

INSTALLATION GUIDE

INTRODUCTION

Modbus remains a popular network interface. It is commonly used with boiler control, variable speed drives, and metering applications — but these devices lack BACnet compliance. To make Modbus devices appear as individual BACnet devices, the BASgatewayLX is used. This device has one 10/100 Mbps Modbus TCP or BACnet/IP Ethernet port and an opto-isolated Modbus EIA-485 serial port for Modbus RTU or Modbus ASCII devices.

Up to 30 Modbus serial devices can share the unit's Modbus port and up to 1000 Modbus registers can be processed. The virtual routing feature in the BASgatewayLX allows each connected Modbus device to appear as an individual BACnet-compliant device. What is needed is a device profile for each Modbus type device. Contemporary Controls maintains a library of common device profiles. If one is not available, Contemporary Controls will provide it upon request. Custom device profiles can be uploaded to the gateway.

Using web pages and a resident database of common Modbus device profiles, Modbus registers from Modbus Serial devices can be mapped to BACnet objects.

Gateway Functionality Between ...

- Modbus Serial (RTU or ASCII) to BACnet/IP
- Modbus TCP and BACnet/IP

Routing Functionality Between...

- Modbus Serial (RTU and ASCII) and Modbus TCP

Flexible Communication Ports

- 10/100 Mbps Ethernet with auto-negotiation and Auto-MDIX
- Opto-isolated serial port supports either 2-wire or 3-wire EIA-485
- Jumper-selectable EIA-485 bias and termination
- Baud rates from 2.4–115.2 kbps

Convenient Installation

- 24 VAC/VDC powered
- DIN-rail mounting

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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.

SPECIFICATIONS

Electrical ($\pm 10\%$)

	DC	AC
Input voltage:	24 V	24 V
Input power:	6 W	10 VA
Input frequency:	N/A	47–63 Hz

(Intended for use with Class 2 circuits only.)

Communications

	Ethernet	
Compliance	IEEE 802.3	
Protocols supported	Modbus TCP BACnet/IP	
Data rate	10 Mbps, 100 Mbps	
Physical layer	10BASE-T, 100BASE-TX	
Cable length	100 m (max)	
Port connector	Shielded RJ-45	
LEDs	L (Link)	D (Duplex)
	Green=100 Mbps Yellow=10 Mbps Flash=Activity	Green=Full-duplex Off=Half-duplex Flash=Collision

EIA-485

Modbus V1.02	
RTU Master	
ASCII Master	
2.4, 4.8 9.6, 19.2, 38.4, 57.6, 76.8, 115.2 kbps	
EIA-485, 3-wire isolated	
1200 m (max)	
5-pin removable terminal	
Tx	Rx
Green=Activity	Green=Activity

Protocol Compliance

BACnet/IP:	ASHRAE 135-2004, Annex J, B-ASC Profile
Modbus TCP: (modbus.org)	Modbus Appl. Protocol Spec. V1.1b, Dec. 28, 2006 Modbus Messaging on TCP/IP Impl. Guide V1.0b, Oct. 24, 2006
Modbus Serial: (modbus.org)	Modbus over Serial Line Spec. and Implementation Guide V1.02b, Dec. 20, 2006

Mounting *TS-35 DIN-rail*

Shipping Weight *1 lb. (.45 kg)*

Regulatory Compliance

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



TD100300-01D

Environmental

Operating temperature: 0°C to +60°C
Storage temperature: -40°C to +85°C
Humidity: 10% to 95%, non-condensing

Ethernet Connector Pin Assignments

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

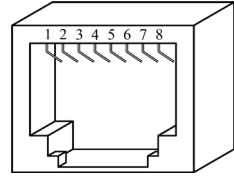


Figure 1 — RJ-45 Jack

USB Pin Assignments (USB 2.0, Type A)

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

(This connector is reserved for future use.)

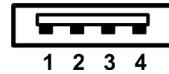


Figure 2 — USB Pins

EIA-485 Connector Pin Assignments

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

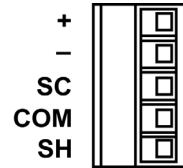


Figure 3 — EIA-485 Connector

EIA-485 Bias and Termination Jumpers (J5)

D Jumper Install jumper to apply pull-down bias.
T Jumper Install jumper to terminate bus.
U Jumper Install jumper to apply pull-up bias.
(All are installed by default.)



Figure 4 — EIA-485 Jumpers

Mechanical

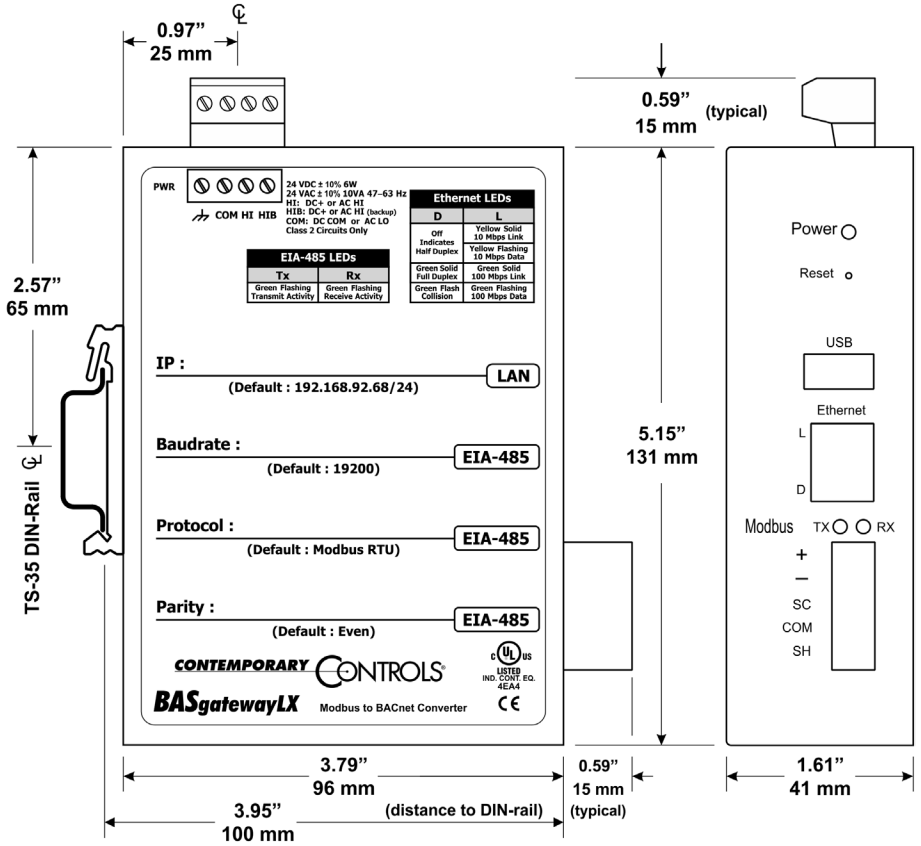


Figure 5 — Dimensional Drawing

POWER

The BASgatewayLX requires 24 VAC or 24 VDC and draws a commensurate amount of current. 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.

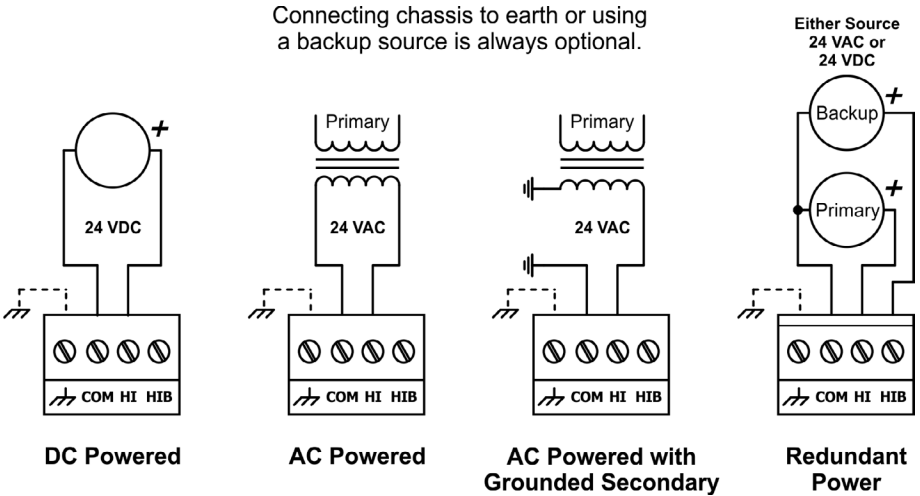


Figure 6 — Power Options

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

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.

For devices that share a power source with our product, see Figure 5 for proper 2-wire bus connections and Figure 6 for proper 3-wire bus connections.

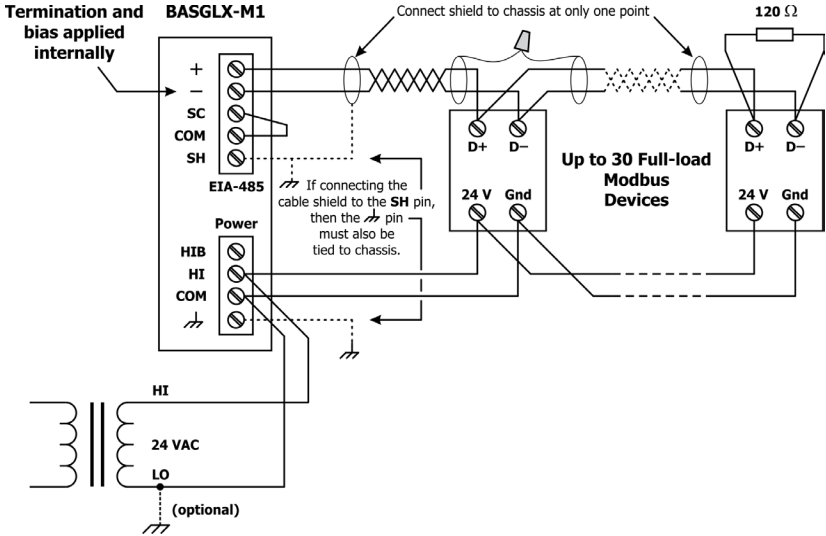


Figure 7 — 2-wire EIA-485 Bus with Shared Power Source

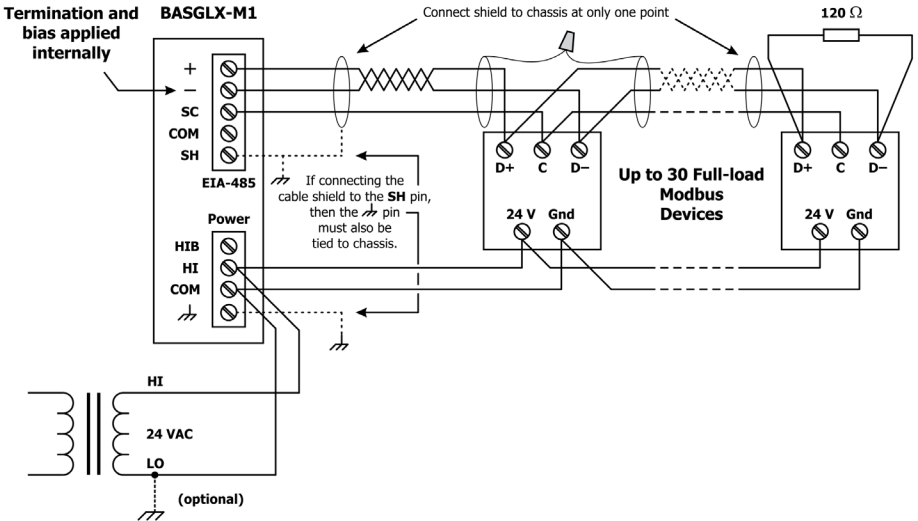


Figure 8 — 3-wire EIA-485 Bus with Shared Power Source

For devices that do not share power with our product, see Figure 7 for proper 2-wire bus connections and Figure 8 for proper 3-wire bus connections.

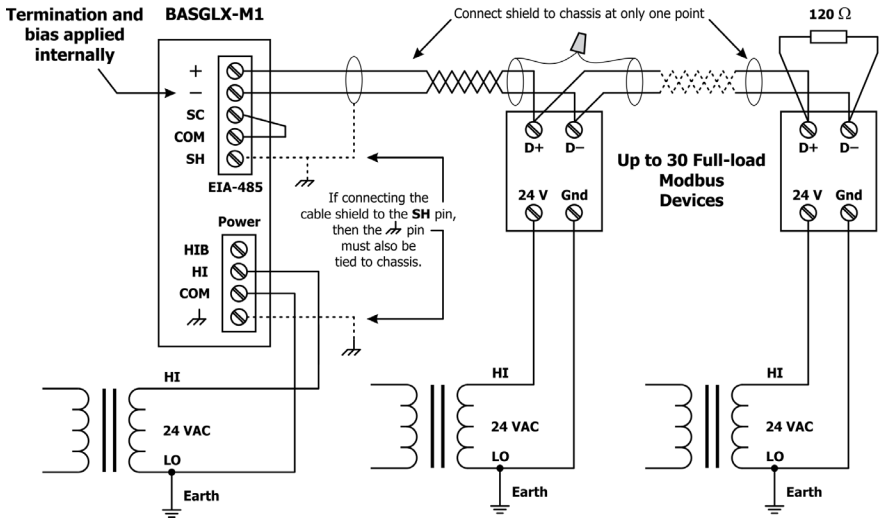


Figure 9 — 2-wire EIA-485 Bus with Separate Power Source

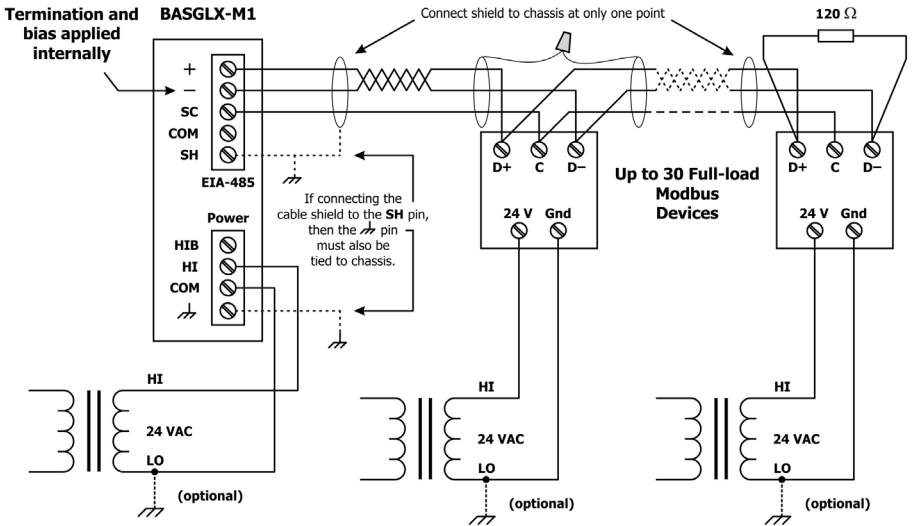


Figure 10 — 3-wire EIA-485 Bus with Separate Power Source

Limited Power Sources

The gateway should be powered by a limited power source complying with the requirements of the National Electric Code (NEC) article 725 or other international codes (SELV) 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).

LEDS

- Power* This LED is green if power supplied to the unit is proper.
- Ethernet* **L** glows green for a proper 100 Mbps link and yellow for a proper 10 Mbps link. It flashes to show activity.
- D** glows green for a full-duplex link and is off for a half-duplex link
- EIA-485* **Tx** flashes green when transmitting valid EIA-485 traffic.
- Rx** flashes green when receiving valid EIA-485 traffic.

RESET SWITCH

To reset the gateway to its default authentication and IP values (other configuration settings are unaffected), use a paperclip or similar tool to press the Reset IP button for at least 3 seconds while the gateway is powered. Then release the reset button and remove power from the gateway for 3 seconds. Restore power and the unit will now use default IP values and User ID/Password.

CABLING CONSIDERATIONS

When attaching cables to the unit, Table 1 should be considered.

Function	Signalling & Data Rate	Minimum Required Cable	Maximum Segment Distance
Ethernet	10BASE-T 10 Mbps	Category 3 UTP	100 m (328 ft)
Ethernet	100BASE-TX 100 Mbps	Category 5 UTP	100 m (328 ft)
Modbus	2.4–115.2 kbps	Belden® 9841, 3106A, 9842	1200 m (3937 ft)

Table 1 — Cabling Considerations

NOTE: If using shielded cable, connect to chassis at only one point. Wire size may be dictated by electrical codes for the area where the equipment is being installed. Consult local regulations.

Observe in Table 1 that 10BASE-T segments can successfully use Category 3, 4 or 5 cable — however, 100BASE-TX segments *must* use Category 5 cable. Category 5e cable is highly recommended as the minimum for new installations.

The Ethernet port of the gateway employs Auto-MDIX technology so either straight-through or crossover cables can be used to connect to the network.

MODBUS PORT

This port uses an isolated EIA-485 transceiver connected to a 5-pin removable connector. 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 Modbus segment signal common — *or EIA-485 communication will fail!*

In Figure 9 a simplified schematic of the isolated EIA-485 transceiver is shown. Notice that the transceiver common (SC) is electrically isolated from the gateway 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 EIA-485 network. This is accomplished by pin SC. The differential pair is labelled + and – and requires a three-wire connection to the EIA-485 network. Connecting other isolated EIA-485 devices is no problem since each device requires a 3-wire connection. Just make corresponding connections. For non-isolated EIA-485 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 an application where one connection is made to Ethernet and the other to EIA-485, the location of the gateway is probably at the end of the EIA-485 bus segment and therefore both bias and termination must be applied to the segment end. The product is shipped with bias and termination applied, but this can be changed by removing three jumpers. This should be done if the gateway is to be connected anywhere between the end EIA-485 devices.

The gateway can address up to 30 Modbus devices on the local bus at baud rates from 2.4 to 115.2 kbps.

EIA-485 Bias and Termination Jumpers

After removing the gateway cover, three jumpers are accessible on a 6-pin jumper block located near the EIA-485 connector. With all jumpers installed (default condition), this resistor network imparts to the bus approximately 245 mV of bias via the upper jumper (pull-up) and the lower jumper (pull-down), and 130 Ω of termination impedance with the middle jumper. With all three jumpers in place, the effective termination resistance is 120 Ω — consistent with the EIA-485 standard. It is recommended that the gateway be installed at the end of a segment — but if installed mid-span, remove all the jumpers and install 120 Ω resistors at each far end of the bus. If no bias source is available for the bus, apply the gateway's internal bias by installing the outer jumpers while leaving the inner jumper location vacant.

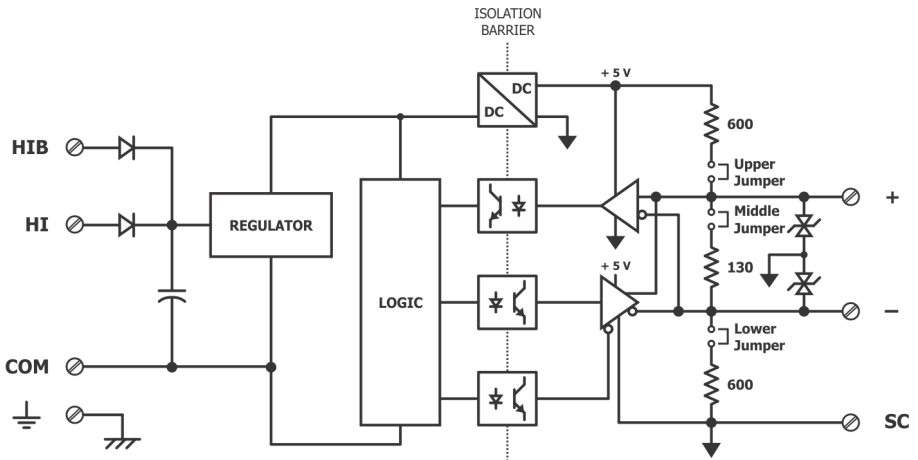


Figure 11 — Internal Termination and Bias

WEBPAGE CONFIGURATION

Each BASgatewayLX contains an interactive web server, accessible from any Internet-compatible PC on the local network and compatible with recent versions of Internet Explorer (5.0 or later, suggested) or Netscape Navigator (7.1 or later, required). It is factory-programmed with a default IP address of 192.168.92.68 and a Class C subnet mask of 255.255.255.0 (/24).

Figure 10 shows the setup for accessing the EIA-485 network using BASgatewayLX, a computer for configuration, and a connection to the EIA-485 network.

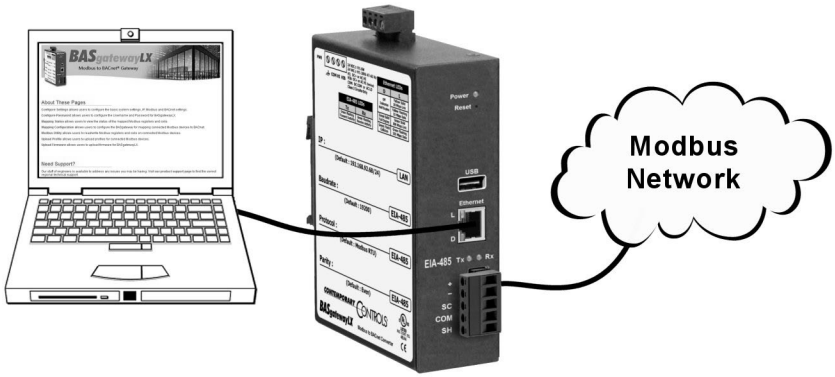


Figure 12 — Setup for Initial IP Address Configuration

To configure the BASgatewayLX, attach it to a computer with an Ethernet connection and a standard web browser. For initial configuration, the PC chosen for the procedure should **temporarily** have its IP address modified as illustrated in Figure 11 — which employs a Windows® XP example.

The example in Figure 11 suggests an IP address for the PC of 192.168.92.69, but the final quad of the address could be any value from 3 to 254 — except for **68** which is used by the BASgatewayLX. After the IP address of the PC has been set to the same subnet as the BASgatewayLX, a browser running on that PC can then access the device via its default IP address.

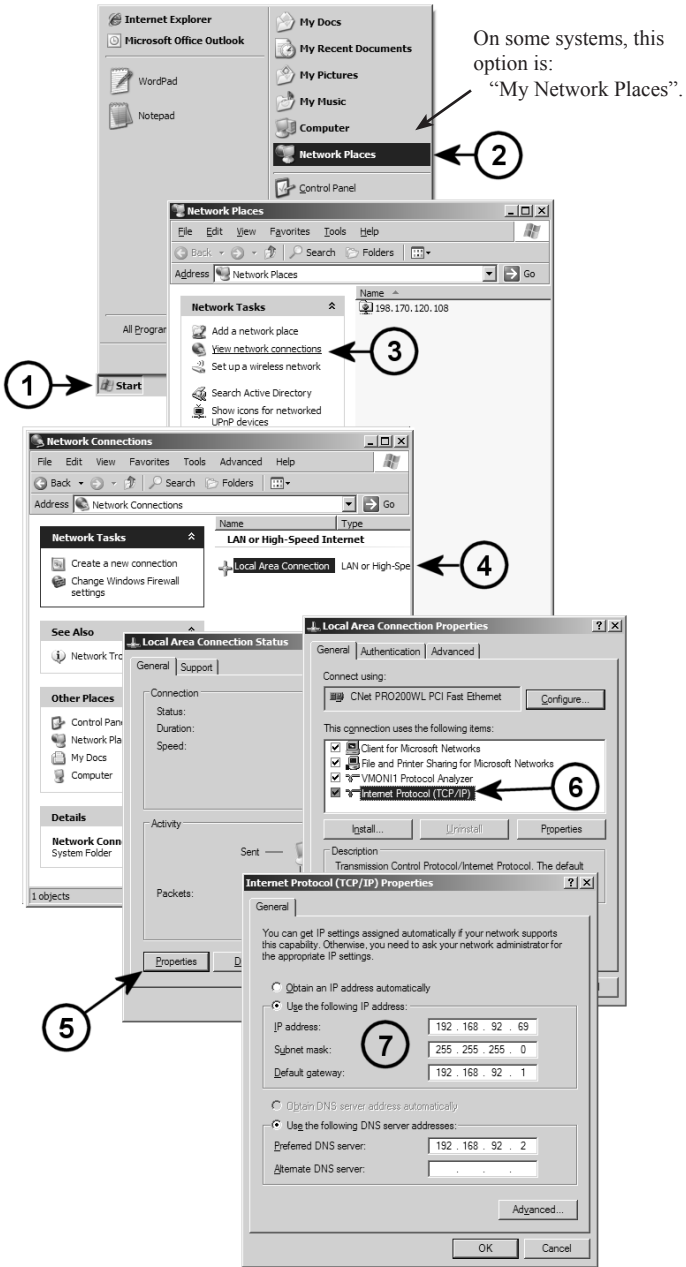


Figure 13 — Steps for Changing the IP Address of the PC Used for Setup

After entering the BASgatewayLX's IP address into your browser's address field, you will see a Logon Screen prompting for the *User Name* and *Password*. The default value of both is **admin**.

After successfully logging on, the BASgatewayLX Home Page initially appears as shown in Figure 12. To interact with the BASgatewayLX, you must enable **Java** in your browser. When you access the BASgatewayLX's first Java applet, you may encounter an additional Java security screen prompting for *User ID* and *Password*. These will be the same values as before. After satisfying these prompts, the remaining Java screens should display with no further security prompts.

As you interact with the BASgatewayLX, you will find convenient, context-relevant help information along the right side of each screen (except for the home page).

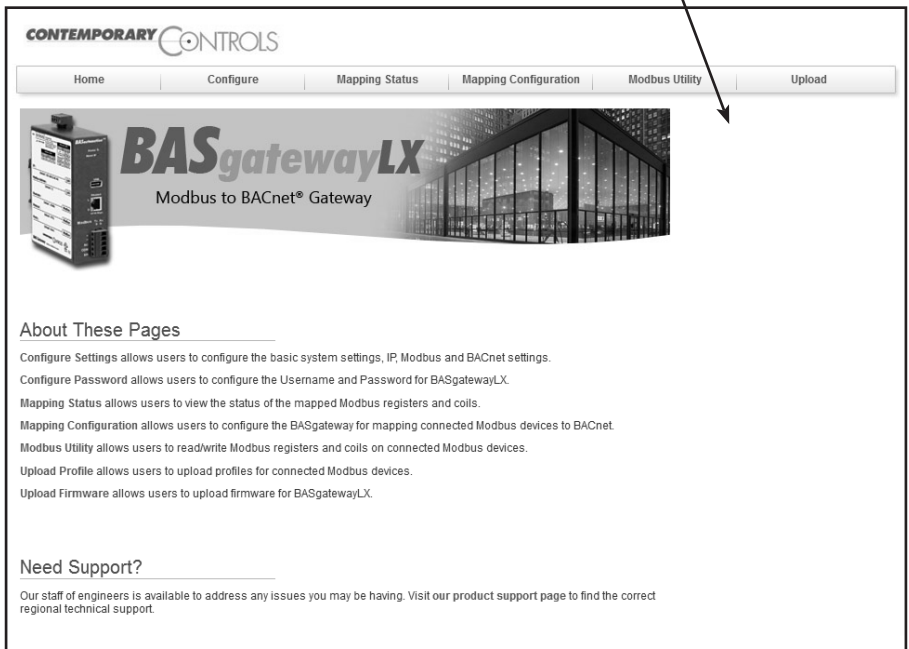


Figure 14 — BASgatewayLX Home Page

NEED MORE HELP INSTALLING THIS PRODUCT?

The product features embedded help which can be useful during installation. More information can be found on our web site at www.ccontrols.com. When contacting one of our offices, just ask for Technical Support.

WARRANTY

Contemporary Controls (CC) warrants its new 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 that the repaired product is shipped back to the purchaser or for the remainder of the original warranty period, whichever is longer.

If a CC 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.

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

www.ccontrols.com/rma.htm

DECLARATION OF CONFORMITY

Information about regulatory compliance can be found at the URL below:

www.ccontrols.com/compliance.htm

November 2013

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