WebRelay-Quad™

Users Manual



Revision: 2.5 - May 2015

Covers: **X-WR-4R1-5**
X-WR-4R1-I
X-WR-4R1-E

CONTROL by WEB™
www.ControlByWeb.com

a division of...
Xytronix Research & Design, Inc.
Nibley, Utah, USA

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Limitation

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FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Warning:

This equipment has been tested and found to comply with the limits for a Class B (Class A for POE model) digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in

accordance with the instructions, may cause interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Notice:

Changes or modification not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

Installation Guidelines (Read Before Installing)

Do not open the WebRelay-Quad™ enclosure. This will void the warranty.

- This unit must be installed by qualified personnel.
- This unit must not be installed directly outdoors.
- This unit must not be used for medical, life saving purposes, or for any purpose where its failure could cause serious injury or the loss of life.

Notes about security:

By design, WebRelay-Quad™ is very secure. It does not support terminal or file transfer programs such as telnet, ftp, ssh, etc. This means that it is not possible for someone to 'break in' to WebRelay-Quad™ and access other devices on your local network. WebRelay-Quad™ does not support remote firmware updates which means that it is not possible for someone to remotely install malicious software. The simplicity of WebRelay-Quad™ makes it a very secure device. As with any device to be installed on a network, there are some security precautions that should be observed. If WebRelay-Quad™ is installed on the Internet, it is recommended that passwords be enabled for the control page. Make sure secure passwords are used. Passwords should be at least 8 characters in length and should be a combination of upper case letters, lower case letters, and numbers. Don't use passwords that would be easy to guess. For additional security, a firewall may be used to limit access only to selected IP addresses. Another option may be to set up a Virtual Private Network (VPN) between the network where WebRelay-Quad™ resides and the client machine (web browser, second WebRelay-Quad™, etc.).

Final installation note. This ControlByWeb™ product supports connection to 10Mbps and 100Mbps networks. Although 100Mbps networks are faster, the amount of data transferred to and from this device is very minimal and little if any performance increase will be gained by setting it to 100Mbps. There are advantages however, to operate this device at 10Mbps. At 10Mbps, less power is required, the unit runs cooler, and the lifetime of the product will be extended.

Section 1: Introduction

WebRelay-Quad™ is a compact, four-relay module with a built in web server. It can be controlled and/or monitored over any IP network including private networks, IP-based industrial control networks, and the Internet. Users can operate WebRelay-Quad™ using a web browser or a custom application. Computers, PLCs, or automation controllers may control and monitor WebRelay-Quad™ without user intervention. This works by sending text commands over the network and reading XML status pages from WebRelay-Quad™, or by using Modbus/TCP protocol.

WebRelay-Quad™ has many applications and is only limited by imagination. It works very well as a stand-alone device that can be controlled using a web browser or as a convenient way to add I/O to a computer. It can be used in industrial applications to control motors, lights, coils, pumps, valves, etc.

1.1 Features

WebRelay-Quad™ is very simple but has many features. Some features include...

- No programming required
- Easy to use as a stand alone device or as part of a large control system
- Built-in web server provides simple, web based configuration and control
- Control page can be customized with appropriate text and buttons
- 10/100 Ethernet connectivity
- Four, 24Volt 1-Amp relays
- Removable terminal connectors (included) simplifies wiring and service
- Custom applications can control WebRelay-Quad™ with simple text commands and read XML formatted status.
- Modbus/TCP protocol support provides inter-interoperability with devices/software from other manufacturers.
- Password protection
- Selectable TCP ports
- On/Off or pulse mode
- DIN-Rail or Wall Mount

1.2 WebRelay-Quad™ Models Available

WebRelay-Quad™ is currently available in two models. The only difference between the two models is the power supply requirements.

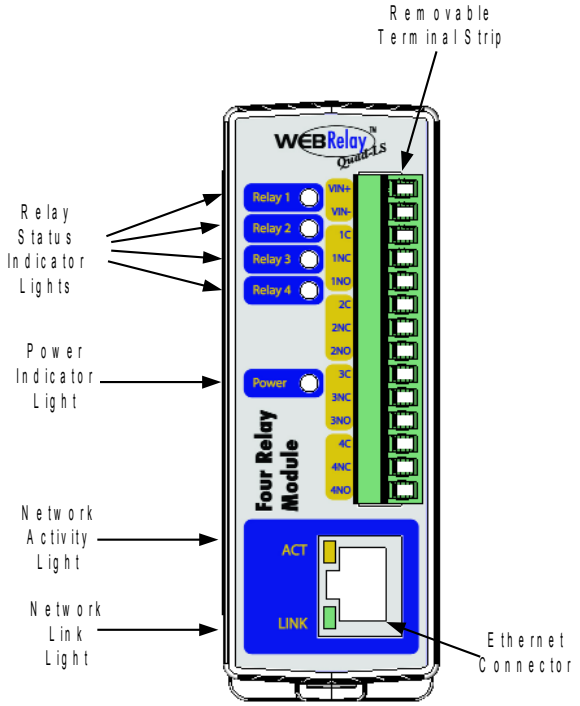
Note: The *WebRelay-Quad X-WR-4R1-I and X-WR-4R1-E have been replaced by X-WR-4R3-I and X-WR-4R3-E respectively. These new models use the same firmware and are 100% compatible with the original module. They use slightly larger relays which provide higher switching current capacity.*

Part Number	Power Supply Requirements
X-WR-4R3-I	9-28VDC
X-WR-4R3-E	Power Over Ethernet or 5VDC

1.3 Connectors & Indicators

WebRelay-Quad™ has a removable terminal connector and an Ethernet connector. The terminal connector is used to provide power to the internal web server, and is used to connect external electrical loads to the relay contacts.

There are seven LED indicators on WebRelay-Quad™. The Power LED (green) indicates that the unit is powered. Four LEDs (green) labeled Relay 1-4 which indicate that the corresponding relay coil is energized. When the relay coils are energized, the NO (Normally Open) contacts are closed and the NC (Normally Closed) contacts are open. The load device that is connected to the relay contacts may be on or off when the coil is energized depending on how it is wired. The LINK (green) LED indicates that WebRelay-Quad™ is properly connected to an Ethernet network. The ACK LED (amber) flashes when there is network activity. Note that the LINK and ACT LEDs are located on the Ethernet connector.

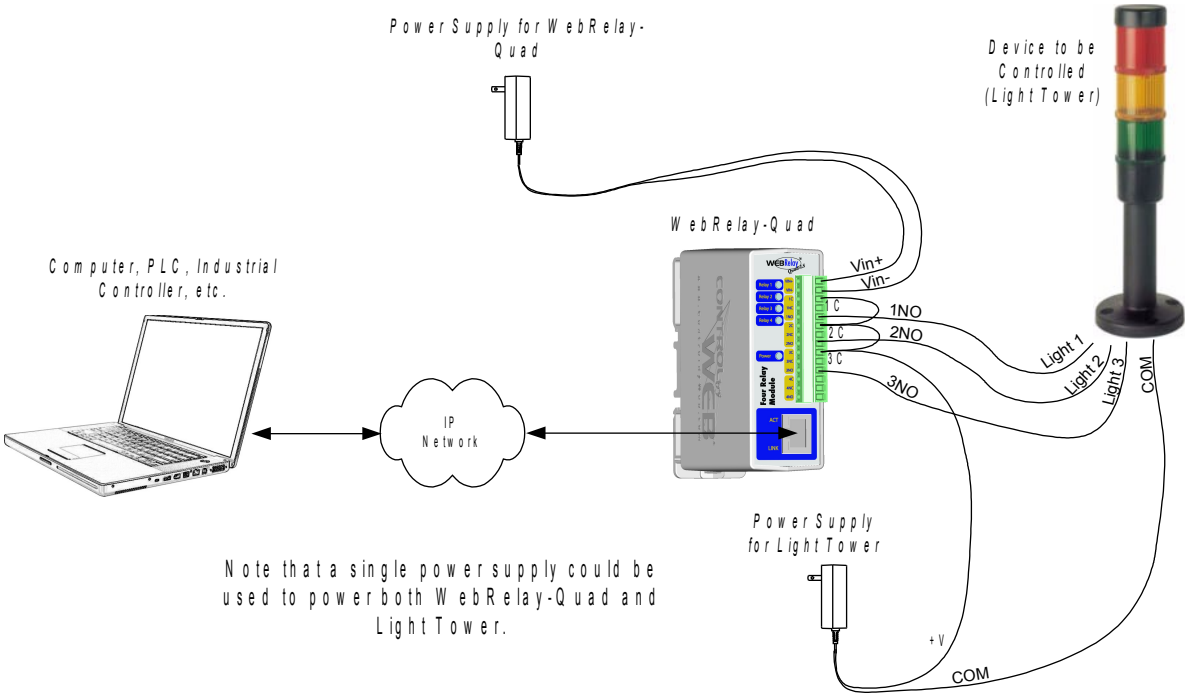


1.4 Example Configurations and Applications

WebRelay-Quad™ is very versatile and can be used in many applications. Several basic installation schemes are illustrated in this section.

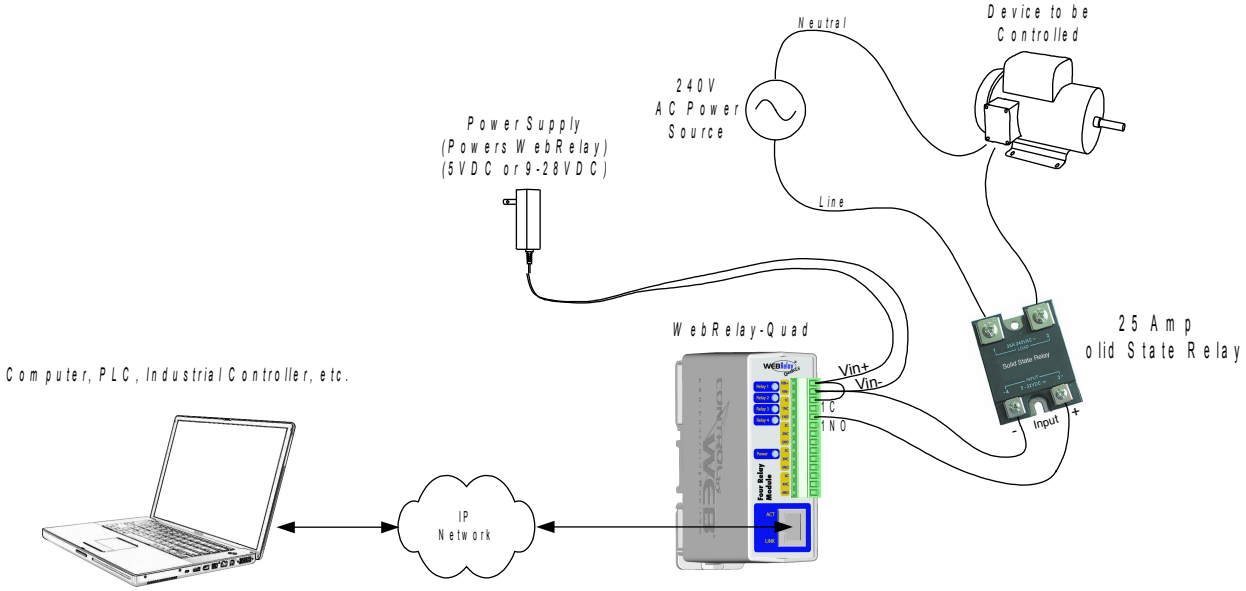
1.4.1 Basic Setup

The illustration below shows a simple WebRelay-Quad™ application. The example shows how a 3-color industrial light tower can be controlled remotely over an Ethernet network. The three lights are connected to three of the relays so each light can be controlled individually. The lights can be connected directly to the relay contacts because they are low power lights (LEDs). The controller can be a web browser, a custom control application running on a computer, a PLC, or an embedded industrial controller. Commands are sent to WebRelay-Quad™ over the Ethernet network using standard IP protocols so the controller can be placed physically next to the light tower or a distance away.



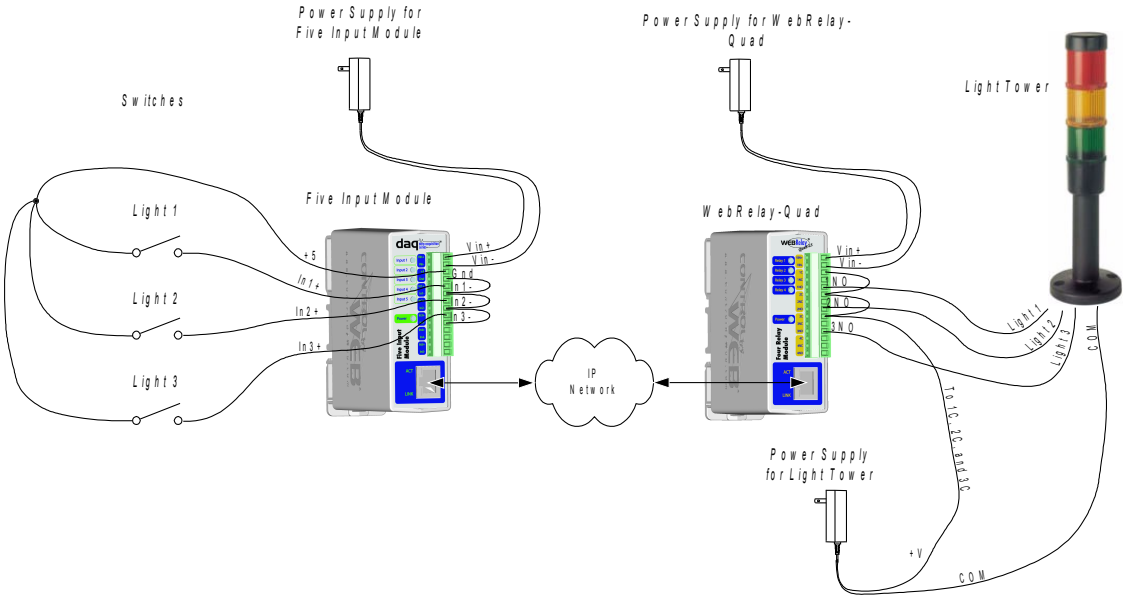
1.4.2 Controlling High Power Devices

WebRelay-Quad™ can be used to control high power devices by using an external relay. In this configuration, WebRelay-Quad™ does not control the load directly, but controls the external relay and the external relay controls the load. This is illustrated below.



1.4.3 Using WebRelay-Quad™ Without a Computer

WebRelay-Quad™ can be used in conjunction with other ControlByWeb products such as WebRelay™ or the Five- Input Module. This allows users to control devices at a remote location by using switches or buttons instead of using a computer. The illustration below shows how three switches can remotely control three indicator lights in a light tower at a remote location. This configuration offers many possibilities in security and remote control. The inputs can be driven by switches, sensors, or digital outputs from a PLC or automation controller.



Section 2: Installation and Setup

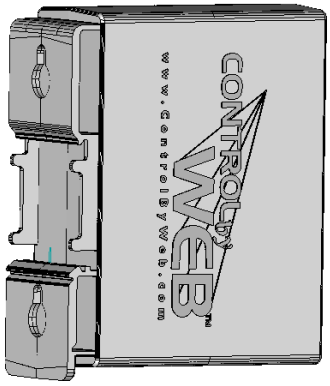
Installation consists of mounting WebRelay-Quad™, connecting to an IP network, providing power, configuring via a web browser, and wiring relay contacts to the device that will be controlled.

2.1 Mounting

WebRelay-Quad™ can be be wall mounted or DIN rail mounted. It should be mounted in a clean dry location where it is protected from the elements. Ventilation is recommended for installations where ambient air temperature is expected to be high.

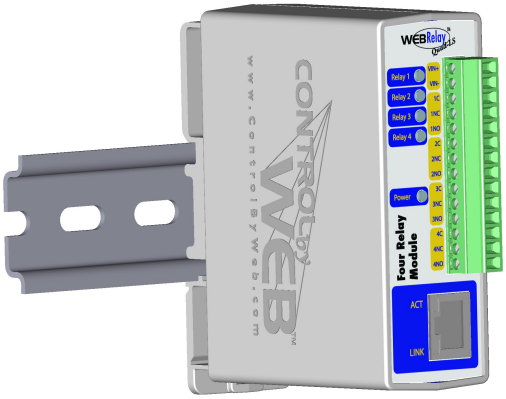
2.1.1 Wall Mounting

WebRelay-Quad™ includes two keyholes in the rear of its enclosure for wall mounting. Mount to a wall by using two #8 screws. Attach the screws to the wall vertically spaced exactly 2.5 inches apart. The head of the screws should be about 1/10 inch away from the wall. See Appendix C for mechanical details.



2.1.2 DIN-Rail Mounting

WebRelay-Quad™ can be mounted to a standard (35mm by 7.55mm) DIN rail. Attach WebRelay-Quad™ to the DIN rail by hooking the top hook on the back of the enclosure to the DIN rail and then snap the bottom hook into place. Remove WebRelay-Quad™ from DIN rail using a flat-head screwdriver. Insert the screwdriver into the notch in the release tab and pry against the enclosure to release the bottom hook.



2.2 Connection

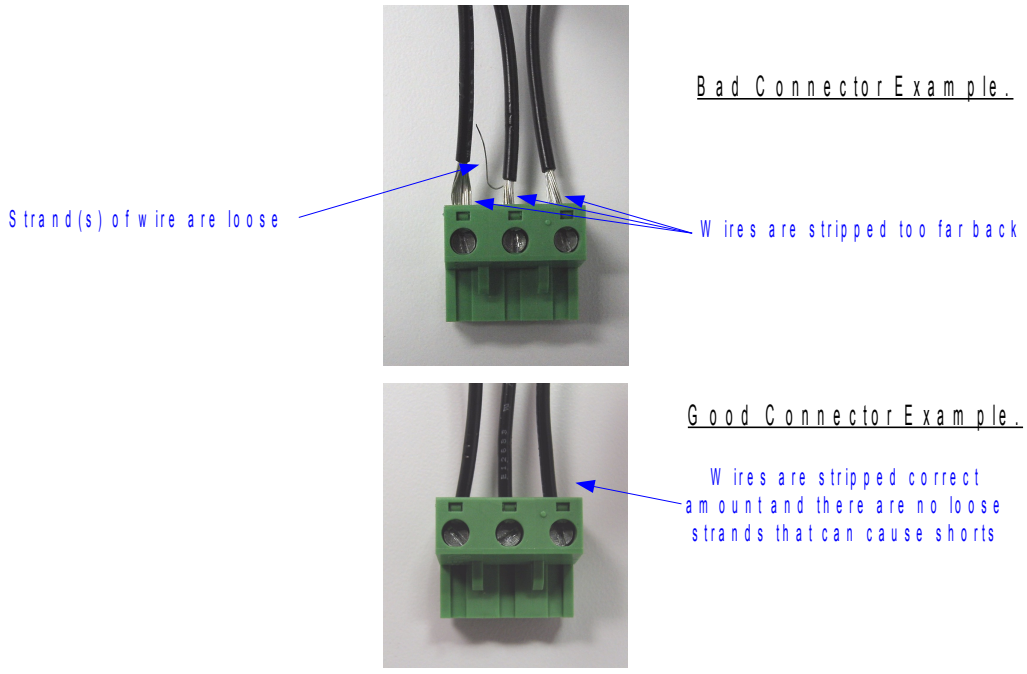
CAUTION: MAKE SURE POWER IS SHUT OFF BEFORE WIRING!

Two removable terminal connectors are provided for simple wiring to WebRelay-Quad™. The correct wiring procedure is as follows;

1. Make sure power is turned off.
2. Remove terminal connectors from WebRelay-Quad™ and make wiring connections to the terminals.
3. Reconnect terminal connectors.
4. Apply power.

It is recommended that the load (device to be controlled) not be connected to WebRelay-Quad™ until after WebRelay-Quad™ has been configured and tested. By doing this, wiring and configuration mistakes will not cause the load device to turn on unexpectedly.

IMPORTANT: MAKE SURE WIRES ARE PROPERLY ATTACHED TO THE TERMINALS!



14-pin connector pinout:

Pin	Description
VIN+	Power supply input. Connect to the positive side of the appropriate power supply. DO NOT EXCEED MAXIMUM POWER SUPPLY VOLTAGE. Model X-WR-4R3-I 9~28VDC Power supply Model X-WR-4R3-E Power Over Ethernet model. These units do not require a power supply to be connected to this pin when the unit is connected to an 802.3af compliant network. Alternatively, this model can be powered using a 5VDC power supply.
VIN-	Power supply ground (-) connection.
1C	Relay 1 Common Contact
1NC	Relay 1 Normally Closed Contact
1NO	Relay 1 Normally Open Contact
2C	Relay 2 Common Contact
2NC	Relay 2 Normally Closed Contact
2NO	Relay 2 Normally Open Contact
3C	Relay 3 Common Contact
3NC	Relay 3 Normally Closed Contact
3NO	Relay 3 Normally Open Contact
4C	Relay 4 Common Contact
4NC	Relay 4 Normally Closed Contact
4NO	Relay 4 Normally Open Contact

2.2.1 Power Supply Connection

WebRelay-Quad™ requires power for its internal logic circuits. Connect appropriate power supply to the Vin+ and Vin- terminals. Alternatively, WebRelay-Quad™ units with the Power Over Ethernet option may be powered through the Ethernet connection instead of using an external power supply.

Multiple WebRelay-Quad™ units may be connected to a single power supply by connecting the power supply input terminals in parallel. The power supply must have a high enough current rating to power all units connected (see specifications for current requirements for a specific model number).

WebRelay-Quad™ units with the Power Over Ethernet option may be connected to an 802.3af compliant Ethernet port instead of connecting an external power supply. In this case, WebRelay-Quad™ is powered through the network port. In an 802.3af compliant network, a 48 Volt power source is injected into the Ethernet line. This power source is provided by an 802.3af compliant hub, switch, or power injector which may be located in a utility closet which could be a distance away from WebRelay-Quad™. This option is very useful for installations where local power is not available. The power injector may inject the 48 Volt power source through the data lines or the spare lines in the Ethernet cable. DO NOT USE A POWER INJECTOR THAT APPLIES A VOLTAGE TO BOTH THE DATA LINES AND THE SPARE LINES.

2.2.2 Network Connection

Connect the Ethernet port to a 10 Base T or 10/100 Base T Ethernet connection. This typically connects to an Ethernet hub, switch, or router. For configuration, WebRelay-Quad™ may be connected directly to the Ethernet port on a computer using a “crossover” cable. Otherwise for connection through a hub or router, a standard “straight-thru” cable should be used.

2.2.3 Relay Connection

The relay contacts internally connect directly to the 14-pin connector. No internal fuse is provided. The relay contacts are rated at 1 Amp max (28V max). For larger loads, an external relay may be used to control the load.

2.3 Establishing Communications for Setup

WebRelay-Quad™ is set up using a web browser. The first task is to establish communications between a computer and the WebRelay-Quad™ device so that the browser-based configuration can begin. To do this, the computer and WebRelay-Quad™ must be physically connected to the same network and both must have IP addresses on the same network. There are two ways to set up the computer and WebRelay-Quad™ so that they are on the same network. The first way (Option 1), is to change the IP address of WebRelay-Quad™ to an address that is on the same network as the computer. The second way (Option 2) is to change the IP address of the computer to an address that is on the same network that WebRelay-Quad™ is set to by default.

2.3.1 Option 1: Assign a temporary IP address to WebRelay-Quad™

This option is used to TEMPORARILY assign an IP address to WebRelay-Quad™ without the need to change the IP address of the configuration computer. Note that WebRelay-Quad™ will only use this IP address as long as power is maintained. Once power is lost and restored, WebRelay-Quad™ will use the IP address assigned in the setup page and not the temporary address assigned here. This means that once communications are established, the desired IP address should be entered into the network setup page using the browser.

To assign the temporary IP address...

1. Make sure WebRelay-Quad™ and the configuration computer are connected to the same physical network. This will not work through routers or gateways.

2. Assign the address as follows...

   Windows**:**
   Open a Command Prompt (on Windows XP, select START, then RUN, then type “cmd”).
   Type...

   arp -s {new IP address} {serial number of WebRelay-Quad™ }

   Note: IP address format is: xxx.xxx.xxx.xxx
   Serial number format is: ss-ss-ss-ss-ss-ss

   For example, to set a WebRelay-Quad™ device (with serial number 00-0C-C8-01-00-01) to 10.10.10.40 the following command would be used.

   arp -s 10.10.10.40 00-0c-c8-01-00-01

   Next, type...

   ping -l 102 {new IP address}

   For example, if the new IP address is 10.10.10.40, the following command would be used.

ping -l 102 10.10.10.40

Linux/Unix:
Open a terminal, change to root user (su -, then enter root password).
Type...

arp -s {new IP address} {serial number of WebRelay-Quad™ }

Note: IP address format is: xxx.xxx.xxx.xxx
Serial number format is: ss:ss:ss:ss:ss:ss

For example, to set a WebRelay-Quad™ device (with serial number 00-0C-C8-01-00-01) to 10.10.10.40 the following command would be used.

arp -s 10.10.10.40 00:0c:c8:01:00:01

Next, type...

ping -s 102 {new IP address}

For example, if the new IP address is 10.10.10.40, the following command would be used.

ping -s 102 10.10.10.40

Mac OS X
Open a terminal,
Note that the terminal is in the “Utilities” directory which is in “Applications” directory.

type
sudo arp -s {new IP address} {serial number of WebRelay-Quad™ }

Note: Administrator password is required.
IP address format is: xxx.xxx.xxx.xxx
Serial number format is: ss:ss:ss:ss:ss:ss

For example, to set a WebRelay-Quad™ device (with serial number 00-0C-C8-01-00-01) to 10.10.10.40 the following command would be used.

sudo arp -s 10.10.10.40 00:0c:c8:01:00:01

Next, type...

ping -s 102 {new IP address}

For example, if the new IP address is 10.10.10.40, the following command would be used.

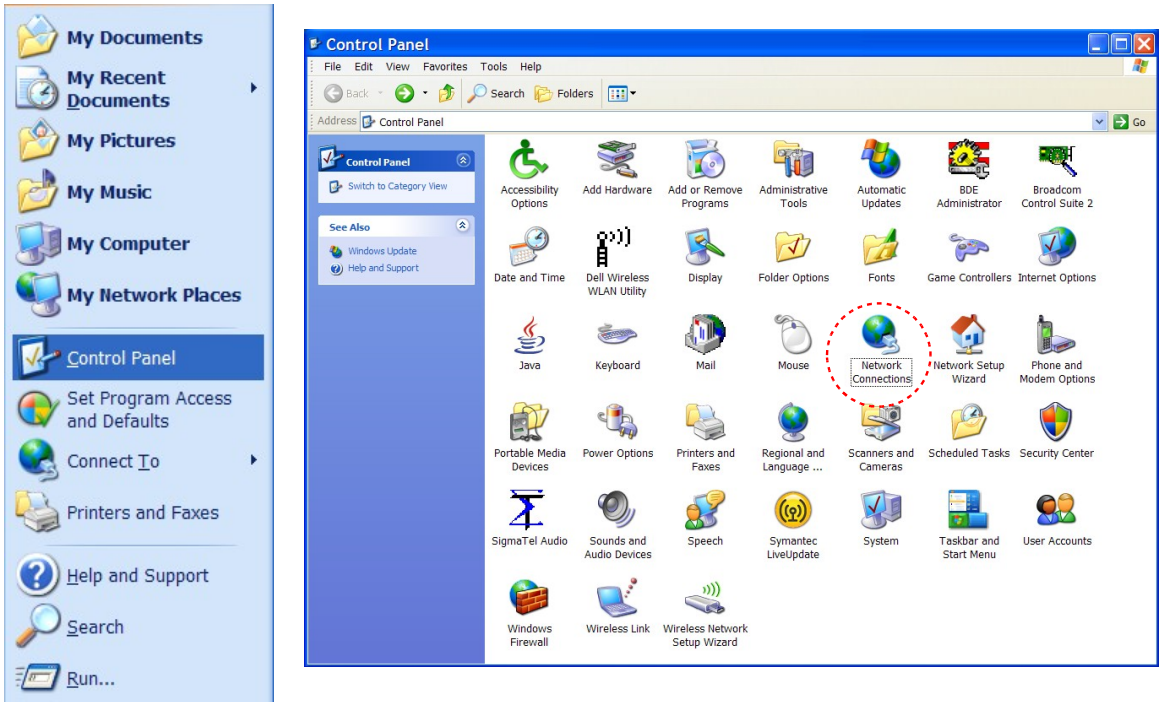
ping -s 102 10.10.10.40

2.3.2 Option 2: Assign a temporary IP address to configuration computer

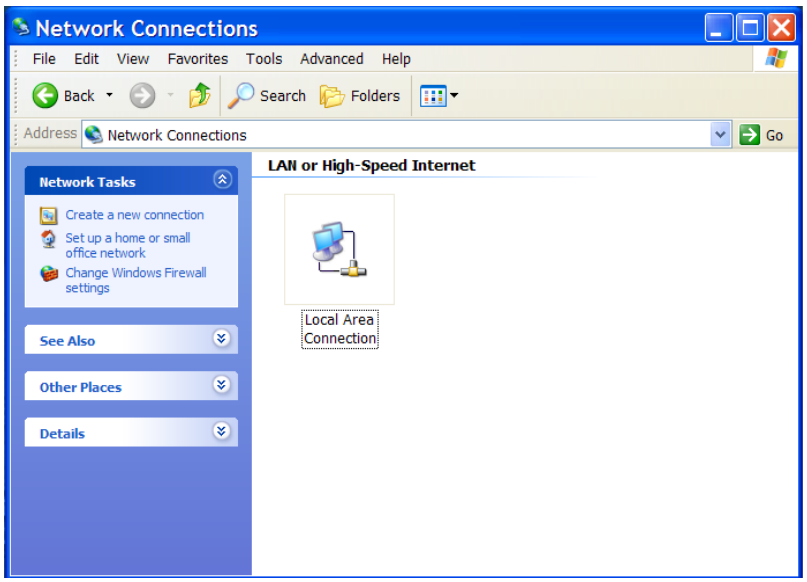
If the first option above is not used, you can use this option to communicate with WebRelay-Quad™ . By default, WebRelay-Quad™ comes from the factory with an IP address of 192.168.1.2. Communications with WebRelay-Quad™ may be established by assigning an IP address to the configuration computer that is on the same network as WebRelay-Quad™ (for example the configuration computer could be assigned to 192.168.1.50) .

Instructions for changing the IP address of the computer that will be used for WebRelay-Quad™ configuration are given here. Note that these instructions are specifically for computers with the Windows XP operating system. For setup using other operating systems, refer to the appropriate users manual.

Step 1: Open the control panel by clicking on the start menu and then clicking on Control Panel. (Note that control panel shown is in “Classic View”. If control panel is in “Category View” select the “Classic View” option before proceeding.)

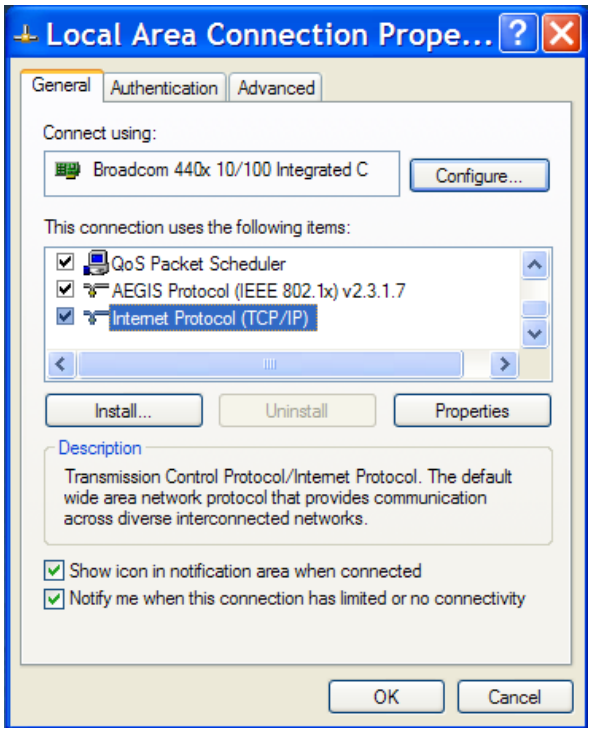


Step 2: Double click on the icon labeled Network Connections. The following menu will pop up.

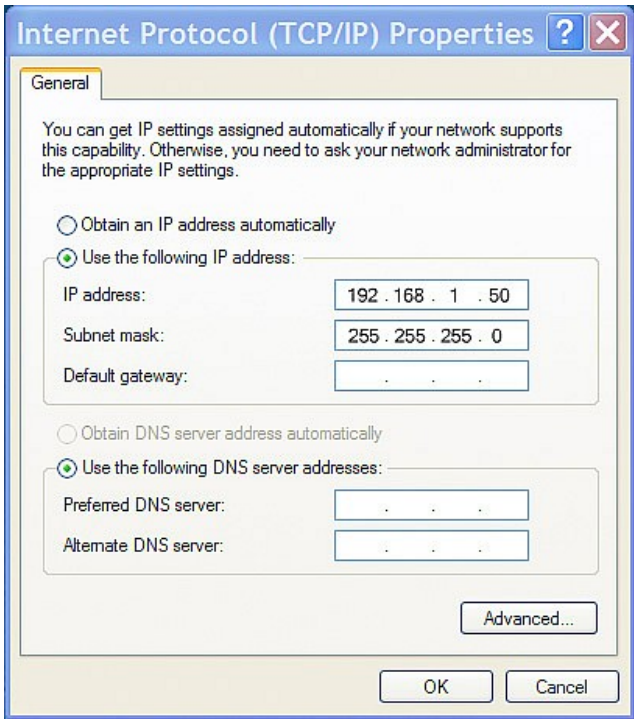


Step 3: Right click on the icon labeled Local Area Connection. Another menu will appear. Select the option at the bottom of the menu labeled Properties. The Local Area Connection Properties window will appear.

Step 4: On the Local Area Connection Properties page scroll down to Internet Protocol (TCP/IPv4), select it, and then click the button labeled properties.



Step 5: Before making any changes to the network settings, write down the current settings so they can be restored once WebRelay-Quad™ is configured. Next, select the radio button labeled "Use the following IP address," and type in the IP address 192.168.1.50. Type in a subnet mask of 255.255.255.0. Leave the default gateway field blank. Click OK to apply settings.



2.3.3 Open Configuration Web Page

Once the network is set up, open the configuration setup page by typing the following URL into the browser:

```
http://192.168.1.2/setup.html
```

Note: If option 1 above was used for initial configuration, replace the IP address given here with the newly assigned IP address.

A password is required to change any parameters. The default password is 'webrelay' (do not include quotes, password is case sensitive).

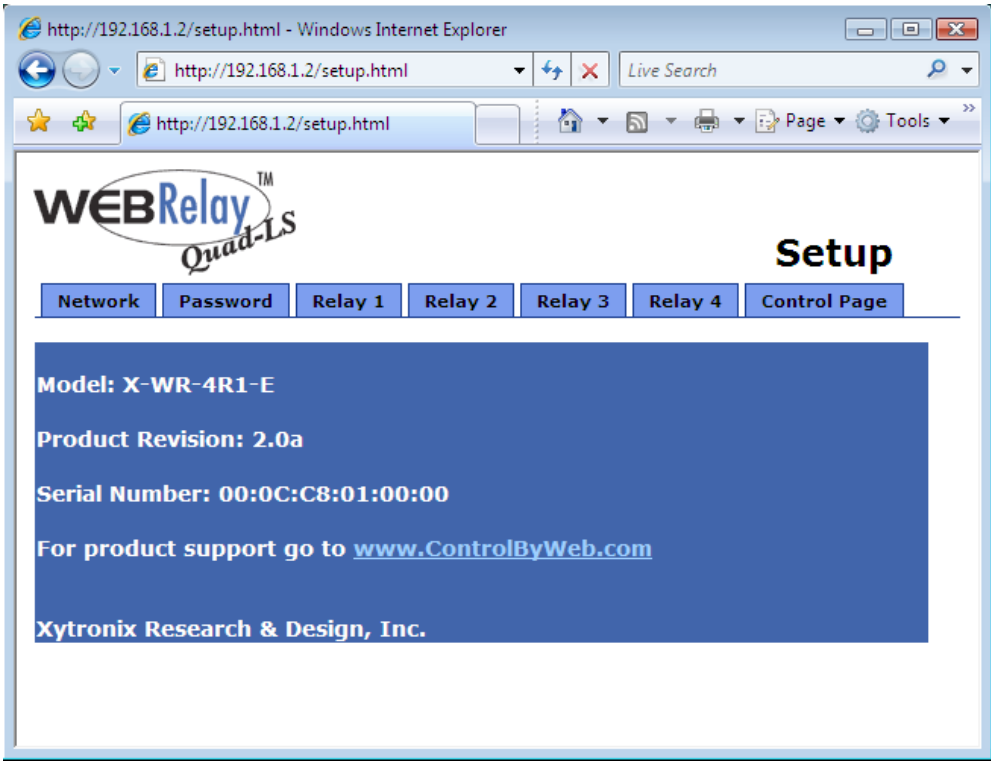
2.4 Web-Based Setup

WebRelay-Quad™ is fully configurable through HTML 4.0 compliant web browsers such as Internet Explorer and Mozilla Firefox. It's easy to use tab based menu system has been designed to allow the unit to be configured easily. Note that in this chapter, the default IP address of 192.168.1.2 is used in all examples. If the IP address has been changed, substitute the new IP address for the address shown in the examples.

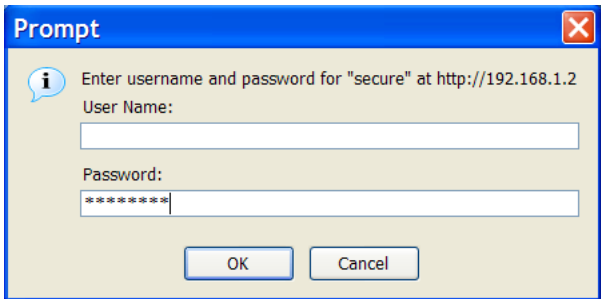
Before proceeding, make sure a network connection has been established between the computer and WebRelay-Quad™. This is done by typing the following URL into the web browser: http://192.168.1.2/setup.html. Another way to check communications is to ping WebRelay-Quad™ (from the command prompt (type ping 192.168.1.2)). Each setup page is described below.

2.4.1 Main Setup Page

This is the initial page that appears when the URL http://192.168.1.2/setup.html is entered into the web browser. It provides basic information about the WebRelay-Quad™ unit.



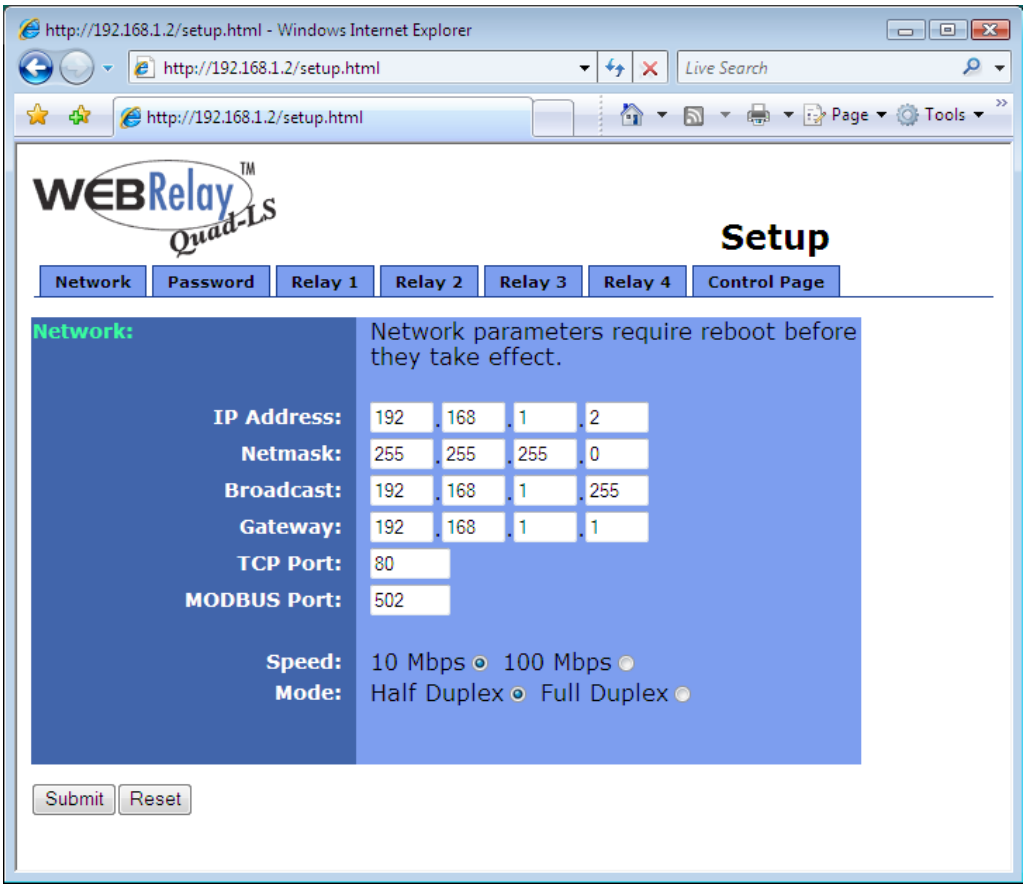
Navigating between setup pages is done by clicking on the tabs at the top of the page. All setup pages require a password. The default password is 'webrelay' (no quotes, all lower case) and no user name is required.



Each setup page has a "Submit" button and a "Reset" button at the bottom of the page. After entering the desired parameters into each page, the "Submit" button must be pressed before any parameters will be saved. If a mistake is made in entering the parameters, the "Reset" button may be used to restore all parameters on the page to their current settings. The "Reset" button is only effective before the "Submit" button is pressed.

2.4.2 Network Setup Page

The network parameters are changed on this page. Note that if multiple WebRelay-Quad™ units are used on the same network, install one unit at a time and set the IP address of each unit before connecting the next unit to the network. This avoids having multiple WebRelay-Quad™ units installed on the network with the same factory default IP address at the same time. It may be necessary to clear the arp cache each time you swap WebRelay-Quad™ units on the network (this is because each unit has the same default IP address but different mac address). This is done by typing arp -d in the command prompt of a Windows computer (arp -d -a as super user on Apple OSX). Also note that the unit must be power-cycled (power disconnected, then reconnected) before network settings take effect. No other setup page requires power-cycling for the settings take effect.



IP Address

WebRelay-Quad™ requires a static IP address. This is a unique address that identifies WebRelay-Quad™ on the network. Dynamic IP address assignment is not supported. The lack of dynamic IP addressing support is intentional because a dynamically changing the IP address would make it difficult for a client to access the web server built into WebRelay-Quad™. The IP address is specific to the network where WebRelay-Quad™ will be installed, and must be obtained from the network administrator.

This guide is not meant to be a tutorial on IP addressing, however a few comments about IP addressing are given here.

If WebRelay-Quad™ will be used over the Internet, the IP address must be a routable address assigned by the upstream Internet Service Provider (ISP).

In cases where the ISP only provides a single routable IP address for the entire network (this is typical with ISPs such as cable providers), a proxy server (or gateway router) may be used. A proxy server allows multiple devices to connect to the Internet using a single routable IP address. Many small routers from LinkSys, Dlink, and Netgear perform proxy server functions. If a proxy server is used, WebRelay-Quad™ will not be accessible from the Internet until the proxy server is properly configured (forward proper port to WebRelay-Quad™). This information is mentioned for convenience but details of setting up a configuration such as this is beyond the scope of this manual.

If WebRelay-Quad™ is used on a private network only and is NOT used over the Internet, a routable IP address is not necessary. This may be the case when WebRelay-Quad™ is used to control (or monitor) a device in another room or a nearby building.

If WebRelay-Quad™ will be installed on a simple, private network that does not connect to the Internet, the default IP address may be used as long as no other device on the network uses the same address. If multiple WebRelay-Quad™ units are installed on the same network, each unit must have its own unique IP address. For example, WebRelay-Quad™ comes from the factory with a default IP address of 192.168.1.2. If multiple units are used, change the IP address for each unit (192.168.1.3, 192.168.1.4, 192.168.1.5 etc.).

Netmask:

This specifies the size of the local network. This must be obtained from the network administrator. By default, the netmask is set to 255.255.255.0.

Broadcast:

This specifies the broadcast address. This must be obtained from the network administrator. By default, this is set to 192.168.1.255.

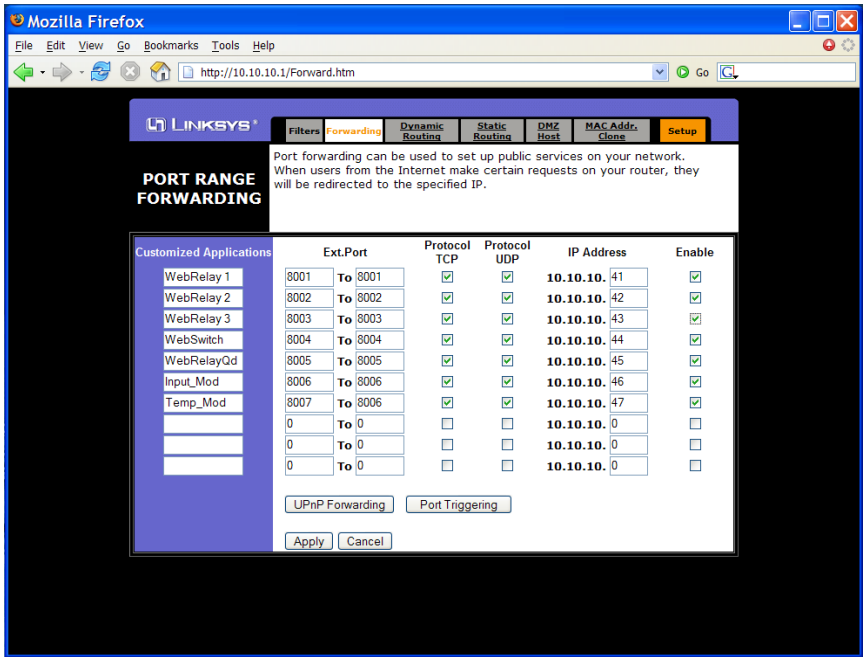
Gateway:

This specifies the IP address of the gateway router. This must be obtained from the network administrator. By default, this is set to 192.168.1.1.

TCP Port:

This specifies the TCP port used for communications with WebRelay-Quad™. By default, the port is set to 80 which is the standard http port. It is recommended that the port not be changed without an understanding of TCP/IP and ports.

Changing the port can be useful for accessing multiple WebRelay-Quad™ devices which are installed behind a gateway router on a private network that uses non-routable IP addresses (192.168.x.x, 10.x.x.x, and 172.16.x.x through 172.31.x.x are non-routable or private IP addresses). In this case, each WebRelay-Quad™ unit would be assigned a different port (for example 8000, 8001, 8002, etc). The gateway router would be set up to forward all traffic for each of the assigned ports to the IP address of the WebRelay-Quad™ unit which uses that port. The WebRelay-Quad™ units could then be accessed from outside the private network by entering the IP address of the gateway and the port for the desired WebRelay-Quad™ unit. Note that whenever any port is assigned other than port 80, all communications with that WebRelay-Quad™ device must include the port. For example, if WebRelay-Quad™ is assigned port 8000, access to the setup page would require the following URL to be entered; http://192.168.1.2:8000/setup.html.



An example screenshot of a gateway router configuration is given below. This setup allows seven ControlByWeb™ products to be accessed on a private network behind a gateway router. Note that this screenshot is simply an example of a typical router setup page. Routers will vary. In the example, the seven ControlByWeb™ products are assigned IP addresses of 10.10.10.41 to 10.10.10.47. The first device labeled WebRelay-Quad 1 has an IP address of 10.10.10.41 and is assigned port 8001. Note that in the WebRelay-Quad™setup page (under Network settings tab), TCP Port 8001 must be specified for this device. The second device, labeled WebRelay-Quad 2 has an IP address of 10.10.10.42 and is assigned port 8002. This WebRelay-Quad™ must have its TCP Port set to 8002 in it's network settings page. This pattern continues through 10.10.10.77 which is assigned the port 8007. To access the ControlByWeb™ units from the Internet, enter the IP address of the gateway plus the port number of the desired device.

Modbus Port:

This specifies the port used for Modbus/TCP communications with WebRelay-Quad™. By default this is set to port 502 which is the standard Modbus port. For users not familiar with Modbus, Modbus is a messaging structure protocol used in industrial manufacturing control and automation. It is an open protocol and offers interoperability with software and devices from other manufacturers. If Modbus is not used, this setting can be ignored. Modbus communications are disabled whenever the control password is enabled.

Speed

This option sets the data rate of the Ethernet port. Both 10Mbps and 100Mbps can be selected. The 100Mbps option offers faster communications but the amount of data to and from WebRelay-Quad™ is so small that users will not likely notice much of a difference. When WebRelay-Quad™ is set to 10Mbps, it draws less power and runs a little cooler which translate into a longer product life. IT IS RECOMMENDED THAT THIS SETTING BE LEFT AT 10MBPS UNLESS THE USER HAS A SPECIFIC REASON TO USE 100MBPS.

Mode

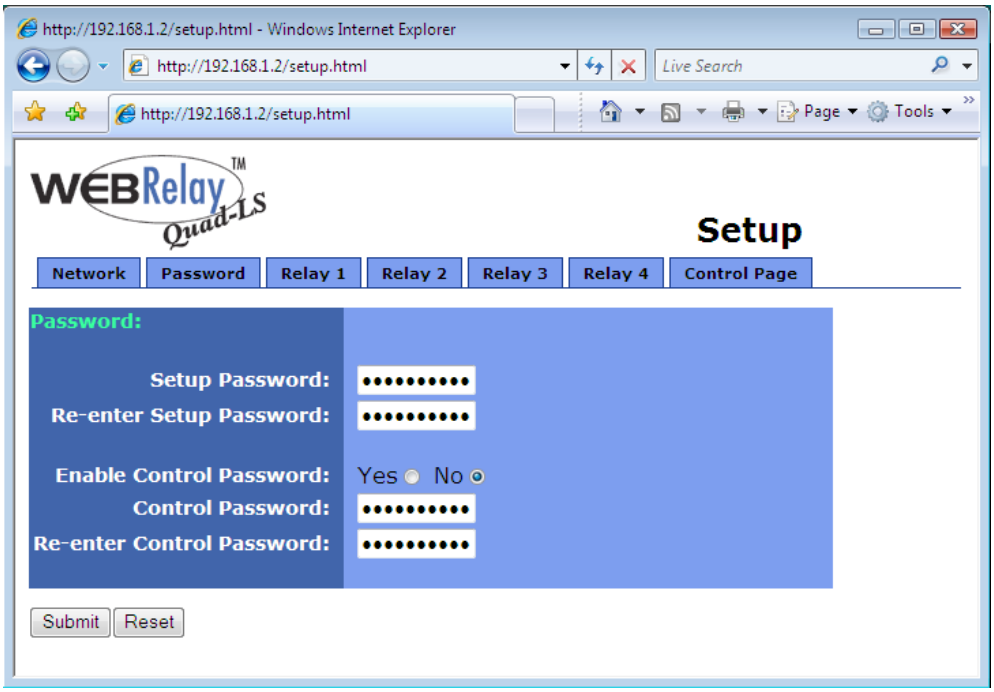
This option allows the Ethernet port to be set to Half Duplex or Full Duplex. Legacy Ethernet operates in Half Duplex mode which means that devices can either send data or receive data, but not both at the same time. Full duplex means that devices can send and receive data at the same time.

MTU Setting

To change the MTU, manually enter the advSetup.html (case sensitive) page into the address bar. (http://192.168.1.2/advSetup.html). This new setup page will have a text box that will allow the MTU to be changed. The valid range is 256 to 1476 bytes. MTU is a network parameter that stands for Maximum Transmission Unit. This defines the max size, in bytes, of the TCP packets sent out from the device. This normally can be left alone, but there are some circumstances where it might be beneficial to change it. One of these circumstances is when the device is to be used over a VPN (virtual private network). VPN's add extra information to TCP packets, if the new packets are too big to physically travel across the network (greater than about 1500 bytes) then the packets will be split up. This causes problems for some firewalls and those firewalls will just discard the packets. To fix this, the MTU can be adjusted until the TCP packets do not get split up.

2.4.3 Password Setup Page

The password setup page is used to change and enable passwords. A password is required for the setup pages but is optional for the control page. The password is enabled or disabled for the control page by using the ***Yes*** or ***No*** radio buttons. Enabling the control page password also enables the requirement for a password when reading/writing XML pages. Enabling the control page password also disables the ability to communicate with WebRelay-Quad™ using Modbus. Note that when the password is changed, the password may be displayed in the browser's history in clear text. It is advisable to clear the browsers history after setting the password. Passwords may be up to 10 characters.



2.4.4 Relay Setup Pages

These pages are used to set up the function of each of the four relays, and how each relay is represented on the control page. All four pages are identical, with the exception of the Relay 1 page which also includes a field for the main header text on the control page, the option to automatically refresh the control page, and the time duration for auto refresh.

The following settings are only included on the Relay 1 setup page and not on Relay 2,3 or 4 setup pages.



Main Header Text:

This text will be displayed in the main header area of the control page. This field can be up to 25 characters in length.

Auto Refresh Page:

Web pages traditionally display static information. The WebRelay-Quad™ control page, however, displays information that is dynamic. Each time the control page is loaded to the browser, it displays a snapshot of the current status of the unit. If the state of the unit changes, the information on the control page will be outdated unless the page is re-loaded. Whenever a user changes the state of the relay via the web browser, the web page will automatically reload the control page to display current information. If, however, the relay state changes due to a change due to a command sent from another machine, the relay state will not be updated and the control page information will be obsolete. The 'Auto Refresh Page' option will cause the control page to continually update its contents by setting a timer in the web page that causes it to be reloaded at a specified time interval.

Duration:

If the 'Auto Refresh Page' option is set to ***Yes***, this field specifies the time interval in seconds that the page will be refreshed. It can be set from 1 to 32 seconds.

The following settings are included on all four relay setup pages. The settings correspond only to the relay associated with that page.

Relay Description:

This text is used to describe the function of the relay on the control page. This text will not appear if the 'Display Relay Status' is set to ***No***, the 'On/Off Buttons' is set to ***0***, and the 'Pulse Button' is set to ***No***. This field can be up to 20 characters in length.

Display Relay Status:

When this option is set to ***Yes***, the relay status will be displayed on the control page. If it is set to ***No***, the relay status will not be displayed.

Status ON Color:

When the 'Display Relay Status' option is set to ***Yes***, this field specifies the color that will be displayed when the relay is *on* (coil energized).

Status ON Text:

When the 'Display Relay Status' option is set to ***Yes***, this field specifies the text that will be displayed when the relay is *on* (coil energized).

Status OFF Color:

When the 'Display Relay Status' option is set to ***Yes***, this field specifies the color that will be displayed when the relay is *off* (coil not energized).

Status OFF Text:

When the 'Display Relay Status' option is set to ***Yes***, this field specifies the text that will be displayed when the relay is *off* (coil not energized).

ON/OFF Buttons:

This option allows the user to specify ***0***, ***1***, or ***2*** buttons to turn the relay on or off. ***Zero*** buttons disables the users ability to turn the relay *on* and *off* (a pulse button may still be included... see below). ***One*** button may be used to toggle the relay *on* and *off*. ***Two*** buttons gives the user one button to turn the relay *on* and another button to turn the relay *off*.

Button 1 Label:

When ***1*** or ***2*** buttons is selected in the 'ON/OFF Buttons' option, this field specifies the text that will be displayed in pushbutton number 1.

Button 2 Label:

When ***2*** buttons is selected in the 'ON/OFF Buttons' option, this field specifies the text that will be displayed in pushbutton number 2.

Pulse Button:

This option allows the user to include a pulse button to control the relay. If the pulse button is included, the relay will *pulse* for the time specified in the 'Pulse Duration' field in the 'Relay/Input' page each time the button is pressed.

Pulse Button Label:

When the 'Pulse Button' option is set to ***Yes***, the text entered here will appear in the pulse button on the control page.

Pulse Duration:

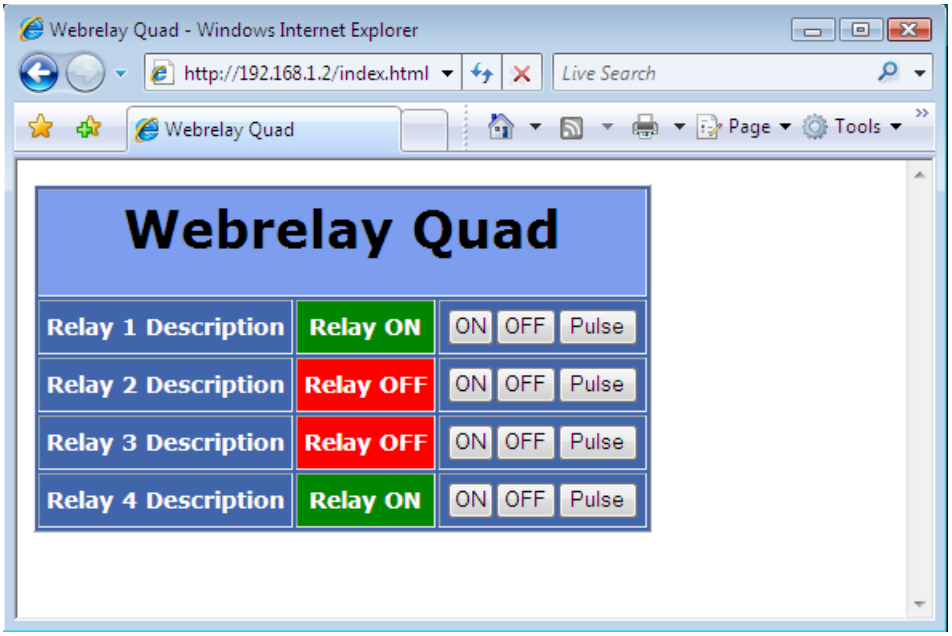
When WebRelay-Quad™ receives a command (from over the network or through an input change) to *pulse* the relay, this is the time in seconds that the relay will pulse *on*. This time can be set from 0.1 seconds to 86,400 seconds (1 day). Note that each time WebRelay-Quad™ receives a pulse command, the relay will be turned *on* (if not *on* already) and the pulse timer will be reset. If WebRelay-Quad™ receives a pulse command and and a second pulse command comes in before the pulse timer has expired, the relay will remain on and the pulse timer will be reset so the duration of the pulse will be extended. If pulse commands are issued continuously so that the pulse timer is not allowed to expire, the relay will remain on until after the last pulse command was sent (to be precise, the relay will go off at the time of the last command plus the Pulse Duration time). The pulse command can be canceled before the pulse duration time has expired by issuing any other command. The factory default setting for this is 1.5 seconds.

Section 3: Operation

WebRelay-Quad™ can be operated by using a web browser, by sending text commands to an XML status/control page, or by sending Modbus/TCP requests.

3.1 Browser Operation

Once the unit is set up, the control page may be accessed by typing the following URL into the web browser: http://192.168.1.2 (Note that if the IP address was changed, replace the default IP address shown with the new address that was assigned. Note also that if any port is used other than port 80, the port must also be included in the request: http://192.168.1.2:8000) The new control page will appear. A control page with default settings is shown below.



3.2 XML Operation

Custom computer applications may be created to monitor and control WebRelay-Quad™ without using a web browser. Monitoring the state of the relays is done by sending a GET request to port 80 (or port specified in setup) for the XML page. Control of the relay is done by sending GET requests to the same page. This can be demonstrated by entering commands into the URL line of a web browser.

3.2.1 state.xml

Request the current state: http://192.168.1.2/state.xml

This will return the following XML page.:

```
<?xml version="1.0" encoding="utf-8" ?>
<datavalues>
      <relay1state>0</relay1state>
      <relay2state>1</relay2state>
      <relay3state>1</relay3state>
      <relay4state>1</relay4state>
</datavalues>
```

The tags <relay1state>... <relay4state> indicate the current state of each of the four relays. Values for the tags are described below.

XML Tags*	**Values**
`<relayXstate>`	0 = Off (coil off) 1 = On (coil energized)

* 'X' is replaced by the relay number.

3.2.2 XML Control

Commands can be sent to WebRelay-Quad™ to control the relays. Commands are sent using variables called relay1State, relay2State, relay3State and relay4State. Examples of using relayXState (X represents the appropriate relay) are given here.

Note: http://192.168.1.2/ would be included on all of the following commands.

Command	**Description**
`state.xml?relay1State=0`	Turn Relay 1 Off
`state.xml?relay1State=1`	Turn Relay 1 On
`state.xml?relay1State=1&relay3State=0`	Turn Relay 1 ON, Turn Relay 3 OFF

Commands can be issued to pulse the relays instead of simply turning them on or off by setting the relayXState to 2. Commands can also specify pulse times so that the relay can be pulsed for times other than the times specified in the relay setup pages. This is done by sending an additional variable called pulseTimeX (once again, X represents the appropriate relay).

Command	**Description**
`state.xml?relay1State=2`	Pulse Relay 1 for the preset time
`state.xml?relay1State=2&pulseTime1=5`	Pulse Relay 1 for 5 seconds
`state.xml?relay3State=2&pulseTime3=10`	Pulse Relay 3 for 10 seconds

The pulseTimeX variable does not change the pulse time specified in the setup page and it is not stored or recorded. The pulseTimeX variable only changes the pulse duration for the single pulse initiated by that command. In other words, you must issue the pulseTimeX for each pulse command that differs from the preset pulse time. For example, suppose the pulse time is set to 1.5 seconds in the configuration pages. To issue one 1.5 second pulse, three five second pulses, and a 1.5 second pulse once again, you would issue the following commands...

state.xml?relay1State=2	This will pulse the relay for the preset time (1.5 seconds)
state.xml?relay1State=2&pulseTime1=5	This will pulse the relay for 5 seconds.
state.xml?relay1State=2&pulseTime1=5	This will pulse the relay for 5 seconds
state.xml?relay1State=2&pulseTime1=5	This will pulse the relay for 5 seconds
state.xml?relay1State=2	This will pulse the relay for the preset time (1.5 seconds)

Note: http://192.168.1.2/ would be included on all commands above

Multiple relays can be changed with a single command by submitting multiple relayXState variables separated by an ampersand symbol (&). All four relayXState variables or a subset of the relayXState variables can be included. The relayXState variables can be in any order. Relays that are already in the desired state will not be affected by on/off commands.

Note: Pulse commands will reset the pulse timer each time a command is received.

The following line illustrates how to turn ‘ON’ Relay 1, turn ‘ON’ Relay 2, and turn ‘OFF’ Relay 4.

```
http://192.168.1.2/state.xml?relay1State=1&relay4State=0&relay2State=1
```

When the above commands are sent to WebRelay-Quad™, its current state is returned in the form of an XML page.

Note: The XML reply does not contain headers. To generate an XML reply with headers use the following command:

Command	**Description**
`stateFull.xml`	Return the XML reply with headers

The commands can also be sent without having WebRelay-Quad™ return the XML page. This is accomplished by adding the noReply field as follows.

Command	**Description**
`state.xml?relay1State=1&noReply=1`	Turn Relay 1 ON without returning state.
`state.xml?relay1State=0&noReply=1`	Turn Relay 1 OFF without returning state.

3.2.3 GET Requests

GET requests can be used by custom applications to monitor and control the relays. A few example GET requests are provided below.

No Password Enabled:

GET requests to the device for specific files.

Example: Request home.html

```
GET /home.html HTTP/1.1\r\n\r\n
```

Example: Turn Relay 1 ON

```
GET /state.xml?relay1State=1 HTTP/1.1\r\n\r\n
```

Password Enabled:

If the control password is enabled in the WebRelay-Quad™ unit and the XML page is requested through a browser, the browser will prompt the user for the password. If the XML request is sent from another application and not a browser, the html request will need to contain the password encoded using the base 64 encoding scheme. The html request header without the password looks like this:

```
GET /state.xml?noReply=1 HTTP/1.1 (Terminated with two \r\n)
```

The html request header with the password looks like this:

```
GET /state.xml?relay2State=1&noReply=1 HTTP/1.1 (Terminated with one \r\n)
Authorization: Basic bm9uZTp3ZWJyZWxheQ== (Terminated with two \r\n\)
```

where bm9uZTp3ZWJyZWxheQ== is the base 64 encoded version of the username and password none:webrelay.

A utility is provided at http://www.ControlByWeb.com/encoder that can be used to encode the password. The utility is used by simply typing the string username:password into the website and pressing encode.

3.3 Modbus Operation

WebRelay-Quad™ can be controlled (and read) using Modbus/TCP protocol. This provides a standard means of using WebRelay-Quad™ in conjunction with devices and software from other manufacturers. This section contains the information necessary to communicate with WebRelay-Quad™ using Modbus/TCP. This is not a tutorial on Modbus and it is assumed that reader is already familiar with Modbus. Detailed Modbus information can be found at http://www.modbus.org.

It is important to note that when the control password in WebRelay-Quad™ is enabled, Modbus/TCP communications are disabled. This is because Modbus/TCP does not provide a mechanism for password protection. Make sure the control password is disabled (default) before using Modbus with WebRelay-Quad™.

WebRelay-Quad™ functions as a Modbus server. Client devices open a connection with WebRelay-Quad™ on port 502 (unless another modbus port is selected) and sends commands or requests to to read the state of a relay, or change a relay. When WebRelay-Quad™ receives a command, it will perform the desired function and return a response. The following commands are available:

- Read Coils (Modbus function 01) - read the status of the relay (and/or the input).
- Write Single Coil (Modbus function 05) - change the relay state
- Write Multiple Coils (Modbus Function Code 15) – change multiple relays at the same time
- Write Multiple Registers (Modbus function 16) - pulse the relay or multiple relays.

Multiple commands may be sent without closing and re-opening the connection but if no data is transferred for about 50 seconds the connection will time out. To keep the connection open, a read request can be sent periodically.

3.3.1 Read Coils (Modbus Function Code 01 (0x01))

This function returns the state of the relay coil(s).

Relay 1 is at address 0x0000, relay 2 is at address 0x0001, relay 3 is at address 0x0002, and relay 4 is at address 0x0003. Multiple relays may be read at the same time by specifying the correct starting address and quantity of coils. When address 0x0000 is used, the quantities of coils can be 0x0001, 0x0002, x0003 or 0x0004. When address 0x0003 is used, the only valid quantity of coils is 0x0001. This means that relays 1 and 4 cannot be read without reading relays 2 & 3.

Request
Modbus/TCP:
Transaction identifier (2 Bytes): 0x0001
Protocol identifier (2 Bytes): 0x0000
Length (2 Bytes): 0x0006
Unit identifier (1 Byte): 0xff

Modbus:
Function code (1 Byte): 0x01 (read coils)
Starting address (2 Bytes): 0x0000 (0x0000 ~ 0x0003)
Quantity of coils (2 Bytes): 0x0002 (0x0001 ~ 0x0004)

Character String Example:

```
char read_coils_mb_request[] =
        {0x00, 0x01, 0x00, 0x00, 0x00, 0x06, 0xff, 0x01, 0x00, 0x00, 0x00, 0x02 };
```

Response
Modbus/TCP:
Transaction identifier (2 Bytes): 0x0001

Protocol identifier (2 Bytes): 0x0000
Length (2 Bytes): 0x0004
Unit identifier (1 Byte): 0xff

Modbus:
Function code (1 Byte): 0x01 (Read coils)
Byte count (1 Byte): 0x01
Coil status (1 Byte): 0x00 to 0x0F (see chart below)

Data Byte (hex)	LS Data Bits (binary)	Relay 4 State	Relay 3 State	Relay 2 State	Relay1 State
0x00	0000	off	off	off	off
0x01	0001	off	off	off	on
0x02	0010	off	off	on	off
0x03	0011	off	off	on	on
0x04	0100	off	on	off	off
0x05	0101	off	on	off	on
0x06	0110	off	on	on	off
0x07	0111	off	on	on	on
0x08	1000	on	off	off	off
0x009	1001	on	off	off	on
0x0A	1010	on	off	on	off
0x0B	1011	on	off	on	on
0x0C	1100	on	on	off	off
0x0D	1101	on	on	off	on
0x0E	1110	on	on	on	off
0x0F	1111	on	on	on	on

Modbus Error:
Function code (1 Byte): 0x81
Exception code (1 Byte): 0x01 or 0x02

Exception codes:
0x01 - Function code not supported
0x02 - Incorrect starting address / quantity of outputs combination

Character String Example:
char read_coils_mb_response[] =
{0x00, 0x01, 0x00, 0x00, 0x00, 0x04, 0xff, 0x01, 0x01, 0x01};

3.3.2 Write Single Coil (Modbus Function Code 05 (0x05))

This function is used to change the state of the coil

Request

Modbus/TCP:

Transaction identifier (2 Bytes): 0x0001
Protocol identifier (2 Bytes): 0x0000
Length (2 Bytes): 0x0006
Unit identifier (1 Byte): 0xff

Modbus:

Function code (1 Byte): 0x05 (write coil)
Output address (2 Bytes): 0x0000 – 0x0003 (specifies relay)
Output value (1 Byte): 0xff - turn relay on, 0x00 - turn relay off
Padding (1 Byte): 0x00

Character String Example:

```
char write_coil_mb_request[] =
        {0x00, 0x01, 0x00, 0x00, 0x00, 0x06, 0xff, 0x05, 0x00, 0x00, 0xff, 0x00 };
```

Response

Modbus/TCP:

Transaction identifier (2 Bytes): 0x0001
Protocol identifier (2 Bytes): 0x0000
Length(2 Bytes): 0x0006
Unit identifier (1 Byte): 0xff

Modbus:

Function code (1 Byte): 0x05 (write coil)
Reference number (2 Bytes): 0x0000
Data (1 Byte): 0xff - relay on, 0x00 - relay off
Padding (1 Byte): 0x00

Modbus Error:

Function code (1 Byte): 0x85
Exception code (1 Byte): 0x01 or 0x02

Exception codes:

0x01 - Function code not supported
0x02 - Incorrect starting address / quantity of outputs combination

Character String Example:

```
char write_coil_mb_response[] =
        {0x00, 0x05, 0x00, 0x00, 0x00, 0x06, 0xff, 0x05, 0x00, 0x00, 0xff, 0x00 };
```

3.3.3 Write Multiple Coils (Modbus Function Code 15 (0x0F))

A single byte can be written to set the state of all four relays. To do this, set the starting address to 0, set the quantity of outputs to 4, and write a single byte with the appropriate value according to the table below.

Data Byte (hex)	LS Data Bits (binary)	Relay 4 State	Relay 3 State	Relay 2 State	Relay1 State
0x00	0000	off	off	off	off
0x01	0001	off	off	off	on
0x02	0010	off	off	on	off
0x03	0011	off	off	on	on
0x04	0100	off	on	off	off
0x05	0101	off	on	off	on
0x06	0110	off	on	on	off
0x07	0111	off	on	on	on
0x08	1000	on	off	off	off
0x009	1001	on	off	off	on
0x0A	1010	on	off	on	off
0x0B	1011	on	off	on	on
0x0C	1100	on	on	off	off
0x0D	1101	on	on	off	on
0x0E	1110	on	on	on	off
0x0F	1111	on	on	on	on

Alternatively, to modify the state of one, two, or three relays only, the starting address and quantity of outputs can be set to values other than 0, and 4 respectively.

Request

Modbus/TCP:

Transaction identifier (2 Bytes): 0x0001
Protocol identifier (2 Bytes): 0x0000
Length (2 Bytes): 0x0008
Unit identifier (1 Byte): 0xff

Modbus:

Function code (1 Byte): 0x0f (write coil)
Starting address (2 Bytes): 0x0000 ~ 0x0003
Quantity of outputs (2 Bytes): 0x0001 ~ 0x0004
Byte count (1 Byte): 0x01
Output value (1 Byte): 0x00 ~ 0x0f (see table above)

Character String Example:

```
char write_mult_coil_mb_request[] =
        {0x00, 0x01, 0x00, 0x00, 0x00, 0x08, 0xff, 0x0f, 0x00, 0x00, 0x00, 0x01, 0x01,
         0x0F };
```

Response
Modbus/TCP:
Transaction identifier (2 Bytes): 0x0001
Protocol identifier (2 Bytes): 0x0000
Length(2 Bytes): 0x0006
Unit identifier (1 Byte): 0xff

Modbus:
Function code (1 Byte): 0x0f (write coil)
Starting address (2 Bytes): 0x0000
Quantity of outputs (2 Bytes): 0x0000 - 0x0004

Modbus Error:
Function code (1 Byte): 0x8f
Exception code (1 Byte): 0x01 or 0x02

Exception codes:
0x01 - Function code not supported
0x02 - Incorrect starting address / quantity of outputs combination

Character String Example:
char write_coil_mb_response[] =
{ 0x00, 0x05, 0x00, 0x00, 0x00, 0x06, 0xff, 0x0f, 0x00, 0x00, 0x00, 0x00};

3.3.4 Write Multiple Registers (Modbus Function Code 16 (0x10))

This is used to pulse the relay(s) for a specified time. When WebRelay-Quad™ receives this command, it immediately turns the appropriate relay coil(s) on (if not on already on) and starts the pulse timer. The relay(s) are selected by writing the pulse time to the register(s) associated with the appropriate relay(s). The pulse time is specified in the register value field and can range from 0.1 seconds to 86400 seconds (1 day). When the pulse time expires, the relay coil will be turned off. If a pulse time command is sent with a value greater than 86400, the pulse timer will be set to 86400. If a pulse time command is sent with a value less than 0.1, the pulse timer will be set to 0.1. If any commands are sent to WebRelay-Quad™ (commands may be modbus, xml or html) before the pulse timer has expired, the pulse timer will be canceled immediately and the new command will be executed.

The pulse time is provided in IEEE 754 floating point format. The four data bytes are treated as two individual big endian 16-bit words but the least significant word is sent first. In other words, the 32-byte floating point number represented as ABCD is sent as CDAB. In the example shown below, the relay will pulse for 10 seconds. Ten seconds is represented using a floating point number of 41200000. It is transferred as 00004120.

Request
Modbus/TCP:
Transaction identifier (2 bytes): 0x0001
Protocol identifier (2 bytes): 0x0000
Length (2 bytes): 0x000b
Unit identifier (1 byte): 0xff

Modbus:
Function code (1 Byte): 0x10 (Write Multiple Registers)
Starting address (2 Bytes): 0x0010 (0x0010 relay1, 0x0012 relay 2, 0x0014 relay 3, 0x0016 relay 4)
Number of registers (2 Bytes): 0x0002 (2 registers for each relay to be pulsed)
Byte count (1 Byte): 0x04 (2 times the number of registers)
Register value (4 Bytes for each relay to be pulsed): 00 00 41 20 (10 second pulse time)

Character String Example:

```
char write_registers_mb_request =
        {0x00, 0x01, 0x00, 0x00, 0x00, 0x0b, 0xff, 0x10, 0x00, 0x10, 0x00, 0x02, 0x04,
         0x00, 0x00, 0x41, 0x20 };
```

Response

Modbus/TCP:

- Transaction identifier (2 Bytes): 0x0001
- Protocol identifier (2 Bytes): 0x0000
- Length (2 Bytes): 0x0006
- Unit identifier: 0xff

Modbus:

- Function (1 Byte): 0x10 (Write Multiple Registers)
- Reference number (2 Bytes): 0x0010
- Word count (2 Bytes): 0x0002

Modbus Error:

- Function code (1 Byte): 0x90
- Exception code (1 Byte): 0x01, 0x02

Exception codes:

- 0x01 - Function code not supported
- 0x02 - Incorrect starting address / quantity of outputs combination

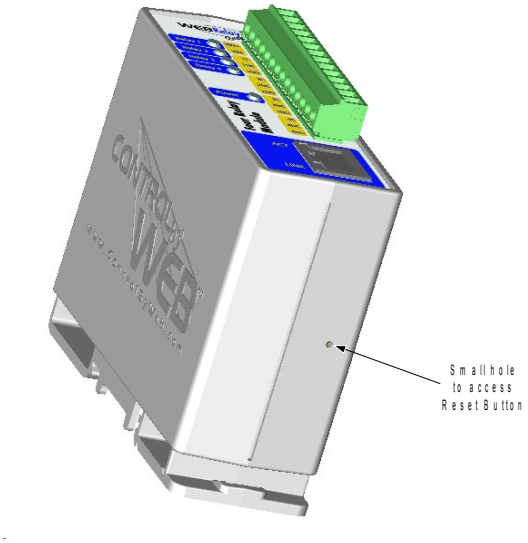
Character String Example:

```
char write_registers_mb_response[] =
        {0x00, 0x05, 0x00, 0x00, 0x00, 0x06, 0xff, 0x10, 0x00, 0x10, 0x00, 0x02 };
```

Appendix A: Restoring Factory Default Settings

In the event that the IP address or passwords are forgotten, WebRelay-Quad™ may be restored to its original factory default settings. To do this, first remove the power from the unit. Next, insert a thin object (such as a toothpick) through the small hole in the bottom of the unit to press the small button that is located inside the unit. When the object is inserted, a tactile feel can be detected as the button is depressed. While holding the button down, apply power and wait for about 10 seconds. After about 10 seconds, release the button. Now all settings will be back to the original factory defaults.

CAUTION: DO NOT USE METAL OBJECTS FOR THIS FUNCTION.



Appendix B: Installing New Firmware

From time to time, updates are made to WebRelay-Quad™ firmware. The firmware can be updated in the field. The procedure for updating the firmware is outlined below. Please note that it is important that this procedure is followed precisely.

Requirements

The firmware update software requires Windows XP/Vista/7 with the .Net framework installed. The .Net framework is generally installed automatically through Windows update. To install it manually, go to the following address:

http://www.microsoft.com/downloads/details.aspx?FamilyId=333325FD-AE52-4E35-B531-508D977D32A6&displaylang=en

Select the Download button. Once you've downloaded the installation file, double click on the installation file to install the framework.

Setup

1. Download the firmware zip file from the ControlByWeb website. Only a WebRelay-Quad™ image can be installed on a WebRelay-Quad™ so make sure the correct image is being downloaded.
2. bootloader.exe will connect to WebRelay-Quad™ using default IP address 192.168.1.2, not the address currently assigned to WebRelay-Quad™. After the update, all settings will be lost and the device will return to its default IP address of 192.168.1.2.

   Configure the PC to the same subnet as the IP address 192.168.1.2, such as 192.168.1.10. For instructions on doing this, see section **2.3 Establishing Communications for Setup**.

   Note: The IP address of the WebRelay-Quad™ will automatically be set to the default 192.168.1.2 during the update process.

   Note: A crossover cable cannot be used during the update procedure; an ethernet switch will be necessary to properly update the firmware.

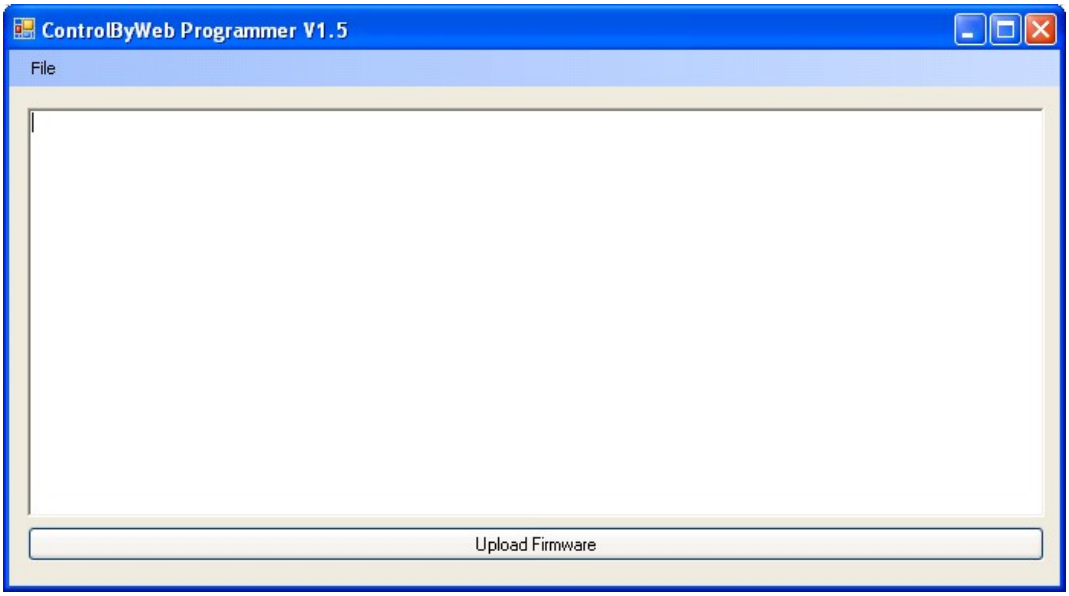


Figure Appendix B.1 - Firmware Update Utility

3. Open the bootloader.exe utility on the computer by double clicking on the downloaded file (Figure Appendix B.1).
4. Within the ControlByWeb™ Programmer utility programmer, select File, then Open. Specify the firmware image downloaded from the ControlByWeb™ web site.

Device Upgrade Procedure

Carefully follow the following steps to put WebRelay-Quad™ into bootloader mode and perform the upgrade:

1. Remove DC power from WebRelay-Quad™.
2. Using a small, non-conductive tool, press and hold the reset button.
3. While holding the reset button, apply power to WebRelay-Quad™. The LINK and ACT lights will flash. Continue to hold the reset button for the next step.
4. While holding the reset button, press the Upload Firmware button at the bottom of the ControlByWeb™ Programmer window. After the programming process begins, the reset button can be released
5. Programming will take approximately 20-30 seconds. The LINK LED will stop flashing and remain lit during this time. WebRelay-Quad™ will be set to factory defaults with an IP address of 192.168.1.2.
6. Refer to section **2.3 Establishing Communication for Setup** to reconfigure the WebRelay-Quad™. Verify the new version of firmware has been installed by viewing the default **Setup Page** with a web browser (http://192.168.1.2/setup.html).

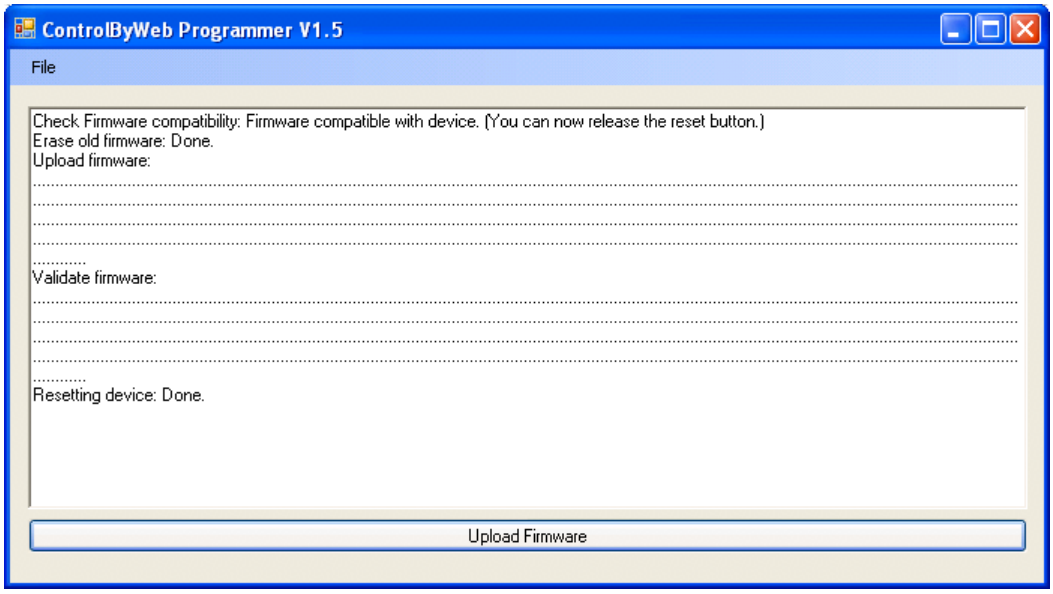


Figure Appendix B.2 - Firmware Update Complete

Appendix C: Specifications

Power Requirements:

Model X-WR-4R3-I

Voltage: 9~28VDC
Current: See table below for typical values

Power Supply	All Relays OFF		All Relays ON	
	10 Mbps	**100 Mbps**	**10 Mbps**	**100 Mbps**
9 VDC	110 mA	192 mA	334 mA	425 mA
12 VDC	83 mA	145 mA	251 mA	317 mA
24 VDC	45 mA	76 mA	127 mA	160 mA
28 VDC	39 mA	66 mA	110 mA	138 mA

Model X-WR-4R3-E
POE Class 1 (0.44 to 3.84 Watt). Optionally can be powered with an external, 5VDC power supply.

I/O: 4 Relays

Relay Contacts:
Contact Form: SPDT (Form C) (Direct access to dry contacts)
Contact Material: Ag (Au clad)
Max Voltage: 28V
Max Current: 3A
Min Load: 1mA @ 5VDC

Relay Control Options: ON/OFF or Pulsed

Pulse Timer Duration: 100ms to 86400 Seconds (1 day)
Accuracy of pulse timer: 99.99%

Network: 10/100Base-T Ethernet

Network Setup: static IP address assignment, TCP port selectable

Connectors:
Power/Relay Contacts: 14-position, removable terminal strip, 3.81mm terminal spacing
(Replacement part number, Phoenix Contact 1803691)
Network: 8-pin RJ-45 socket

LED Indicators: 7
-Power on
-Relay coils (1-4) engaged
-Network linked
-Network activity

Physical:
Operating Temperature: -40°C to 65.5°C (-40°F to 150°F)
Size: 1.41in (35.7mm) wide X 3.88in (98.5mm) tall X 3.1 in(78.0mm) deep
Weight: 4.5oz (128 grams)
Enclosure Material: Lexan 940 (UL94 V0 flame rated)

Password Settings:
Password protection on setup page: Yes
Password protection on control page: Optional
Password Encoding: Base 64
Max password length: 10 characters

Regulatory Compliance:
Electromagnetic Compliance:
IEC CISPR 22, CISPR 24
FCC 47CFR15 (-I and -5 Models class B, POE Model Class A)
EU EN55024, EN55022

Product Safety:
IEC 60950-1 / EN 60950-1

Appendix D: Mechanical Information

