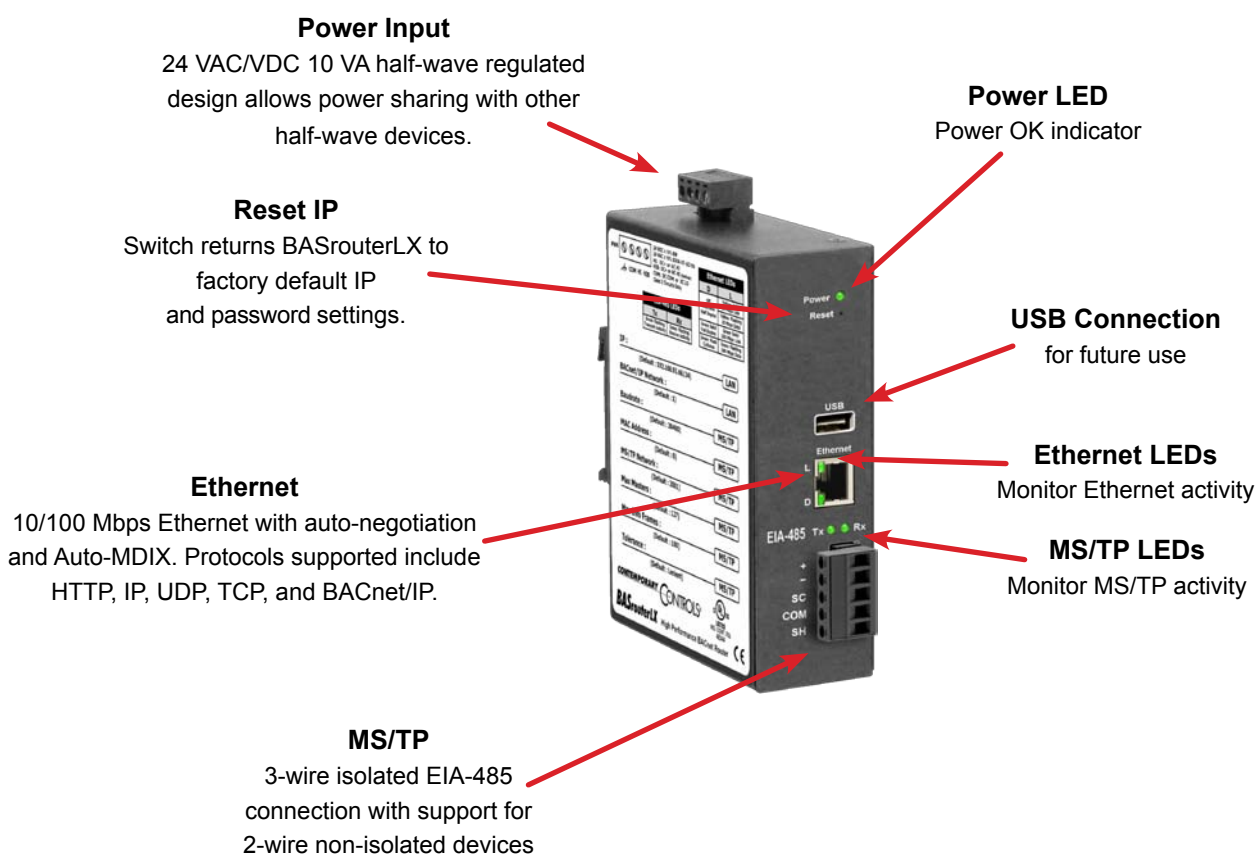
The optically-isolated EIA-485 serial port allows for connection to either 2-wire or 3-wire MS/TP networks using a removable 5-pin terminal block. Up to 31 full-load or 62 half-load EIA-485 devices can share the serial bus at data rates between 9.6 and 115.2 kbps. Internal jumpers provide 120 Ω termination and bias. These jumpers can be removed for mid-span installations.

The Ethernet port offers a shielded RJ-45 connector. Through auto-negotiation and Auto-MDIX, it automatically matches connections to the attached equipment. Thus, either CAT5 straight-through or

crossover cable can be used to attach to the BACnet/IP network at either 10 or 100 Mbps speed.

MS/TP slave devices do not participate in token passing but can be made assessable throughout the complete MS/TP address range using either Manual Slave Address Binding or Automatic Slave Discovery. Once they are known, the BASgatewayLX functions as their proxy.

A resident web server allows for commissioning, and troubleshooting via a standard web browser. A reset switch is provided on the router to return the unit to the factory default IP and password settings. Five LEDs are provided. The power LED indicates that proper power is being provided. Two Ethernet LEDs indicate link status, data activity, data rate and duplex. Two EIA-485 LEDs indicate transmission and reception of data.



Web Page Configuration, Status and Diagnostics

Basic Setup

Onboard Help

Advanced Options

Current MS/TP Driver Status:

```


BACnet MS/TP Line Discipline 2.24
=====
Baud Rate: 76800
SilenceTimer: 10
Nmax_master: 127
Nmax_info_frames: 100
This_Station: 0
Next_Station: 57
Poll_Station: 13
RFSM State: 00 Idle
MNSM State: 07 PollForMaster
Turnaround: 1
PFM timeout: 30
TP timeout: 85
Event Count: 24
Rcv Count: 516036124
Rcv Error Count: 0
RX Queue size: 0
TX Queue size: 0
Trace Queue size: 3628
    
```

Capture/View MS/TP Frames Without Extra Hardware

Setup — System Settings

CONTEMPORARY CONTROLS

Setup Advanced Status



About This Page

Use the setup page to perform basic settings for Device Parameters, BACnet Ethernet, BACnet/IP and MS/TP.

Device Parameters

Device Name (Default Value = BASRTLX-B-xxxxx): This is used to configure a unique device object name for the device on the network. It can be up to 80 characters and defaults to a unique name of the form BASRTLX-B-XXXXXX - where the Xs are replaced with the final six characters of the router's Ethernet MAC address.

Device Instance (Default Value = 0): The router's device instance is a 22-bit value (0-4,194,302). Do not use 4,194,303 which is reserved by BACnet. Each BACnet device within the same BACnet internetwork must have a unique device instance. One must be assigned to the BASRTLX-B.

Device Description and Device Location can be used to configure additional identifiable information for the router. They are blank by default.

[More Information...](#)

Need Support?

Our staff of engineers is available to address any issues you may be having.

Please visit our [website](#) for more information.

Device Name:

Device Instance: (0 - 4194302)

Device Description:

Device Location:

Ethernet Network: (0 - 65534) *Normally leave at 0. [More Information](#)*

BACnet/IP UDP Port 1: (Hexadecimal value e.g. BAC0)

BACnet/IP Network 1: (1 - 65534)

IP Address:

IP Subnet:

IP Gateway:

MS/TP MAC: (0 - 127)

MS/TP Network: (1 - 65534)

Max Masters: (1 - 127)

Max Info Frames: (1 - 100)

MS/TP Baudrate:

MS/TP Tolerance: Strict Lenient

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Release: 1.2.0

Setup — System Settings

<i>Device Parameters</i>	<i>Default Value</i>	<i>Description</i>
Device Name	BASRTLX-Bxxxxxx	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	The router device instance is a 22-bit decimal value (0–4,194,302).
Device Description		If you wish, enter a brief description. This entry is optional.
Device Location		If you wish, specify a location for the device. This entry is optional.
<i>BACnet Ethernet Parameter</i>	<i>Default Value</i>	<i>Description</i>
BACnet Ethernet Network	0	16-bit decimal value (1–65534). Each BACnet network, regardless of technology, must have a unique network number, including BACnet Ethernet. By retaining the default value of 0, BACnet Ethernet routing is disabled — but not BACnet/IP routing.
<i>BACnet/IP Parameters</i>	<i>Default Value</i>	<i>Description</i>
BACnet/IP UDP Port 1	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	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 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	255.255.255.0	The default value is 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.
<i>MS/TP Parameters</i>	<i>Default Value</i>	<i>Description</i>
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 maximum number of 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, 57600, 76800 or 115200 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 BASrouterLX.
MS/TP Tolerance	Lenient	Affects the degree to which interoperability with devices is successful. Lenient option causes less efficient traffic but optimises interoperability.

Setup — Setting Date and Time

Set the **Year**, **Month** and **Day** as well as the **Hours**, **Minutes** and **Seconds**. The current data and time is appended to MS/TP captures that are viewed using Wireshark. Note that date and time settings are not retained after power is removed from the unit.

Setup — Username and Password

Change the **Username** and **Password** to access the BASRTLX-B webpage. Each string must be between 5 and 63 alphanumeric characters — and is case sensitive.

Setup — Configure Upload/Download

Router settings can be uploaded or downloaded to and from your PC. Click on the **Browse...** button to select the configuration file from your computer and then click **Upload** to upload it to the router. The router will check the file and if it is a valid configuration file, the router will reboot the router using the settings from the uploaded file.

By clicking on **Save**, the current router configuration is saved to your PC.

Setup — Firmware Upload

New firmware can be uploaded to the BASrouterLX. Click on the **Browse...** button to select the firmware file from your PC, then press **Upload**.

NOTE: The firmware filename should not be changed and used as provided by Contemporary Controls.

The screenshot shows a form titled "Set Date" and "Set Time". Under "Set Date", there are three input fields: "Year (YYYY)" with the value "2013", "Month (MM)" with the value "4", and "Day (DD)" with the value "11". Under "Set Time", there are three input fields: "Hours (hh)" with the value "09", "Minutes (mm)" with the value "44", and "Seconds (ss)" with the value "25". At the bottom of the form are two buttons: "Apply" and "Cancel".

The screenshot shows a form titled "Select Configuration File to Upload :". It features a text input field followed by a "Browse..." button. Below the input field are two buttons: "Upload" and "Cancel". At the bottom of the form, there is a section titled "Save Configuration File to PC :" with a "Save" button.

The screenshot shows a form titled "Select Firmware File to Upload :". It features a text input field followed by a "Browse..." button. Below the input field are two buttons: "Upload" and "Cancel".

The screenshot shows a form with three input fields: "Username:", "Password:", and "Confirm Password:". At the bottom of the form are two buttons: "Apply" and "Cancel".

Advanced — BACnet/IP Broadcast Management Device (BBMD)

Parameters	Default Value	Description
BBMD Enable	Unchecked	Check to enable BACnet/IP Broadcast Management Device (BBMD) which normally will also allow Foreign Device Registration (FDR).
BBMD UDP Port	Primary	Normally the primary port is selected. The secondary port is used in very special applications with NAT routing.
Accept FDR	Checked	Uncheck to disable foreign devices from registering with this router. Both BBMD Enable and Accept FDR must be checked to allow Foreign Device Registration.

Advanced — Network Address Translation (NAT)

Parameters	Default Value	Description
Secondary BACnet/IP UDP Port	0000	Enter secondary UDP port as a 16-bit hex value (0-FFFF) when operating with two BACnet/IP BACnet networks. In this case use BAC1 if it is available.
Secondary BACnet/IP Net	0	Assign a network number unique from all other BACnet networks.
Public IP Address	0.0.0.0	If the BASrouterLX is being accessed through a NAT router then you'll need to enter the public IP address of the NAT router here. If not, leave this value at the default setting of 0.0.0.0.

BBMD Enable: (Caution: Only one BBMD can be enabled per subnet)

BBMD UDP Port: Primary

Accept FDR: (BBMD must be enabled to accept FDR)

BBMD Logging Enable:

Secondary BACnet/IP UDP Port: 0000 (Hexadecimal e.g. BAC1)

Secondary BACnet/IP Network: 0 (1-65534)

Public IP Address: 0.0.0.0

Advanced — Slave Proxy

<i>Parameters</i>	<i>Default Value</i>	<i>Description</i>
Slave Proxy Enable	Off	When enabled, the router will proxy MS/TP slave devices for clients. Slaves can be discovered (when Auto Slave is enabled) and you can also manually enter information about the slaves. When Auto Slave is disabled, MS/TP slaves must be manually configured.
Auto Slave Enable	Off	When enabled, MS/TP slaves will be automatically discovered — if Slave Proxy has first been enabled.
Auto Slave Table		This table lists the slaves that have been automatically discovered. To view the table, click View Auto Slaves.
Manual Slave Proxy Entry		Enter the MAC address, Device Instance, Vendor ID and Max APDU for each slave device and then click Apply.
Manual Slave Table		This table lists the slaves that have been manually entered.

Advanced — Broadcast Distribution Table (BDT)

<i>Table or Screen Name</i>	<i>Default Value</i>	<i>Description</i>
BBMD IP Address		Enter the IP address of every BBMD device on the internetwork except for this router. These entries will appear in the Broadcast Distribution Table. Up to 50 entries can be made.
Broadcast Distribution Mask	255.255.255.255	Use the default setting in almost all cases. If the IP router can pass broadcast messages, enter the same mask as the IP router.
Broadcast Distribution Table (BDT)		This table lists the IP addresses and broadcast distribution masks of all the other BBMDs located on the network. Entries can be deleted by entering the entry number and checking on Delete Entry No.

Status — MS/TP Driver

<i>Item</i>	<i>Description</i>
Current MS/TP Driver Status:	For Contemporary Controls to assist a customer with an MS/TP bus issue, information about the bus is available within the BASrouterLX. During a technical support call, the customer may be asked to supply the information from this status page. Although to the customer the information is confusing, it could be helpful to the staff at Contemporary Controls. What follows are short definitions of the types of data being stored on an ongoing basis. The status page is refreshed automatically.
BACnet MS/TP Line Discipline 2.24 =====	
Baud Rate: 76800	Confirms the baud rate of the MS/TP segment
SilenceTimer: 12	A counter indicating the amount of time between successive characters
Nmax_master: 127	The highest address of a master node as set by the router
Nmax_info_frames: 100	The maximum number of frames the router can send before a token pass
This_Station: 0	MAC address of the router
Next_Station: 67	The router's logical neighbour in the token pass
Poll_Station: 39	The last MAC address sent by the router in a poll-for-master sequence
RFSM State: 00 Idle	Receive frame state machine: current state
MNSM State: 01 Idle	Master node state machine: current state
Tturnaround: 1	Time between the end of a reception to the beginning of a transmission
PFM timeout: 30	Poll-for-master timeout setting
TP timeout: 85	Token-passing timeout setting
Event Count: 24	Number of received characters or error — used to detect activity
Rcv Count: 116482958	Receive frame counter
Rcv Error Count: 0	Receive frame error counter
RX Queue size: 0	Number of messages in the receive queue
TX Queue size: 0	Number of messages in the transmit queue
Trace Queue size: 1438	Background task related to Wireshark capture

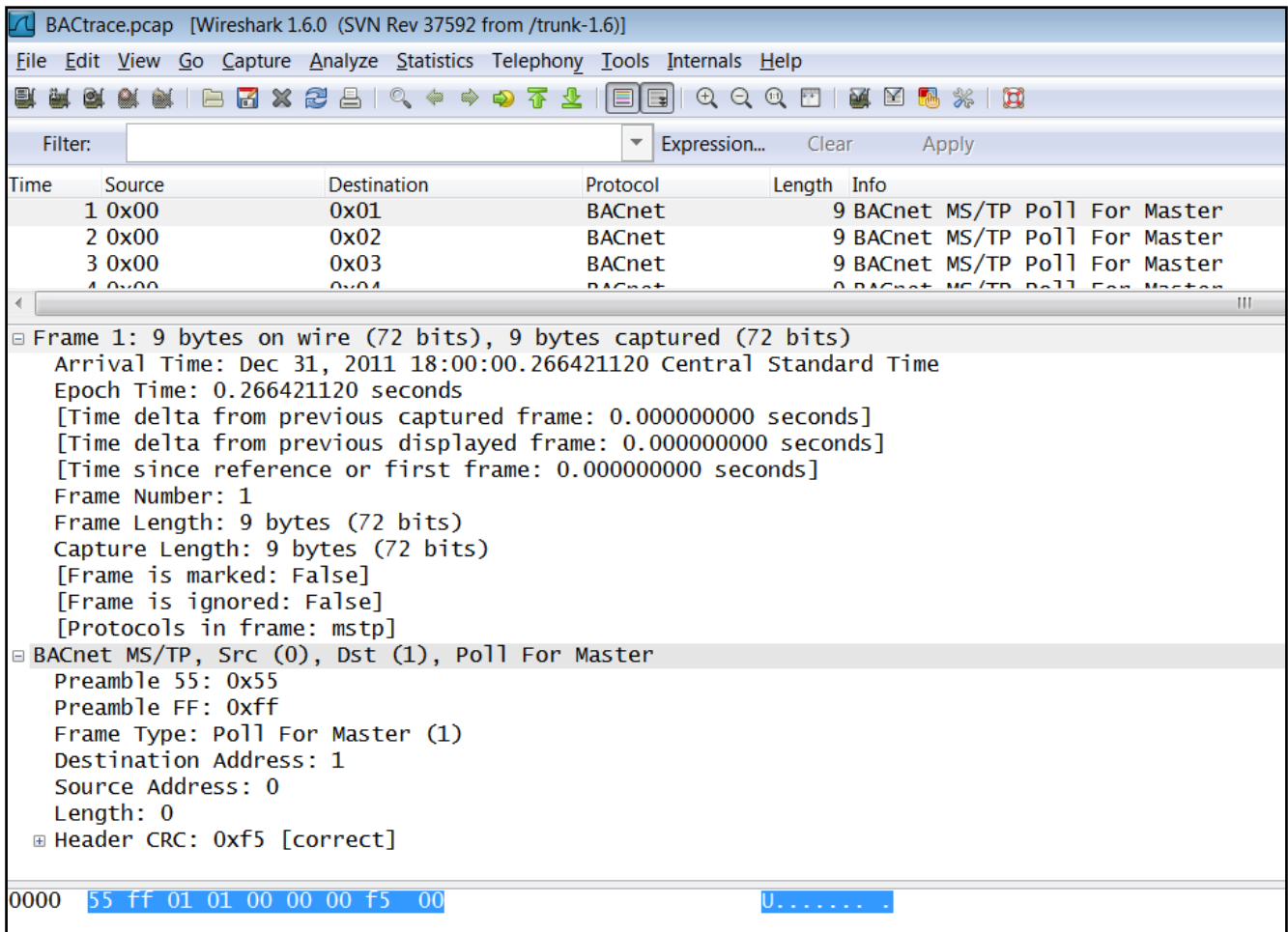
Application Assistance

Contemporary Controls has produced an Application Guide that covers all its BACnet routers. Numerous network examples are provided with appropriate completed configuration screens to assist the installer on how best to apply BACnet routers in the field. It is available from the company website.

Status — MS/TP Traffic

The BASrouterLX has the ability to view MS/TP traffic from the Ethernet side of the router. This is a handy feature when verifying proper MS/TP network activity without the need of installing specialized interfacing hardware to the MS/TP bus. As a background task, the BASrouterLX continuously records the last 3900 messages sent over MS/TP — including both data and token passes. By depressing the **Generate MS/TP**

Wireshark File, those last 3900 messages are converted to a “pcap” format file for viewing by a Wireshark® protocol analyser. Once the conversion is made, depressing the **View MS/TP Traffic** button sends the captured file to the attached PC for Wireshark viewing. BACnet protocol decoding is built into this free but powerful protocol analyser.



Status — Foreign Device Table

Table or Screen Name

Foreign Device Table (FDT)

Description

This table automatically lists all foreign devices that have registered with this router. Information includes IP address, port number, time-to-live, and remaining time of each lease. Up to 147 entries can be accommodated

Foreign Device Registrations:			
IP Address:	Port	TTL	Remaining Time
10.0.0.103:	BAC0	300	143

Protocol Implementation Conformance Statement (PICS)



BASrouterLX High-Performance BACnet Router



BACnet Protocol Implementation Conformance Statement (Annex A)

Date: 12 September 2013
Vendor Name: Contemporary Controls
Product Name: BASrouterLX
Product Model Number: BASRTLX-B
Applications Software Version: 1.0.0 **Firmware Revision:** 1.2.0 **BACnet Protocol Revision:** 7
Product Description: BASRTLX-B High-Performance BACnet Router with slave proxy support.

BACnet Standardized Device Profile (Annex L):

- BACnet Operator Workstation (B-OWS)
- BACnet Building Controller (B-BC)
- BACnet Advanced Application Controller (B-AAC)
- BACnet Application Specific Controller (B-ASC)
- BACnet Smart Sensor (B-SS)
- BACnet Smart Actuator (B-SA)

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

- DS-RP-A Data Sharing — ReadProperty — A
- DS-RP-B Data Sharing — ReadProperty — B
- DS-RPM-B Data Sharing — ReadPropertyMultiple — B
- DS-WP-B Data Sharing — WriteProperty — B
- DS-WPM-B Data Sharing — WritePropertyMultiple — B
- DM-DDB-B Device Management — Dynamic Device Binding — B
- DM-DOB-B Device Management — Dynamic Object Binding — B
- DM-DCC-B Device Management — Device Communication Control — B
- DM-RD-B Device Management — ReinitializeDevice — B
- DM-R-B Device Management — Restart — B
- DM-LM-B Device Management — List Manipulation — B
- NM-RC-B Network Management — Router Control

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; 57,600; 76,800; 115,200
- MS/TP slave (Clause 9), baud rate(s): 9600; 19,200; 38,400; 57,600; 76,800; 115,200
- 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
- IBM™/Microsoft™ DBCS
- ISO 8859-1
- ISO 10646 (UCS-2)
- ISO 10646 (UCS-4)
- 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.

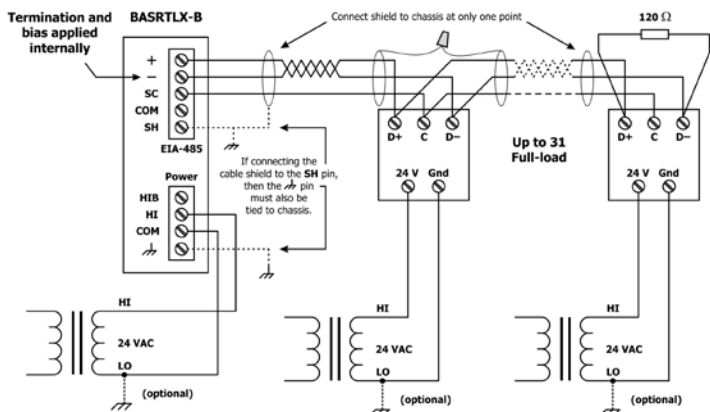
Wiring Diagrams

Since the product incorporates a half-wave rectifier circuit, it can share the same 24 VAC power with other half-wave rectified devices. It can also be powered from a 24 VDC source. A redundant power connection exists for back-up power schemes.

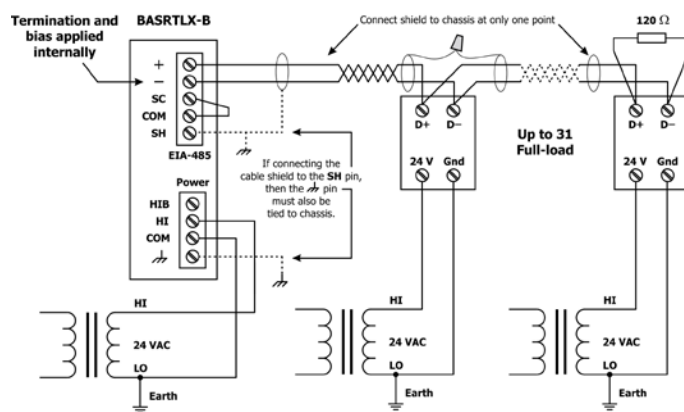
The product incorporates a 3-wire optically-isolated EIA-485 interface for the serial connection, allowing better circuit protection and noise immunity. To connect to other 3-wire devices simply make a one-to-one connection to the other devices. But when connecting to 2-wire non-isolated devices, the

signal common (SC) on the product must share the reference used by the 2-wire devices. This is accomplished by tying the SC pin to COM on the product and by 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. For shield connections, use the SH pin. Far-end external termination is required as shown. Near-end bias and termination are internally supplied within the product.

3-wire MS/TP Network



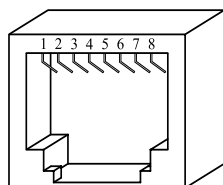
2-wire MS/TP Network



Connector Pin Assignments

Ethernet

Pin	Function
1	TD+
2	TD-
3	RD+
4	N/C
5	N/C
6	RD-
7	N/C
8	N/C



EIA-485

Pin	Function
+	Signal High
-	Signal Low
SC	Signal Common
COM	0V
SH	Shield (Chassis)

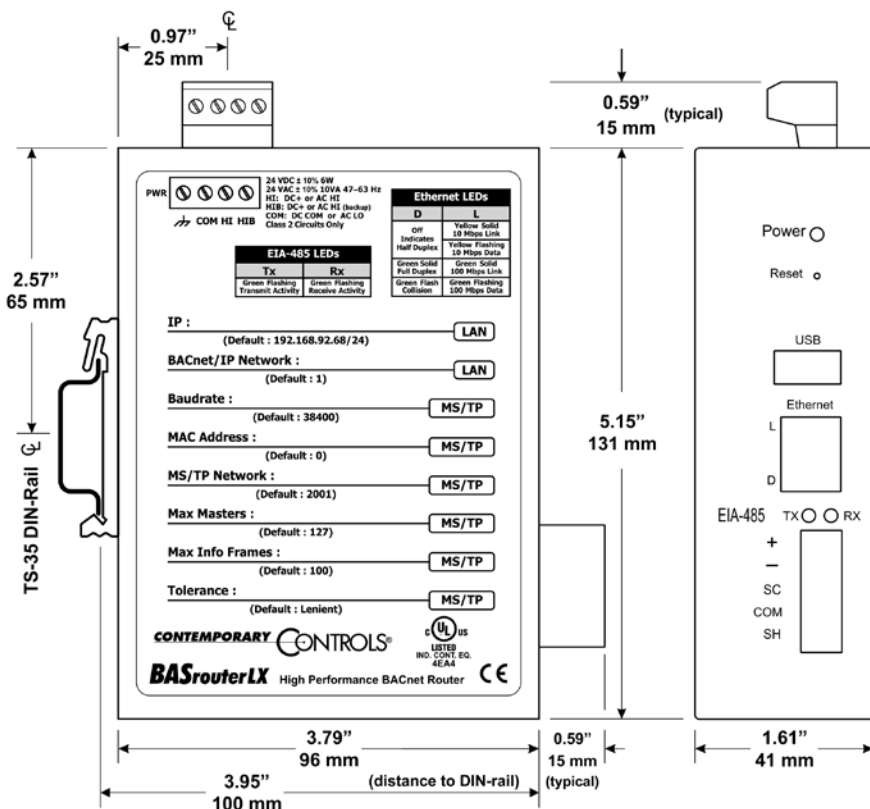
Power

Pin	Function
HIB	Redundant Power
HI	DC+ or AC High
COM	0V or AC Low
SH	Chassis

USB

Pin	Function
1	+5V
2	-Data
3	+Data
4	Ground

Mechanical Drawing



Specifications

Power Requirements 24 VAC ±10% 10 VA 47–63 Hz or 24 VDC ±10% 6 W

Operating Temperature 0°C to 60°C

Storage Temperature –40°C to 85°C

Relative Humidity 10–95%, non-condensing

Protection IP30

USB Port USB 2.0, Type A

Communication

Ethernet

EIA-485

Compliance
Protocols supported
Data rate
Physical layer
Cable length (max)
Port connector

IEEE 802.3
BACnet/IP
10 Mbps, 100 Mbps
10BASE-T, 100BASE-TX
100 m
Shielded RJ-45

ANSI/ASHRAE 135 (ISO 16484-5)
BACnet MS/TP
9.6, 19.2, 38.4, 57.6, 76.8, 115.2 kbps
EIA-485, 3-wire isolated
1200 m (or 1000 m if using 115.2 kbps)
5-pin removable terminal

LEDs

L (Link)	D (Duplex)
Green = 100 Mbps	Green = Full-duplex
Yellow = 10 Mbps	Off = Half-duplex
Flash = activity	Flash = Collision

Tx	Rx
Green = activity	Green = activity

Regulatory Compliance CE Mark; CFR 47, Part 15 Class A; RoHS
UL 508, C22.2 No. 142-M1987



Ordering Information

Model	RoHS	Description
BASRTLX-B	✓	High-performance BACnet router with diagnostic capabilities

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