Compact Modbus Gateway

Model BB-MESP211T

USER MANUAL

ADVANTECH

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TABLE OF CONTENTS

FCC RADIO FREQUENCY INTERFERENCE STATEMENT

This equipment has been tested and found to comply with the limits for a Class B computing device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which the user will be required to correct the interference at his own expense. Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

The use of non-shielded I/O cables may not guarantee compliance with FCC RFI limits. This digital apparatus does not exceed the Class B limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe B prescrites dans le Règlement sur le brouillage radioélectrique publié par le ministère des Communications du Canada.

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1. INTRODUCTION

Thank you for purchasing the BB-MESP211T Modbus Gateway. This product has been manufactured to the highest standards of quality and performance to ensure your satisfaction.

ABOUT BB-MESP211T MODBUS GATEWAY

Model BB-MESP211T Modbus Gateway connects Modbus networks (RS-232, RS-422 or RS-485) to Ethernet networks, allowing the Modbus network to become a node on the network. The serial port can be accessed over a LAN/WAN using Direct IP Mode connections. Model BB-MESP211T features a 10/100BaseTX copper RJ-45 port.

The BB-MESP211T is built for industrial environments, featuring an IP30 slim-line, panel mountable case with a DIN rail mounting option. The server requires a 10-30Vdc power source. A 12Vdc wall adapter power supply is included and the preferred method to power the unit.

BB-MESP211T FEATURES

Model Number	Serial Protocol	Serial Port	Ethernet Port
BB-MESP211T	RS-232/422/485	Terminal Block (removable)	RJ45

- Pluggable terminal block serial port connector
- Software selectable as RS-232, RS-422 or RS-485 2- or 4-wire
- Configuration of Ethernet and serial port settings using software
- Configuration can be done via network, web page or direct serial connection
- Slim-line, panel mountable case (DIN rail mount option)
- 10-30Vdc power input required; 12Vdc AC wall adapter included (Model# BB-SMI-12-V-P5)
- 10/100 Mbps Ethernet with Auto Selection, Auto MDI/MDIX
- LAN and WAN Communications
- Modbus TCP Client or Modbus TCP Server - configurable
- Firmware Upload for future revisions/upgrades
- Software Support - Windows XP (32/64 bit), 2003 Server (32/64 bit), Vista (32/64 bit), 2008 Server (32/64 bit), Windows 7 (32/64 bit), Windows 8 (32/64 bit), Windows Server 2012

CONFIGURATION SOFTWARE

The configuration software enables you to find connected Modbus Gateways, configure them, upgrade firmware, and save/load configuration files. It features a graphical user interface (GUI) that is convenient and easy to use.

2. BB-MESP211T HARDWARE

The BB-MESP211T Modbus Gateway is enclosed in a panel mountable case with a DIN rail mount option and features LED indicators, power, Ethernet and serial connectors and a recessed Reset/Mode switch.

PACKAGE CHECKLIST

BB-MESP211T Modbus Gateway ships with the following items included:

- **BB-MESP211T** Modbus Gateway Module
- Quick Start Guide
- CD with configuration software
- 12Vdc AC Wall Adapter Power Supply

LED INDICATORS

BB-MESP211T Modbus Gateway has a **Power LED**, a **Ready LED** and **Data LEDs.**

LEDs		
Ready	Off	Power is not connected.
	On	Power is connected.
Ethernet	Off	No Ethernet link.
	On	Ethernet link.
	Blink	Ethernet activity.
Serial	On	Serial port is available.
	Blink	Data is present on serial port.

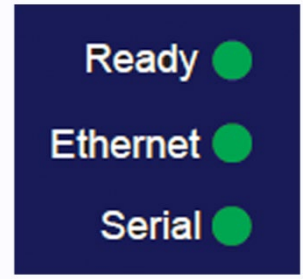


Figure 1. *LEDs*

MODE SWITCH

A recessed momentary reset switch is located on the front left side of the enclosure. To activate the switch, insert a small plastic tool through the enclosure hole and press gently.

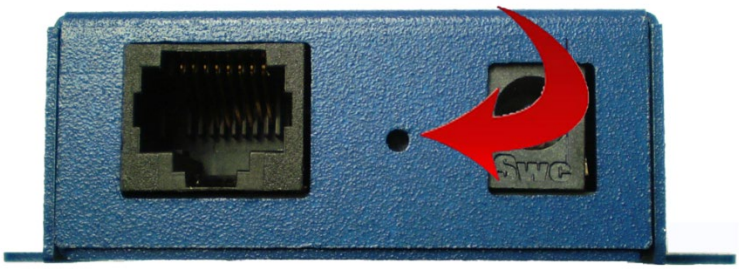


Figure 2. *Mode/Reset Switch*

The Mode/Reset switch can be used to:

- Initiate a Hardware Reset
- Enter Console Mode
- Reload Factory Defaults

Note: Refer to Section 3: Modbus Gateway Setup and Connections for more information on using the Mode switch.

ETHERNET CONNECTOR

Modbus Gateway models using 10BaseT/100BaseTX network connections use an RJ45 receptacle. The Modbus Gateway is connected to a standard Ethernet network drop using a straight-through RJ45 (male) Ethernet cable.

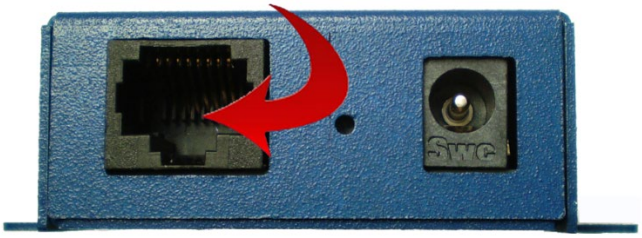


Figure 3. *Ethernet Connector.*

Note: Refer to Appendix D for connection pin-outs.

SERIAL PORT CONNECTOR

Model BB-MESP211T has a 5-position terminal block connector.

Figure 4. *Five-Position, Pluggable Terminal Block*

POWER CONNECTOR

BB-MESP211T serial server uses a barrel jack connector for power. The connector accepts a 2.1 mm plug and requires 12 VDC at 2.5 W maximum. Note: a 12Vdc wall adapter power supply is included.

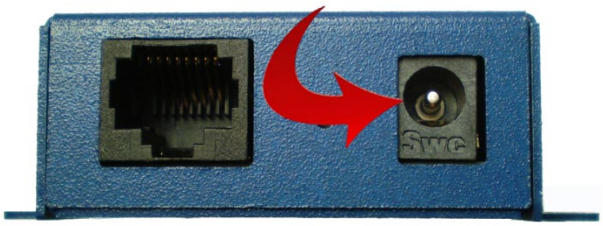


Figure 5. *Power Connection - 12 V DC input*

Figure 6. *NOTE: 12V DC wall adapter/power supply included with each serial server and is the preferred method to power the unit.*

Figure 7.

MOUNTING HARDWARE

An optional DIN rail mount adapter is available from Advantech B+B SmartWorx (# BB-DRAD35).

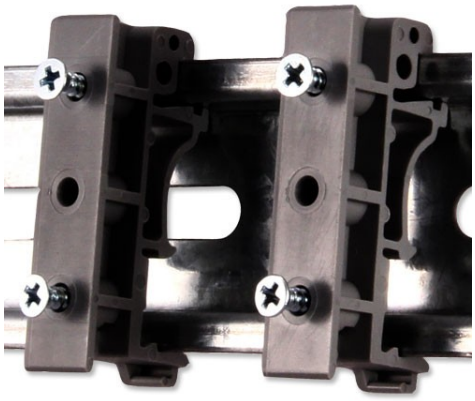


Figure 8. *Optional DIN Clip for Modbus Gateway Module.*

3. SETUP AND CONNECTIONS

Note: In this section, devices to be connected to the Modbus Gateway's serial connection are referred to as the "Modbus network".

CONNECTING THE POWER SUPPLY

Connect a DC power supply to BB-MESP211T Modbus Gateway. A 12V DC, 6W power supply is included with international AC blades.

NOTE: A 12V DC wall adapter/power supply is included with each serial server and is the preferred method to power the unit.
NOTE: acceptable voltages are 10- 30 V DC. The power supply must be capable of supplying 4W.

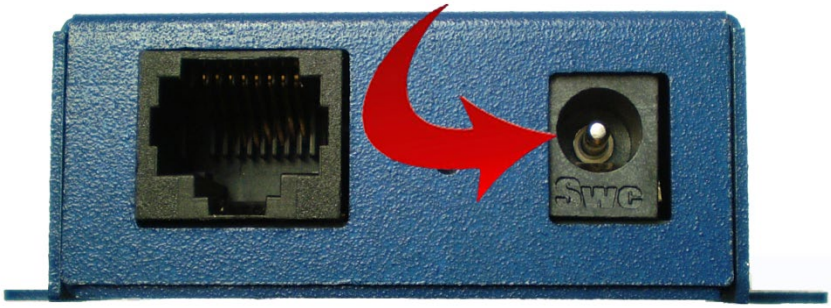


Figure 9. *BB-MESP211 Power Connection*

CONNECTING BB-MESP211T TO MODBUS NETWORKS

The BB-MESP211T gateway can be configured to connect to Modbus networks using RS-232, RS-422,

RS-422 4-wire connections support two signal pairs: RXA(-), RXB(+) and TXA(-), TXB(+), plus GND. The data lines are differential pairs (A & B) in which the B line is positive relative to the A line in the idle (mark) state. Ground provides a common mode reference. RS-232 connections are also supported.RS-485 connections support 2-wire or 4-wire operation.

When configured for **4-wire operation** the connection supports two signal pairs: RXA(-), RXB(+) and TXA(-), TXB(+), plus GND. This makes full-duplex operation possible. The data lines are differential pairs (A & B) in which the B line is positive relative to the A line in the idle (mark) state. Ground provides a common mode reference.

When configured for **2-wire operation** the connection supports one signal pair: Data B(+) and Data A(-) signal channels using half-duplex operation. The data lines are differential with the Data B line positive relative to Data A in the idle (mark) state. Ground provides a common mode reference.

CONNECTING THE BB-MESP211T

The **BB-MESP211T** has a 5-position, pluggable terminal block connector.

If you select RS-232 mode when you configure the Modbus Gateway, you must connect the Modbus serial network to the Modbus Gateway via a serial cable. The BB-MESP211T is a DTE. If the Modbus network is a DTE, use a null modem (cross-over) cable.

If the Modbus network is a DCE, use a straight-through cable. DTE and DCE ports are complementary, the **Output** signals on a DTE port are ***Inputs*** to a DCE port, and ***Output*** signals on a DCE port are **Inputs** to a DTE port. The signal names match each other and connect pin for pin. Signal flow is in the direction of the arrows

Modem Cable - Straight Cable DB9 to DB9

DTE Device (Computer) **DB9** — **DTE to DCE Connections** — DCE Device (Modem) **DB9**

Pin# DB9 RS-232 Signal Names		Signal Direction	Pin# DB9 RS-232 Signal Names	
#1 Carrier Detector (DCD)	CD	←	#1 Carrier Detector (DCD)	CD
#2 Receive Data (Rx)	RD	←	#2 Receive Data (Rx)	RD
#3 Transmit Data (Tx)	TD	→	#3 Transmit Data (Tx)	TD
#4 Data Terminal Ready	DTR	→	#4 Data Terminal Ready	DTR
#5 Signal Ground/Common (SG)	GND	—	#5 Signal Ground/Common (SG)	GND
#6 Data Set Ready	DSR	←	#6 Data Set Ready	DSR
#7 Request to Send	RTS	→	#7 Request to Send	RTS
#8 Clear to Send	CTS	←	#8 Clear to Send	CTS
Soldered to DB9 Metal - Shield	FGND	—	Soldered to DB9 Metal - Shield	FGND

Figure 10. *BB-MESP211T Serial Connections*

Figure 11. *BB-MESP211T Connections*

CONNECTING BB-MESP211T TO A NETWORK

Network Connection (10BaseT/100BaseTX)

When connecting the BB-MESP211T Modbus Gateway with a 10BaseT/100BaseTX network connection (RJ45 connector), a standard network cable is connected from the Modbus Gateway to a network drop. PCs configuring and/or communicating with the Modbus Gateway are also connected to the network.

CONFIGURATION CONNECTIONS

The BB-MESP211T Modbus Gateway can be configured over the network or via a serial port.

INSTALLING MODBUS GATEWAY MANAGER SOFTWARE

1. The Modbus Gateway Manager Software is contained on the CD that is packaged with the product. Insert the CD into your CD ROM drive. The software should automatically begin the installation process. If AUTO RUN is disabled on your computer, open the CD drive and double-click on the executable file.

   a. The following screen will be displayed on your computer.

Figure 12. *Modbus Gateway Manager Installation Welcome Screen*

   b. Click "**Next**." The License Agreement Screen will be displayed on your computer.

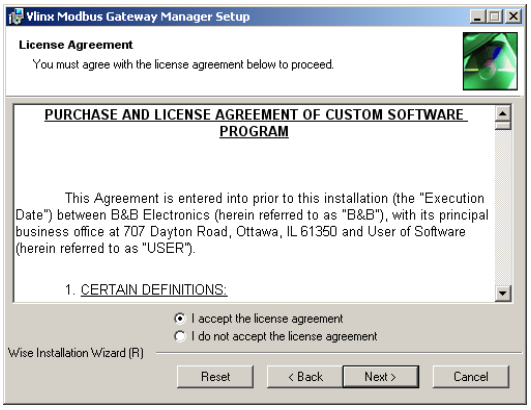


Figure 13. *Modbus License Acceptance Screen*

c. Click "**Next**." The User Information Screen will be displayed on your computer. Enter your name and organization (optional) and select if the software will be accessible to your account or anyone who uses the computer.

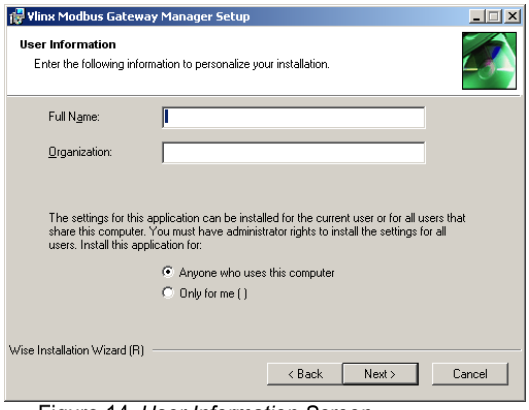


Figure 14. *User Information Screen*

d. Click "**Next**." The Destination Folder Screen will be displayed on your computer. The default directory is:

C:\Program Files\Advantech B+B SmartWorx\Vlinx\Modbus Gateway Manager

If desired, you can select another location by pressing the “Browse” button.

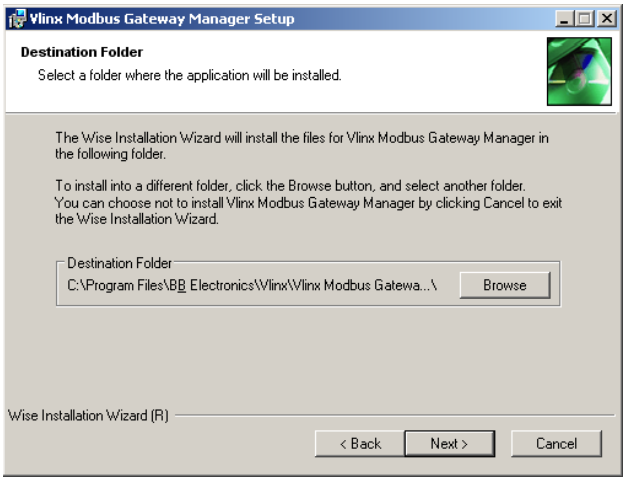


Figure 15. *Destination Folder Screen*

e. Click “**Next**.” The Ready to Install Application Screen will be displayed on your computer. You can select the “Back” button to change destination folder.

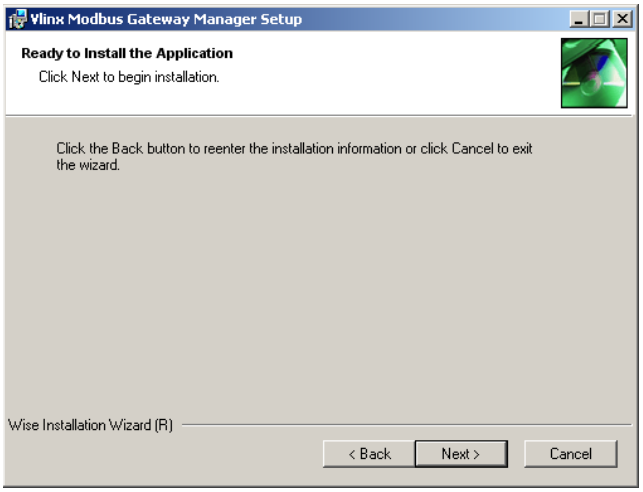


Figure 16. *Ready to Install Application Screen*

f. Click "**Next**." The software will begin installing.

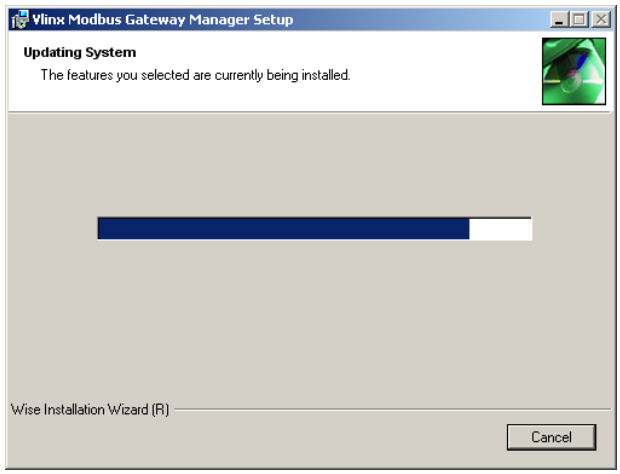


Figure 17. *Software Installing Screen*

g. Click "**Next**." The Installation Complete screen will be displayed on your computer. Click "Finish" to finish the installation.

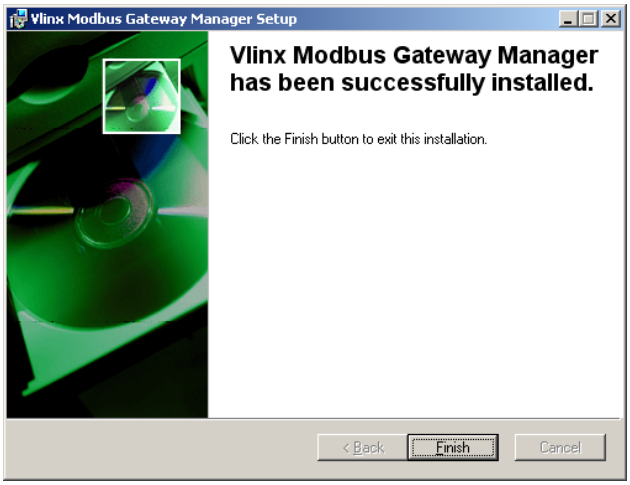


Figure 18. *Installation Complete Screen*

CONFIGURING THE BB-MESP211T VIA THE NETWORK CONNECTION

When configuring via the network, either Modbus Gateway Manager software or the web interface can be used.

CONFIGURING THE MODBUS GATEWAY MANAGER

The BB-MESP211T Modbus Gateway can be configured over the network with Modbus Gateway Manager software running on a PC.

To open Modbus Gateway Manager:

1. From the Desktop, click Start → Programs → B+B Electronics → Vlinx → Vlinx Modbus Gateway Manager→Modbus Gateway Manager. An alternate method is to double click the shortcut installed on the desktop.

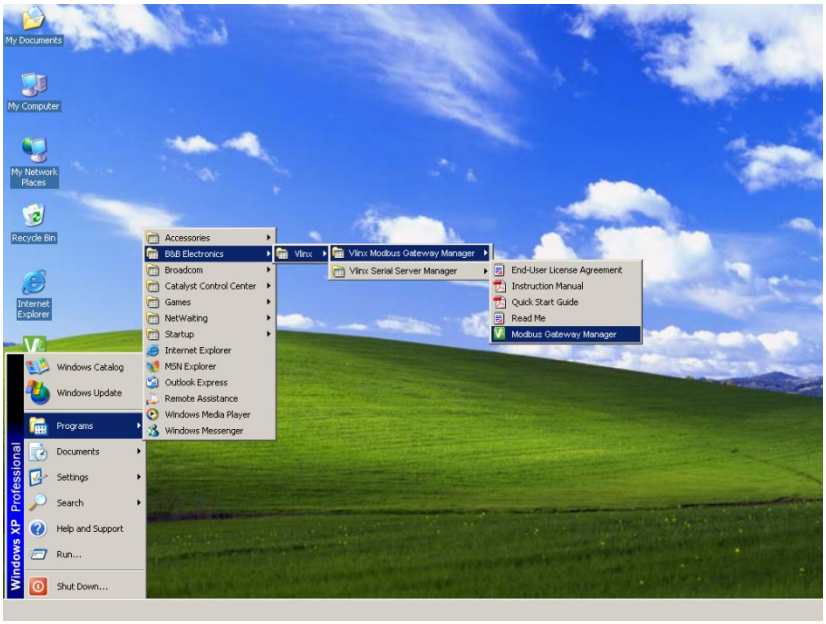


Figure 19. *Opening Vlinx Modbus Gateway Manager*

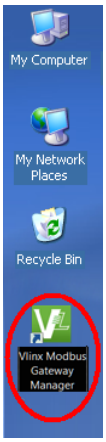


Figure 20. *Vlinx Modbus Gateway Manager Shortcut Icon*

The Vlinx Modbus Gateway Manager Device Discovery window appears.

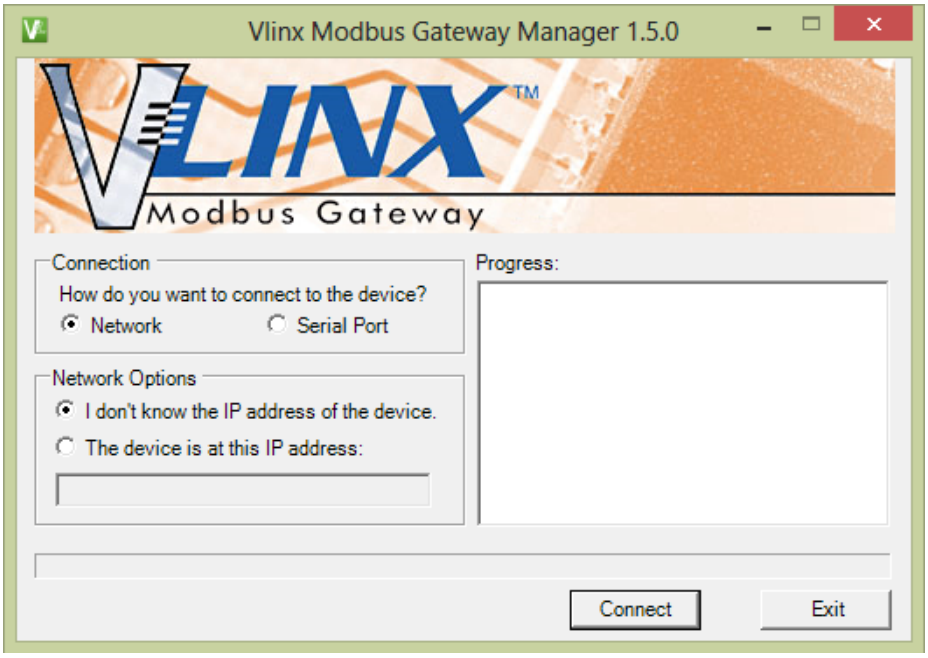


Figure 21. *Modbus Gateway Manager Discovery Window*

If you do not know the IP address, check the "**Network**" and "**I don't know the IP address of this device**" selections and press the "**Connect"** button. The software will discover any BB-MESP211T gateways on the network. The configuration manager screen will be displayed on your computer. All available devices will be listed on the top portion of this screen. If you know the IP address, you may select "**The Device is located at this IP address**" and input the address in the box provided.

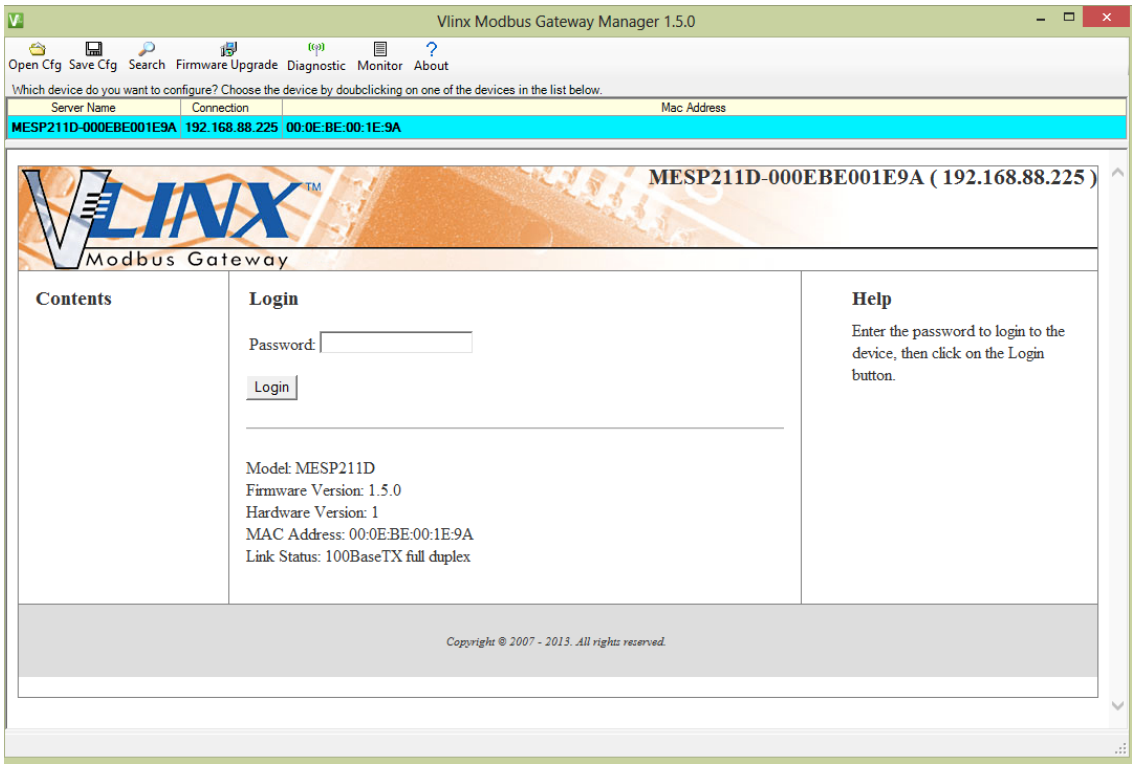


Figure 22. *Configuration Manager Screen*

2. All Modbus Gateways on the network will be displayed in the top portion of the screen. To select a gateway, simply click the appropriate device on the top portion of the screen.

   a. The main portion of the screen displays the Model, Firmware version, Hardware Version, MAC Address, and Link Status. The IP Address is also displayed on the top portion of the screen and title graphic area.

3. There is no password unless you choose to enter one. The default password is no password at all. Click the "**Login**" button. The "General" Settings screen will be displayed on your computer.

VLINX MODBUS MANAGER SETTINGS SCREEN OVERVIEW

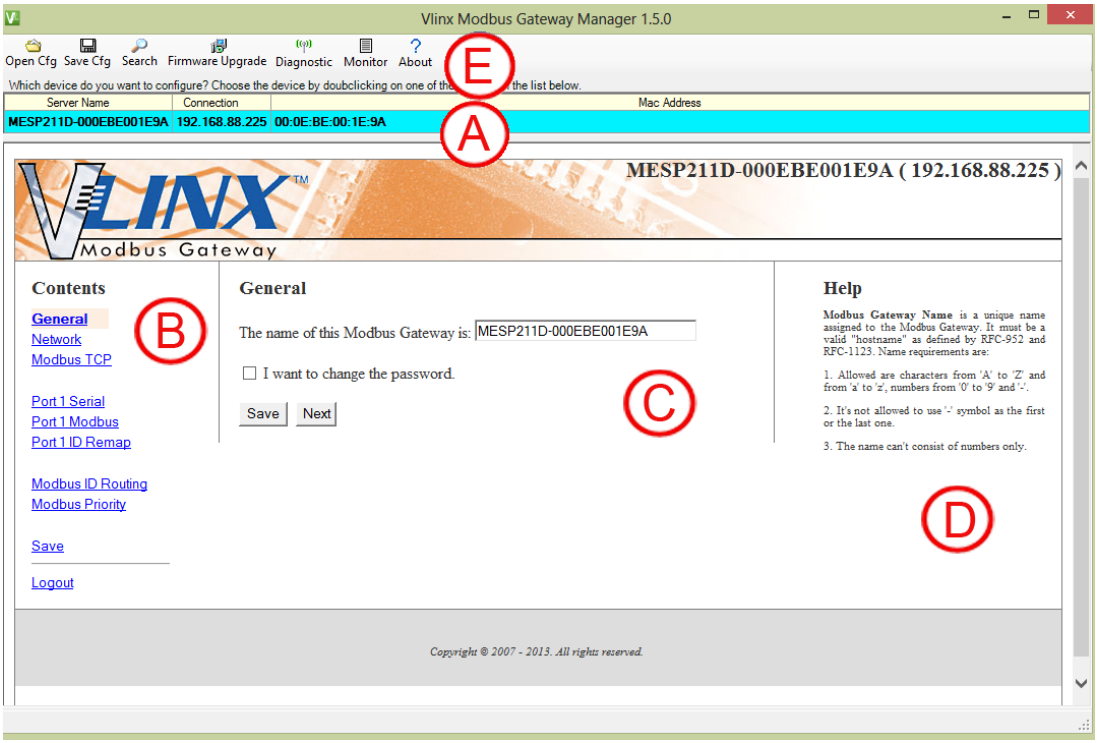


Figure 23. *Settings Screen Overview*

a. This area shows Modbus Gateways available on the network.

b. This area is used to jump directly to the configuration screen you need to access. An alternate method of accessing the configuration screens is to use the "**Next**" button in area C.

c. This area contains dialog boxes specific the configuration screen.

    1. *Note: Any configuration changes you make need to be saved using the "**Save**" button.*

d. This area contains helpful information about the configuration screen that you are currently on.

e. This area contains shortcuts to specific functions.

1. "**Open**" allows you to load a previously saved configuration file into your Modbus Gateway.
2. "**Save**" allows you to save your configuration to a file. This should not be confused with the "Save" button described in 6.c above.
3. "**Search**" allows you to search for Modbus Gateways on the network.
4. "**Upgrade**" allows you to upgrade your Modbus Gateway's firmware.
5. "**Diagnostic**" allows you to test a configured Modbus Gateway. See Section 5.
6. "**Monitor**" allows you to monitor a Modbus Gateway. See Section 5.
7. "**About**" contains information about your Modbus Gateway.

Note: If an unacceptable value or character is entered on any of the configuration screens, the background turns yellow. You will be unable to leave this screen as long as the yellow background is present. When an acceptable value is entered, the yellow background goes away and you can leave the screen.

GENERAL SETTINGS

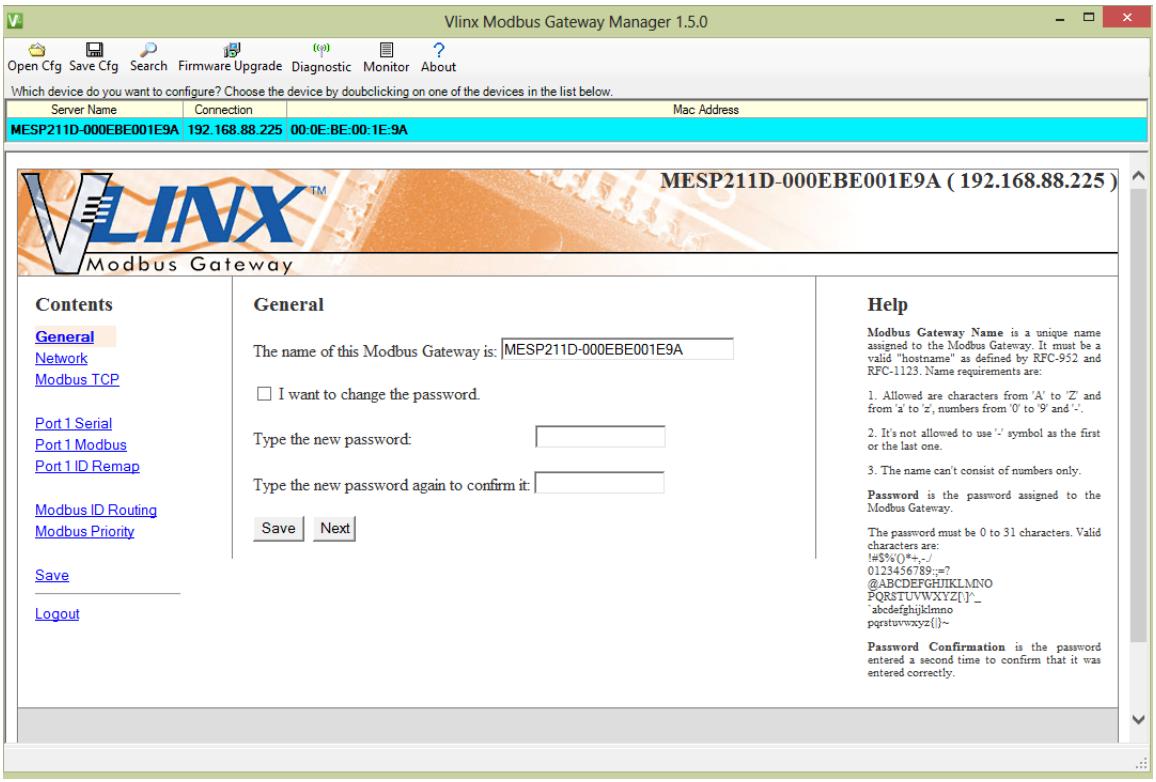


Figure 24. *General Settings Screen*

a. This screen enables you to assign a unique name to the gateway. This allows you to easily identify a particular gateway when multiple devices are used on the same network. To change the name, type a new name in the "**The Name of this Modbus Gateway is**" box. The name must be a valid "hostname" as defined by RFC-952 and RFC-1123. Allowed characters are A to Z, a to z, 0 to 9 and "-". The "-"symbol cannot be the first or last character. The name cannot consist of numbers only. To save the new name click the "**Save**" button.

b. You can also change the gateway's password on this screen. To do this, check the "**I want to change the password**" box. New password entry boxes will appear on the screen.

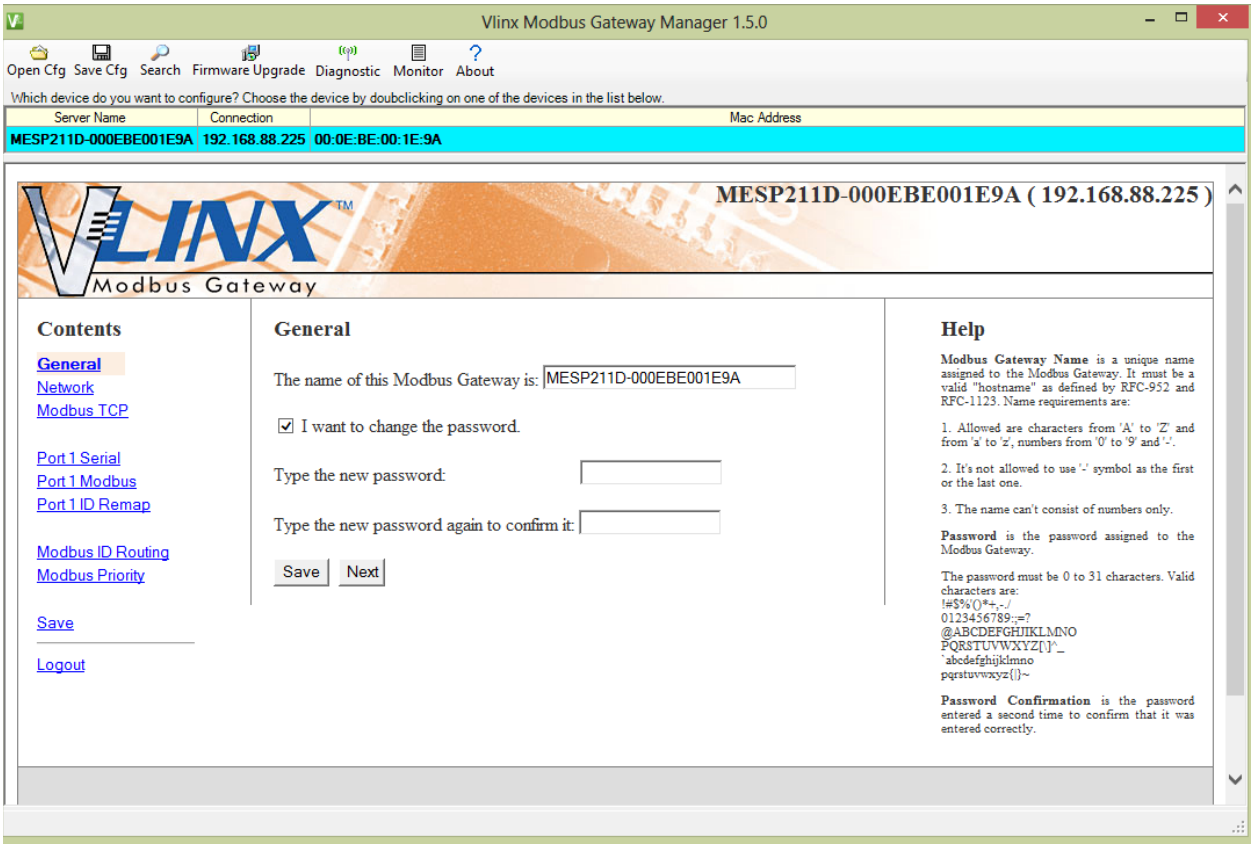


Figure 25. *Changing The Password*

c. Type your new password in the "**Type the new password box.**" Verify the password by typing it again in the box provided. To save the new password click the "**Save**" button.

4. Network Settings

a. To get to the Network Settings Screen you can either click the "**Next**" button or click on the "**Network**" link on the left side of the screen.

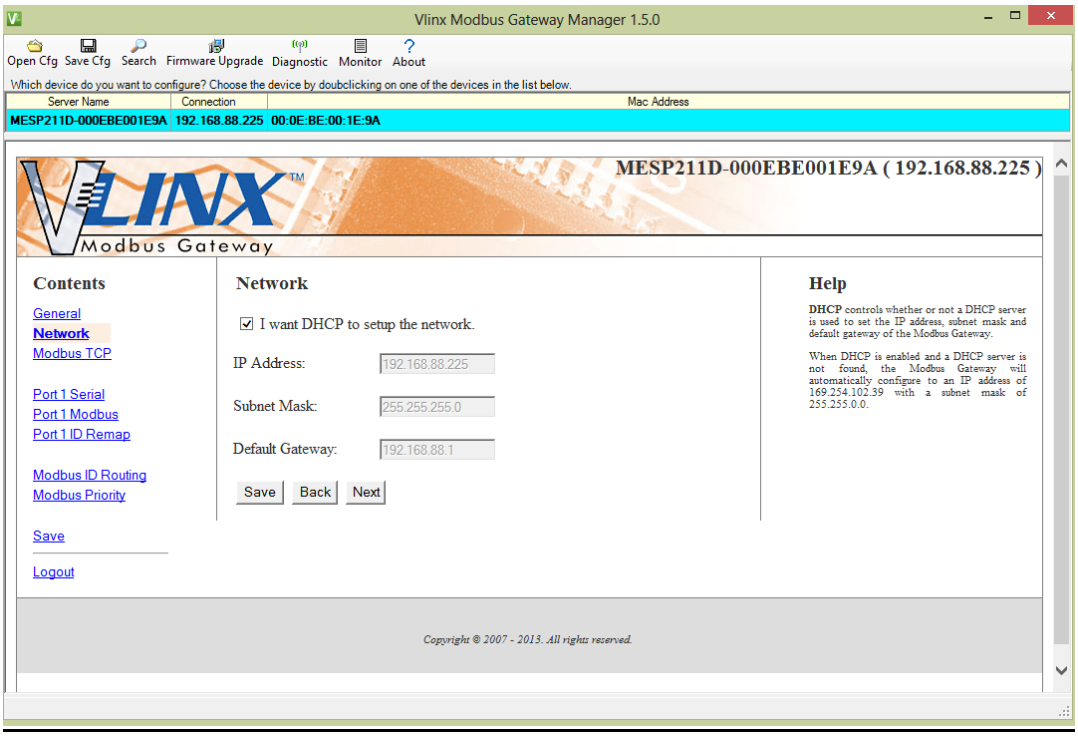


Figure 26. *Network Settings Screen (DHCP Selected)*

b. The default network configuration is to receive an IP address assignment from a DHCP server. **DHCP** controls whether or not a DHCP server is used to set the IP address, subnet mask and default gateway of the Modbus Gateway. When DHCP option is enabled but the DHCP server is not found, the Modbus Gateway will automatically configure IP address 169.254.102.39 with a subnet mask 255.255.0.0

c. To configure your Modbus Gateway without using a DHCP Server, uncheck the "**I want DHCP to setup the network**" box. You will need to know the IP Address, Subnet Mask, and Default Gateway.

   IP Address field contains static internet protocol address of the Modbus Gateway.

   Subnet Mask field contains mask that is used to define sub network.

   For Class A Network (IP addresses 0.0.0.0 through 127.255.255.255), the default subnet mask is 255.0.0.0.

   For Class B Network (IP addresses 128.0.0.0 through 191.255.255.255), the default subnet mask is 255.255.0.0.

   For Class C Network (IP addresses 192.0.0.0 through 223.255.255.255), the default subnet mask is 255.255.255.0.

For Class D Network (IP addresses 224.0.0.0 through 239.255.255.255) and Class E Network (IP addresses 240.0.0.0 through 255.255.255.255), the subnet mask is ignored.

Default Gateway field contains default route to remote networks.

Figure 27. *Network Settings Screen (DHCP not Selected)*

d. More information about assigning an IP address without using a DHCP Server is contained in the section “Configuring the BB-MESP211 on Networks without a DHCP Server.”

e. Save changes by clicking the “**Save**” button.

5. Modbus TCP Settings

a. To access this screen, click the “**Next**” button or click on the Modbus TCP link on the left side of the screen.

b. This screen allows you Modbus TCP client and server settings.

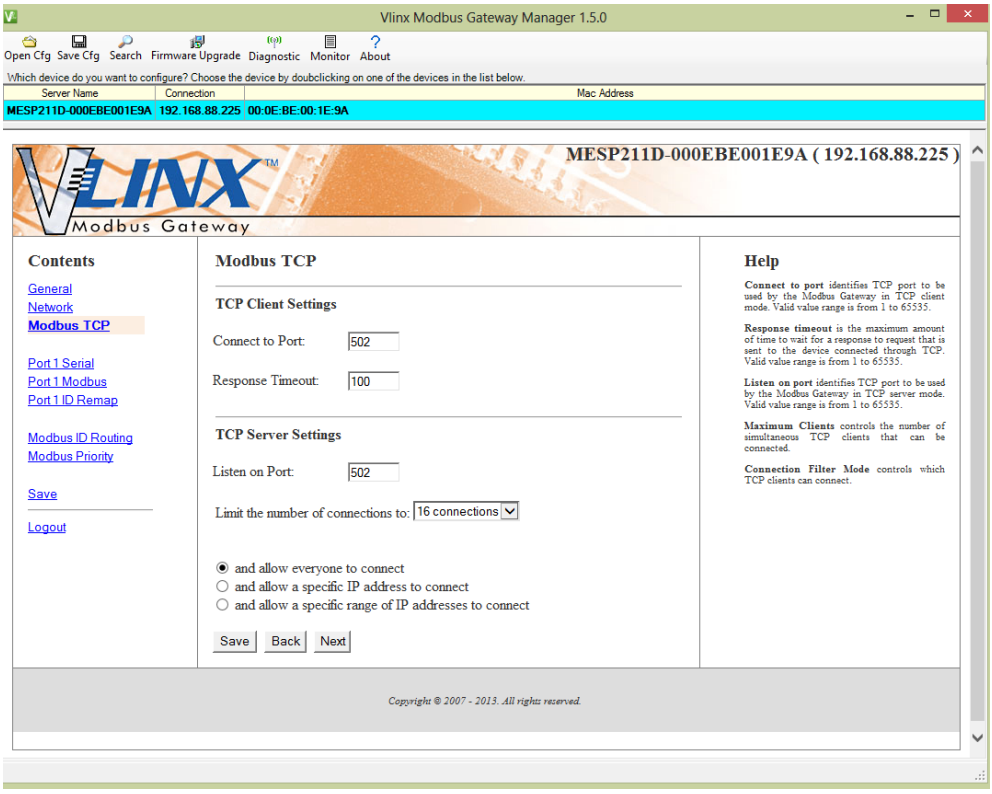


Figure 28. *Modbus TCP Settings Screen*

c. TCP Client Settings

1. **Connect to Port** identifies TCP port to be used by the Modbus Gateway in TCP client mode. Valid value range is from 1 to 65535.

2. **Response Timeout** is the maximum amount of time to wait for a response to a request that is sent to the device connected through TCP. Valid value range is from 1 to 65535.

3. Save settings by clicking the "**Save**" button.

b. TCP Server Settings

1. **Listen on Port** identifies TCP port to be used by the Modbus Gateway in TCP server mode. Valid value range is from 1 to 65535.

2. **Limit the number of connections to** pull down box allows you to control the number of simultaneous TCP clients that can be connected. Choices are 1 through 16.

3. **Connection Filter Mode** controls which TCP clients are able to connect. The default is: "**and allow everyone to connect**."

a. You can select "**allow specific IP addresses to connect**." This filter is limited to 4 IP addresses.

b. You can select "**a specific range of IP addresses to connect**." This filter is limited to 4 IP address ranges

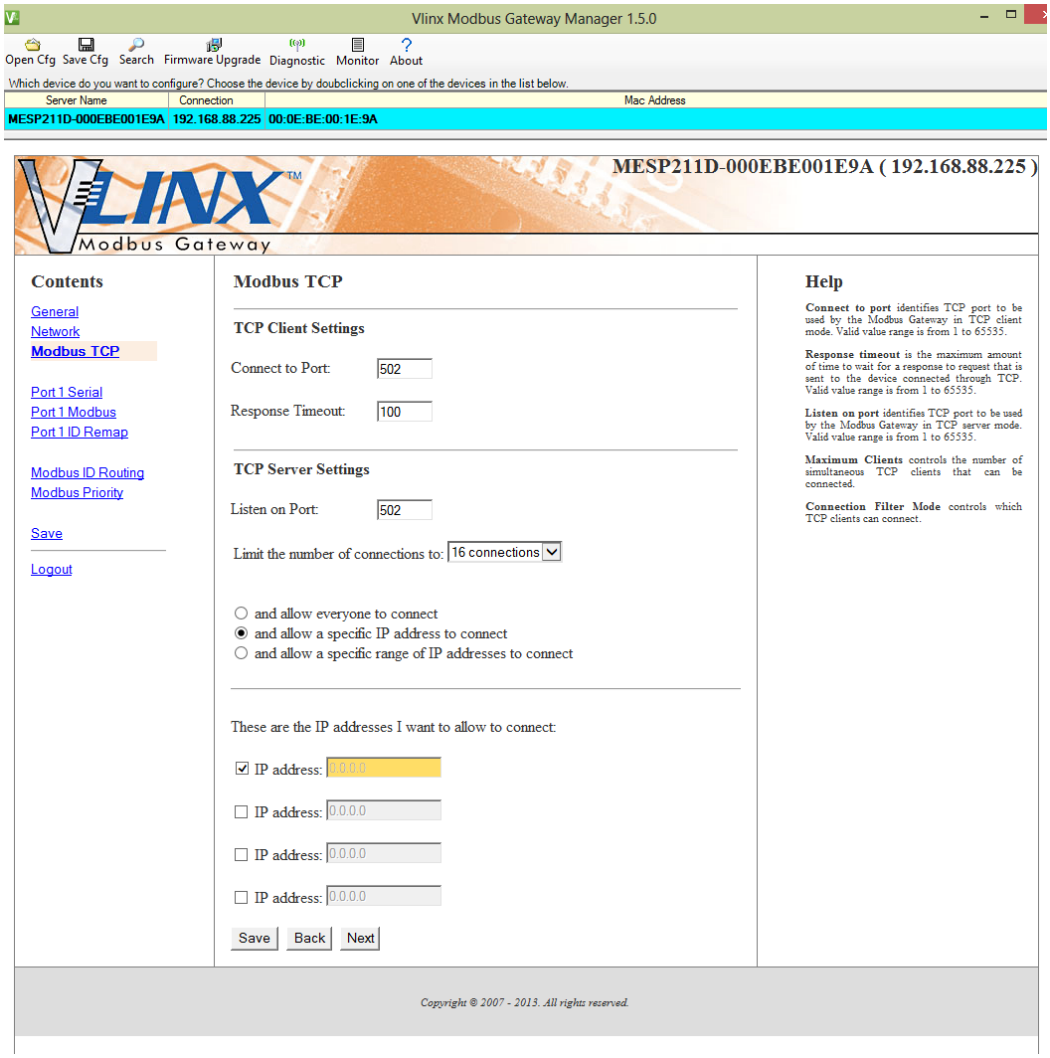


Figure 29. *TCP Connection Filter "Allow Specific IP Addresses to Connect"*

c. Save settings by clicking the "**Save**" button.

Figure 30. *TCP Connection Filter "Allow Specific Range of IP Addresses to Connect"*

6. Port 1 Settings

To access this screen, click the "**Next**" button or click the Port 1 Serial link on the left side of the screen.

a. This screen allows you to change the serial port settings.

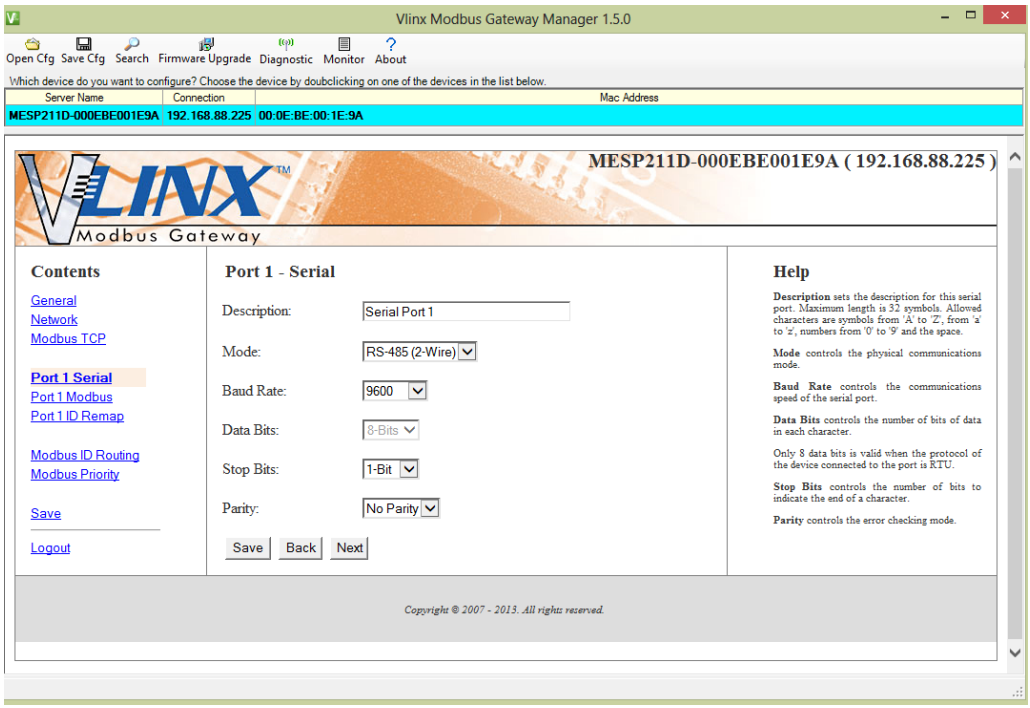


Figure 31. *Serial Port Screen*

b. **Description** - sets the description for this serial port. Maximum length is 32 symbols. Allowed characters are symbols from 'A' to 'Z', from 'a' to 'z', numbers from '0' to '9' and the space.

c. **Mode** – Controls the physical communications mode for the BB-MESP211. The Mode can be RS-232, RS-422 (4-Wire), RS-485 (2-Wire), or RS-485 (4-Wire).

d. **Stop Bits** – Controls the number of bits to end a character. Choices are 1 or 2.

e. **Parity** – Controls the error checking mode. Choices are Odd, Even, Mark, or Space.

f. Save settings by clicking the "**Save**" button.

7. Port 1 Modbus

a. To access this screen, click the "**Next**" button or click the "**Port 1 Modbus**" link on the left side of the screen. This screen allows you to change the Modbus settings for the port.

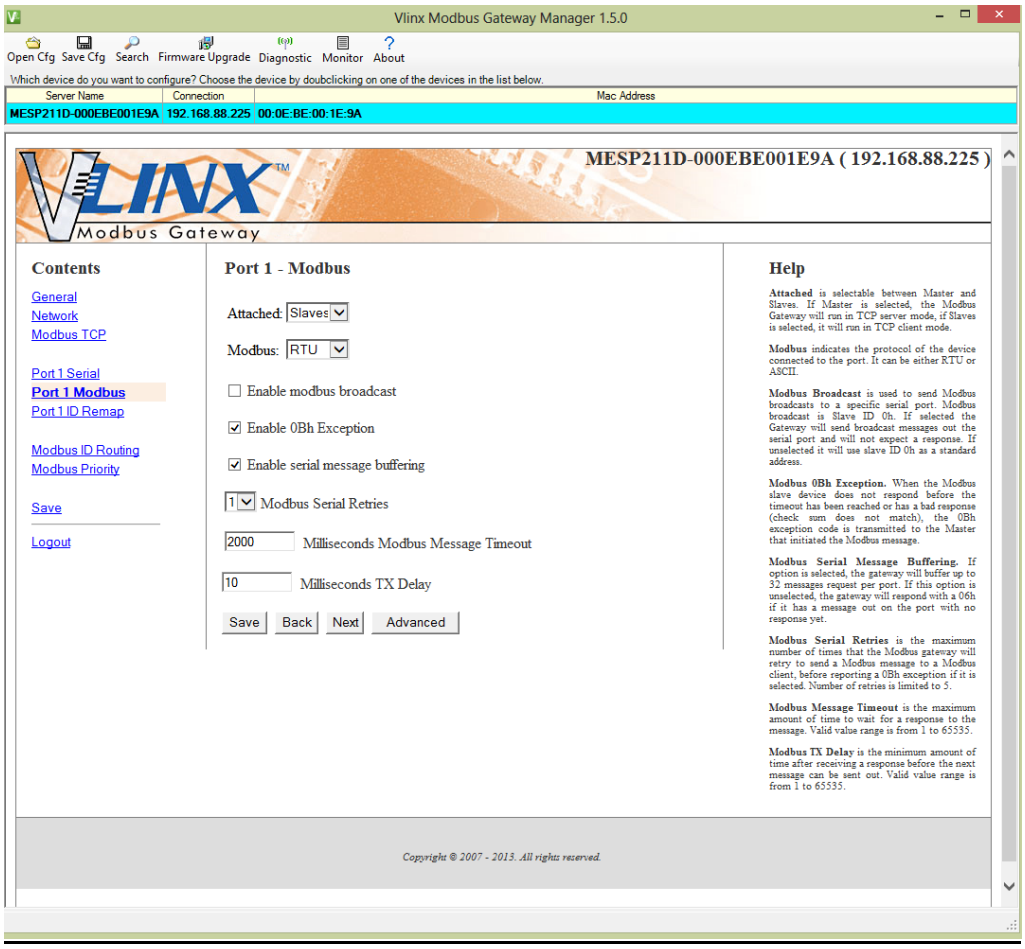


Figure 32. *Modbus Port Screen*

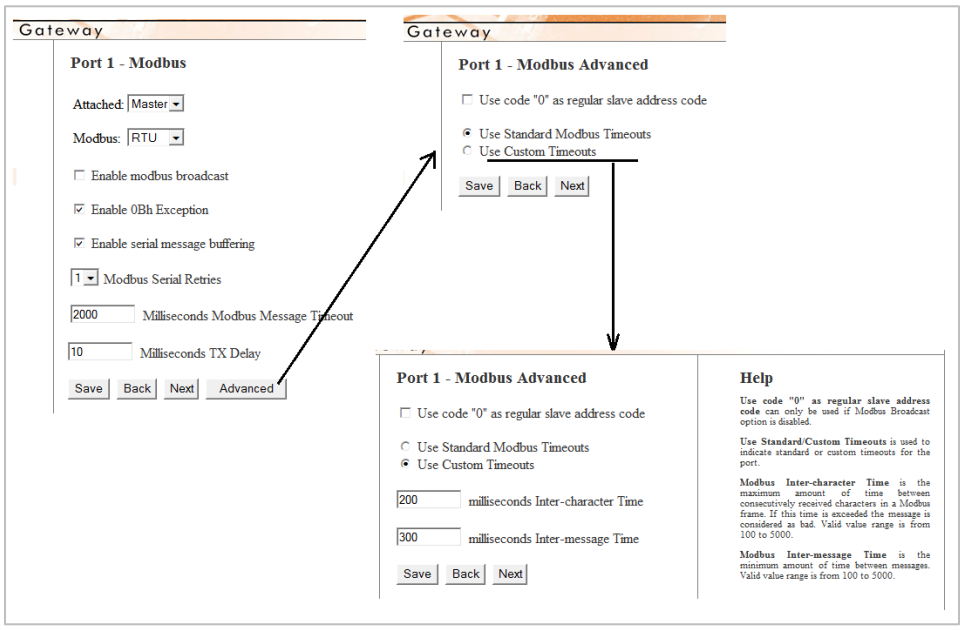


Figure 33. *Modbus Port Screen Advanced*

b. **Attached** – This is selectable between Master and Slaves. If **Master** is selected, the Modbus Gateway will run in TCP server mode; if Slaves is selected, it will run in TCP client mode.

c. **Modbus** – indicates the protocol of the device connected to the port. It can be either RTU or ASCII.

d. **Modbus Broadcast** – Check this box to send Modbus broadcasts to a specific serial port. Modbus broadcast is Slave ID 0h. If selected, the Gateway will send broadcast messages out the serial port and will not expect a response. If unselected, it will use slave ID 0h as a standard address.

e. **Enable 0Bh Exception** – Check this box to enable. When the Modbus slave device does not respond before the timeout has been reached or has a bad response (check sum does not match), the 0Bh exception code is transmitted to the Master that initiated the Modbus message.

f. **Enable Serial Message Buffering** – If this option is selected, the gateway will buffer up to 32 messages request per port. If this option is unselected, the gateway will respond with a 06h if it has a message out on the port with no response yet.

g. **Modbus Serial Retries** – Select 0 through 5. This sets the maximum number of times that the Modbus Gateway will retry to send a Modbus message to a Modbus client, before reporting a 0Bh exception if it is selected. Number of retries is limited to 5.

h. **Milliseconds Modbus Message Timeout** – This is the maximum amount of time to wait for a response to the message. Valid value range is from 1 to 65535.

i. **Milliseconds TX Delay** – This is the minimum amount of time after receiving a response before the next message can be sent out. Valid value range is from 1 to 65535.

j. Save settings by clicking the "**Save**" button.

8. Port 1 ID Remap

a. To access this screen, click the "**Next**" button or click the "**Port 1 ID Remap**" link on the left side of the screen.

b. This screen allows you to set Modbus Slave ID Remap settings.

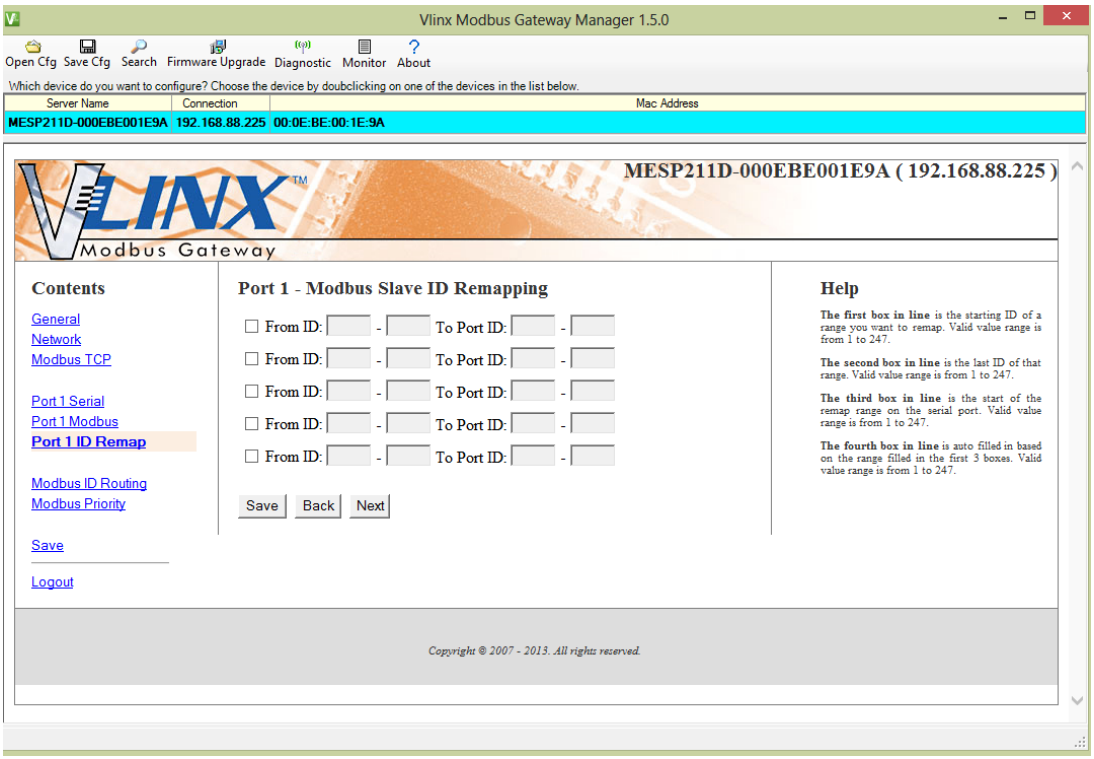


Figure 34. *Port ID Remap Screen*

c. The first box in line is the start of the remap range on the serial port that you want to remap. Valid value range is from 1 to 247.

d. The second box in line is the last serial port of that range. Valid value range is from 1 to 247.

e. The third box in line is the starting ID of a range to remap to. Valid value range is from 1 to 247.

f. The fourth box in line is auto-filled, based on the range filled in the first 3 boxes. Valid value range is from 1 to 247.

g. Save settings by clicking the "**Save**" button.

9. Modbus ID Routing

a. To access this screen click the "**Next**" button or click the "**Modbus ID Routing**" Link on the left side of the screen.

This screen allows you to set the Modbus Slave ID routing.

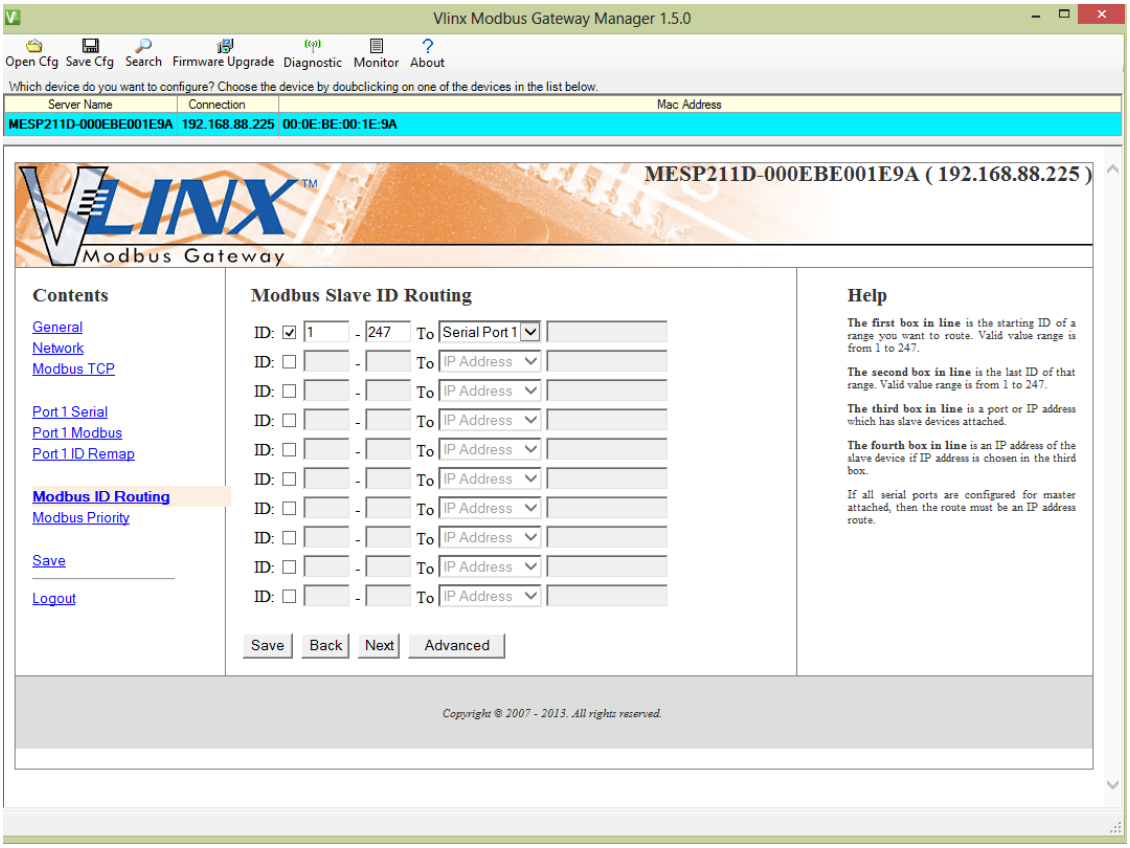


Figure 35. *Modbus ID Routing Screen*

b. The first box in line is the starting ID of a range that you want to route. Valid value range is from 1 to 247.

c. The second box in line is the last ID of that range. Valid value range is from 1 to 247.

d. The third box in line is a port or IP address that has slave devices attached.

e. The fourth box in line is an IP address of the slave device if IP address is chosen in the third box.

f. Save settings by clicking the "**Save**" button.

10. Modbus Priority

a. To access this screen, click the "**Next**" button or click the "**Modbus Priority**" link on the left side of the screen.

b. This screen allows you to configure the gateway to move high priority messages to the front of the serial message buffer.

Figure 36. *Modbus Priority Screen*

c. These settings allow the gateway to move high priority messages to the front of the serial message buffer. The priority can be based on the originating IP address, the Modbus ID, the Modbus function code, or any combination of the three. Up to five different priorities can be set.

d. **IP Address** – Used to set a static Internet protocol address for the Modbus Gateway.

e. **Modbus ID** – Valid range is from 1 to 247.

f. **Function Code** – Valid range is from 1 to 99.

Save settings by clicking the "**Save**" button.

CONFIGURING WITH THE WEB INTERFACE

The BB-MESP211T Modbus Gateway can be configured over the network using a standard web browser such as Internet Explorer, Firefox, Chrome.

To open the web configuration interface:

1. On a PC connected to the network, open a web browser.

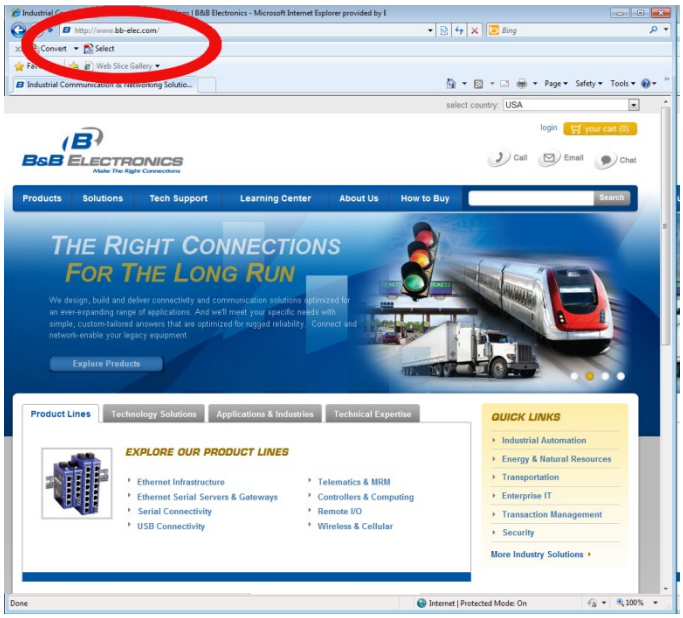


Figure 37. *Open Web Browser*

2. In the browser's address bar, type the IP address of the Modbus Gateway.

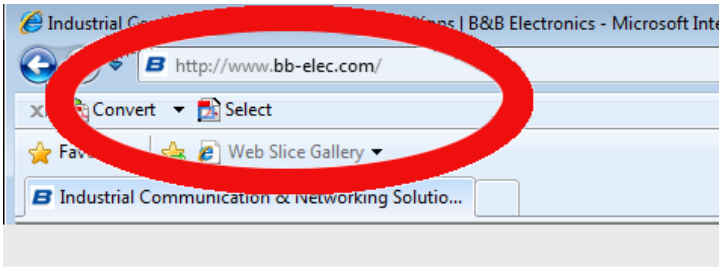


Figure 38. *Type IP Address*

Note: Your BB-MESP211T Modbus Gateway comes from the factory pre-configured to receive an IP address assignment from a DHCP server. If a DHCP server is not available on your network, it will default to 169.254.102.39.

The web interface Login page appears.

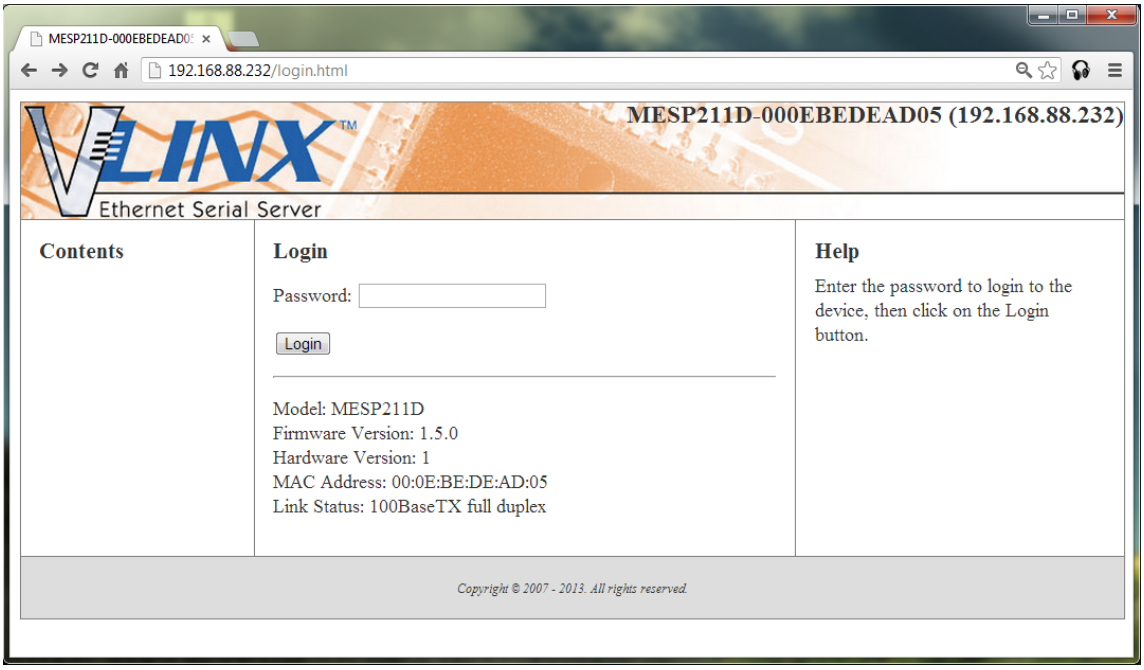


Figure 39. *Modbus Gateway Login Screen*

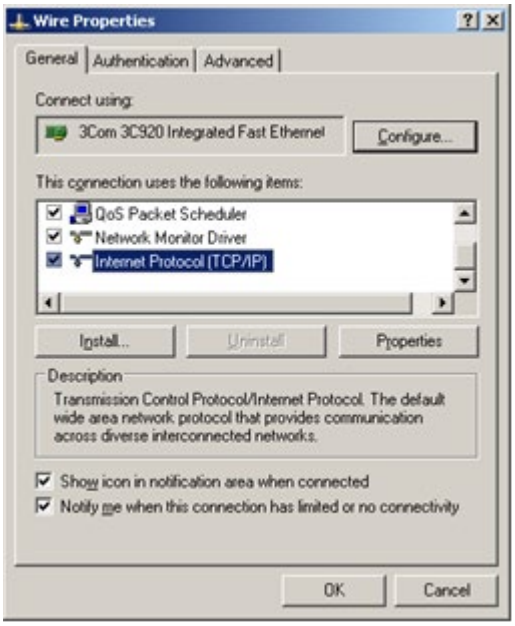
3. The screens for configuring your gateway using a web browser are the same as those used to configure using the Vlinx Modbus Manager software.

CONFIGURING BB-MESP211T ON NETWORK WITHOUT A DHCP SERVER

Your Modbus Gateway comes from the factory set to receive an IP assignment from a DHCP Server. If there is not a DHCP server on your network, the Modbus Gateway will default to IP address **169.254.102.39**. If this address does not work with your PC, there are two methods to manually configure the network information.

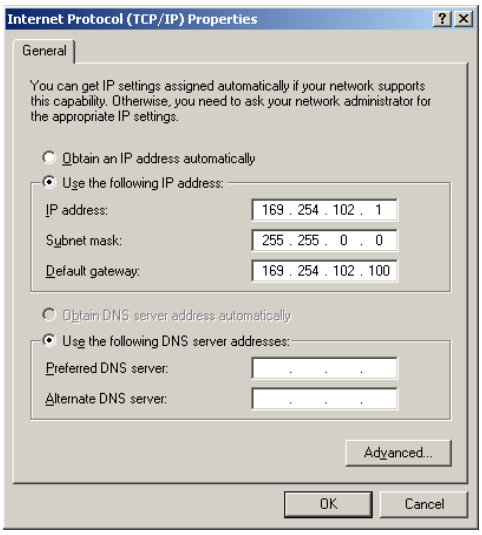
1. **Method 1:** Change your PC Network to Match the Modbus Gateway

    a. Open your network connection.



Click on **Internet Protocol (TCP/IP)** and click **Properties**. Change the parameters to the following:

IP Address = 169.254.102.1
Subnet Mask = 255.255.0.0
Default Gateway = 169.254.102.100



b. Use the Vlinx Modbus Manager Software to search for, discover, and configure the Modbus Gateway.

2. **Method 2:** Change the Modbus Gateway's network settings to match your PC using Console Mode. (Console mode works in RS-232 only.)

   a. Connect a null modem serial cable (crossover cable) from Port 1 on the Modbus Gateway to an available COM port on your PC.

   b. Enter Console Mode. Press and hold the Modbus Gateway's Mode switch for 2 to 10 seconds. Release the reset button. The READY LED will blink for five seconds. This indicates that the Modbus Gateway is re-booting in Console Mode.

   c. When the Modbus Gateway has successfully restarted in Console Mode, the READY LED will be OFF and the PORT 1 LED will be ON.

   d. Open the Vlinx Modbus Manager Software and select "**Serial Port**" as the method to connect to the Modbus Gateway.

   e. After logging in, click on **Network**.

   f. Un-check the box next to "**I want DHCP to setup the network."**

   g. Re-configure the Modbus Gateway's network settings to something within the range of your PC's network settings. For example:

      PC Network Settings

      IP Address = 192.168.0.1

      Subnet Mask = 255.255.0.0

Default Gateway = 192.168.0.100

Change the Modbus Gateway's network settings to:

IP Address = 192.168.0.50

Subnet Mask = 255.255.0.0

Default Gateway = 192.168.0.100

h. Save the settings and remove power from the Modbus Gateway.

i. Re-apply power. Open the Vlinx Modbus Manager Software and select "**Network**" as the method to connect to the device.

CONFIGURING BB-MESP211T VIA SERIAL PORT (CONSOLE MODE)

Your Modbus Gateway can be configured via a serial port using the Vlinx Modbus Manager software. To use this feature, the Modbus Gateway's serial port must be connected to the serial port of a PC (using a null modem cable, RS-232 only).

Figure 40. *Console Mode Setup*

To configure the Modbus Gateway, it must be put into Console Mode using the Mode switch.

To enter Console Mode, press and hold the Mode switch for between two and ten seconds. The LED indicators respond as follows:

1. The Ready LED blinks while the button is being pressed.
2. When the Modbus Gateway has booted into Console Mode, the Ready LED will be OFF.

To configure the Modbus Gateway, open the software and set up the Modbus Gateway's parameters as required.

1. Under Connection, select "**Serial Port**."

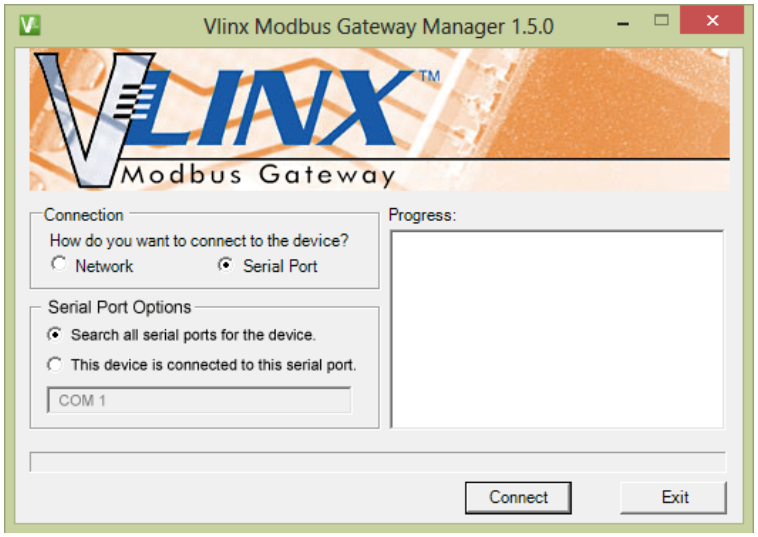


Figure 41. *Connection*

2. If you do not know which COM port your gateway is connect to, select "**Search all serial ports for the device**" under Serial Port Options. If you do know, you may specify the COM port by selecting "**The device is connected to this serial port**" under Serial Port Options and using the pull down menu to choose the COM port.

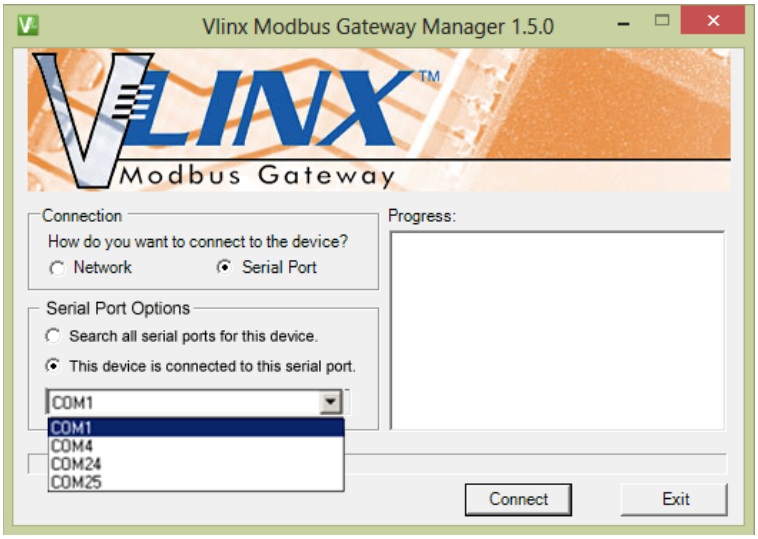


Figure 42. *Serial Port Selection*

NOTE: The remaining screens are identical to *Configuring Your Gateway using a Network Connection*.

To exit Console Mode, press and hold the Reset switch for two seconds. Saving your configuration will also take you out of Console Mode. The LEDs go back to their normal states when the device resumes normal operation.

OPERATIONAL CONNECTIONS

USING THE BB-MESP211T MODBUS GATEWAY IN DIRECT IP MODE

A Direct IP connection allows applications using TCP/IP socket programs to communicate with COM ports on the Modbus Gateway. In this type of application, the Modbus Gateway is configured as a TCP server. The socket program running on the PC establishes a communication connection with the Modbus Gateway. Data is sent directly to and from the serial port on the server.

To set up a Direct IP Mode connection:

1. Connect the Modbus Gateway to the network and a Modbus network as described in previous sections.
2. Configure the Modbus Gateway with the appropriate network settings (used for the web interface).
3. Configure your software application with the appropriate IP address and port number to communicate with the Modbus network(s).

Figure 43. *Direct IP Connection*

INITIATING A HARDWARE RESET ON BB-MESP211T

To initiate a Hardware Reset on the Modbus Gateway, press and hold the Mode switch for 0 to 2 seconds, and then release it. The LED indicators respond as follows:

1. The Ready LED blinks while the button is being pressed.
2. When the Modbus Gateway has reset and rebooted into Normal Mode, the Ready LED will be blinking.

RELOADING FACTORY DEFAULTS

To reload Factory Defaults, press and hold the Mode switch for more than 10 seconds. The LED indicators respond as follows:

1. The Ready LED blinks three times per second while the button is being pressed.

   The Modbus Gateway reloads all factory default configuration parameters. When the device has reset and rebooted the Ready LED will be blinking.
2. The LEDs go back to their normal states when the device resumes normal operation.

Note: Factory default parameters are listed in Appendix A

4. UPGRADING FIRMWARE

Occasionally, updated firmware may become available for your Modbus Gateway. The firmware can be upgraded using the Vlinx Manager software. The following procedure describes the firmware updating process:

1. Click the Upgrade button to open the **Firmware Upgrade** dialog box.

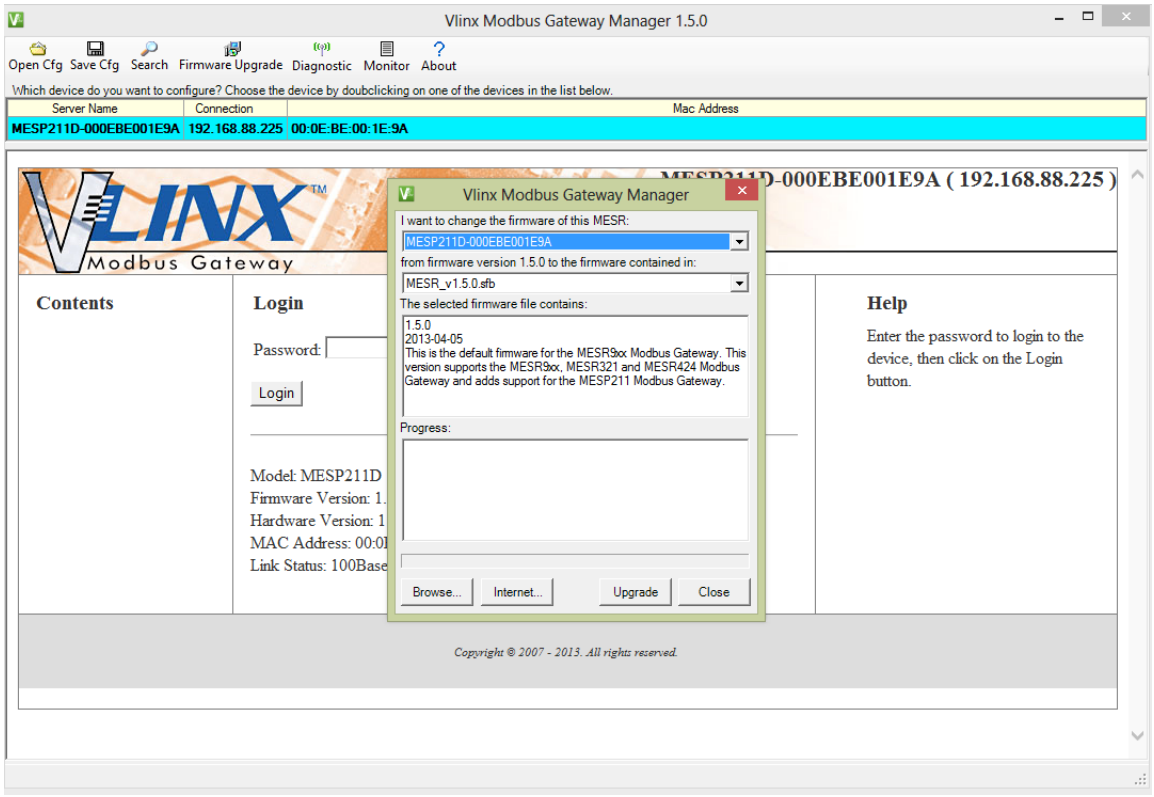


Figure 44. *Firmware Upgrade Dialog Box*

The name of the currently selected Modbus Gateway appears in the top drop down list. Other Modbus Gateways (that have already been discovered) can be selected from the drop down list, if desired.

The current firmware version of the selected Modbus Gateway is shown in the text below the Modbus Gateway name.

Information about the selected firmware file is shown in the third text box.

DOWNLOADING FIRMWARE FILES

The **Firmware File** list (second box) displays all firmware files in the firmware installation folder. Only firmware that is compatible with the selected Modbus Gateway is available in this list.

To download the latest firmware files from an FTP site on the Internet:

1. Click the **Internet** button at the bottom of the window.
   The Vlinx Modbus Manager software connects to an FTP server on the Internet.
2. Click the **Check for Updates** button.
   Progress Bar and **Progress Box** display information about and progress of the download.

To download the latest firmware files from a file:

1. Click the **Browse** button to open an **Open File** dialog box.
2. Browse to the drive and folder containing the firmware file.
3. Select and download the file to the local firmware folder.

UPLOADING THE FIRMWARE TO THE MODBUS GATEWAY

To upgrade the firmware:

1. In the **Modbus Gateway Selection** drop down list, select the Modbus Gateway to be upgraded.
2. In the **Firmware Description** drop down list, select the firmware to upload to the Modbus Gateway.
3. Click the **Upgrade** button.
   Progress Bar and **Progress Box** provides information on the progress of the transfer.
4. In the **Firmware File** drop down list, select the firmware file to upload to the Modbus Gateway.
5. Click **Upgrade**.
   The Progress box and Progress bar display information on the upgrading process.
6. When the upgrade process is complete, click **Close**.

5. DIAGNOSTICS

Clicking the **Diagnostics** icon opens the **Diagnostics** dialog box and enables you to check the operation of connected Modbus Gateways on the local computer.

The **Computer Information** box displays information about the type of network connections, the IP addresses, Subnet Masks and Default Gateways in use.

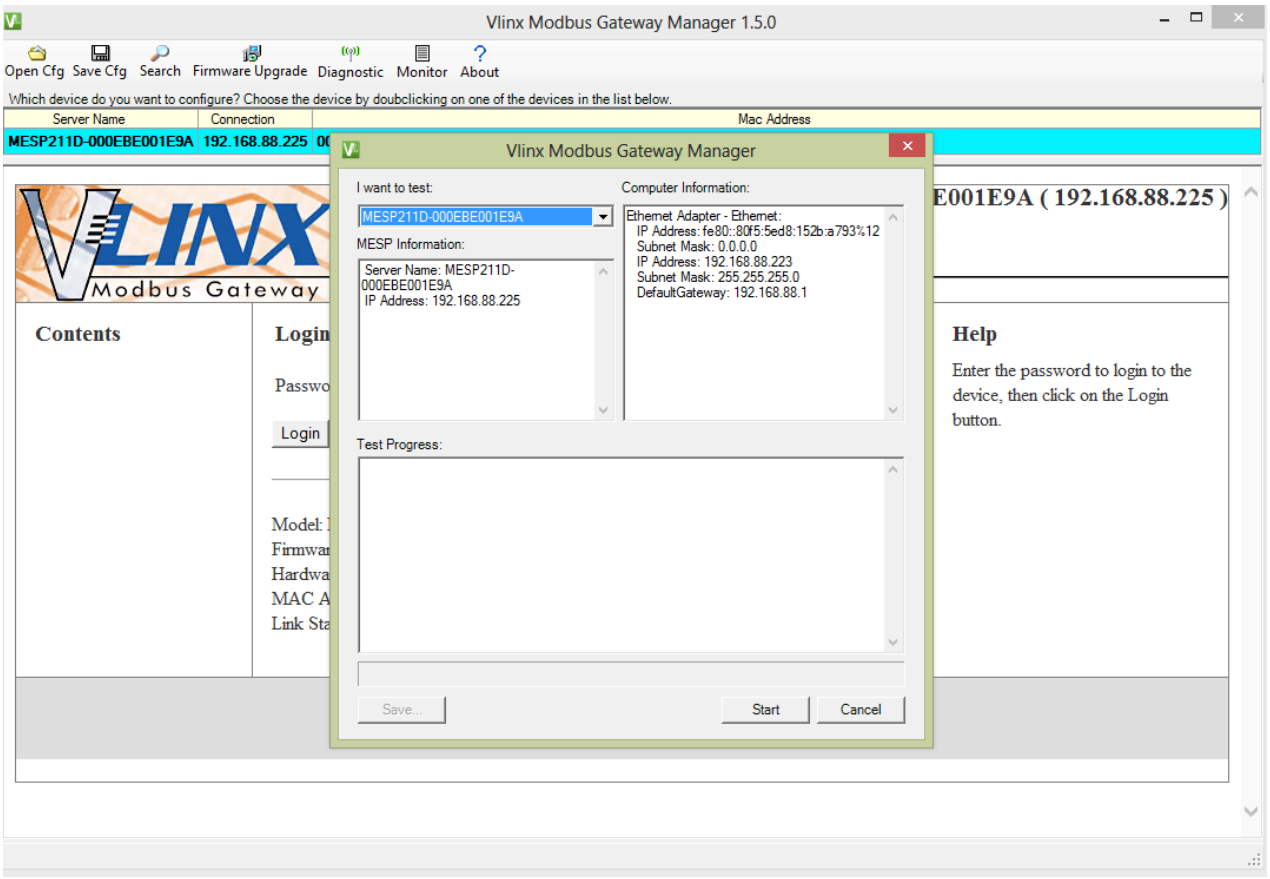


Figure 45. *Diagnostics Dialog Box*

TESTING A MODBUS GATEWAY CONNECTION

To run diagnostics on a Modbus Gateway:

1. Click the **Diagnostics** icon.

   The **Diagnostics** dialog box appears.

2. In the drop down box select the specific Modbus Gateway you want to check.

3. Click the **Start** button.
   Information about the progress of the pinging process is displayed in the **Test Progress** box.

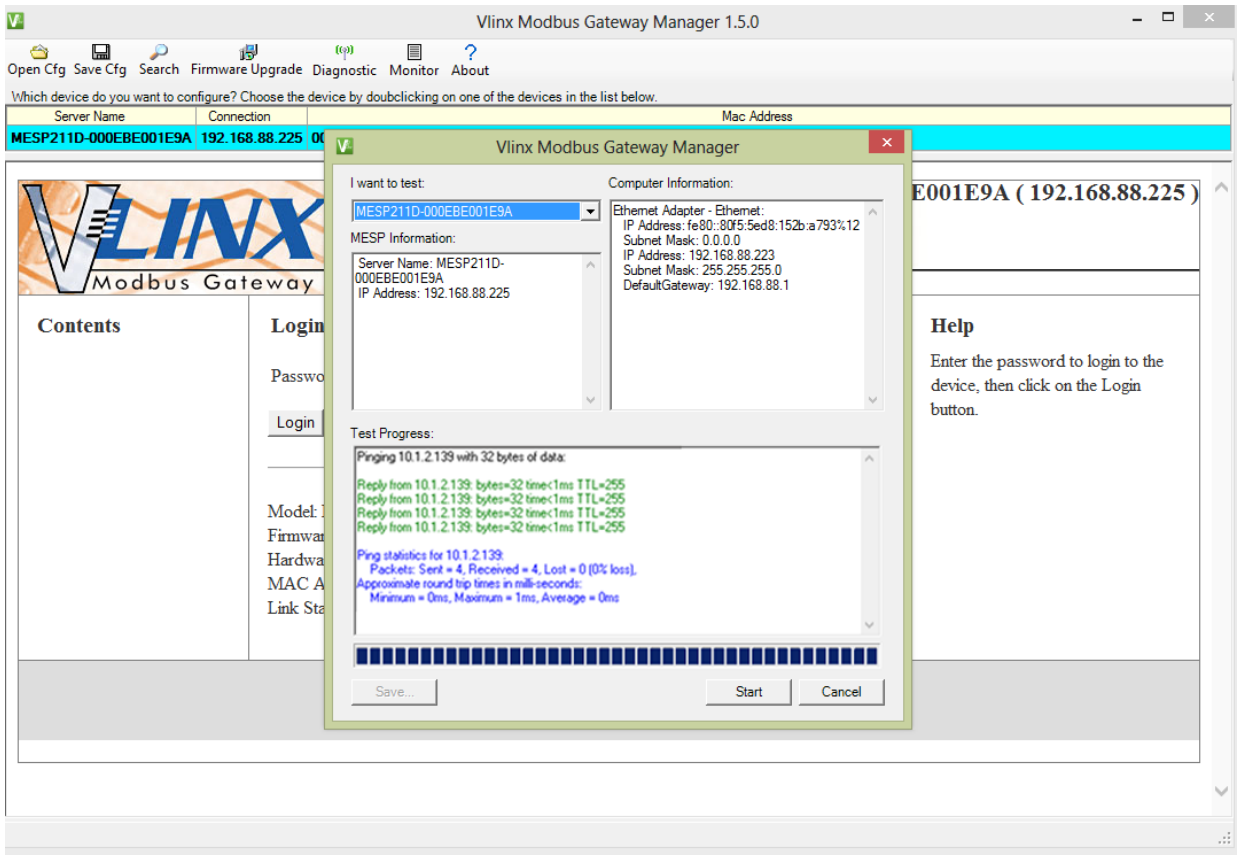


Figure 46. *Testing a Modbus Gateway Connection*

MONITOR FUNCTION

The Monitor button displays a screen that shows information about events and data transfer through the Modbus Gateway.

To start monitoring, select a Modbus Gateway and press the "**Start**" button.

The "**Auto Scroll**" check box enables and disables automatic scrolling of the displayed text.

The "**Clear**" button clears the displayed text.

Press the "**Stop**" button to stop monitoring.

Press the "Save" button to save the information to a file.

6. SETUP EXAMPLES

The Modbus Gateway can be used to integrate Modbus networks in a wide variety of settings. But,as each setting has its own requirements, users may not understand how a gateway helps, or if it is appropriate for their needs. The following scenarios are examples only and many others are possible.

LOG INTO YOUR BB-MESP211T

1. Access the **Port 1 - Serial** setup screen by clicking the link on the left side of the screen.

Figure 47. *Serial Port 1 Setup*

2. Configure **Port 1 – serial** settings. In this case, it is RS-232, 19.2 kbps, 8 data bits, 1 stop bit, and no parity. To save the settings, click the **Save** button.

3. Access **Port 1 Modbus** by clicking the link on the left side of the screen.

Figure 48. *Port 1 Modbus*

4. Configure the **Port 1 Modbus** settings. In this case, **Attached** should be Slaves, **Modbus** should be RTU. The other settings depend on your application.

5. Click and access **Modbus ID Remapping** for each port and configure as necessary.

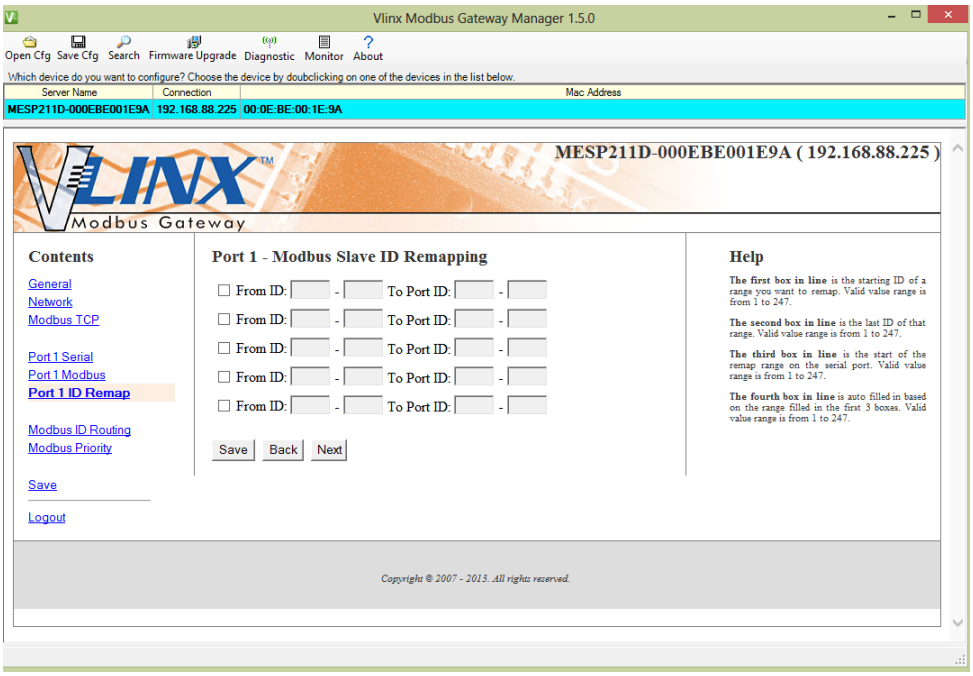


Figure 49. *Port 1 Modbus Slave ID Remapping*

6. Access **Modbus ID Routing.** Configure as necessary. In this example, Slave ID 200 is mapped to serial Port 1, Slave ID 1 through 5 and 205 are mapped to serial port 2.

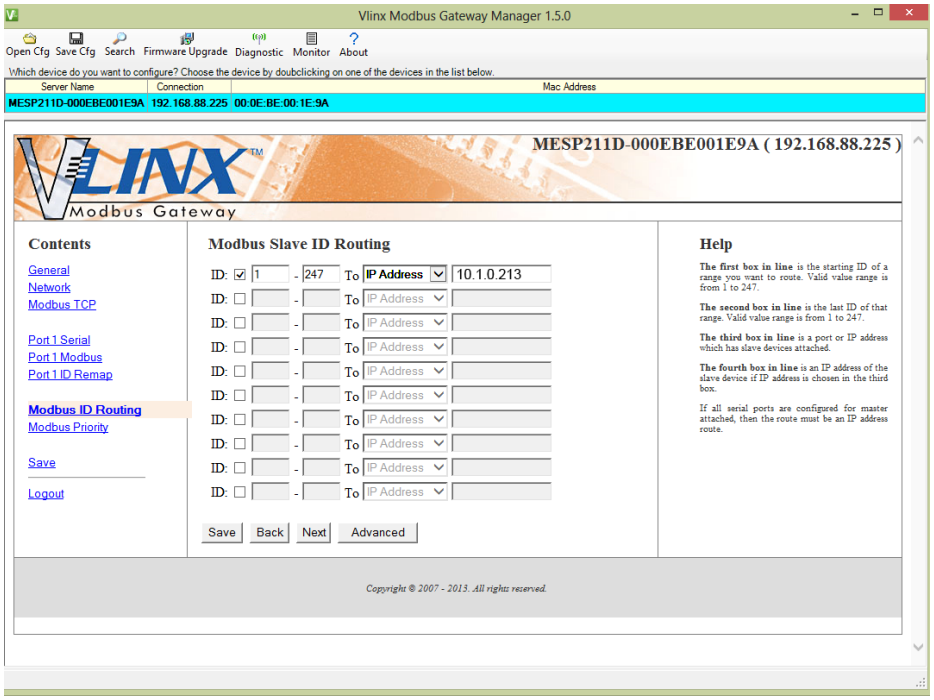


Figure 50. *Modbus ID Routing*

7. Access **Modbus Priority** and configure as necessary.

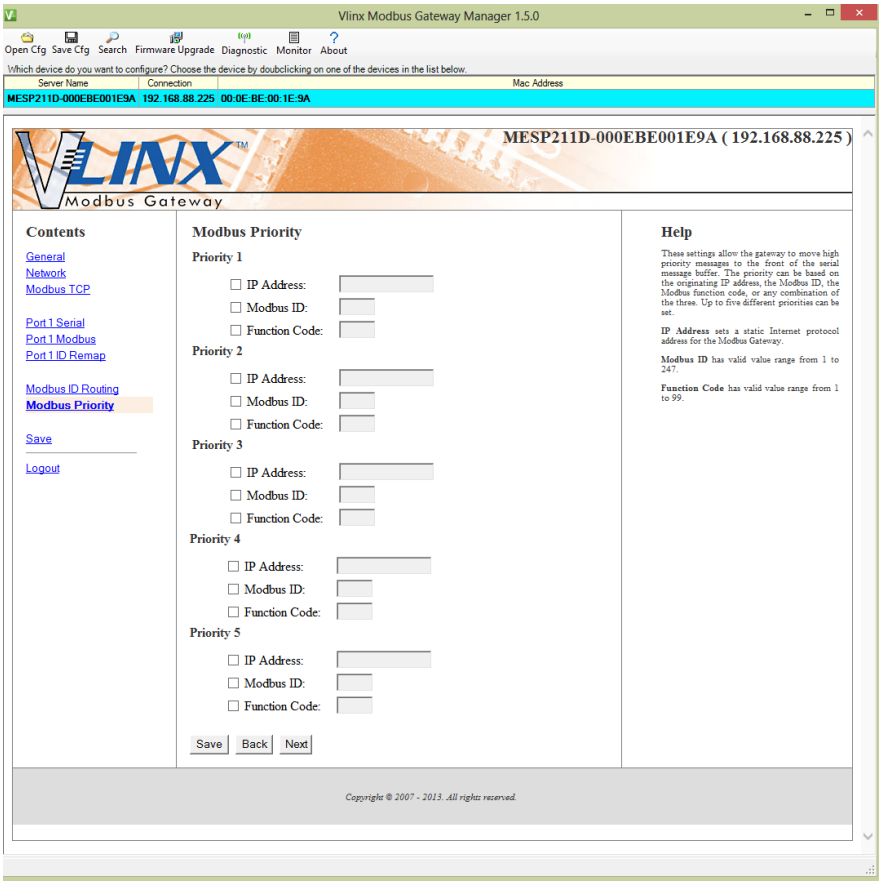


Figure 51. *Modbus Priority*

7. MODBUS HELP

MODBUS ASCII/RTU BASICS

The Modbus protocol emerged in the mid-1970s as an early protocol for linking terminals with Modicon PLCs using a master/slave (sometimes called “master/client”) relationship. This simple, open, message-based protocol caught on quickly and became a de facto standard in the industry. It supports asynchronous point-to-point and multi-drop communications and can be used with a variety of serial interfaces (RS-232, RS-422, RS-485, modems, etc.).

The original Modbus specification included two possible transmission modes: ASCII and RTU.

Modbus RTU mode is the most common implementation, using binary coding and CRC error-checking.

Modbus ASCII messages, though somewhat more readable because they use ASCII characters, are less efficient and use less effective LRC error checking. ASCII mode uses ASCII characters to begin and end messages whereas RTU uses time gaps (3.5 character times) of silence for framing. The two modes are incompatible. So a device configured for ASCII mode cannot communicate with a device using RTU.

All Modbus communications are initiated by Modbus masters using a polling query/response format. The master can send broadcast messages (using a slave address of 0), which all slaves accept, but do not reply to. More commonly, the master polls individual slaves sequentially. In each poll, it sends a message containing a **device address**, followed by a **function code**, any **data** that may be required, and an **error check** field. The addressed slave responds with a similar message structure. Typically, it repeats back its address and the function code, and then sends a field indicating the number of bytes of data it is sending, followed by the data, and the error check field.

Slave addresses can range from 1 to 247. Function codes include common ones typically used in all applications and others that may be implemented in specific cases. Common function codes: Read Coil Status (01), Read Input Status (02), Read Holding Registers (03) and Read Input Registers (04).

When a master sends a message to a slave, it expects to receive a valid response within certain length of time. If the slave does not receive the message, or if the slave receives the message but an error is detected, it does not respond. If the slave cannot respond appropriately for some other reason (e.g. it does not recognize the function code), it will return a message containing an exception response.

HINTS AND TIPS

A few simple suggestions that may assist you if your system is experiencing problems include:

- Slowing down the polling rate may be helpful if power cycling does not cure the problem.
- A common misperception is that every serial network must terminate with a resistor. While this was true of early serial network configurations, it is typically the wrong answer.

8. APPENDICES

This section includes the following Appendices:

- **Appendix A: Default Gateway Settings**
- **Appendix B: Product Specifications**
- **Appendix C: Dimensional Diagrams**
- **Appendix D: Connector Pinouts**

APPENDIX A: DEFAULT GATEWAY SETTINGS

SETTING	DEFAULT VALUE
Gateway Name	User assigned.
Password	Password field is blank from factory.
DHCP	Enabled from factory
IP Address	DHCP will configure. If a DHCP server is not available, the unit will default to 169.254.102.39.
Net Mask	255.255.0.0
Default Gateway	169.254.1.1
MAC Address	Fixed - see bottom product label
Port	1
Serial Port Mode	RS-485
Baud Rate	9600
Data Bits	8
Parity	None
Stop Bits	1
Protocol	TCP
Serial Timeout	0 seconds
Inter-character Timer	0 ms
TCP Port	502
Connection Maximum	1

APPENDIX B: PRODUCT SPECIFICATIONS

This section includes the following specifications:

- **General Specifications**
- **Controls, Indicators and Connector Specifications**
- **Serial Interface Specifications**
- **Network Specifications**

GENERAL SPECIFICATIONS

Hardware and Included Accessories	Device	BB-MESP211T, Modbus Gateway module
	CD	CD with software for Win XP (32/64 bit), 2003 Server (32/64 bit), Vista (32/64 bit), Windows 7 (32/64 bit), Windows 2008 Server (32/64 bit), Windows Server 2012
	Power Supply, included	International, 12 VDC, 6W, 5mm plug, int'l blades
Configuration Options	Via Serial Port	Using serial connection, (press Reset button to enter Console Mode)
	Via Network	Using Vlinx Gateway Manager via Ethernet connection
		Using standard web browser (Internet Explorer, Firefox or Chrome._
Software	Modbus Gateway Configuration	32/64 bit: Windows XP, 2003 Server, Vista, 7, 2008 Server, 8, Server 2012
Environment	Operating Temperature	-40 to +80 °C
	Storage Temperature	-40 to +85 °C
	Operating Humidity	10 to 95%, non-condensing
Enclosure	Rating	IP30
	Mounting	Panel mountable case, DIN rail mount option
	Dimensions	7.938 x 5.257 x 2.209 cm
Power Supply (external supply required; included)	Voltage Requirements	10-30 Vdc
	Power Consumption	2.5 W, maximum
	Output Voltage	12Vdc
	Output Current	0.5A, maximum
	Output Power	6W, maximum
	Output Plug	Standard DC Straight Plug
	Ripple & Noise	200mVp-p, maximum
Terminal Blocks (Note: one conductor per terminal)	Wire Size	28 to 16 AWG
	Wire Type	Copper Wire Only
	Tightening Torque	5 KG-cm
	Wire Temperature Rating	105 °C minimum, Sized for 60°C Ampacity

CONTROLS, INDICATORS, CONNECTOR SPECIFICATIONS

Switches	Reset Button	Hold in for 0 to 2 seconds for hardware reset. Hold in for 2 to 10 seconds for Console Mode. (Do a hardware reset or recycle power to exit Console Mode.) Hold in for more than 10 seconds to reset to factory defaults.
Indicators	Serial LED	Color = Green On = Port open Blink = Data traffic
	RJ45 Ethernet Link LED	Color = Green On = 100BaseTX Off = 10BaseT Blink = Data traffic
	Ready LED	Color = Green Blink (once per second) = System in Normal Mode Off = System in Console Mode
Connector	10BaseT/100BaseTX Ethernet	RJ-45 (8 pin)
	Serial	Terminal block
DC Power		12V DC, external, required, included.

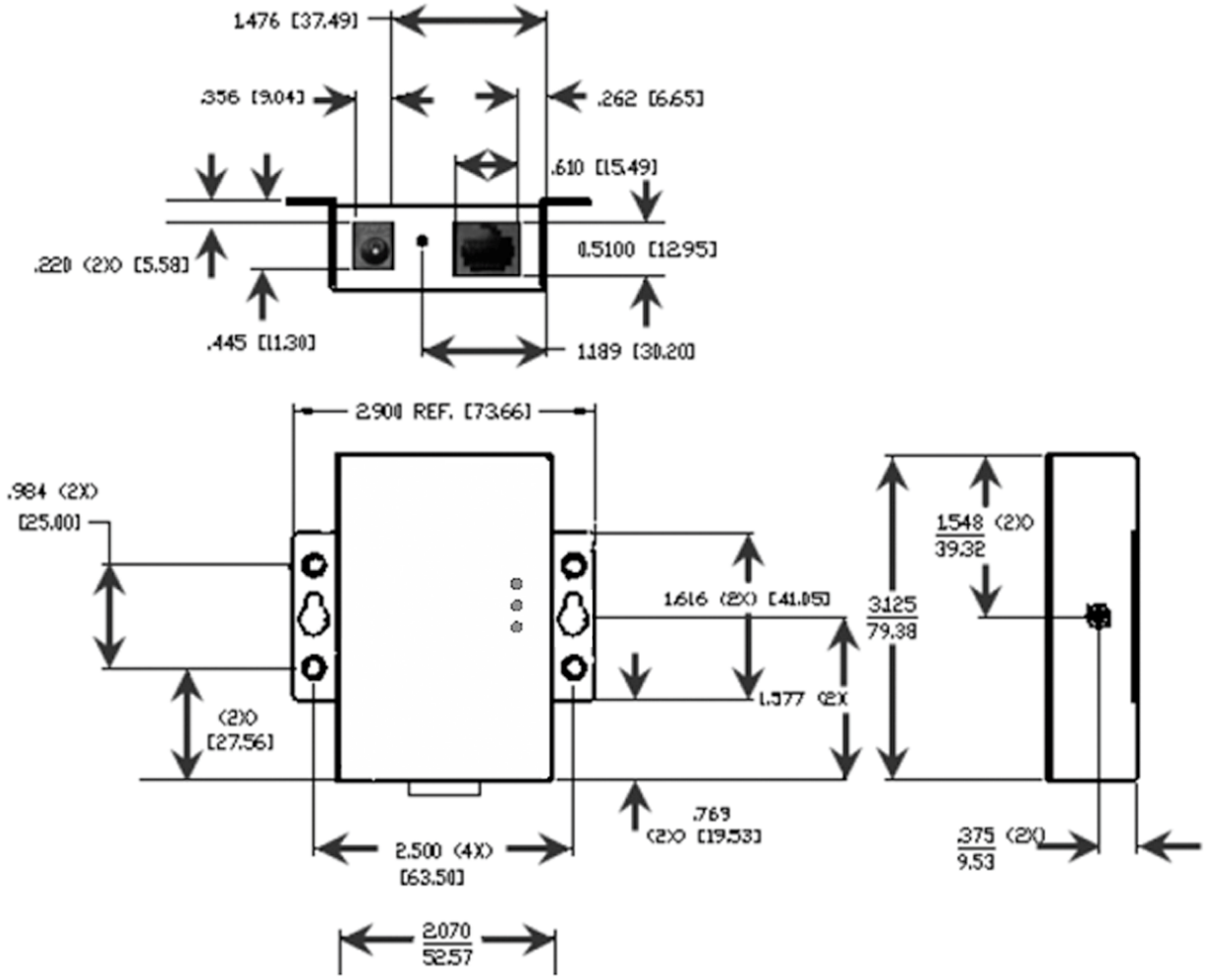
SERIAL INTERFACE SPECIFICATIONS

Mode Selection	RS-232/422/485, software selectable
RS-232 lines	TXD, RXD, RTS, CTS, DTR, DSR, DCD, GND
RS-422 lines (4-wire)	TXDA(-), TXDB(+), RXDA(-), RXDB(+), GND
RS-485 lines (- wire)	Data(-), Data(+), GND
RS-485 lines (4-wire)	TXDA(-), TXDB(+), RXDA(-), RXDB(+), GND
Baud Rates	75, 150, 300, 600, 1200, 2400, 4800, 7200, 9600, 14.4k, 19.2k, 28.8k, 38.4k, 57.6k, 115.2k, 230.4k
Data Bits	7, 8
Parity	None, even, odd, mark, space
Stop Bits	1, 2
RS-422/485 Biasing	Auto 1 K Ohm pull-ups and pull-downs
RS-485 Data Control	Auto control via MCU

NETWORK SPECIFICATIONS

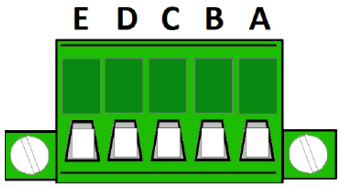
Memory	**Serial Memory**	8 kB per port
	Network Memory	4 kB
TCP Ports	**80**	Web Server
	502	Modbus client/server port – user configurable
	7000	TCP Configuration
	10000	Monitor Port
UDP Ports	**7000**	UDP Configuration
	8899	Device Discovery
Network Communications	**LAN**	10/100 Mbps Auto-detecting 10BaseT or 100BaseTX
Network Physical Layer Standards	**Ethernet**	IEEE 802.3 auto-detecting & auto MDI/MDX 10BaseT, 100BaseTX and 100BaseFX
Protocols Supported		TCP, IPv4, ARP, HTTP 1.0, ICMP/PING, DHCP/BOOTP
	IP Mode	Static, DHCP or Auto IP
	TCP	User definable
Connection Modes		Server, Client
Search		Serial direct COM and Ethernet auto search or specific IP
Firmware Upgrade		Via serial or Ethernet
Timeouts	**Modbus Message**	1 to 65535 ms, default set at 2,000 ms
	TX Delay	1 to 65535 ms, default set at 10 ms
Custom Timeouts	**Inter-character**	100 to 5000 ms, default set at 0 – user to set if enabled
	Inter-message	100 to 5000 ms, default set at 0 – user to set if enabled

APPENDIX C: DIMENSIONAL DIAGRAM



APPENDIX D: SERIAL CONNECTOR PINOUTS

TERMINAL BLOCK PINOUTS



Terminal	RS-232	Direction (RS-232)	RS-422	RS-485
A	RTS	Output	TDA (-)	Data A (-)
B	TD	Output	TDB (+)	Data B (+)
C	CTS	Input	RDA (-)	---
D	RD	Input	RDB (+)	---
E	GND	****	GND	GND

In RS-422 mode, TX lines are outputs and RX lines are inputs. Connect the Modbus Gateway TXB(+) line to the RXB(+) line of the Modbus network; and the Modbus Gateway TXA(-) to the RXA(-) of the Modbus network.

Ground is signal ground and provides a common mode reference for the RS-422 Receiver and Transmitters.

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ELECTROSTATIC DISCHARGE PRECAUTIONS

Electrostatic discharge (ESD) can cause damage to any product, add-in modules or stand-alone units, containing electronic components. Always observe the following precautions when installing or handling these kinds of products.

1. Do not remove unit from its protective packaging until ready to install.
2. Wear an ESD wrist grounding strap before handling any module or component. If the wrist strap is not available, maintain grounded contact with the system unit throughout any procedure requiring ESD protection.
3. Hold the units by the edges; do not touch the electronic components or gold connectors.
4. After removal, always place the boards on a grounded, static-free surface, ESD pad or in a proper ESD bag. Do not slide the modules or stand-alone units over any surface.

WARNING! Integrated circuits and fiber optic components are extremely susceptible to electrostatic discharge damage. Do not handle these components directly unless you are a qualified service technician and use tools and techniques that conform to accepted industry practices.

REGULATORY

UL	UL Listed (File E353510)
FCC	FCC Part 15 Class B
CE - Directives	2014/30/EU – Electromagnetic Compatibility Directive (EMC) 2014/35/EU – Low Voltage Directive (LVD) 2015/863/EU – Reduction of Hazardous Substances Directive (RoHS-3) 2012/19/EU – Waste Electrical and Electronic Equipment (WEEE)
CE - Standards	EN55032 Class B – Electromagnetic Compatibility of Multimedia Equipment – Emission Requirements EN55024 – Information Technology Equipment - Immunity Characteristics – Limits of methods of measurement
CE - Safety	EN 60950-1 +A1 + A11 +A12 + A2

European Directive 2002/96/EC (WEEE) requires that any equipment that bears this symbol on product or packaging must not be disposed of with unsorted municipal waste. This symbol indicates that the equipment should be disposed of separately from regular household waste. It is the consumer's responsibility to dispose of this and all equipment so marked through designated collection facilities appointed by government or local authorities. Following these steps through proper disposal and recycling will help prevent potential negative consequences to the environment and human health. For more detailed information about proper disposal, please contact local authorities, waste disposal services, or the point of purchase for this equipment.