BASrouter

BACnet® Multi-Network Router

User Manual

Firmware 3.0 and Later

CONTEMPORARY CONTROLS®

UM-BASRTB03-AA9

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Disclaimer

Contemporary Control Systems, Inc. reserves the right to make changes in the specifications of the product described within this manual at any time without notice and without obligation of Contemporary Control Systems, Inc. to notify any person of such revision or change.

> **WARNING — This is a Class A product as defined in EN55022.**
> **In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.**

Contents

1 Introduction

The BASRT-B is housed in a metal enclosure which is DIN-rail mountable. The router is powered from a 24 VAC/VDC source and it is fully web page configurable using a standard web browser. It is equipped with one *optically isolated* MS/TP port and one 10/100 Mbps Ethernet Auto-MDIX port. It is a rugged and compact BACnet multi-network router which provides versatile stand-alone routing between BACnet/IP, BACnet Ethernet (ISO 8802-3), and BACnet MS/TP networks. By being BTL-certified, full BACnet compliance is guaranteed by completed independent interoperability testing by BTL (BACnet Test Labs) and listings obtained for both B-RTR and B-BBMD device profiles.

The BASRT-B-U model, with its Country of Origin as USA 🏵️, is available for projects requiring products that comply with **USMCA rules**.

Enhanced Diagnostics are built in and accessible from router web page: BACnet MS/TP *"Status"* webpage with 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 BACnet networks.

The MS/TP port offers a 3-pin terminal block with a removable plug for the EIA-485 connection. Up to 254 master and slave devices can be addressed through this port — however, the attached segment can accommodate up to 31 full-load devices. MS/TP baud rates: 9600, 19200, 38400, and 76800 are supported.

The Ethernet port offers a shielded RJ-45 connector. Through auto-negotiation and Auto-MDIX, it automatically matches its duplex setting, data rate and communication pair usage to whatever is needed by the attached equipment. Thus, only a straight-through CAT5 cable is needed for connection.

DHCP IP Addressing when enabled from the web page, allows the BASrouter to obtain an IP address from a DHCP server on the network automatically. FIXED IP address is the default setting. DHCP setting should be used with caution when BBMD and FDR are enabled because of the dynamic IP addressing nature of the DHCP protocol. If you are unsure use FIXED IP setting.

Reset IP switch is the user-accessible momentary switch used to reset the IP address, subnet mask and gateway address to the factory defaults. Use a paper clip to press it for a few seconds while the router is powered and then power-cycle the router to restore IP address, subnet mask, gateway address and credentials to default values of:

IP Address	192.168.92.68
Subnet Mask	255.255.255.0 *(/24)*
Gateway Address	192.168.92.1
Username	admin
Password	admin

Three LEDs indicate operation:
Power LED glows green when 24V is provided to BASrouter.

Ethernet LED glows green for 100 Mbps link, yellow for 10 Mbps link, and the LED will flash to indicate network activity.

MS/TP LED flashes green when 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.

BBMD: A BACnet Broadcast Management Device (BBMD) within the router can be enabled to allow BACnet communication across routed IP networks, that is a network comprised of multiple IP subnets. If all IP devices use the same subnet, this functionality can be left disabled. The router also supports Foreign Device Registration.

Attention: Be cautious when using BBMD and FDR in conjunction with DHCP IP addressing. Depending on your DHCP server settings, obtained IP address may change. If you are unsure and need to use BBMD, use FIXED IP addressing in the BASrouter.

Each unit complies with Class A radiated and conducted emissions as defined by EN55022 and CFR 47, Part 15, and is intended for use in non-residential areas.

2 Specifications

2.1 Electrical

(Class 2 Circuits Only)

INPUT	DC	AC
Voltage (±10%):	24 V	24 V
Power:	2 W	4 VA
Frequency:	N/A	47–63 Hz

2.2 Environmental

Operating temperature:	–40°C to +75°C
Storage temperature:	–40°C to +85°C
Relative humidity:	10–95%, non-condensing

2.3 Mounting

TS-35 DIN-rail

2.4 Functional

	Ethernet	*MS/TP*
Physical Layer:	10BASE-T 100BASE-TX	*EIA-485*
Cable length limit:	100 m	*1200 m (for AWG 18)*
MS/TP Baud rate (bps):	9600, 19200, 38400, 76800	
MS/TP node limit:	254 devices total, 31 full-load devices per segment	
MS/TP LED:	flashing green = receive MS/TP activity	
Ethernet LED:	green = 100 Mbps yellow = 10 Mbps flashing = activity	

2.5 Regulatory Compliance

CE Mark; RoHS; CFR47, Part 15 Class A
UL508 and C22.2 No. 142-M1987: Industrial Control Equipment

2.6 Electromagnetic Compatibility

Each unit complies with Class A radiated and conducted emissions as defined by EN55022 and CFR 47, Part 15. This equipment is intended for use in non-residential areas.

> **WARNING — This is a Class A product as defined in EN55022.**
> **In a domestic environment this product may cause radio interference in which**
> **case the user may be required to take adequate measures.**

2.7   Connectors

3-pin (MS/TP) Pin Assignments

(Also displayed on product label)

Figure 1 — 3-pin Connector

RJ-45 (MDI Ethernet) Pin Assignments

1 TD +   3 RD +
2 TD –   6 RD –
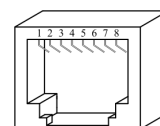
(All other pins are unused.)

Figure 2 — RJ-45 Connector

USB Mini B Connector (Aux)

This connector is only used for firmware upgrades.

Figure 3 — USB

EIA-485 Bias and Termination Jumpers

U   Install jumper to apply pull-up bias.
T   Install jumper to terminate bus.
D   Install jumper to apply pull-down bias.

(All jumpers are installed by default.)

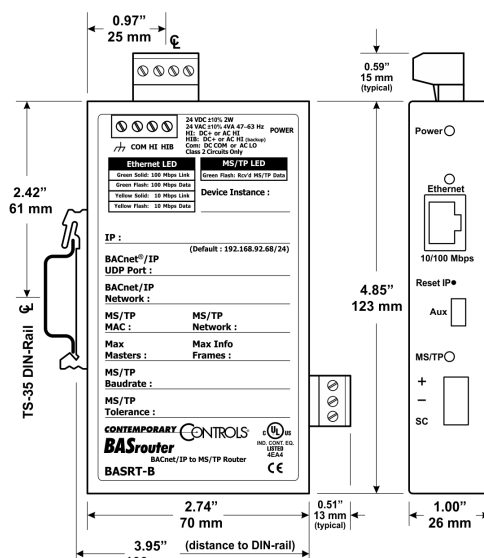**Figure 4 — Internal**

2.8   Mechanical

Figure 5 — Product Dimensions

3 Power

The BASRT-B requires 24 VAC or 24 VDC (see *Figure 6*) while drawing no more than 4 VA of power. The recommended conductor size is 16–18 AWG. COM is directly connected to zero volts and the chassis is DC isolated from zero volts. Input connections are reverse-polarity protected.
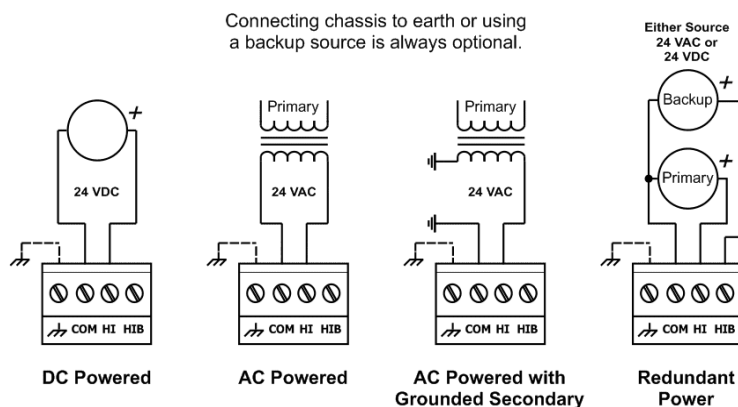

Figure 6 — Power Options

WARNING: Powering devices can present hazards. Read the following text carefully.

3.1   POWER SUPPLY PRECAUTIONS

Internally, the router utilizes a half-wave rectifier and therefore can share the same AC power source with other half-wave rectified devices. Sharing a common DC power source is also possible. Sharing AC power with full-wave rectified devices is <u>NOT</u> recommended. Full-wave rectified devices usually require a dedicated AC power source that has a secondary elevated above ground. Both secondary connections are considered HOT.

AC power sources that power several half-wave devices have a common secondary connection called either COMMON, LO, or GROUND. This connection might be tied to frame ground or earth. The other side of the secondary is considered the HOT or HI side of the connection. Connect the HOT side of the secondary to either the HI or the HIB input on the router and the LO side to COM on the router. All other half-wave devices sharing the same AC power source need to follow the same convention. When using a DC power source, connect the positive terminal of the source to either the HI or the HIB input and the negative terminal to COM on the router. Reversing polarity to the router will not damage the router. If shielded cable is used, it is recommended to tie all shield segments together and connect one of the shield ends to chassis while taping back the other.

For MS/TP devices that share a power source with the BASRT-B, see *Figure 7* for proper 2-wire bus connections and *Figure 8* for proper 3-wire bus connections.

WARNING: Devices powered from a common AC source could be damaged if a mix of half-wave and full-wave rectified devices exist. If you are not sure of the type of rectifier used by another device, do not share the AC source with it.
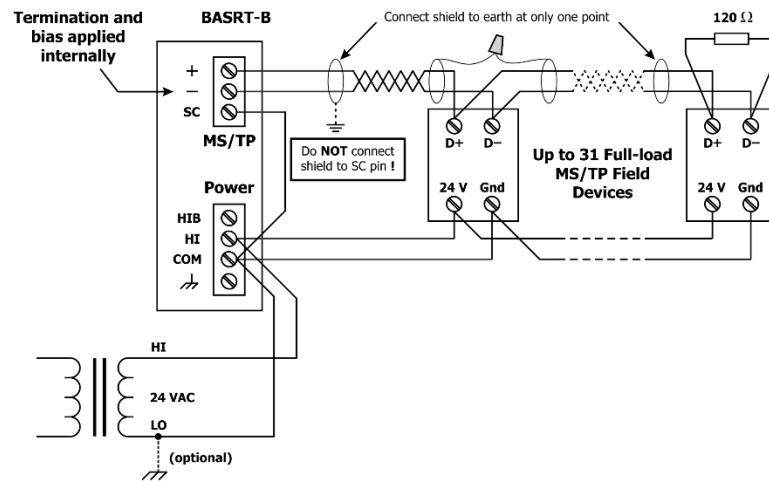
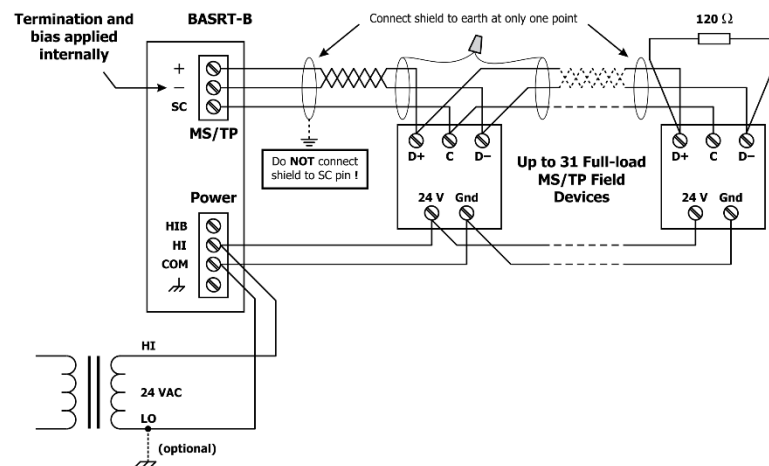*Figure 7 — 2-wire MS/TP Bus with Shared Power Source*

Figure 8 — 3-wire MS/TP Bus with Shared Power Source

For MS/TP devices that use a power source separate from the BASRT-B, see *Figure 9* for proper 2-wire bus connections and *Figure 10* for proper 3-wire bus connections.
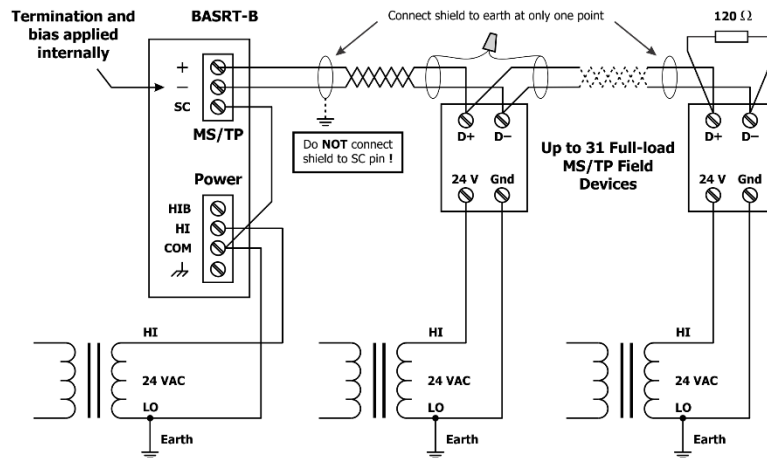

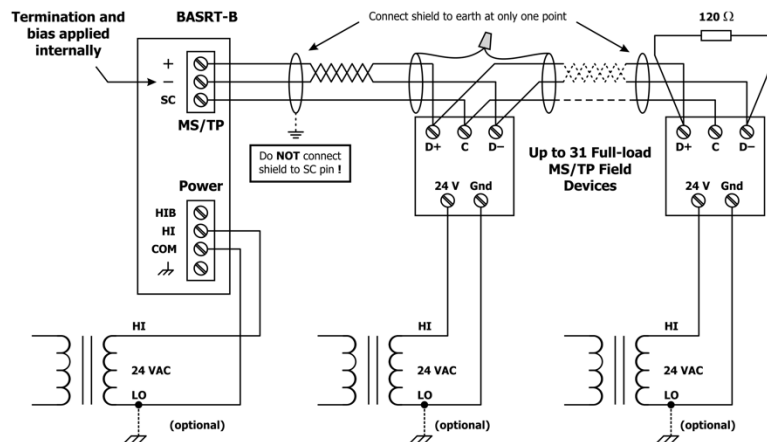
Figure 9 — 2-wire MS/TP Bus with Separate Power Sources

Figure 10 — 3-wire MS/TP Bus with Separate Power Sources

3.2   Limited Power Sources

The router should be powered by a limited power source complying with the requirements of the National Electric Code (NEC) article 725 or other international codes meeting the same intent of limiting the amount of power of the source. Under NEC article 725, a Class 2 circuit is that portion of the wiring system between the load side of a Class 2 power source and the connected equipment. For AC or DC voltages up to 30 volts, the power rating of a Class 2 power source is limited to 100 VA. The transformer or power supply complying with the Class 2 rating must carry a corresponding listing from a regulatory agency such as Underwriters Laboratories (UL).

4 LEDs

Power LED glows green when proper power is provided to BASrouter.
Ethernet LED glows green for 100 Mbps link, yellow for 10 Mbps link, and the LED will flash to indicate network activity.
MS/TP LED flashes green when 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.

5 Operation

5.1   MS/TP Port

The MS/TP port uses an optically isolated EIA-485 transceiver connected to a 3-pin removable connector (*Figure 1*). The transceiver + and – lines tie to + and – pins of the connector. The *SC* pin ties to the transceiver ground. *You MUST connect the SC pin to the MS/TP segment signal common —* **or MS/TP communication will fail!**

In *Figure 11* a simplified schematic of the isolated EIA-485 transceiver is shown. Notice that the transceiver common (*SC*) is electrically isolated from the router power supply common (*COM*) through the use of opto-isolators and an isolated DC-DC converter. An isolated EIA-485 transceiver offers less chance of damage to the transceiver from high common-mode voltages, but there is still a risk. Surge suppression is applied between the two differential inputs and between each input and ground. Since the transceiver is electrically isolated, the transceiver circuit common must be brought out for connection to the other devices on the MS/TP network. This is accomplished by pin *SC*. The differential pair is labelled + and – and corresponds to the same designations in the BACnet MS/TP standard. This requires a three-wire connection to the MS/TP network. Connecting other isolated MS/TP devices is no problem since each device requires a 3-wire connection. Just make corresponding connections. For non-isolated MS/TP devices, usually only a 2-wire connection is provided. The third wire is the power supply common. In this situation, the *SC* connection **MUST** be made to the power supply common of the non-isolated device. Refer to the device vendor instructions for connecting such a device.

In a router application where one connection is made to Ethernet and the other to MS/TP, the location of the router is probably at the end of the MS/TP bus segment and therefore both bias and termination must be applied to the segment end. The router is shipped with bias and termination applied, but this can be changed by removing three jumpers inside of the case. This should be done if the router is to be connected anywhere between the end MS/TP devices.
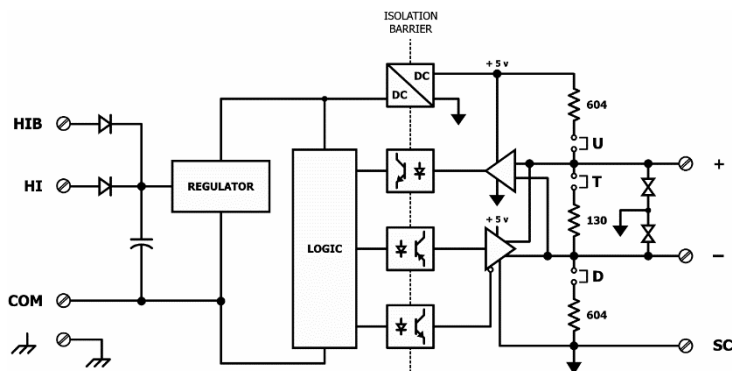

Figure 11 — Isolated EIA-485 Transceiver Circuitry

The router can address 254 MS/TP devices and supports 31 full-load devices on the EIA-485 bus at rates of 9600, 19200, 38400, or 76800 bps.

5.1.1   EIA-485 Bias and Termination Jumpers

After removing the BASRT-B cover, three jumpers are accessible on a 6-pin jumper block located near the MS/TP connector. These impart 604 ohms of pull-up and pull-down bias at jumpers U and D, and 130 ohms of termination impedance for the T jumper. With all three jumpers installed, the effective termination resistance is 120 Ω — consistent with the BACnet standard. If the BASRT-B is not installed at the end of a segment, remove all the jumpers and install 120 Ω at the far end of the bus.

U   Install jumper to apply pull-up bias.
T   Install jumper to terminate bus.
D   Install jumper to apply pull-down bias.

(all jumpers are installed by default)

5.2   Ethernet Port

This port offers a shielded RJ-45 connector. Through auto-negotiation and Auto-MDIX, it automatically matches its duplex setting, data rate and communication pair usage to whatever is needed by the attached equipment. Thus, any CAT5 cable (cross-over or straight-through) may be used to connect to the Ethernet port.

5.3   Reset IP Switch

The Reset IP switch is located on the front, underneath RJ-45 connector. To reset the router to its default values (except for configuration settings), press and hold the Reset IP button using a paper clip for at least 3 seconds while the router is powered. Remove power and restore power again to complete the reset IP, User ID, and Password procedure to factory-programmed default values as shown below. Default *User Name* is **admin** and default *Password* is **admin**.

6 Webpage Configuration

The BASrouter contains an interactive web server accessible from any Internet-compatible PC on the local network with recent versions of most standard web browsers such as Microsoft Internet Explorer, Microsoft Edge, Mozilla Firefox, or Google Chrome installed. It is factory-programmed with a default fixed IP address of **192.168.92.68** and a Class C subnet mask of **255.255.255.0 (/24)**. The default login credentials for the web page are **admin** / **admin**.

Figure 12 shows the setup for initial network configuration. Using BASRT-B, a computer for configuration, and a connection to the MS/TP network.

To configure the router, connect it to a computer with an Ethernet cable and use a standard web browser. For initial configuration, the PC chosen for the procedure should temporarily have its IP address modified to match the default subnet of the BASrouter as described on page 15.

The IP configuration example suggests an IP address of 192.168.92.**69** for the PC, but the final octet of the address could be any value from 3 to 254 — except for **68** which is used by the router. After the IP address of the PC has been set to the same subnet as the BASrouter, a standard web browser can access the BASrouter's web page.
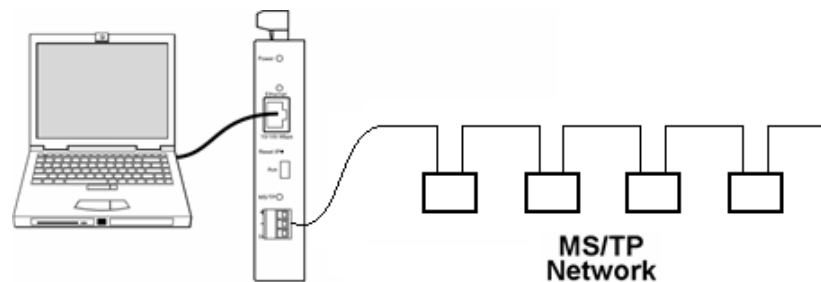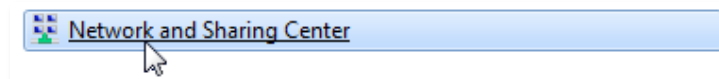

Figure 12 — Setup for Initial IP Address Configuration

To set your computer's IP static address in Windows 7 or Windows 8.x or Windows 10:

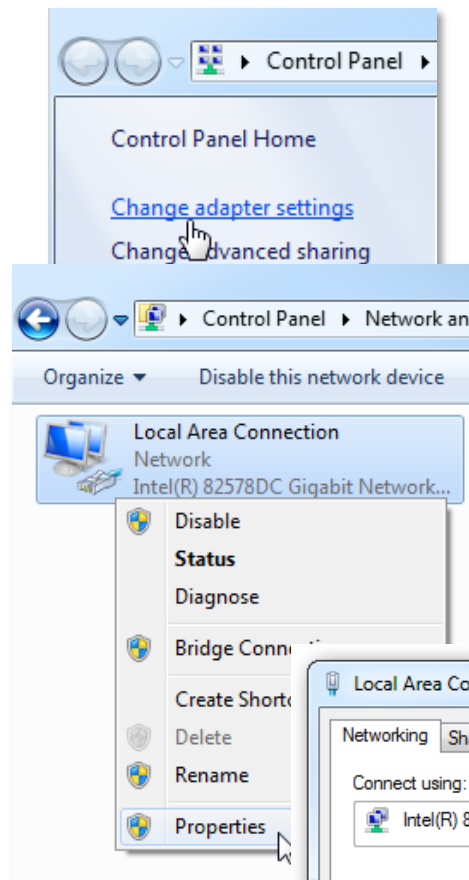1. Type *network and sharing* into the search box in the Start Menu

2. Select **Network and Sharing Center** (which could also be found in Control Panel)
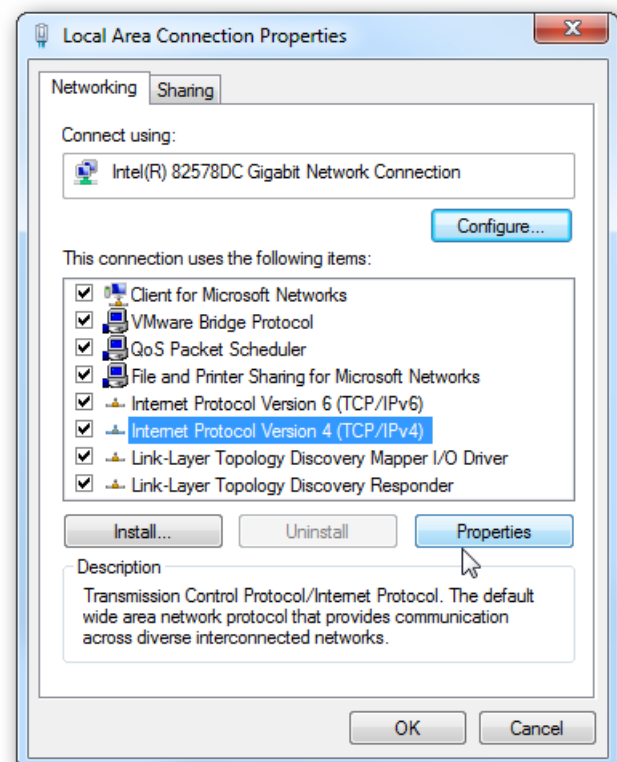

3. Click on **Change adapter settings**


4. Right-click on your network adapter and chose **Properties**

5. In the Local Area Connection Properties window highlight **Internet Protocol Version 4 (TCP/IPv4)** then click the **Properties** button.

6. Your computer was most likely set for DHCP (*Obtain an IP address automatically*) select the radio button **Use the following IP address** and enter in 192.168.92.**69** (for example) in **IP address**. Click on **Subnet mask** and 255.255.255.0 will be entered for you automatically. For **Default gateway** enter 192.168.92.1. Click **OK** and your network adapter IP address has been set.

To set your computer's IP static address in Windows XP:
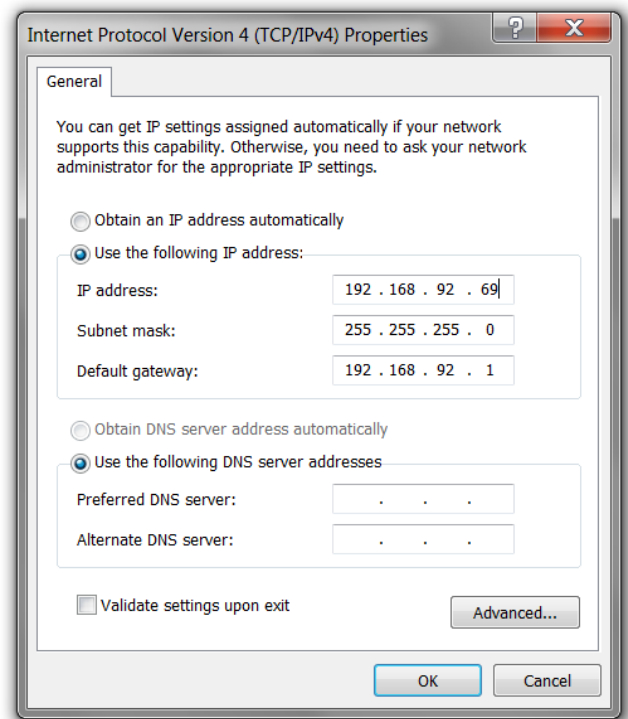
1. Click **Start Menu**

2. Select **Network Places**

3. Click on **View network connections**

4. Open **Local Area Connection**

5. Choose **Properties**

6. Double-click to open **Internet Protocol (TCP/IP)** settings

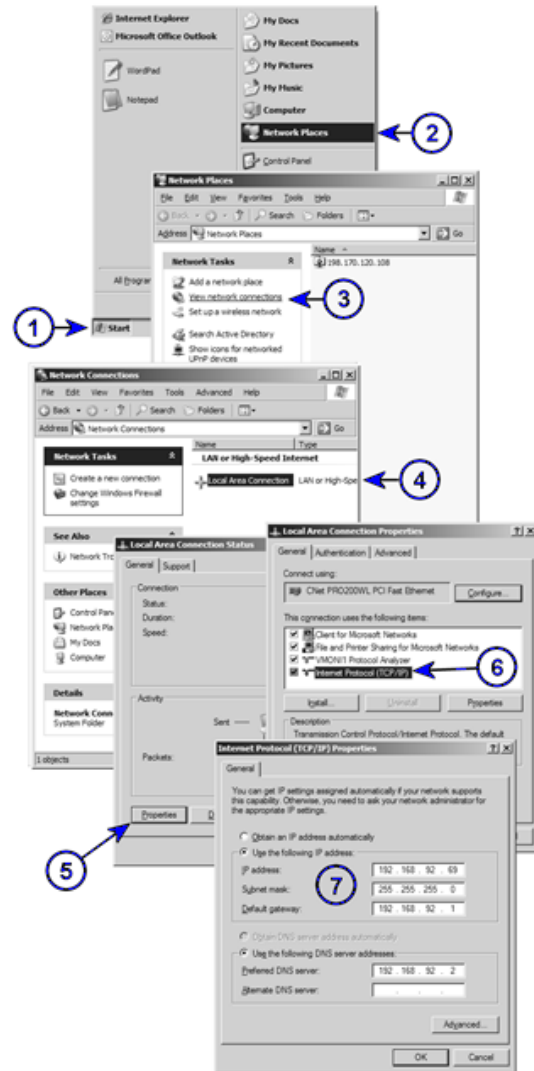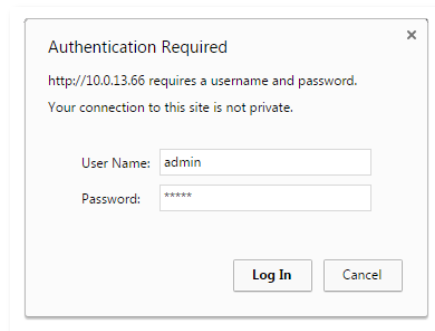7. Select **Use the following IP address**

Figure 13 — Steps for Changing the IP Address of the PC Used for Setup

After entering the router's IP address into your browser's address field, you will see the Authentication Screen of *Figure 14*.
The default value of both the User Name and Password is *admin*

Figure 14 — Router Authentication Screen

After successfully logging in, the main - Router Configuration web page is loaded. This page allows for setting up router parameters.

Figure 15 — Router

Configuration Web Page

Web page navigation

The BASrouter has a navigation bar at the top of the web page which can be used to navigate through all its configuration, advanced settings, status, bdt and fdt tables, and security tabs.
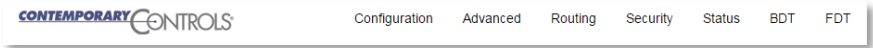
In addition, a dedicated button for each configuration item is placed on the main web page adjacent to the configuration fields:

| Advanced | Status | Routing Table | Security |

Each configuration parameter is explained on the following pages. When **Save Changes** button is clicked, the parameters are stored to non-volatile memory, the unit will automatically reboot (in a few seconds) and the changes will take effect. Advanced, Status and Security screens used to access status and more configuration are discussed in *Section 8*.

6.1 Device Parameters

6.1.1 Device Name (Default Value = *BASRT-Bxxxxxx*)

The BASrouter's Device Object Name can be configured in this field. It is required to be unique throughout the BACnet network. It can be up to 20 characters and defaults to a unique name of the form BASRT-B*XXXXXX* — where the *X*s are replaced with the final six characters of the router's Ethernet MAC address.

6.1.2 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 BASRT-B.

6.1.3 Device Location (Default Value = location)

The Device Location can be configured in this field.

6.2 BACnet Ethernet (0 disables BACnet Ethernet)

6.2.1 Ethernet Network (Default Value = 0)

Most BACnet communication that is carried by Ethernet uses the *BACnet/IP* protocol. However, there are still instances in which the older *BACnet Ethernet* protocol (ISO 8802-3) is found. The BASRT-B allows these two protocols to communicate.

BACnet Ethernet uses *Ethernet MAC addresses* for station addressing — unlike BACnet/IP which addresses messages by means of *Internet Protocol (IP) addresses*. Each Ethernet MAC address (often called the *physical* address) is unique to the Ethernet network adapter. It is permanently embedded into the adapter during manufacture and cannot be changed. It is composed of six two-digit *hexadecimal* numbers (00–FF). An example of an Ethernet MAC address is:

```
00-50-DB-00-79-EE
```

Each Ethernet network adapter has the ability to store an IP address that is *changeable*. This IP address is typically represented as four *decimal* values (each is 0–255) separated by dots. Often called the *dotted quad format*, an example is:

192.168.92.1

NOTE: Although they may share the same Ethernet physical network, BACnet Ethernet devices as well as BACnet/IP devices must have their own unique network number and these two networks *cannot communicate unless their messages pass through a router*. These network numbers must be in the range of 1–65534 (0 and 65535 are reserved). If the BACnet Ethernet network value is left at its default value of 0, the BACnet Ethernet function within the BASRT-B **will be disabled**. Also, to prevent erratic traffic due to message loops, **an IP subnet must have only one router enabled for BACnet Ethernet! If you aren't using BACnet Ethernet, leave this value at 0.**

6.3   BACnet/IP Parameters

6.3.1   BACnet/IP UDP Port (Default Value = 0xBAC0)

This 16-bit hex value (BAC0–BACF) is set to BAC0 by default. Usually, this default value should not be changed. In typical networks, each BACnet/IP device will use the same UDP port.

6.3.2   BACnet/IP Network (Default Value = 1)

Like all networks in the BACnet internetwork, the BACnet/IP network must have a unique number (1–65534). Do not use addresses 0 or 65535 since these addresses are reserved. **This value must <u>NOT</u> be the same as MS/TP network number.**

6.3.3   IP Assigned By (Default Value = FIXED)

The default IP address of the BASrouter is FIXED but can be obtained automatically from a DHCP server or can be set to a FIXED (static) IP address.

6.3.4   IP Address (Default Value = 192.168.92.68)

The IP address of the router can be 1.0.0.1–223.255.255.254. A private address is usually assigned to the BASRT-B.

6.3.5   IP Subnet (Default Value = 24)

This value (0–31 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.

6.3.6   IP Gateway (Default Value = 192.168.92.1)

The default gateway for the IP stack is a dotted decimal number in the range of 1.0.0.1–223.255.255.254. This will be the IP address of your local IP router — if one exists.

6.4   MS/TP Parameters

6.4.1   MS/TP MAC (Default Value = 00)

This is the unique 8-bit (0–127) MAC address of the router's MS/TP port, in decimal. Lower MAC address numbers are preferred with the default recommended. It is further recommended that all other BACnet devices attached to the same MS/TP network be assigned consecutive MAC addresses beginning with 1 without allowing any gaps in addressing. Slave devices may have MAC addresses of 128–254, but MAC address 255 is reserved.

6.4.2   MS/TP Network (Default Value = 2001)

This 16-bit decimal network number (1–65534) must be unique for all BACnet networks within the BACnet internetwork. No other networks, regardless of type, can have the same network number. Do not use addresses 0 or 65535 since these are reserved. **Make sure the MS/TP network number does not match the BACnet/IP network number. They must be different.**

6.4.3   Max Masters (Default Value = 127)

Only master nodes participate in the MS/TP token-passing process. The highest master MAC address (in decimal) in the MS/TP network is 127 and you should use 127 if you are unsure of other MS/TP device addresses. Each MS/TP device should use this same value. For a value in this field to be proper, it must equal or exceed the highest MAC address for any master on the network. Optimum performance occurs when this value:

> *equals* the highest MAC address of any master, and
> all masters use *sequential* MAC addresses starting with 1

Since many BACnet devices do not allow this parameter to be changed, leave the BASRT-B at the default value.

6.4.4   Max Info Frames (Default Value = 100)

This is the maximum number of messages that can be routed onto the MS/TP network by the router per token pass. Its range is 1–100, and typical values are 20–40. Smaller values provide less access to the MS/TP network from the BACnet/IP network because they give native MS/TP messages higher priority than those passed by the router from BACnet/IP. The default value usually provides good performance.

6.4.5   MS/TP Baud Rate (Default Value = 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. On power up, as the router polls for other masters, autobauding devices adjust to its baud rate.

6.4.6   MS/TP Tolerance (Default Selection = Strict)

This setting determines the degree to which interoperability with devices is successful. The Lenient option is less efficient for traffic flow but optimises interoperability. When using *Lenient* the BASrouter will wait longer for devices to respond to a poll for master request. A slight improvement in performance will be realized by selecting the *Strict* setting.

7. Firmware Updates

Firmware upgrades are not necessary. If a firmware upgrade is required, please contact our technical support for more information at our website and click on the "Support" tab.

https://www.ccontrols.com/basautomation/basrouter.php

8. Advanced Features and Diagnostics

8.1　Advanced Configuration Page

The BACnet discovery process uses *broadcast* messages, but broadcasts are blocked by IP routers. To deal with subnets, or routed IP networks, a BACnet/IP Broadcast Management Device (BBMD) must be used.

You may deploy the BASRT-B in a situation in which BACnet communication is confined to just one IP subnet. In such a case, advanced configuration is normally not needed. But if you are dealing with more than one IP subnet, you will need the BBMD functionality offered in the advanced configuration screen shown in *Figure 16*.

To implement BBMD in your router, select the *BBMD Enable* checkbox in the upper section of the screen (NOTE: If this box is not checked, you will get a **blank screen** when you attempt to view *Figure 17 or 18*). Unless your router must deal with multiple IP networks, in the *BBMD UDP Port* drop-down menu accept the "Primary" default setting.

Warning: If you enable BBMD when it is not needed, the router will attempt to find devices that are not present and thus traffic flow will be impaired, and communication will suffer.

If the BASrouter is used to route between two BACnet/IP networks, the *Secondary BACnet/IP UDP Port* and *Secondary BACnet/IP Network* numbers must be entered.

When the BASrouter is used in a NAT environment and its local IP address is non-routable (for example, 192.168.x.y) and it is communicating with BACnet devices on the other side of the NAT firewall, the *Public IP Address* is used in the Forwarded-NPDU IP Address field. The NAT router must be configured such that communications to the NAT router on the Secondary BACnet/IP network port are port forwarded to the BASrouter. The *Public IP Address* of the BASrouter should be set to the public IP address of the NAT router.

Figure 16 — The Advanced Configuration Screen

If you click the *Broadcast Distribution Table* (BDT) button, the screen of *Figure 17*. appears (if the *BBMD Enable* box is checked). Enter the IP addresses of all BBMD devices to which the BASrouter will communicate. ***Do not include the BASrouter's own IP address.*** Normally you will set the Broadcast Distribution Mask (BDM) to 255.255.255.255. If the BASrouter will communicate through an IP router which can forward broadcasts, then set the BDM to the subnet mask assigned to the destination subnet.

Figure 17 — The Broadcast Distribution Table

If you click the button labelled *Foreign Device Registration* (FDR), the screen shown in *Figure 18* appears (unless you have not checked the *BBMD Enable* box). This screen will report all devices that have registered with the BASRT-B as Foreign Devices and how long they will remain registered unless a re-registration occurs.

Figure 18 — Foreign Device Registrations

8.2 Status Screen

The *Status* screen is always operational as long as the BASrouter is powered. It consists of *MSTP Device Status* table, *Network Errors* count, and *Statistics* on BACnet networks to which the 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 BASrouter). These statistics are retained over time, unless the 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. To clear the *MSTP Device Status* table, along with all other *Status* page parameters, press the "*Save Changes*" button on main web page which will reboot the router. If the unit is powered off, *Status* page parameters will be reset.

MSTP Device Status is a graphical table of the BACnet MS/TP device MAC addresses on the attached EIA-485 physical segment. Devices are identified by their MAC address and coloured as:

ONLINE – Green square
OFFLINE – Gray square
ROUTER – Blue square

The *MSTP Device Status* table will be updated at the same 5-second refresh rate as the *Status* page. If changes to the network are made while the BASrouter is operating on the network (such as MS/TP device MAC addressing, powering devices on/off, or rewiring the physical segment), it may take 2 or more refresh cycles, or until the bus has stabilized, to update the MS/TP device table properly. If a MAC address is altered while the BASrouter is operating on the network, it will report the device's old MAC as OFFLINE and its new MAC address as ONLINE in the next refresh cycle (5 seconds). In addition, if network or physical layer changes are made while the BASrouter is operating on the network, the *Network Errors* count may increment slightly or dramatically (depending on the changes) due to improper communication while the bus is in an unstable condition. Once you think you have stabilized the MS/TP bus, reset all statistics and monitor the network for a period of time to ensure device online status, proper MAC addressing, and that no more network errors are being generated.

Network Errors count provides an accumulating count of BACnet MS/TP network errors such as: invalid frames, partial frames, bad CRC, wrong data length, or silence timer greater than 100ms. This count will keep incrementing if there are present MS/TP network issues until the error conditions on the MS/TP bus are resolved. If this number is high but not continuously incrementing, reset the count and observe if new errors are being generated. If no new errors are being generated over several refresh cycles, it is a good sign that the MS/TP network is in stable condition.

Network errors may have many sources. For example, devices powering up/down or having their configuration changed, bias/termination issues, cabling issues, etc. Considering this, it is best to wire up the physical layer, power on all devices and then use the "*Reset Statistics*" button to clear any errors which may have been caused by these initial conditions. After resetting the *Network Errors* count monitor it and make sure that it does not increment. If the *Network Errors* count does not increment while the BASrouter is operational on the network, no new errors are detected by the BASrouter.

If error count is reset with "*Reset Statistics*" button, but *Network Errors* count keeps incrementing, that is a sign that the network isn't stable and network errors are present on the MS/TP bus.

The *Statistics* portion of the *Status* page depicted in *Figure 19* below reports the traffic of the various protocols handled by the BASRT-B including the number of messages transmitted and received for each network. Packet counts only increment for protocols in use. "BIP 1" is the primary BACnet/IP port and "BIP 2" is the secondary port.

Figure 19 — Statistics

After the packet counts the instantaneous state of some router MS/TP values is displayed. These are documented in the MS/TP portion of the BACnet standard — with the following parameters being noteworthy:

"RFSM" is the current *Receive Frame State Machine* state.

"MNSM" is the current *Master Node State Machine* state.

"Next Station" is the MS/TP MAC address of the device to which the router will next pass the token. This value may change if devices leave or enter the network — and when the router searches for devices on the network, as per the BACnet MS/TP standard.

If this value does not change from the BASrouter's own mac address while connected to the MS/TP bus, the BASrouter is not finding any other MS/TP devices on the network.

The Status Screen refreshes automatically — so you can watch the router MS/TP state change and gain insight into the condition of the MS/TP network (as seen by the router). For example, if "MNSM" always reports SoleMaster or PollForMaster, after repeated refreshes, then the router cannot communicate with any MS/TP devices.

"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.
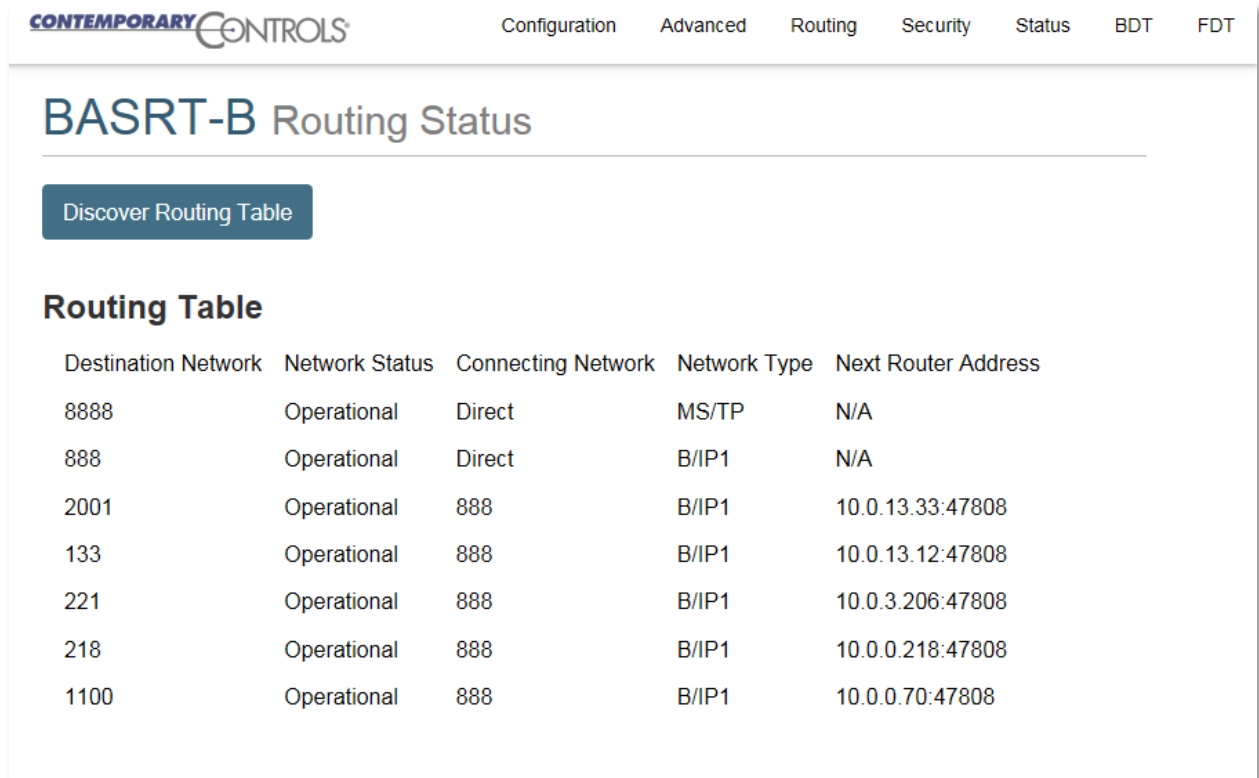
"RX Token Count" is the number of tokens received.

"Invalid Long Frames" is the number of frames received which have a length longer than allowed.

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

8.3 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 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

BASRT-B Routing Status

[Discover Routing Table]

Routing Table

Destination Network	Network Status	Connecting Network	Network Type	Next Router Address
8888	Operational	Direct	MS/TP	N/A
888	Operational	Direct	B/IP1	N/A
2001	Operational	888	B/IP1	10.0.13.33:47808
133	Operational	888	B/IP1	10.0.13.12:47808
221	Operational	888	B/IP1	10.0.3.206:47808
218	Operational	888	B/IP1	10.0.0.218:47808
1100	Operational	888	B/IP1	10.0.0.70:47808

Destination Network shows the routing destination network number of routers on the BACnet internetwork.

Network Status indicates the status of the network.

Connecting Network is the network which is shared with the BASrouter. If it is a BACnet/IP network on the same UDP port, or an MS/TP network on the same physical segment and MAC domain, its network number will be displayed. "*Direct*" is the BASrouter's own (directly connected) BACnet network(s).

Network Type is the type of networks seen by the BASrouter. It could be a BACnet/IP on Primary or Secondary UDP ports (B/IP1 or B/IP2), BACnet MS/TP, or BACnet Ethernet network.
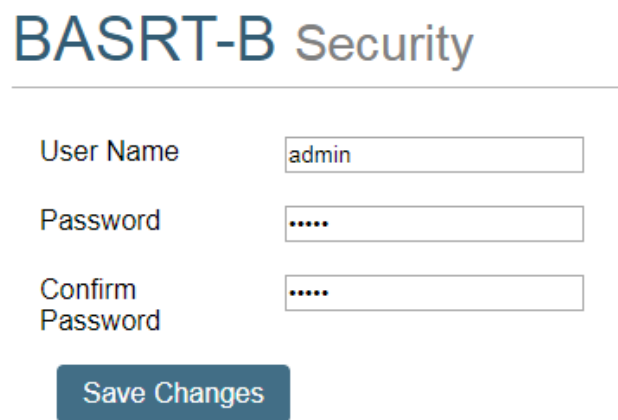
Next Router Address shows the discovered BACnet routers' addresses.

If you want to make sure the routing table is updated, simply click the *"Discover Routing Table"* button again.

8.4 Security Screen

The Security Screen of *Figure 20* displays the default *User Name* which is "**admin**". The default *Password* is also "**admin**".

The default login credentials must be changed before the System configuration on BASrouter can be altered. Please change the Password to a 8-10 character alpha-numeric value (at least one letter and one number). This ensures only authorized access to the router. User Name can be values between 1 and 10 characters in length.

Figure 20 — Security Screen

9 Warranty

Contemporary Controls (CC) warrants this product to the original purchaser for two years from the product shipping date. Product returned to CC for repair is warranted for one year from the date the repaired product is shipped back to the purchaser or for the remainder of the original warranty period, whichever is longer.

If the product fails to operate in compliance with its specification during the warranty period, CC will, at its option, repair or replace the product at no charge. The customer is, however, responsible for shipping the product; CC assumes no responsibility for the product until it is received.

CC's limited warranty covers products only as delivered and does not cover repair of products that have been damaged by abuse, accident, disaster, misuse, or incorrect installation. User modification may void the warranty if the product is damaged by the modification, in which case this warranty does not cover repair or replacement.

This warranty in no way warrants suitability of the product for any specific application. IN NO EVENT WILL CC BE LIABLE FOR ANY DAMAGES INCLUDING LOST PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT EVEN IF CC HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY PARTY OTHER THAN THE PURCHASER.

THE ABOVE WARRANTY IS IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED OR STATUTORY, INCLUDING THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE OR USE, TITLE AND NONINFRINGEMENT.

10   Returning Products for Repair

Return the product to the location where it was purchased by following the instructions at the URL below:

www.ccontrols.com/rma.htm

11   Declaration of Conformity

Additional compliance documentation can be found on our website.

www.ccontrols.com

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