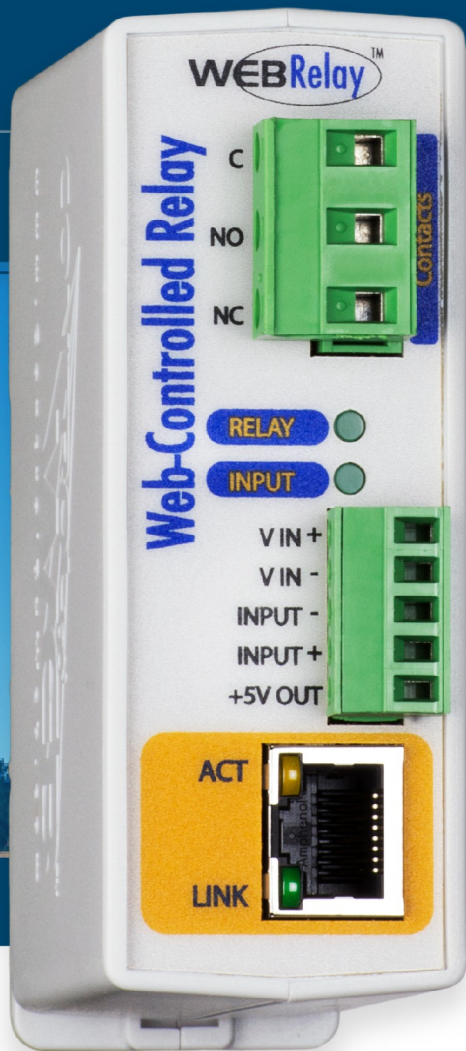# WebRelay™

USERS MANUAL Revision 4.1

Single Relay and Input Module

Features

▶ 12A relay contacts - ON/OFF or Pulsed relay modes

▶ Optically-isolated input uses: Monitoring, Relay control, Remote relay control (peer-to-peer)

▶ Auto-Reboot controller mode for remote reboot of network devices

▶ Removable terminal connectors included

▶ DIN rail or wall-mount

▶ No programming required

▶ Full control using a standard web browser or text-based XML messages

▶ Can operate as a Modbus/TCP slave

▶ Password protected

▶ Five-Year Warranty

FOR MODELS:

X-WR-1R12-1I5-5

X-WR-1R12-1I5-I

X-WR-1R12-1I24-I

X-WR-1R12-1I5-E

X-WR-1R12-1I-I

X-WR-1R12-1I-E

CONTROL by WEB™

www.ControlByWeb.com

WebRelay User Manual Revisions	
Revision	**Description**
4.0	Added changes for models X-WR-1R12-1I-I and X-WR-1R12-1I-E. Made minor changes to the digital input specification. Added documentation for new POE operation with external power applied. New document format, moved warranty and other information to the appendix. Moved XML and Modbus information to *Section 5 Auxiliary Operations* Added "Accessing the Internet" to the appendix Changed warranty to 5-years Reworked and updated the photos, wiring connections and applications.
4.1	Added UL listing

Table of Contents

Section 1: Introduction

Remote Control and Monitoring

WebRelay™ is an electromechanical relay with a built-in web server. It can be controlled and monitored over any IP network including private networks, IP-based industrial control networks, and the Internet.

Stand-Alone Module

Users can access and operate WebRelay using its built-in setup and control pages by using a standard web browser. WebRelay can also be controlled using custom applications.

Drop-In Solution for Existing Systems

Computers, PLCs, or automation controllers may control and monitor a WebRelay without user intervention. This works by sending text commands over the network and reading XML status pages from the WebRelay, or by using Modbus/TCP protocol.

Control Using Digital Inputs

WebRelay can also be operated by using the optically-isolated input. The optically-isolated input can be configured to turn the relay on/off, pulse the relay, toggle the relay, latch the relay (for alarming), etc.

The input can also be used to control a relay at a remote location or to simply monitor the status of a digital signal.

Remote Reboot Controller

WebRelay can function as a high-end reboot controller with fully configurable setup options. It can be used to remotely reboot servers, computers, satellite modems, and other devices over the Internet, or it can be configured to automatically reboot devices when they fail to respond to pings that are sent from the WebRelay. There are three ways that a WebRelay can be wired to a device for reboot:

1. In series with the power source of the device and simply switch the power on and off.

2. In parallel with the power switch of the device. This is useful for devices that will not automatically start operating when power is applied. These devices require a user to press a power switch before the device will boot.

3. Connect the WebRelay to the reset circuit of a device. In this configuration, the WebRelay does not power down the device, but simply forces the device to reset. All three reboot methods have different requirements for wiring connections and relay timing.

Applications

WebRelay, can provide remote relay control in countless applications including pump and motor control, security lock systems, remote reboot, and lighting control. WebRelay's powerful and flexible design make imagination its only limit.

1.1 Features

- ➢ No Internet cloud services or fees required
- ➢ No programming required
- ➢ Built-in web server provides simple, web based configuration and control
- ➢ Control page can be customized with appropriate text and buttons.
- ➢ 10/100 Base-T Ethernet connectivity
- ➢ 12 Amp/240VAC relay for direct connection to load
- ➢ Relay has On/Off or pulse mode
- ➢ Optically-isolated digital input can be used for status monitoring, local relay control, or remote relay control
- ➢ Removable terminal connectors (included)
- ➢ Custom applications can control WebRelay with simple text commands and read XML formatted status
- ➢ Easy to use as a stand alone device or as part of a large control system
- ➢ Modbus/TCP protocol support provides inter-interoperability with devices/software from other manufacturers
- ➢ Password protection
- ➢ Selectable TCP ports
- ➢ Built-in automatic reboot controller
- ➢ Reboot Counter (XML readable only)
- ➢ Powered from a 9-28VDC power adapter. The model X-WR-1R12-1I-E is an Ethernet powered device (POE).
- ➢ Simple and easy to use
- ➢ UL Listed (X-WR-1R12-1I-I and X-WR-1R12-1I-E)
- ➢ 5-year warranty

Relay Output
The WebRelay has an internal high-current relay. Screw terminals are provided for the *Common, Normally Open,* and *Normally Closed* contacts of the relay. The screw terminals are internally connected directly to the relay with no internal fuse or other over-current protection. The relay contacts are isolated from all other circuits.

Digital Input
The WebRelay has an optically-isolated digital input. The optically-isolated input provides electrical isolation between the digital input and the low voltage control circuits of the WebRelay.

Power Supply
The WebRelay employs a switch-mode power supply which works from 9-28VDC. The model X-WR-1R12-1I-E is an Ethernet powered device (PD) which receives power, along with data, on the twisted-pair Ethernet cable. It can accept backup power on the Vin+ and Vin- terminals.

1.2 Applications

The WebRelay was designed to meet a broad range of industrial applications. It works 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 or existing control system. It can be configured using its built-in setup pages.

Use the WebRelay to control motors, lights, coils, pumps, valves, bells, etc. Also, use it to monitor alarms sensors, switches, fluid level switches, and much more. A few example applications include:

- Control a fan from anywhere in your building
- Control tennis court lighting from your office
- Open a gate with your smart phone
- Reboot controller for a server
- I/O Extender

1.3 Part Numbers and Accessories

The WebRelay is currently available in two different models.

Part Number	Power Supply Requirements	Digital Input
X-WR-1R12-1I-I	9-28VDC	4-26 VDC
X-WR-1R12-1I-E	Power Over Ethernet and/or 9-28VDC	4-26 VDC
X-WR-1R12-1I5-5	5VDC	4-12 VDC
X-WR-1R12-1I5-I	9-28VDC	4-12 VDC
X-WR-1R12-1I24-I	9-28VDC	11-26 VDC
X-WR-1R12-1I5-E	Power Over Ethernet or 5VDC	4-12 VDC

1.3.1 Optional Accessories

Accessory	Description	Part Number
Power Supply	Regulated, DIN-rail & wall mount 24V DC, 1.75Amp, 100-240V AC Input	2868648
Power Supply	Regulated, plug in 12V DC, 1.5Amp,100-240V AC Input	PS12VW1.5-B
Spare Connector	5-Pin Connector Plug, 3.81mm	Phoenix Contact 1803604
Spare Connector	3-Pin Connector Plug, 7.62mm	Phoenix Contact 1767012

1.4 Security Notes

The WebRelay is a dedicated device and does not employ a general purpose computer operating system (i.e. Windows, Linux etc.) It does not have features such as telnet, FTP, SSH, nor uncontrolled open ports. This means it is extremely difficult if not impossible for someone to 'break in' to the WebRelay and access other devices on your local network. WebRelay does not support remote firmware updates which means that it is not possible for someone to remotely install malicious software. The simplicity of the WebRelay makes it an inherently secure device. Nevertheless, as with any device installed on a network, appropriate security precautions should be observed.

It is recommended that passwords be enabled for the *Control Page and Setup Pages*. Passwords should be at least 8 characters in length and use a combination of upper and lower case letters and numbers. For additional security, a firewall may be used to limit access to selected IP addresses. Another option may be to set up a Virtual Private Network (VPN) between the network where WebRelay resides and the client machine (web browser, second WebRelay, etc.).

The firmware in the WebRelay can be upgraded, but not over the internet. By design, a firmware upgrade requires physical access to a button on the WebRelay enclosure.

1.5   Connectors & Indicators

WebRelay has two removable terminal connectors and an Ethernet connector. The three-position terminal connector is used to connect the relay to the load. The five-position terminal connector provides power to the internal web server, and has connections for the optically-isolated input and +5VDC output.
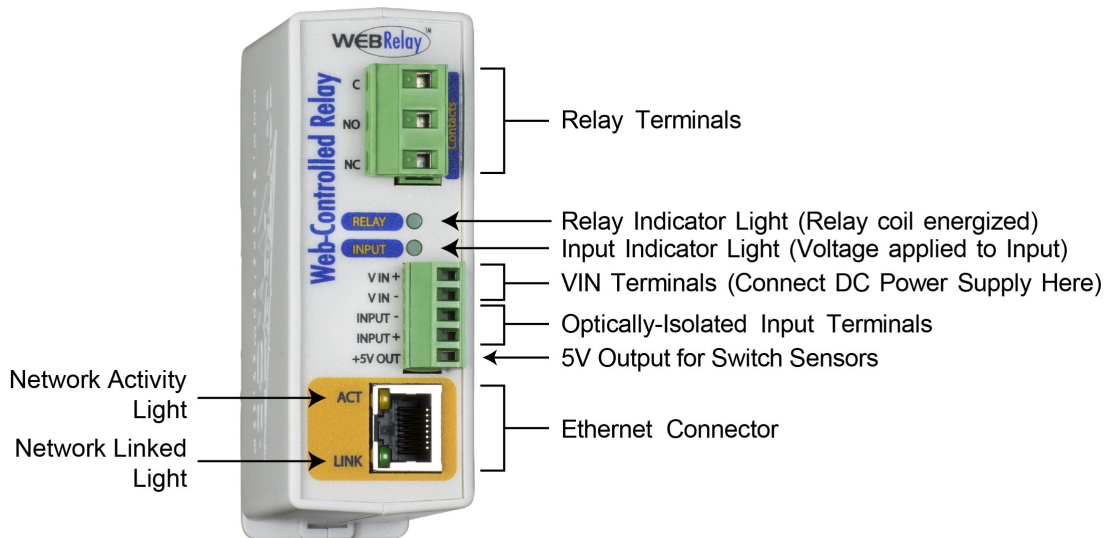
Relay

The WebRelay has an internal high-current relay. Screw terminals are provided for the *Common, Normally Open,* and *Normally Closed* contacts of the relay. The screw terminals are internally connected directly to the relay with no internal fuse or other over-current protection. The relay contacts are isolated from all other circuits.

Digital Input

The WebRelay has an optically-isolated digital input. The optically-isolated input provides electrical isolation between the digital input and the low voltage control circuits of the WebRelay.

Power Supply

Connect a 9-28VDC source to the Vin+ and Vin- terminals

LED Indicators

> *Relay*: Green, Illuminated whenever the relay is energized. When the relay coil is energized, the NO (Normally Open) contact is closed and the NC (Normally Closed) contact is open. The load device that is connected to the relay contacts may be on or off when the coil is energized depending on how its wired.

> *Input*: Green, Illuminated when a sufficient voltage is applied to the opto-coupler input

> *Link*:   Green, Power is on and WebRelay is properly connected to a network

> *Act*:   Amber, Flashes when network is active

The WebRelay has a five-position, removable screw terminal connector for power and input connections, the three-position connector provides connections to the internal relay.

5-Pin Connector	
Terminal	**Description**
Vin+	Power supply input + (not required for POE model) Do not exceed maximum power supply voltage (9-28VDC)
Vin-	Power input- (GND) Negative side of the power supply
Input-	Digital Input - The negative side of the optically-isolated input.
Input+	Digital Input + The positive side of the optically-isolated input.
+5Vout	+5VDC out. This voltage is provided as a convenient voltage source for the optically-isolated input. It can be used, for example, when a switch is needed to control the input state. This can be done by connecting the INPUT- directly to VIN- and then connecting the 5Vout to through a switch to the INPUT+. Do not use this output for other purposes.
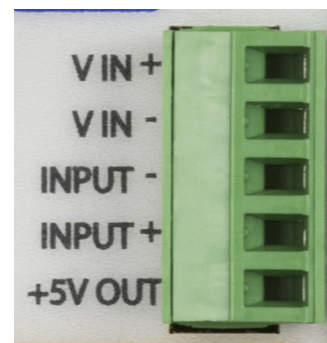
3-Pin Connector	
Terminal	**Description**
C	Relay COMMON
NO	Relay NORMALLY OPEN
NC	Relay NORMALLY CLOSED
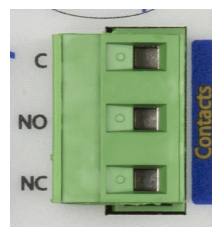
1.6   Accessing the WebRelay using a Web Browser

The WebRelay has a built-in web server that provides the user simple web pages that can be accessed directly using a standard web browser. This allows users to access the unit with NO SPECIAL SOFTWARE installed on their computer. This is ideal for applications that require a quick and simple solution that does not need to be accessible to more than a few people. This configuration is simple to setup, simple to use, and can be accessed from just about any computer or smart phone.

Note: Network routers may need to be configured to allow access from computers outside of the local network (see Appendix C: Accessing the WebRelay Over The Internet).
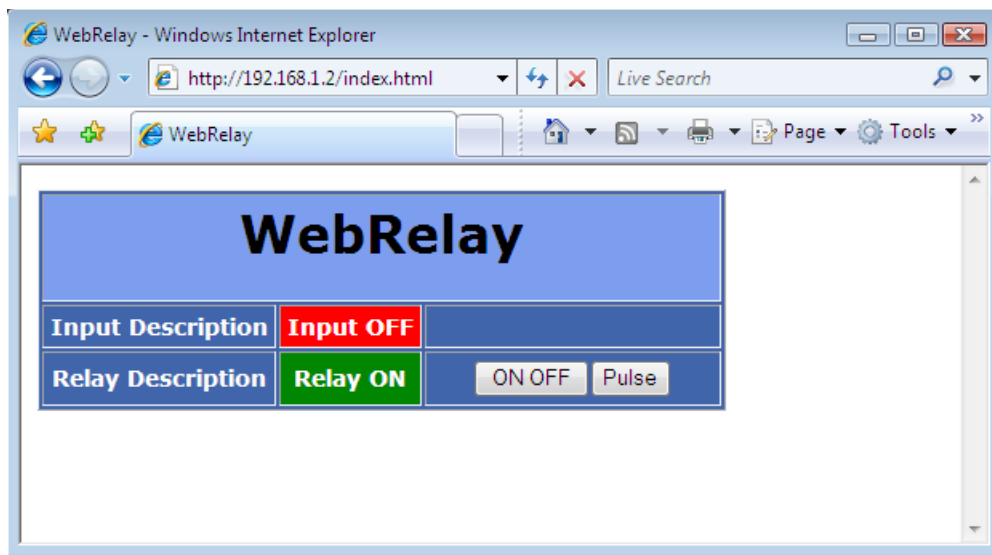
Section 2: Installation and Connections

Installation consists of mounting the WebRelay, connecting it to an Ethernet network, providing power, and connecting the relay contacts to the device that will be controlled. Optionally, a control signal may be connected to the optically-isolated input. The installation is completed by configuring the module using a web browser.

The WebRelay 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 device is extended.

2.1   Installation Guidelines

- This unit must be installed by qualified personnel.

- This unit must not be installed in unprotected outdoor locations.

- 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.

- This unit must not be used in any way where its function or failure could cause significant loss or property damage.

- Do not use to directly control motors or other actuators not equipped with limit switches or other safeguards to protect from equipment or wiring failures.

- The WebRelay should be located in a clean, dry location where it is protected from the elements. Ventilation is recommended for installations where ambient air temperatures are expected to be high. See *Appendix H: Mechanical Information* for additional mechanical details.

- The WebRelay must installed inside an NRTL certified industrial control panel or similar NRTL certified fire/electrical enclosure.

- If the WebRelay is used in a manner not specified by Xytronix, the protection provided by the equipment may be impaired.

2.1.1   Wall Mounting

Mount the WebRelay 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 screw should be about 1/10 inch away from the wall.

2.1.2   DIN-Rail Mounting

The WebRelay can be mounted to a standard (35mm by 7.55mm) DIN-Rail. Attach the WebRelay 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. To remove the WebRelay from the DIN-Rail, use a flat-head screwdriver. Insert the screw driver into the notch in the release tab and pry against the enclosure to release the bottom hook.

2.2   Making Connections

CAUTION: Make sure the power is shut off before making connections

CAUTION: This unit should be installed by a qualified technician.

CAUTION: Miswiring or misconfiguration could cause permanent damage to the WebRelay, the equipment to which it is connected, or both.

A removable terminal connector is provided for making the power connections. To help protect the WebRelay from mechanical stress, remove the terminal connector before making the connections.

1. Make sure power is turned off.

2. Remove the terminal connector from the WebRelay and make wiring connections to the terminals. This technique avoids stressing the internal components while torquing the screws.

3. Reconnect the terminal connector.

4. Apply power.

It is recommended that any load (device to be controlled) not be connected until after the WebRelay has been configured and tested. By doing this, wiring and configuration mistakes will not cause the load device to turn on unexpectedly. Make certain the wires are properly inserted into to the terminals and that the screws are tight.

See *Appendix D: Specifications* for wire size, temperature rating and torque requirements for making connections to the terminal blocks.

2.2.1   Power Supply Connections

The WebRelay requires power for its internal logic circuits. Connect a 9-28 VDC power supply to the +Vin and Vin- (Gnd) terminals. A regulated power supply is recommended, such as a wall-mount AC-DC adapter. Verify that the adapter is rated for the operating current of the WebRelay (See *Appendix D: Specifications* for the current requirements.) Multiple WebRelay 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.

The model X-WR-1R12-1I-E is normally powered from an 802.3af compliant Power Sourcing Equipment (PSE) device which passes DC power, along with data on the twisted-pair Ethernet cabling. This allows a single cable to provide both the data connection and DC power. With the X-WR-1R12-1I-E no connections are needed to the Vin+ and Vin- terminals. The Vin+ and Vin- terminals however, can be used as a backup power source. The WebRelay has an internal "diode or" circuit between the Vin+ terminal and the internal Powered Device (PD) circuits. If a power supply is connected to the Vin+ terminal, the WebRelay will draw power from the PSE if the input voltage is less than 12.0V, and from the Vin+ terminal if the input voltage is greater than 12.0V. If the PSE power fails, the WebRelay will draw all power from the Vin+ terminal.

Note: the X-WR-1R12-1I5-E power-over-ethernet module does not support 9-28VDC as a backup power source on the Vin+ and Vin- terminals. This POE model is powered from the power sourcing equipment or optionally via +5V applied to the Vin+ terminal (but not both.)

2.3   Relay Connections (Control a device over an IP network)

The Com, NC and NO relay contacts are internally connected directly to the terminal connector. No internal fuse is provided. If the power source connected to the relay contacts can deliver more than rated maximum contact current, an external fuse or circuit breaker must be used. The relay contacts are normally wired in series with the power source for a device that will be controlled (the load).

When mechanical relays switch inductive loads such as motors, transformers, relays, etc., the current will arc across the internal relay contacts each time the contacts open. Over time, this causes wear on the relay contacts which can shorten their life span. When switching an inductive load, it is recommended that relay contact protection devices are used. Note that the WebRelay does not provide relay contact protection in order to provide the greatest versatility and because appropriate protection differs for various loads.

The illustration below shows a simple example of using WebRelay to control a device over an IP network. The device to be controlled is wired in series with the relay contacts. Note that a fuse or circuit breaker is shown to limit current overload. This configuration is used for control of a device using a web browser or a control script/application running on a computer.
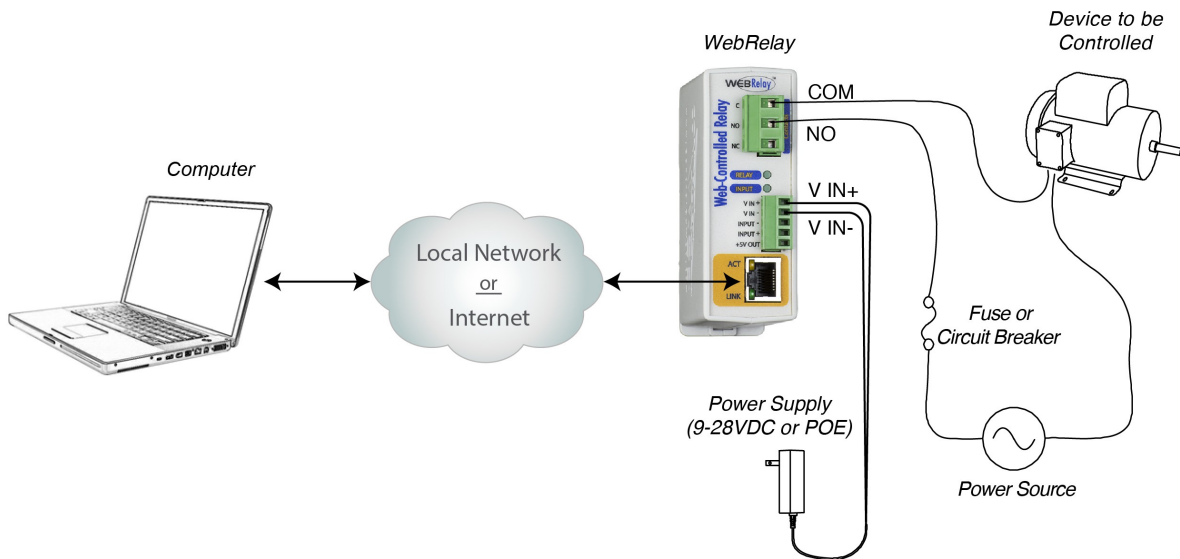
2.4   Digital Input Connections

The digital input can be used to control the internal relay, control a remote relay (over the network), or simply to monitor the state of a discrete device. To use this input, connect a DC control voltage directly to the *Input+* and *Input-* terminals, and set up the function of the input using the configuration pages. A current limiting resistor is provided internally, so no external resistors are required as long as the maximum input voltage is not exceeded. If an AC signal, or a signal greater than the rated input voltage needs to be detected by the WebRelay, use a signal conditioner to convert the signal to a DC signal within the input range.

2.4.1   Switch-Closure Connections

The WebRelay can sense the state of a switch-closure sensor. Sensors with switch-closure outputs include push buttons, magnetic door alarm switches, micro-switches, or any device which has a relay, switch closure, or open collector output. The WebRelay can be configured for the alarm to be active when the switch is either open or closed.

The illustration below shows an example of using the WebRelay to monitor the status of a gate or door over an IP network. The status of the device is detected with a switch. These types of sensors are called "dry contacts" in that the sensor output is a bare switch with no power source. In this example the voltage source for the switch is provided via the +5V output. When using the +5V output for excitation, a connection is needed between Input- and GND since the input circuit is isolated.
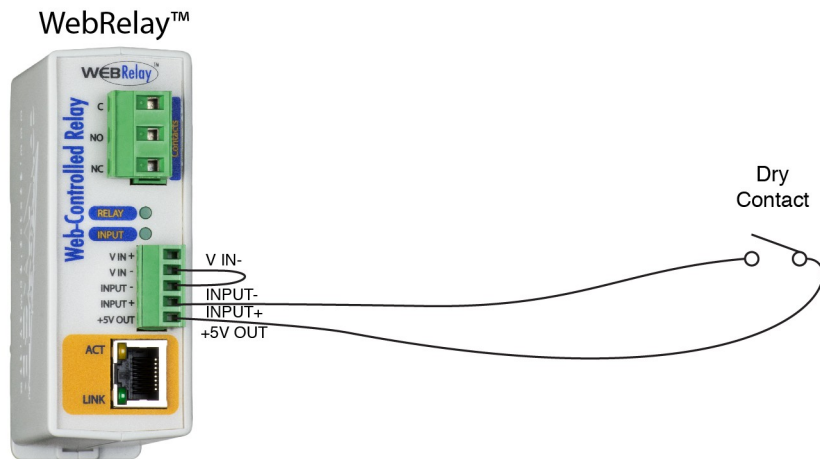
Many of the illustrations in this manual show the WebRelay contacts wired in series with a power source, which allows the power for the device to be switched on and off remotely. In many cases, however, it is useful to control other functions and not just power. One way to do this is to connect relay contacts in parallel with push-button switches within a device.

For example, suppose you have a gate controller system that has a push-button switch that opens a gate when pressed. The button that controls the gate is located on one side of a building, but you want to be able to open the gate elsewhere. If the building is wired for networking, it is a simple task to accomplish this goal by connecting the WebRelay contacts in parallel with the pushbutton. An illustration of this is shown below. Users can now operate the gate with the existing push-button, or users can operate the gate at a remote location using a web browser or smart phone.

Another option (not shown here), is to connect another push-button switch to the input of a second WebRelay device in a room across the building. The second device can be configured to send control messages to the first device each time the remote push-button is pressed. As a result, there is a second push-button that can operate the gate.

Existing pushbutton switch that performs desired function

WebRelay

COM

NO

Device to Control

Device Circuitry

WebRelay contacts are connected in parallel to existing switch.
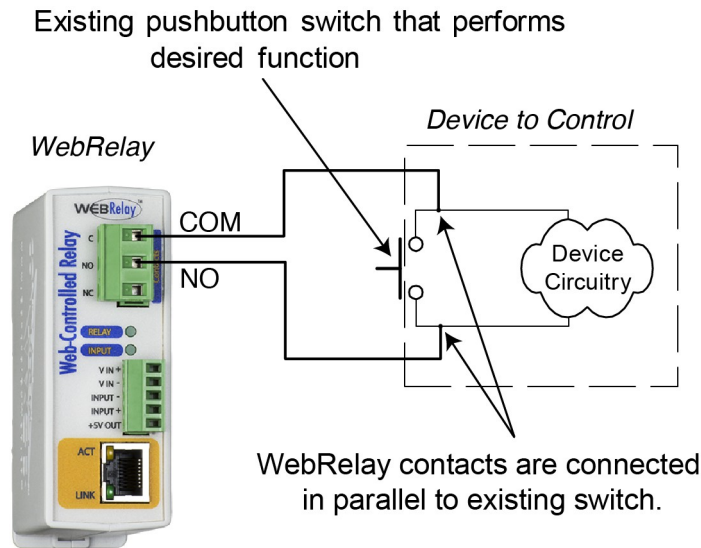
2.4.2 DC Input Connections

The digital input is connected internally through a current-limiting resistor directly to a photo-coupler circuit. The photo coupler inputs isolated from the power supply circuits. No external resistor is necessary as long as the input signal is within the proper range *(See Appendix D: Specifications)*. A DC voltage can be reduced with an external resistor of the appropriate value and power rating to reduce the input current.

The digital input has an internal 3K ohm resistor. The forward voltage drop of the photo-coupler is approximately 1.2V and works well with an input current of 9mA. Use the following formula to determine the resistor value needed for other voltage ranges:

R =((Vin-1.2)/0.009)-3000

Where:

- R = External resistor value required
- Vin = Desired input voltage
- 1.2V = forward voltage drop of the LED in the photo coupler
- .009A = workable LED current
- 3000 ohm = Internal resistor

For example:

To connect a 48VDC signal voltage to the WebRelay:

R = ((48-1.2)/0.009)-3000 = 2200 ohms

Check the power dissipated by the resistor:

P = I x I x R, The resistor must be at least .009 x .009 x 2200 = 0.18 Watts, so use a 1/2 Watt resistor.

2.4.3 AC Input Connections

If an AC signal voltage needs to be detected, use a signal conditioner to convert the AC signal to a DC voltage within the input range. An AC signal conditioner can be made using a diode (or bridge rectifier) and a capacitor. Pre-packaged signal converters are available as accessories at industrial automation distributors. A simple voltage converter module (RedLion VCM10000 or VCM20000) is shown below. These are available in two input voltage ranges that cover the spectrum from 4-270VAC/DC.

These devices have a MOSFET output (solid state DC contact closure) which is compatible with the WebRelay input. The converter module accepts AC (50/60 Hz) or DC voltages with an input pulse rate up to 30 Hz. The converter provides isolation between the input and output using an opto-isolator. You must provide a voltage source for the converter circuit as shown in the example below:
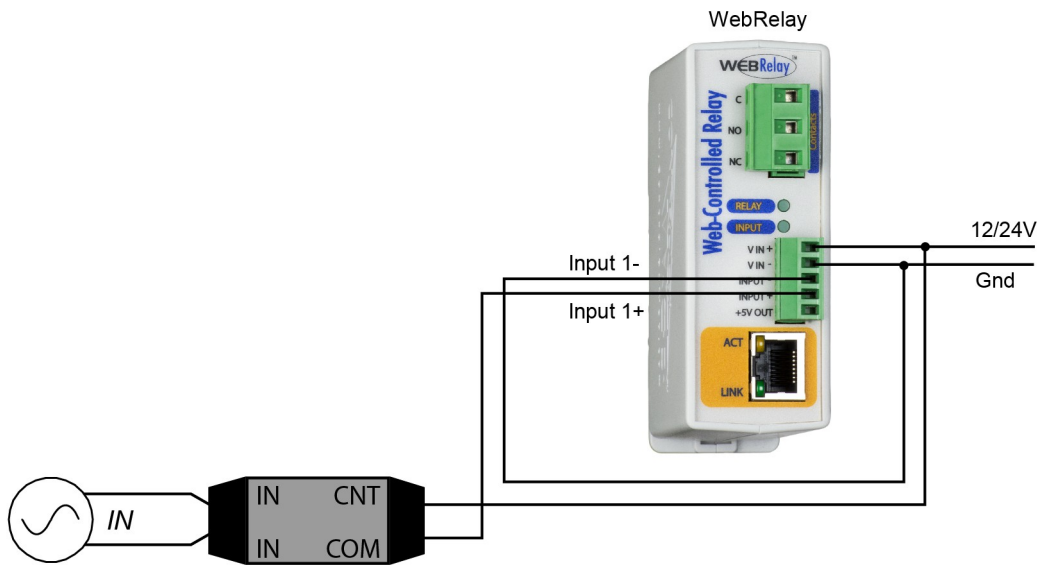
2.5 Example Applications and Configurations

Several basic installation schemes are illustrated in this section.

2.5.1 Single WebRelay Device (IP network control only)

The example below shows the use of an interposer relay to control a load with larger current requirements than that provided by the 12-amp relay in the WebRelay.
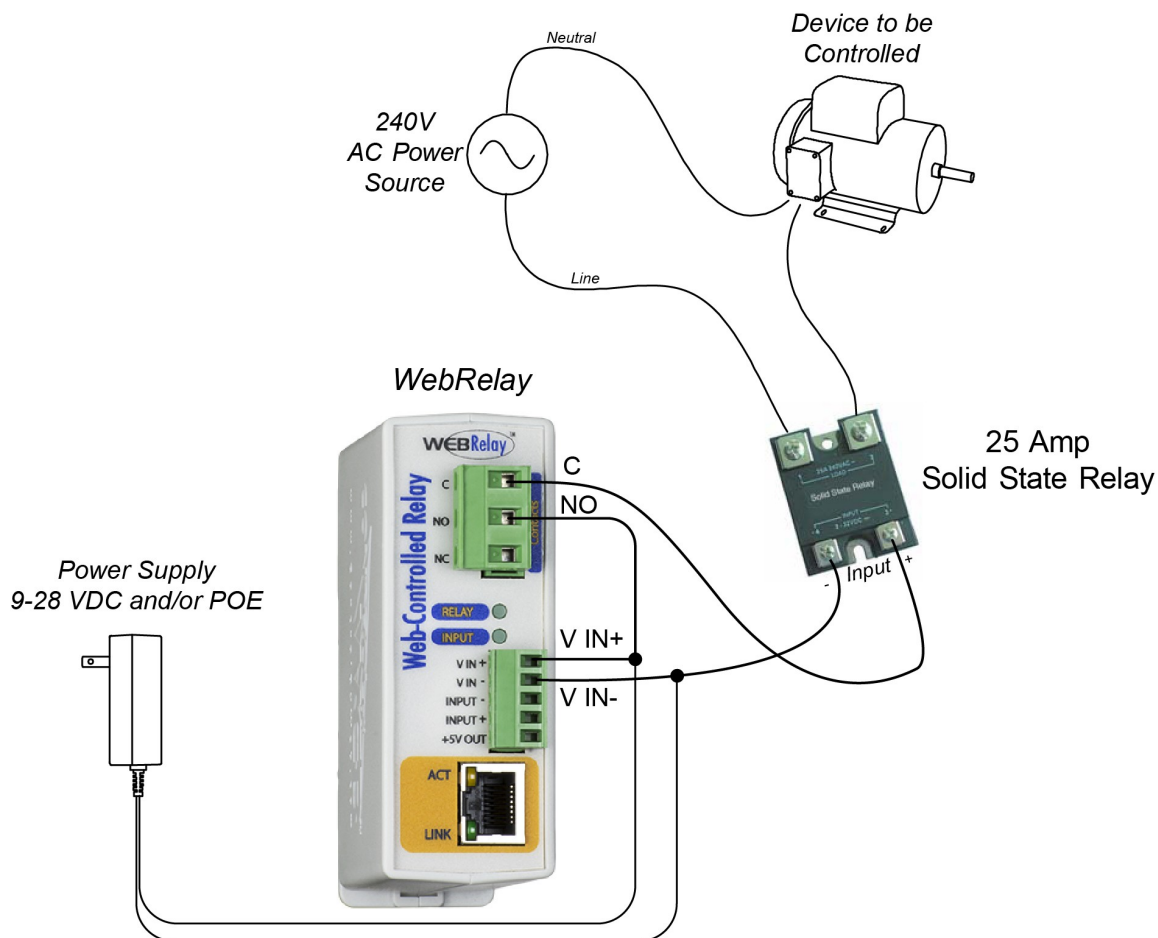
2.5.2   Single WebRelay Device (digital input and/or IP network control)

This configuration offers both network and local control. In the example, the light shown on the right can be controlled locally using a mechanical switch, or it can be controlled remotely over the IP network.

The mechanical switch controls a 5 volt signal that is applied to the optically-isolated input. Each time the 5 volt signal changes (turns on or off), WebRelay changes the state of the relay to on or off.
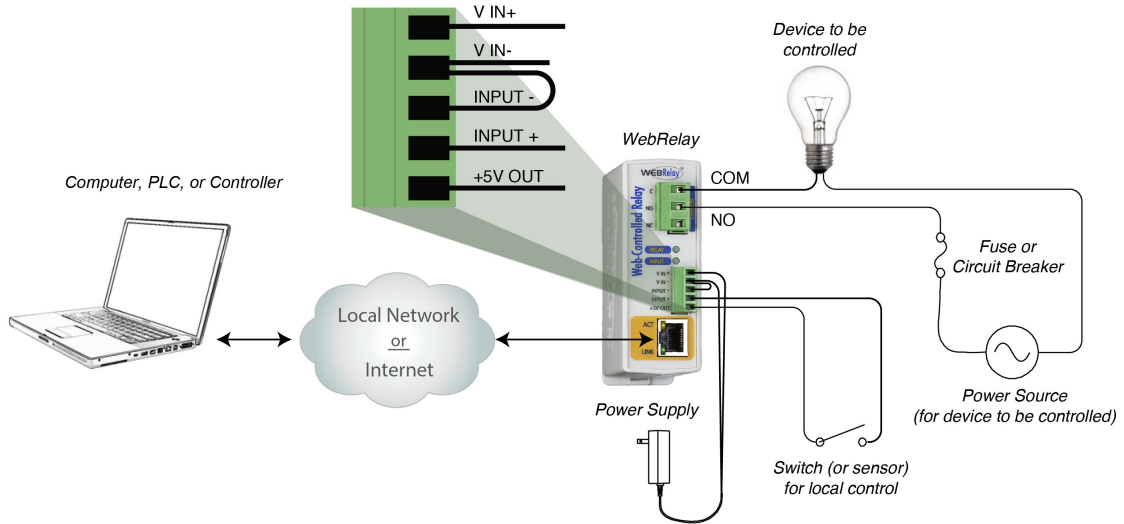
2.5.3 Dual WebRelay Devices (no computer required)

This configuration is used to control devices remotely without a web browser, or to extend a digital signal to a remote location on the network. A control voltage applied to one WebRelay controls the relay contacts of another WebRelay at a remote location.
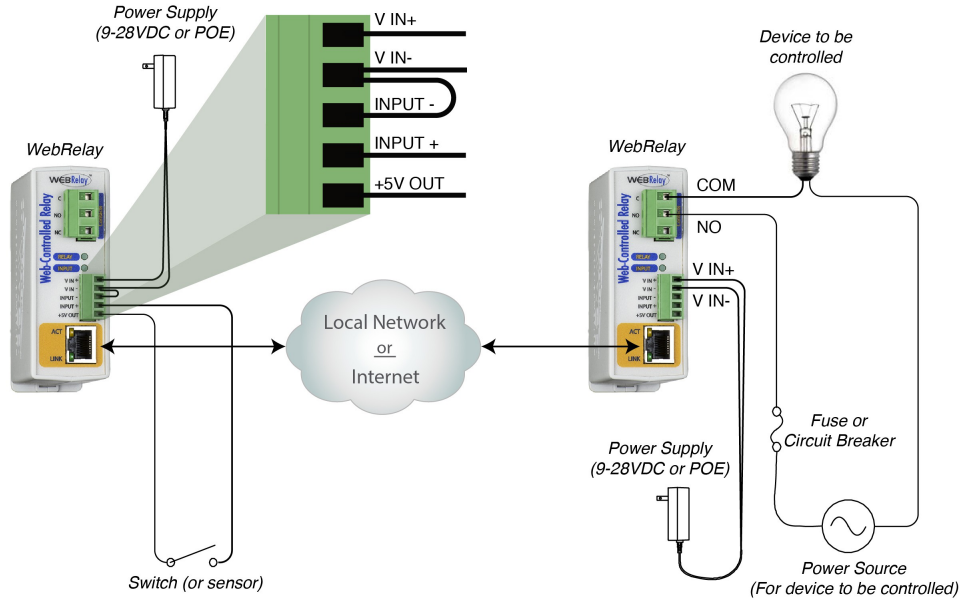
This configuration has may uses. It allows a switch to be placed a long distance from the device that it controls.

For security applications, the switch in the example could be replaced with a sensor, and the device to be controlled could be a buzzer or chime. A business owner, for example, could set up a sensor at his/her office and a chime at his/her home. The chime at the home would announce each time the sensor detects entry to the office (which could be miles away). When the chime indicates an office entry late at night, the business owner can take appropriate action.

Another way this configuration is useful is to extend the output of a PLC (Programmable Logic Controller) in a factory to control a motor in another building. The output of the PLC is connected to the input of one WebRelay, and the motor is connected to the relay contacts of a second WebRelay. This allows any PLC to control devices across an IP network.
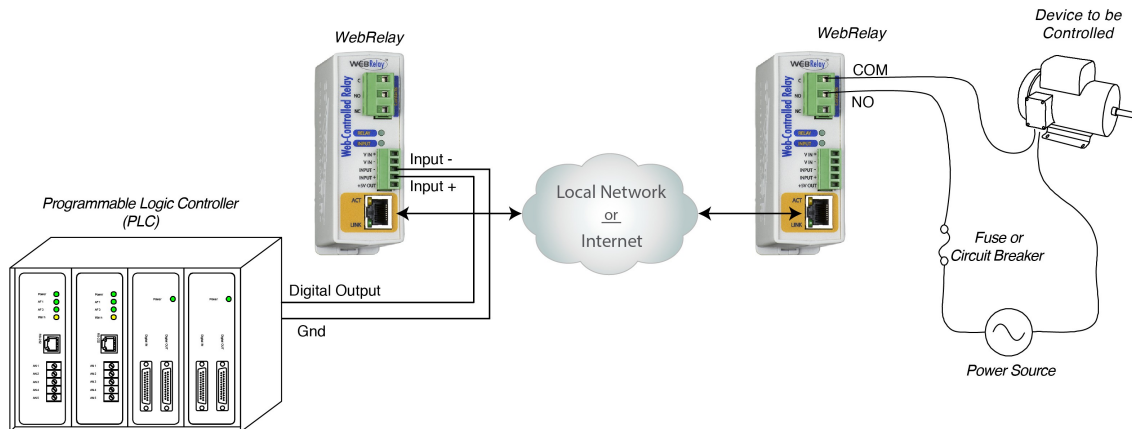
2.5.4 Multiple WebRelay Operation (no computer required)

For some applications, it is useful to for one WebRelay to control multiple WebRelays at remote locations. There is not a way to configure a single WebRelay to control multiple WebRelays directly, but it is possible to set up multiple WebRelays in a daisy-chain mode so that one WebRelay controls a second WebRelay which, in turn, controls a third WebRelay and so on.

In the illustration below, each WebRelay is numbered (1, 2, 3, and 4). A mechanical switch controls WebRelay 1. Then WebRelay 1 controls WebRelay 2, which then controls WebRelay 3, which then controls WebRelay 4.
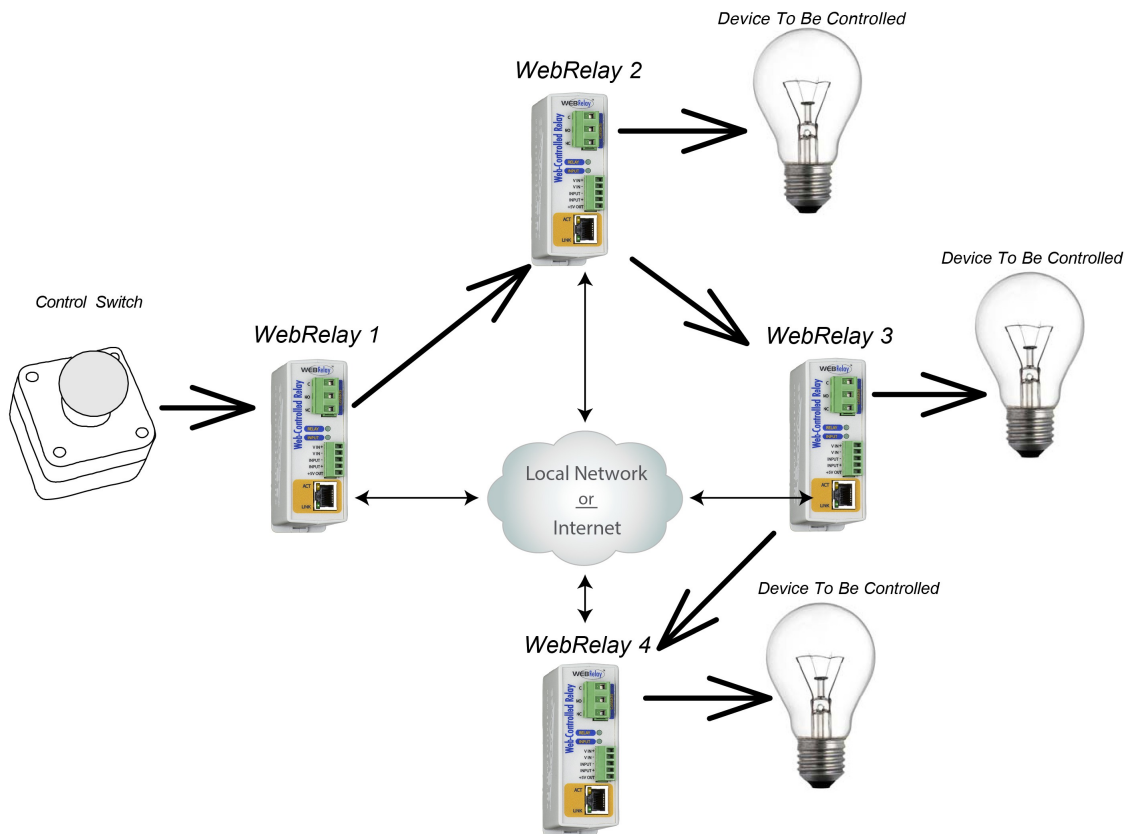
This daisy-chain mode is set up by configuring the Relay options in WebRelays 1, 2 and 3 to "*remote command equals local relay*". Note that the relay contacts of each WebRelay will be set to the same state as the contacts of the WebRelay that is configured to control it and not necessarily to the state of the switch. In other words, if the switch is 'ON' but a user changes the state of WebRelay 3 to 'OFF' by changing the relay in the web page, WebRelay 4 will be changed to the 'OFF' state also. Also note that in this example, WebRelays 2, 3, and 4 are each controlling load devices but WebRelay 1 is not; however, a load could be connected to WebRelay 1 as well.

2.5.5 WebRelay Used for Reboot (wired in series with power)

The illustration below shows an example of how WebRelay can be used to reboot a server. The WebRelay module is wired in series with the server's power source, which allows it to turn the server on and off.
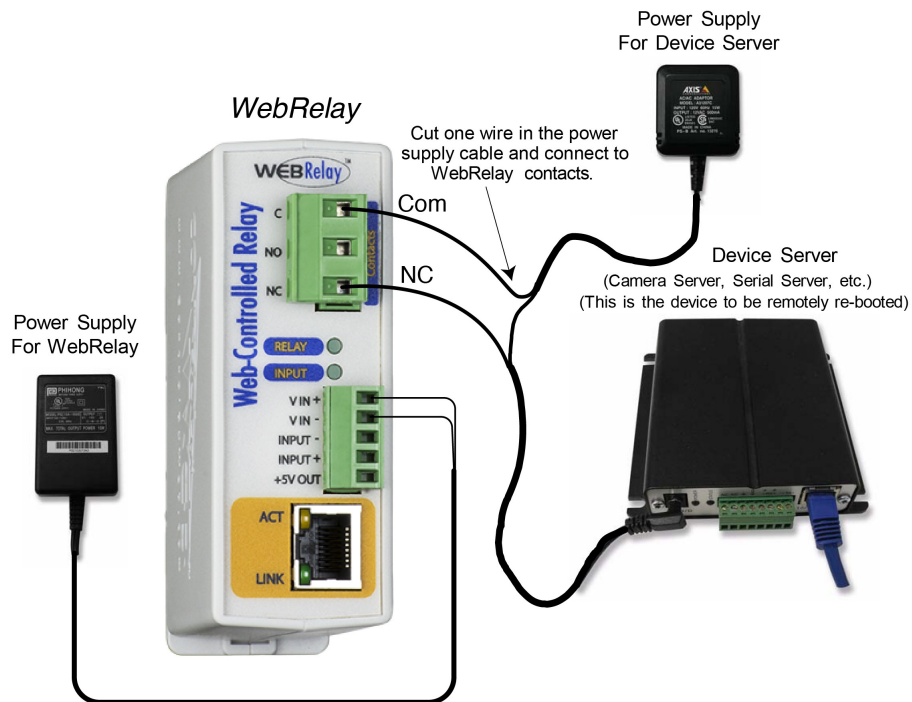
2.5.6 WebRelay Used for Reboot (wired to reset)

The illustration below shows how WebRelay can be wired to the reset circuit of a computer motherboard.
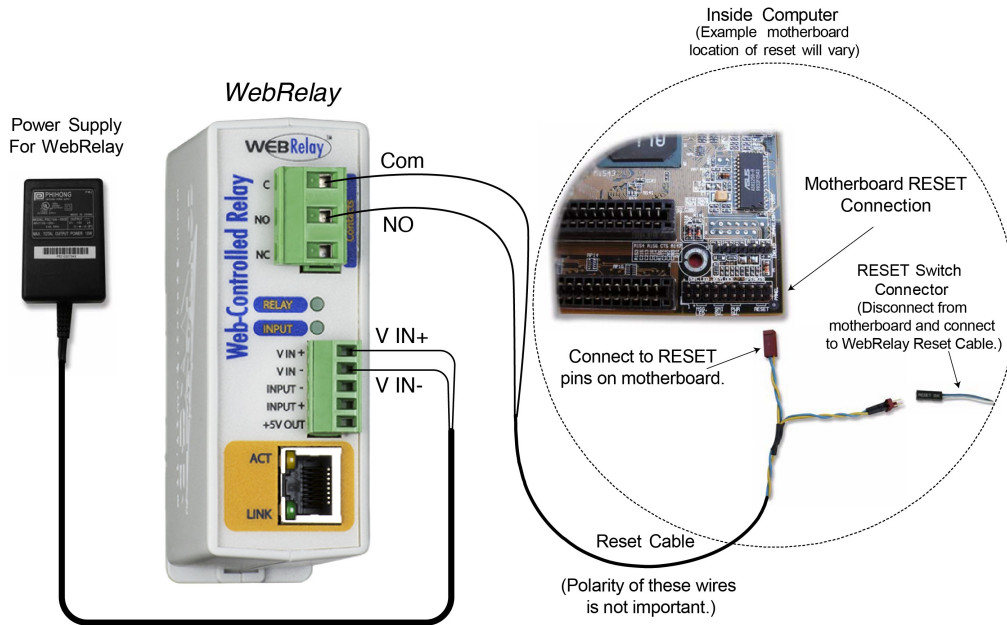
In this scenario, the computer is never powered down, only reset when necessary by temporarily closing the relay contacts. This approach is more gentle on the computer it controls than the approach of switching the power. The Common and Normally Open contacts of WebRelay are wired to the reset circuit of the computer. If the computer has an existing push-button switch for reset, the relay contacts may be wired in parallel with the push-button switch. This allows both local and remote reset.

2.5.7 WebRelay Used for Reboot (wired in parallel with power switch)

Many computers have momentary power buttons that are wired to the motherboard similar to the way the reset button is wired.

The previous example, which describes connecting WebRelay to the reset circuit, can be used to illustrate connection. Instead of connecting the WebRelay contacts to the motherboard reset, connect the contacts to the power control pins on the motherboard. This allows the computer to be powered down without cutting off the AC power.

2.5.8   Network Connection

WebRelay™   Computer

WebRelay™   Computer
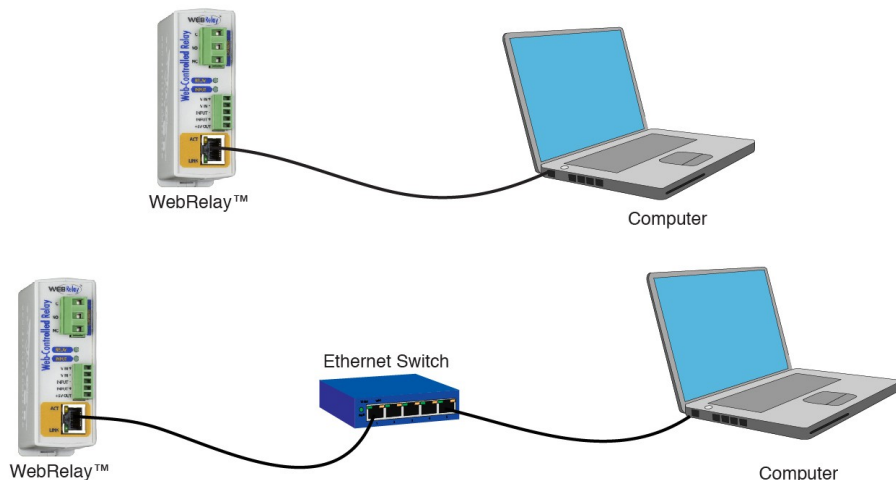
Connect the Ethernet port to a standard 10/100 Base-T Ethernet connection. The WebRelay typically connects to an Ethernet hub, switch, or router. The WebRelay does not support auto-negotiation on the Ethernet cable. For configuration, WebRelay may be connected directly to the Ethernet port on a computer using a "crossover" cable. Otherwise, for connection through a hub or router, a standard "straight-thru" cable should be used.
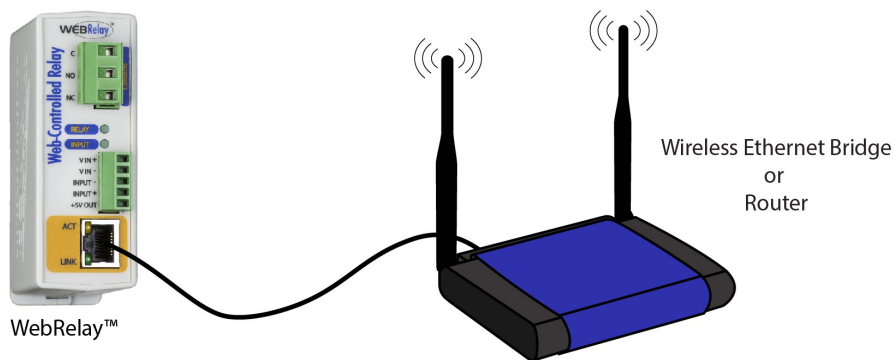
WebRelay™

Note: The wireless Ethernet bridge or router must be properly configured for the wireless network. Refer to the installation instructions for the wireless device.

2.6   Establishing Communications for Setup

WebRelay is set up using a web browser. The first task is to establish communications between a computer and the WebRelay device so that the browser-based configuration can begin. To do this, the computer and WebRelay 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 so that they are on the same network.

Method 1: Temporarily change the IP address of a connected computer to the match the default IP address used by the WebRelay.

-or-

Method 2: Assign a temporary IP address to the WebRelay to work on an existing network.

Note: If multiple ControlByWeb™ products are used on the same network, install one at a time and set the IP address of each unit before connecting the next unit to the network. This avoids having multiple devices being installed on the network with the same factory default IP address at the same time. If this approach is used, be sure to clear the arp cache after disconnecting each unit (`arp -d`).

2.6.1   Method 1: Assign a Temporary IP Address to Configuration Computer

By default, the WebRelay comes from the factory with an IP address of 192.168.1.2. Communication with the WebRelay may be established by assigning an IP address to the configuration computer so that it is on the same network as the WebRelay (for example, the configuration computer could be assigned to 192.168.1.50)

The following example is for those running the Windows-8 operating system, but may be similar to other operating systems:

1. Apply Power, wait 15 seconds for the WebRelay to become operational, and then connect the Ethernet cable.

2. Open the Windows 8 start screen.

3. Type *"Control Panel"* and press enter (the search box opens automatically when you begin typing).
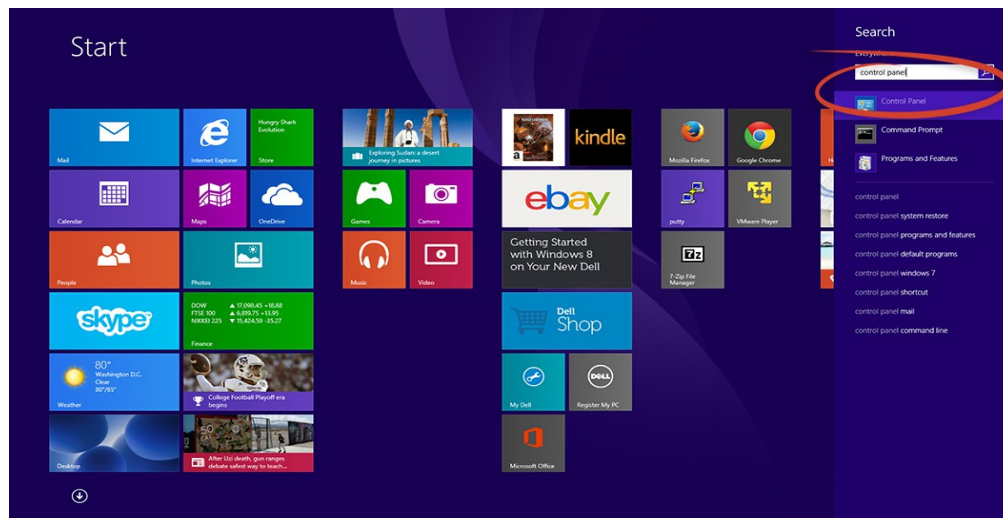
4. Select *View network status and tasks.*
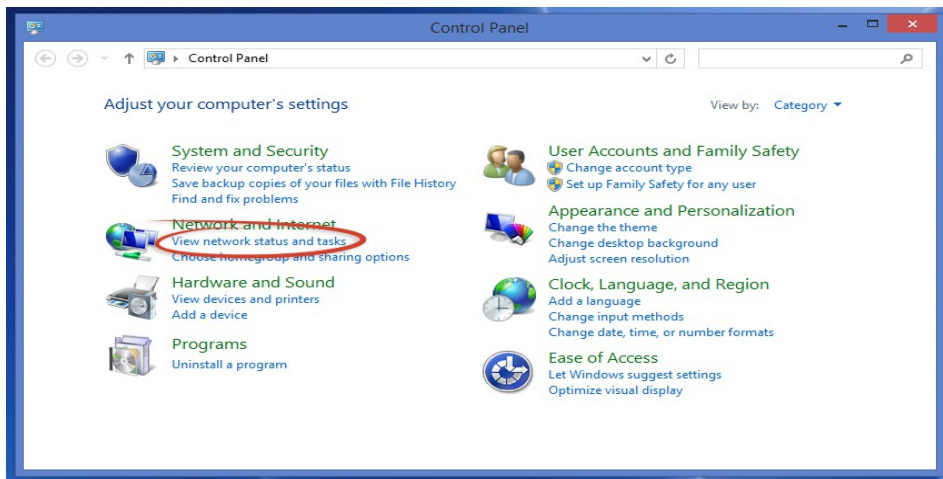
5. Select *Change adapter settings*
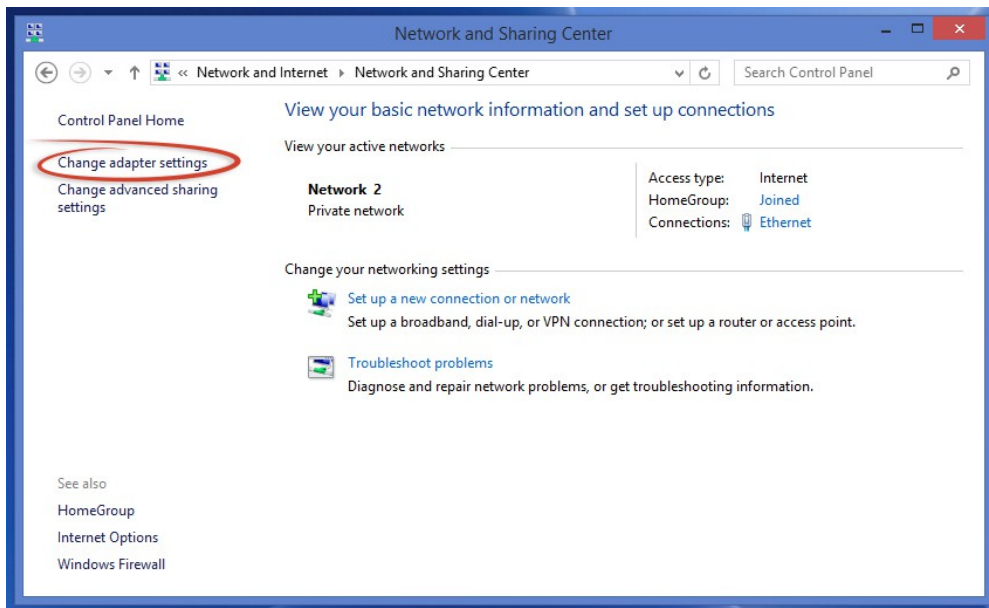
6. Your machine may have more than one Internet connection shown. Right-click on the adapter for your connection to the internet. A drop-down box will appear, choose *Properties* to view/edit the settings for this internet connection.
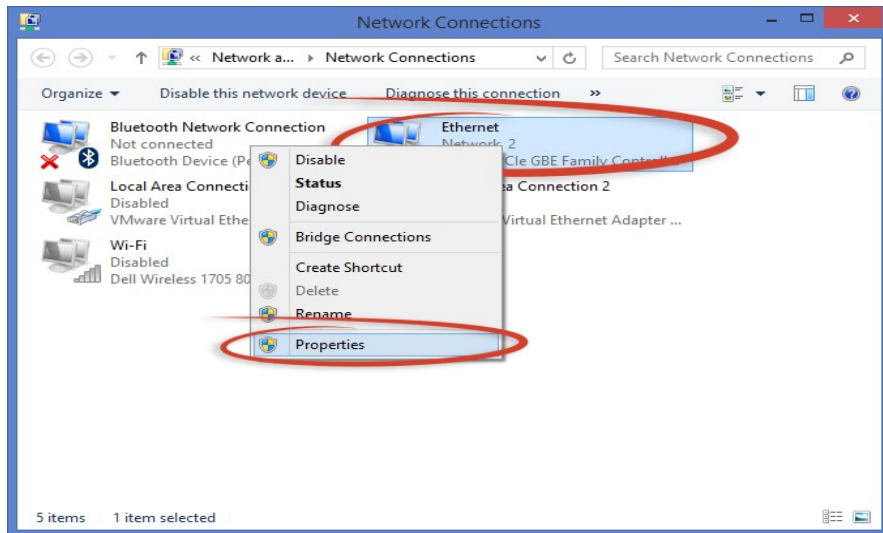
7. Select *Internet Protocol Version 4 (TCP/IPV4)* and then click the *Properties* button.
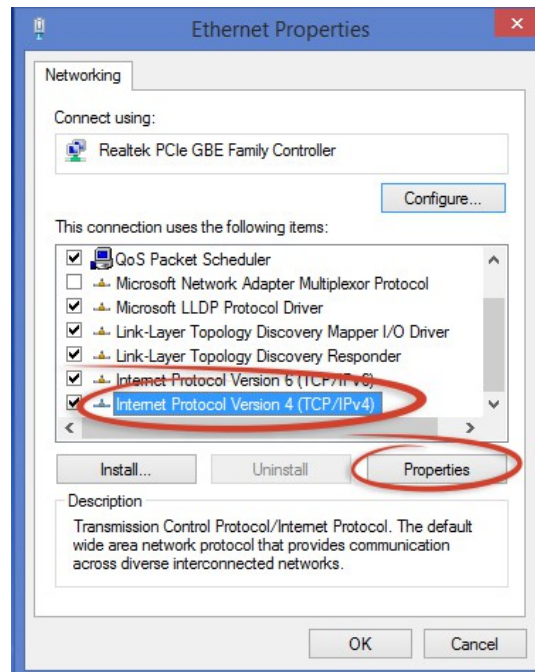
8. If "Use the following IP address" is already selected, the computer has been setup with a static IP address. Record these values so that the current IP address of the computer can be restored once the IP address of the WebRelay has been successfully changed.

Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically

◉ Use the following IP address:

IP address: 192 . 168 . 1 . 50

Subnet mask: 255 . 255 . 255 . 0

Default gateway: .   .   .

○ Obtain DNS server address automatically

◉ Use the following DNS server addresses:

Preferred DNS server: .   .   .

Alternate DNS server: .   .   .

☐ Validate settings upon exit   Advanced...

OK   Cancel

Select the radio button labeled *"Use the following IP address"* and type in the IP address:

```
192.168.1.50
```

Type in the subnet mask:

```
255.255.255.0
```

No need to change the default gateway field. Click *OK* to accept the new settings.

9. Open the setup pages of the WebRelay by entering the following URL in the address bar of a web browser:

```
http://{ipaddress}/setup.html
```

(For example: http://192.168.1.2/setup.html)

If the setup pages are not accessible, verify that the WebRelay is powered on and that the LINK light is illuminated. Check all network connections and settings.

Another way to check communications is to ping the WebRelay from the command prompt by typing:

```
ping [ipaddress]
```
(e.g. `ping 192.168.1.2`)

2.6.2 Method 2: Assign a Temporary IP address to the WebRelay

This option (arping) is used to TEMPORARILY assign an IP address to the WebRelay without the need to change the IP address of the configuration computer. The WebRelay will use this IP address as long as power is maintained. Once power is lost and restored, the WebRelay will use the IP address assigned in the setup page and not the temporary address assigned here. Make sure that the WebRelay and the configuration computer are connected to the same network. Since ARP is non-routable, this will not work through routers or gateways.

Microsoft Windows Instructions

1. Open a Command Prompt (select START, then RUN, then type "cmd").

   Note: For Vista, 7, 8, and 8.1, the Command Prompt should be run as administrator (select Start, then type "cmd" and right click on "cmd" and select "Run as administrator").

2. Type:

   ```
   arp -s {new IP address} {serial number of the WebRelay }
   ```

   Note: IP address format is xxx.xxx.xxx.xxx. The serial number can be found on a label on the module board. The format is ss-ss-ss-ss-ss-ss.

   For example, to set the WebRelay (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
   ```

3. 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
   ```

4. Proceed with the WebRelay setup in *Section 3*.

   Once setup is complete, it may be necessary to clear the 'arp' cache to configure additional devices. This is necessary because each unit has the same default IP address, but a different unit serial number (MAC address). Clearing the arp table can be done by typing `arp -d` in the command prompt window.

Linux/Unix Instructions

1. Open a terminal and change to root user (su -, then enter root password).

2. Type:

   ```
       arp -s {new IP address} {serial number of the WebRelay }
   ```

   Note: IP address format is xxx.xxx.xxx.xxx. The serial number can be found on a label on the module board. The format is ss:ss:ss:ss:ss:ss.
   For example, to set the WebRelay (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
   ```

3. 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
```

4. Proceed with the WebRelay setup in *Section 3*.

   Once setup is complete, it may be necessary to clear the 'arp' cache to configure additional devices. This is necessary because each unit has the same default IP address, but a different unit serial number (MAC address). Clearing the arp table can be done by typing `sudo arp -d -a` in the command prompt window.

Mac OS X Instructions

1. Open a terminal.

   Note: The terminal is in the "Utilities" directory, which is in the "Applications" directory.
2. Type:

   ```
   sudo arp -s {new IP address} {serial number of the WebRelay }
   ```

   Administrator password may be required.

   Note: IP address format is xxx.xxx.xxx.xxx. The serial number can be found on the label on the module board. The format is ss:ss:ss:ss:ss:ss.
   For example, to set the WebRelay (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
   ```

3. 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
   ```

4. Proceed with the WebRelay setup in *Section 3*.

Once setup is complete, it may be necessary to clear the 'arp' cache to configure additional devices. This is necessary because each unit has the same default IP address, but a different unit serial number (MAC address). Clearing the arp table can be done by typing `sudo arp -d -a` in the command prompt window.

2.3.3 Open Configuration Web Page

Once the network is set up, open the setup pages 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.

Section 3: Web Server and Setup Pages

WebRelay is fully configurable through HTML 4.0 compliant web browsers such as Chrome, Internet Explorer, and Mozilla Firefox. It has an easy-to-use, tab-based menu system.

The internal web server presents two types of web pages; *Setup* pages and *Control* pages. *Setup* pages are used by an installer to provision and configure the WebRelay. The *Control* page allows the relay to be controlled and displays and digital input status information.

To access the *setup* pages, enter the following URL in the address bar of a web browser:

```
http://{ipaddress}/setup.html
```

For example, using the default IP address, enter:

http://192.168.1.2/setup.html

To access the *control* page, enter the following URL in the address bar of a web browser:

```
http://192.168.1.2
```

Before any setup page submission, the browser will request a username and password. The default username is `admin` and the default password is `webrelay` (password is case sensitive).

Note: The default IP address of 192.168.1.2 is used in all examples in this manual. If the IP address has been changed, substitute the new IP address for the address shown in the examples.

3.1.1 Main Setup Page

This is the initial page that appears when the following URL http://192.168.1.2/setup.html is entered into the web browser. It provides basic information about the WebRelay unit. Navigating between setup pages is done by clicking on the tabs at the top of the page.

The setup pages require a password. The default user name is 'admin'. The default password is 'webrelay' (no quotes, all lower case).

Most setup pages have a "Submit" button and a "Reset" button at the bottom of the page. After entering the desired parameters into each page, click the "Submit" button before any parameters will be saved.

If a mistake is made in entering the parameters, click the "Reset" button to restore all parameters on the page to their current settings. The "Reset" button is only effective *before* the "Submit" button is pressed.
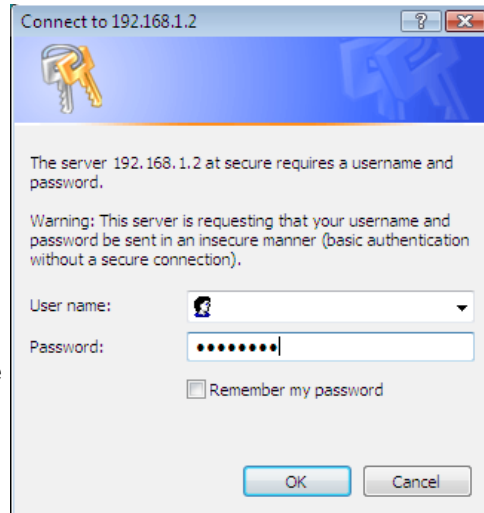
3.1.2 Network Setup Page

The network parameters are changed on this page. Note that if multiple WebRelay 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 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 units on the network (this is because each unit has the same default IP address but a 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 requires a static IP address. This is a unique address that identifies WebRelay on the network. Dynamic IP address assignment (DHCP) is not supported. The lack of dynamic IP addressing support is intentional because dynamically changing the IP address would make it difficult for a client to access the web server built into WebRelay. The IP address is specific to the network where WebRelay 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 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 will not be accessible from the Internet until the proxy server is properly configured (forward proper port to WebRelay). 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 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 is used to control (or monitor) a device in another room or a nearby building.

If WebRelay 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 units are installed on the same network, each unit must have its own unique IP address. For example, WebRelay 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. 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 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 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 unit which uses that port. The WebRelay 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 unit.

Note: Whenever any port is assigned other than port 80, all communications with that WebRelay device must include the port. For example, if WebRelay 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.

See Appendix C: *Accessing the WebRelay Over the Internet* for further information of configuring a router to allow access to a WebRelay behind a gateway router.

Modbus Port
This specifies the port used for Modbus/TCP communications with the WebRelay. By default this is set to port 502 which is the standard Modbus port. Modbus is a messaging structure protocol used in the industrial, manufacturing, control and automation industries. 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. Either 10Mbps or100Mbps can be selected. The 100Mbps option offers faster communications but the amount of data to and from WebRelay is so small that users will not likely notice much of a difference. When WebRelay is set to 10Mbps, it draws less power and runs a little cooler which provides a longer service 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
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.

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.

3.1.3 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 disables the ability to communicate with WebRelay using Modbus. Passwords may be up to 10 characters.
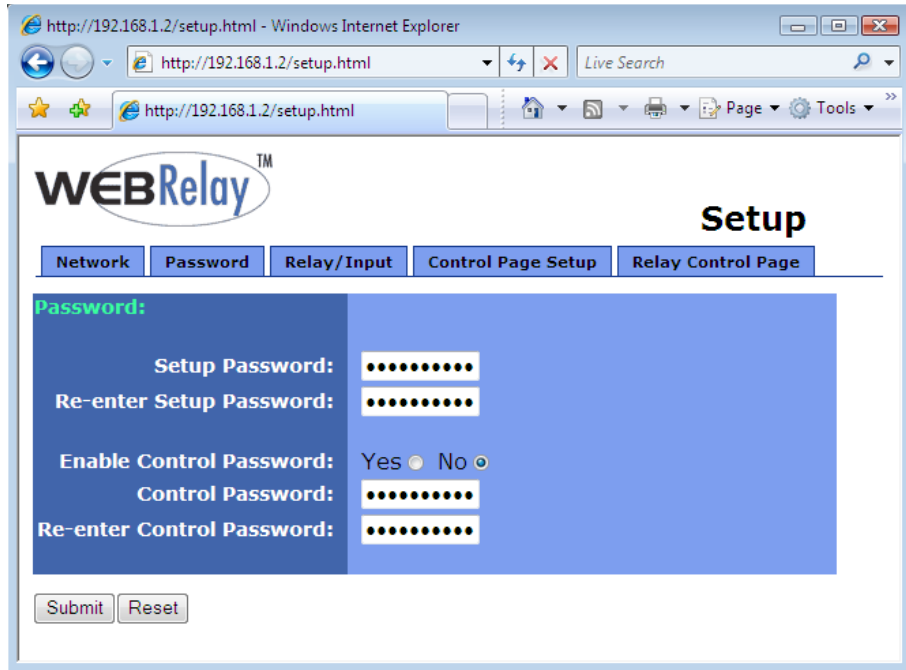
Note: When the password is changed, the password may be displayed in the browser's history in clear text. It is advisable to clear the browsers history after setting the password.

3.1.4 Relay/Input Setup Page

This page is used to set up the function of the relay and the control input. Note that in this manual, the relay is considered to be *on* when the relay coil is energized. When the relay coil is *on*, the normally open contacts are closed and the normally closed contacts are open. When the relay coil is *off*, the coil is not energized and the normally closed contacts are closed and the normally open contacts are open. The input is considered to be *on* when a voltage is applied to the input.

The respective LEDs on the front panel of WebRelay will illuminate whenever the relay or input are in the *on* state.

Relay Mode
The unit may be configured so that it operates in *Standard* mode or *Automatic Reboot* mode.

> *Standard* mode is used for all applications, except automatic reboot applications. Unless the WebRelay will be used as an automatic reboot controller, *Standard* mode should be selected. In cases where WebRelay will be used to remotely reboot devices but not for automatic reboot, *Standard* mode should still be selected.

> *Automatic Reboot* mode is used to configure WebRelay as a reboot controller. When this option is selected, the options in both the Relay/Input and the Control Page Setup menus automatically change.

> In *Automatic Reboot* mode, the WebRelay is configured to periodically confirm that another device (such as a server, computer, router, etc.) is working by sending ping requests to the

device. The WebRelay expects a response after each ping. If a preset number of ping requests fail, it is assumed that the device is not functioning properly. The WebRelay will attempt to restore the device to normal operation by rebooting the device. In *Automatic Reboot* mode, users also have the ability to manually reboot the device from a remote location over the network.

When the WebRelay is set to *Automatic Reboot* mode, at power-up it will automatically turn the device on. This is so that users will not need to manually turn the device on after the power fails.

Also note that from the control page, users can temporarily disable the automatic reboot function but it will automatically be re-enabled if the WebRelay loses and regains power.

Finally, note that the optically-isolated input cannot be used to control the local relay in this mode. In this mode the status of the input may be displayed on the control page or the input may be used to control a WebRelay at a remote location but local relay control is disabled.

3.1.4.1 Standard Relay Mode

The following parameters are available when WebRelay is set to *Standard* relay mode.

Pulse Duration
When the WebRelay 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). Each time the WebRelay receives a pulse command, the relay will be turned *on* (if not *on* already) and the pulse timer will be reset.

If the WebRelay receives a pulse command and a second pulse command is received 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.

Relay Options
The optically-isolated input can be configured to control the relay. The **Relay Options** setting is used to specify if and how the input affects the local relay. The options in the drop down list are described below.

Note that in all cases, input changes will only affect the relay at the time the input is changed. Once the change has taken place the state of the input has no effect on the state of the relay. In other words, if the input causes the relay to go on, a user may turn the relay off from the web browser, even if the input is still on.

no local relay control - The input has no effect on the local relay.

set relay equal input - When a voltage is applied to the input, the relay goes *on*. When a voltage is removed from the input, the relay goes *off*.

set relay equal input (init at powerup) - When a voltage is applied to the input, the relay goes *on*. When a voltage is removed from the input, the relay goes *off*. In addition, the relay will automatically be set to match the state of the input when the WebRelay is powered on.

set relay opposite of input - When a voltage is applied to the input, the relay goes *off*. When a voltage is removed from the input, the relay goes *on*.

set relay opposite of input (init at powerup) - When a voltage is applied to the input, the relay goes *off*. When a voltage is removed from the input, the relay goes *on*. In addition, the relay will automatically be set to the opposite of the state of the input when the WebRelay is powered on.

latch relay when input on (reset via web) - When a voltage is applied to the input, the relay goes *on*. Once the relay is on it will stay *on* (unaffected by input changed) until it is turned *off* via the web by a user or the WebRelay is powered off. This option is useful for alarming functions.

latch relay when input off (reset via web) - When a voltage is removed from the input, the relay goes *on.* Once the relay is *on* it will stay *on* (unaffected by input changed) until it is turned off via the web by a user or the WebRelay is powered off. This option is useful for alarming functions.

latch relay when input changes (reset via web) - When a voltage is applied to the input or removed from the input, the relay goes *on*. Once the relay is *on* it will stay *on* (unaffected by input changes) until it is turned off via the web by a user or the WebRelay is powered off. This option is useful for alarming functions.

toggle relay when input on - When a voltage is applied to the input, the relay will change states. When a voltage is removed from the input, the relay will remain in its current state.

toggle relay when input off - When a voltage is removed from the input, the relay will change states. When a voltage is applied to the input, the relay will remain in its current state.

toggle relay when input changes - When a voltage is applied to the input or removed from the input the relay will change states.

pulse relay when input on - When a voltage is applied to the input, the relay will pulse for the Pulse Duration specified. The voltage may remain on or be removed and the pulse time will not be affected. If the voltage is applied, removed, and then re-applied before the end of the pulse time, the Pulse Duration timer will be re-started (it will re-start each time a voltage is applied) and the relay will continue to remain *on* until the timer expires.

pulse relay when input off - When a voltage is removed from the input, the relay will pulse for the Pulse Duration specified. The voltage may remain off or be re-applied and the pulse time will not be affected. If the voltage is removed, re-applied, and then removed again before the end of the pulse time, the Pulse Duration timer will be re-started (it will re-start each time a voltage is removed) and the relay will continue to remain *on* until the timer expires.

pulse relay when input changes - When a voltage is applied to or removed from the input, the relay will pulse for the Pulse Duration specified. If the state of the voltage changes before the end of the pulse, the timer will be re-started (it will re-start each time the voltage changes) and the relay will continue to remain *on* until the timer expires.

3.1.4.2 Automatic Reboot Mode

The following parameters are available only when the WebRelay is set to *Automatic Reboot* relay mode.
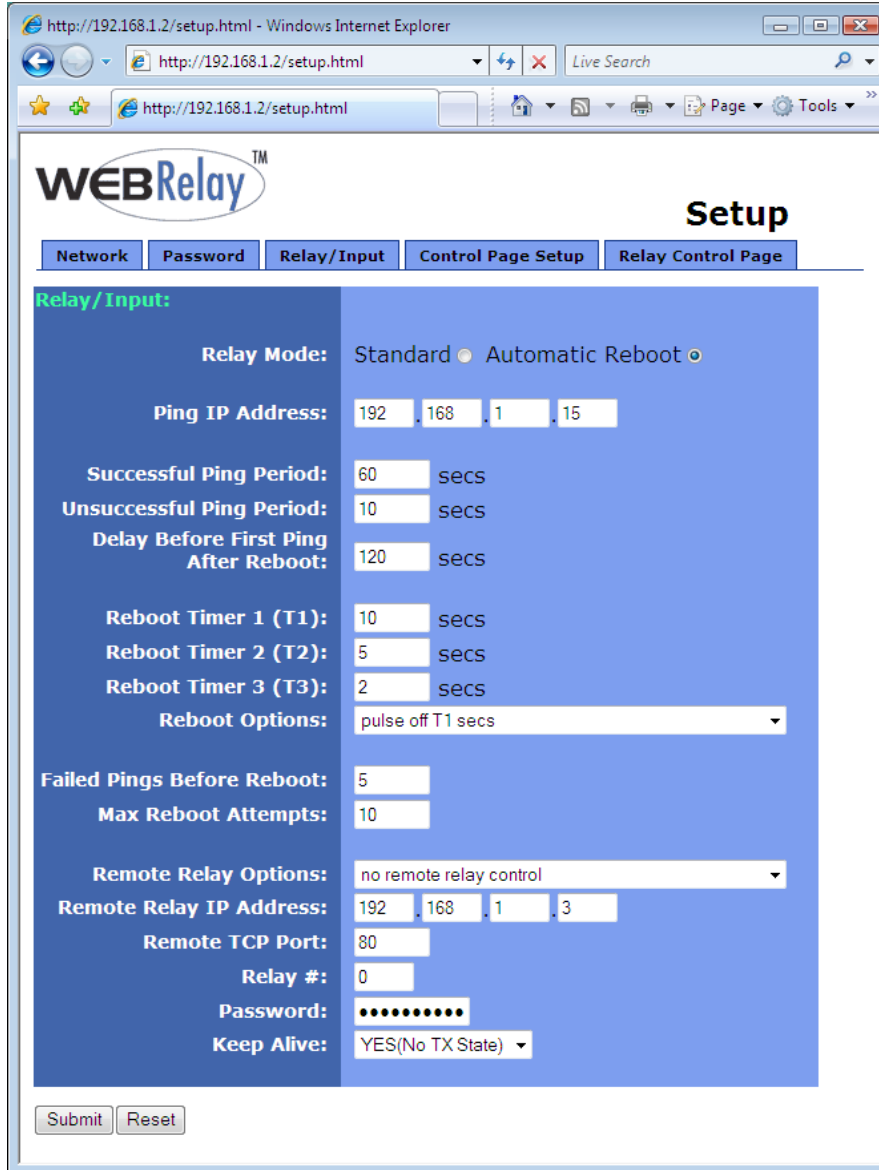
Ping IP Address
This is the IP address that WebRelay will ping. This is typically the IP address of the device that will be re-booted upon failure (such as a server, router, computer, etc.). It could however, be the address of a device on the opposite side of a communications link. This is useful to auto reboot communications devices such as CSU/DSUs, satellite modems, routers, etc.

Successful Ping Period
This is the time interval (in seconds) between successful ping requests. This time can be set from 1 to 6000 seconds (100 minutes or 1.67 hours).

Unsuccessful Ping Period
When ping requests fail (no response from device), it may be desirable to begin pinging at a shorter time interval. This allows the WebRelay to determine in less time that the device is not functioning. After each unsuccessful ping, the WebRelay will wait this time interval (in seconds) before the next ping attempt. This time can be set from 1 to 6000 seconds (100 minutes or 1.67 hours).

Delay Before First Ping After Reboot
When the WebRelay is first powered, it will wait this time interval (in seconds) before beginning to ping the device. This time delay allows the device to boot before being pinged. This time can be set from 0 to 6000 seconds (100 minutes or 1.67 hours).

Reboot Timer 1 (T1)
Pulse Time 1 (in seconds). See "Reboot Options" below for details. This time can be set from 1 to 6000 seconds (100 minutes or 1.67 hours).

Reboot Timer 2 (T2)
Pulse Time 2 (in seconds). See "Reboot Options" below for details. This time can be set from 1 to 6000 seconds (100 minutes or 1.67 hours).

Reboot Timer 3 (T3)
Pulse Time 3 (in seconds). See "Reboot Options" below for details. This time can be set from 1 to 6000 seconds (100 minutes or 1.67 hours).

Reboot Options
This parameter defines how the device will be re-booted. This is determined by the way WebRelay is connected to the device. There are several options for connection. Three reboot methods are discussed here which will help in understanding of how reboot options should be set.

> **Reboot Method #1:** Connect the WebRelay in series with the power source of the device. By doing this, WebRelay can switch the device on and off by switching the power to the device on and off.

> **Reboot Method #2:** Connect the WebRelay in parallel with the reset switch of the device. With this approach, WebRelay re-boots the device by momentarily closing the reset switch. This has the advantage of being less "hard" on the device that is being controlled than switching the power on and off.

> **Reboot Method #3:** Some devices have on/off switches that will remain in the on or off position and other devices have momentary power buttons. Devices with momentary power buttons usually will not turn on after power is applied until a user presses the power button. In this case, simply controlling the power to the device will not work for reboot because once the device is off, it will not come back on until the power button is pressed (even after power is restored, pressing the button is required). The WebRelay can be wired in parallel with the power button and can momentarily close the power button to turn the device on or off.

> Each option in the Reboot Options drop-down list is explained below:

> *pulse off T1 secs* This option is usually used for method #1 described above. In this case the power to the device is wired in series with the relay. Common and Normally Open contacts should be used. When this option is selected, the WebRelay will automatically turn *on* the relay when it is first powered. The Normally Open relay contacts will be closed and the device is powered on. When the device needs to be re-booted, the relay contacts will be pulsed *off* for the time duration specified in T1 (see above) seconds. This option does not use parameters T2 or T3.

> *pulse on T1 secs* This option is usually used for method #2 described above. In this case the reset button is wired in parallel with the relay. Common and Normally Open contacts are used. When the device needs to be re-booted, the relay will be pulsed *on* for the time duration specified in T1 (see above) seconds. This option does not use parameters T2 or T3.

> *pulse on T1 secs, off T2 secs, on T3 secs (without pp)* This option is usually used for

method #3 described above. In this case the power button is wired in parallel with the relay. Common and Normally Open contacts are used. When the device needs to be re-booted, the relay will be pulsed *on* for T1 (see above) seconds. After the first pulse, the relay will stay *off* for T2 seconds, and then pulse *on* for T3 seconds. The purpose for the first pulse (T1) is to turn the device off. Usually this requires holding the power switch for 5-10 seconds. Once the device is off, there is a delay before turning the device back on. This delay time is specified in parameter T2. Finally the device is turned on once again by applying a second pulse (T3) to the power switch. The second pulse usually does not need to be as long as the first. The notation **without pp** means without power-up pulse. The power-up pulse is explained in the next paragraph.

pulse on T1 secs, off T2 secs, on T3 secs (with pp) This option is identical to the option above, but with one exception; it pulses at power-up (**with pp**). If the WebRelay loses power, it is assumed that the device which the WebRelay controls has also lost power. When the power is restored, the device will not come back on without some help. When this reboot option is selected, the WebRelay will automatically power the device on each time power lost and restored. It does this by waiting T2 seconds after power-up and then pulsing T3 seconds. After the pulse to turn the device on, the WebRelay will allow the device to boot and begin its normal ping algorithm.

Failed Pings Before Reboot
The device will be re-booted after this number of consecutive ping failures. This number can be set between 1 and 255.

Max Reboot Attempts
After the device has been re-booted this number of times without any successful pings, it is assumed that there are problems with the device and the WebRelay will no longer attempt to reboot the device. At this point, the WebRelay will leave the device on but will disable the auto reboot feature. The auto reboot feature will remain disabled until a user enables it through the control page or WebRelay is powered down and powered up once again. This number can be set between 1 and 255.

3.1.4.3 Standard or Automatic Reboot Mode

The following parameters are available when WebRelay is set to either **Standard** or **Automatic Reboot** relay mode.

Remote Relay Options
The optically-isolated input can be configured to control a WebRelay device at a remote location. The 'Remote Relay Options' setting is used to specify if and how the input affects the remote relay. The options in the drop-down list are described below. Note that in all cases, input changes will only affect the remote relay at the time the input is changed. Once the change has taken place the state of the input has no effect on the state of the remote relay (unless Keep Alive is set to **Yes (TX State)**. In other words, if the input causes the remote relay to go on, a user may turn the remote relay off from the web browser, even if the local input is still on.

no remote relay control - The input has no effect on the remote relay.

remote command equals input - When a voltage is applied to the input, a command is sent to the remote WebRelay to set the relay state to *on*. When a voltage is removed from the input, a command is sent to the remote WebRelay to set the relay state to *off*.

remote command opposite of input - When a voltage is applied to the input, a command is sent to the remote WebRelay to set the relay state to *off*. When a voltage is removed from the input, a command is sent to the remote WebRelay to set the relay state to *on*.

send on command when input on (no off command) - When a voltage is applied to the input, a command is sent to the remote WebRelay to set the relay state to *on*. When a voltage is removed from the input, no commands are sent to the remote WebRelay.

send on command when input off (no off command) - When a voltage is removed from the input, a command is sent to the remote WebRelay to set the relay state to *on*. When a voltage is applied to the input, no commands are sent to the remote WebRelay.

send off command when input off (no on command) - When a voltage is removed from the input, a command is sent to the remote WebRelay to set the relay state to *off*. When a voltage is applied to the input, no commands are sent to the remote WebRelay.

send off command when input on (no on command) - When a voltage is applied to the input, a command is sent to the remote WebRelay to set the relay state to *off*. When a voltage is removed from the input, no commands are sent to the remote WebRelay.

send pulse command when input on - When a voltage is applied to the input, a command is sent to the remote WebRelay to pulse the relay. When a voltage is removed from the input, no commands are sent.

send pulse command when input off - When a voltage is removed the input, a command is sent to the remote WebRelay to pulse the relay. When a voltage is applied to the input, no commands are sent.

send pulse command when input changes - When a voltage is applied to the input or removed from the input, a command is sent to the remote WebRelay to pulse the relay.

send toggle command when input on - When a voltage is applied to the input, a command is sent to the remote WebRelay to toggle the relay (change the remote relay to the state opposite of its current state). When a voltage is removed from the input, no commands are sent.

send toggle command when input off - When a voltage is removed the input, a command is sent to the remote WebRelay to toggle the relay (change the remote relay to the state opposite of its current state). When a voltage is applied to the input, no commands are sent.

send toggle command when input changes - When a voltage is applied to the input or removed from the input, a command is sent to the remote WebRelay to toggle the relay (change the remote relay to the state opposite of its current state).

remote command equals local relay - This option is used to "daisy-chain" WebRelay units. In this mode, commands are sent to the remote WebRelay based upon the state of the local relay and not the local input. When the local relay changes state to *on,* a command is sent to the remote WebRelay to set the relay state to *on*. When the local relay changes state to *off*, a command is sent to the remote WebRelay to set the relay state to *off*.

Remote Relay IP Address
When any option in the 'Remote Relay Options' setting is selected other than *no remote relay control*, commands are sent over the IP network to this address as the control voltage input changes.

Remote TCP Port
When any option in the 'Remote Relay Options' setting is selected other than *no remote relay control*, commands are sent over the IP network to this TCP port on the remote WebRelay as the control voltage input changes.

Relay #
When any option in the 'Remote Relay Options' setting is selected other than *no remote relay control*, commands are sent to the remote device with this relay offset. This option should ALWAYS be set to 0, unless the remote device is something other than WebRelay. This is used when the remote device has multiple relays. For example, the WebRelay-Quad has 4 relays. To send commands to third relay on a WebRelay-Quad, this option would be set to 3. To send commands to the first relay on a WebRelay-Quad, this option would be set to 1.

For a more technical description of this option, commands sent to remote WebRelay units look like this:

http://192.168.1.2/state.xml?relayState=1

When a 0 is entered into this field, the above format is used which is required for standard WebRelay units. Commands sent to a remote WebRelay-Quad look like this:

http://192.168.1.2/state.xml?relay1State=1

http://192.168.1.2/state.xml?relay2State=1

http://192.168.1.2/state.xml?relay3State=1

http://192.168.1.2/state.xml?relay4State=1

In this case, each of the four relays can be addressed as illustrated. The address of the specific relay on the WebRelay-Quad board is given in this field.

For custom computer applications, the 'Relay #' option may be useful to monitor input changes as they happen. This works by pointing the 'Remote Relay IP Address' above, to a computer instead of another WebRelay device. Each time the input changes, a message is sent to the computer indicating the change. The computer can identify the device sending the message by the 'Relay #'. Note that when remote relay commands are sent to a computer instead of a WebRelay, the computer must appear to this WebRelay as another WebRelay device which may require some advanced programming. This field may be set from 0 to 255.

Password
When any option in the 'Remote Relay Options' setting is selected other than *no remote relay control*, this password is included with commands that are sent to the remote WebRelay unit. If the remote WebRelay unit has the control password option enabled, the password for that unit must be entered here for the remote commands to have any effect.

Keep Alive
When any option in the 'Remote Relay Options' setting is selected other than *no remote relay control*, the Keep Alive option may be turned on to keep the TCP connection to the remote WebRelay unit alive. If the connection is alive, commands sent to the remote unit will change the state of the remote relay almost instantly (with a good network connection). If the connection is not alive, commands sent to the remote unit will be delayed a few seconds while the connection is being setup. There are three options available in this field.

>   *NO*: When this option is selected, the TCP connection between the two units will be terminated if there is a time gap (more than about 50 seconds) between commands. Once the connection is closed, the two WebRelay units must re-establish a connection before the next command can be sent. This means that when the input voltage toggles, it may take a few seconds for the remote relay to respond. In many cases, this delay may not be a problem. This option uses the least network bandwidth (and is the most secure) because communications only take place when the input voltage changes.

>   *YES (No TX State)*: When this option is selected, a message is sent to the remote unit every 50 seconds to keep the TCP connection alive. The message does not contain the state of the local input. If power is lost and the control voltage changes while the unit is not powered, the new control voltage status will not be sent to the remote unit when the power is restored. The state will not be updated until the next time the control input changes.

>   *YES (TX State)*: When this option is selected, a message is sent to the remote unit every 50 seconds to keep the TCP connection alive. This message will contain the current state of the input. By sending the state of the unit, changes to the control voltage input will eventually be sent to the remote unit, even if the change occurred during a power loss. Transmit state is only valid for the 'Remote Relay Options' *remote command equals input, remote command*

opposite of input, and **remote command equals local relay**. If any of the other 'Remote Relay Options' are selected, the state will not be transmitted.

Note: When units are set up to require a control password, this password must be sent each time the state is updated. When the option is selected to transmit the state of the input each time the keep alive message is sent, the password will be frequently transmitted over the network. This may not be a problem, but the user should be aware that the more often the password is sent, the more opportunity hackers would have to capture the password, decode it, and potentially use it to control the remote relay (especially in public networks such as the Internet).

3.1.5 Control Page Setup (When Relay Mode is set to Standard)

Once the WebRelay is set up, it can be controlled and monitored using a web browser by accessing its control page. Titles, colors, and basic contents of the control page can be customized by setting the appropriate options on the 'Control Page Setup' page. Note that this setup page only affects the control web page and does not affect the function of the WebRelay in any way. This section describes the Control Page Setup page when the relay mode is set to **Standard**. The next section describes the setup page for **Automatic Reboot** mode.
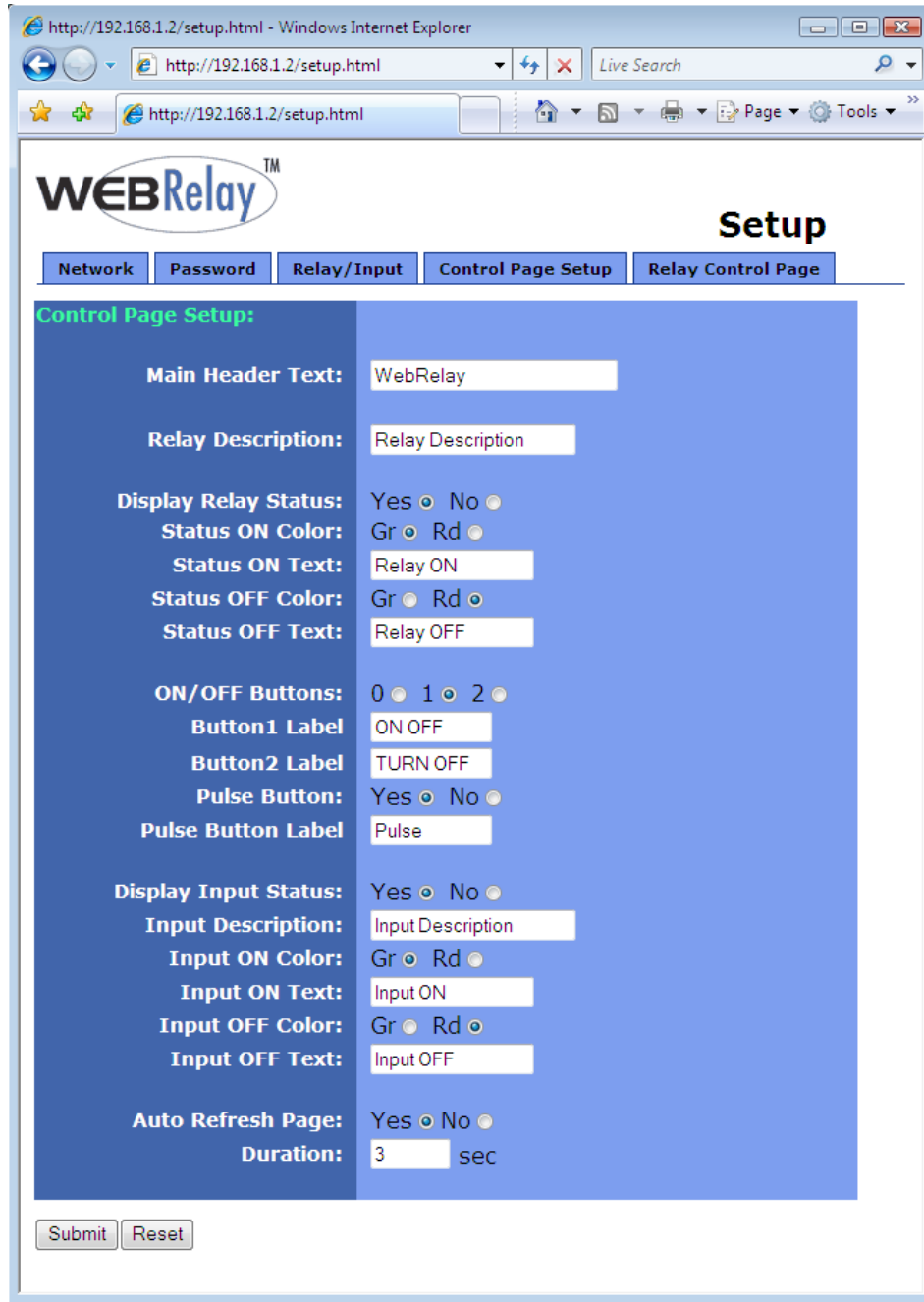
Main Header Text
This text will be displayed in the main header area of the control page. This field can be up to 25 characters in length.

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 displayed... 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 inclusion of 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.

Display Input Status
When this option is set to *Yes,* the status of the optically-isolated input will be displayed on the control page. Note, the input can be used to control a local relay, a remote relay, or be read using the XML page no matter how this option is set.

Input Description
This is the text that will be displayed next to the input status when the 'Display Input Status' is enabled. It can be up to 20 characters in length.

Input ON Color
When 'Display Input Status' is set to *Yes*, this field specifies the color that will be displayed when the input is *on* (voltage applied to input).

Input ON Text
When 'Display Input Status' is set to *Yes*, this field specifies the text that will be displayed when the input is *on* (voltage applied to input).

Input OFF Color
When 'Display Input Status' is set to *Yes*, this field specifies the color that will be displayed when the input is *off* (voltage is not applied to input).

Input OFF Text
When 'Display Input Status' is set to *Yes*, this field specifies the text that will be displayed the input is *off* (voltage is not applied to input).

Auto Refresh Page
Web pages traditionally display static information. The WebRelay 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 in the control voltage input or due to a command sent from another machine, the relay state will not be updated and the control page information will be obsolete.

In addition, when the optically-isolated input changes, the control page will be obsolete until the page is refreshed. WebRelay can not force the web page to be updated when the input changes. 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.

3.1.6   Control Page Setup (When Relay Mode is set to Automatic Reboot)

Once the WebRelay is set up, it can be controlled and monitored using a web browser by accessing its control page. Titles, colors, and basic content of the control page can be customized by setting the appropriate options in the 'Control Page Setup' page. Note that this setup page only affects the control web page and does not affect the function of the WebRelay in any way. This section describes the Control Page Setup page when the relay mode is set to **Auto Reboot.**
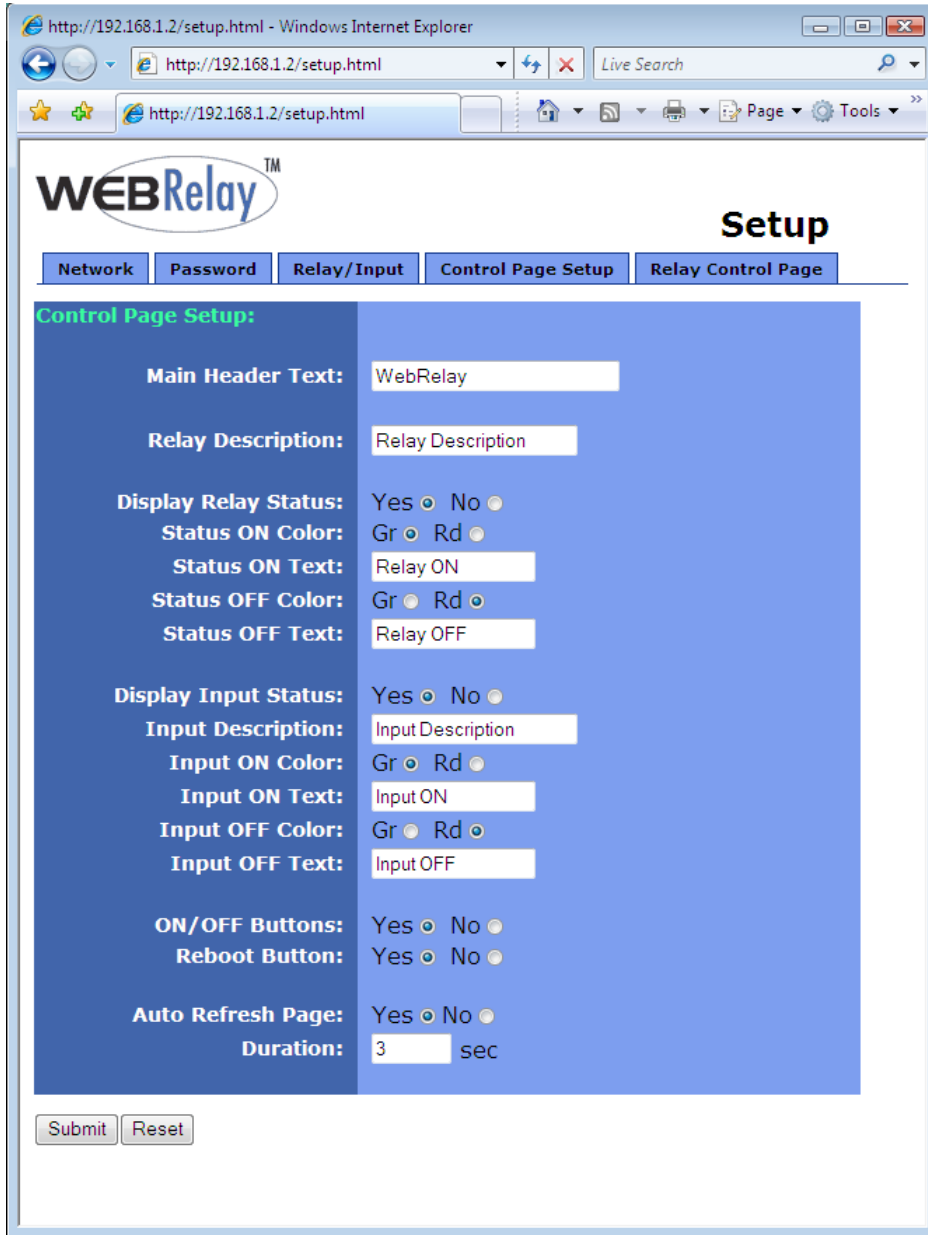
Main Header Text
This text will be displayed in the main header area of the control page. This field can be up to 25 characters in length.

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*, and 'ON/OFF' buttons are not displayed which allow relay control. This field can be up to 20 characters in length.

The following settings are used to set up the way the relay status is displayed.

Note: Be aware that when the WebRelay is used for re-boot purposes, the relay status may or may not be the same as the device status. When the WebRelay is used to assert the a reset signal on the motherboard of a server, for example, the relay will be 'OFF' most of the time even though the server is 'ON' most of the time. The specific re-boot method used should be considered when assigning text and color to the relay status.

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).

Display Input Status
When this option is set to *Yes* the status of the optically-isolated input will be displayed on the control page. For most reboot applications, the optically-isolated input will not be used so this should be set to *No*. Note that this input can be used to control a remote relay or be read using the XML page no matter how this option is set (local relay control is not available in *Automatic Reboot* mode).

Input Description
This is the text that will be displayed next to the input status when the 'Display Input Status' is enabled. This field can be up to 20 characters in length.

Input ON Color
When 'Display Input Status' is set to *Yes*, this field specifies the color that will be displayed when the input is *on* (voltage applied to input).

Input ON Text
When 'Display Input Status' is set to *Yes*, this field specifies the text that will be displayed when the input is *on* (voltage applied to input).

Input OFF Color

When 'Display Input Status' is set to *Yes*, this field specifies the color that will be displayed when the input is *off* (voltage is not applied to input).

Input OFF Text
When 'Display Input Status' is set to *Yes*, this field specifies the text that will be displayed when the input is *off* (voltage is not applied to input).

ON/OFF Buttons

When this option is set to *Yes*, the control page will display buttons to turn the device *on* and *off*. These buttons attempt to represent the state of the device and not the relay (the relay status however, represents the state of the relay).

When the 'Reboot Options' field (under the 'Relay/Input' tab) is set to **pulse off T1 secs**, it is assumed that the device is *on* when the relay is *on*. In this case the 'on' button will turn both the relay and the device *on* and the 'off' button will turn both the relay and the device *off*.

When the 'Reboot Options' field (under the 'Relay/Input' tab) is set to **pulse on T1 secs**, it is assumed that the device is *on* when the relay is *off*. In this case the 'on' button will turn the relay *off* and the device *on*. The 'off' button will turn the relay *on* and the device *off*.

When the 'Reboot Options' field (under the 'Relay/Input' tab) is set to either **pulse on T1 secs, off T2 secs (without pp),** or **pulse on T1 secs, off T2 secs (with pp)**, the 'ON/OFF' buttons will not be displayed in the control page. In addition, the option to display the ON/OFF buttons will not appear in the 'Control Page Setup' page.

It is recommended that the 'ON/OFF' buttons not be displayed on the control page in two distinct cases. First, if turning the device *off* causes communications with WebRelay to be lost (for example, WebRelay controls a router or modem which must be operating properly to remotely communicate with WebRelay). In this case the user may press the 'OFF' button and lose communications with WebRelay so he/she cannot turn the device back *on*. The second situation where not displaying the 'ON/OFF' buttons is recommended is when WebRelay is wired to control a reset line instead of power. In this case the user cannot actually power off the device so 'ON/OFF' buttons are not necessary.

Reboot Button
When this option is set to *Yes*, the control page will display a button to reboot the device. When the user presses this button, WebRelay will go through the reboot sequence specified in the 'Reboot Options' field (under the 'Relay/Input' tab).

Auto Refresh Page
Web pages traditionally display static information. The WebRelay 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 in the control voltage input or due to a command sent from another machine, the relay state will not be updated and the control page information will be obsolete.

In addition, when the optically-isolated input changes, the control page will be obsolete until the page is refreshed. WebRelay can not force the web page to be updated when the input changes. 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.

Section 4: Control Page

The WebRelay can be operated using a web browser, by sending text commands to an XML status/control page, and/or by sending Modbus/TCP requests. The WebRelay can be controlled using inputs, or other relays. (Using an input to control the relay was described in the previous sections of the manual, and will not be described here.)

4.1 Browser Operation (Standard Relay Mode)

Once the WebRelay is set up, users can access the *Control Page* using a web browser. Type the IP address of the WebRelay directly into the web browser address bar. For example, using the default IP address, the user would enter http://192.168.1.2. If the IP address is changed from the default, the user must use the new IP address. Note that if any port is used other than the default port 80, the port must also be included in the request. For example, accessing the unit at port 8000 would be as follows: http://192.168.1.2:8000. The same is true when the default HTTPS port is changed.

The following screen with default settings appears when the Control Page is requested from the address bar. The control page updates every three seconds.
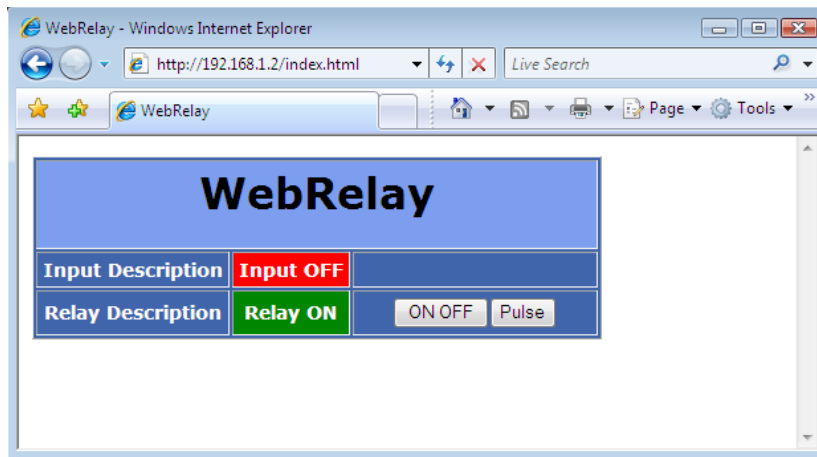
The Control Page is normally what users see and use and it can be configured to fit your needs. The *Control Page Setup* tab has settings that determine if a specific resource is displayed or not displayed. The device title (text) is also specified in the *Control Page Setup* tab.

Header
Displays the text entered in the Main Header Text field on the *Control Page Setup* tab in the setup pages. This is usually a description of the application.

Input
This row displays the current state of the digital input. This row can be displayed (as shown) or not displayed by the settings in the *Control Page Setup* tab in the setup pages. The text in the left column is also specified in the Description field in the *Control Page Setup* tab.

Relay
This rows displays the current state of the internal relay and allows the user to change relay state. The row can be displayed (as shown) or not displayed by the settings in the *Control Page Setup* tab in the setup pages. The text in the left column (by default reads Relay Description) is also specified in the

Description field in the *Control Page Setup* tab. The state of the relay is shown to the right of the relay description text. By default, the status text will read Relay ON or Relay OFF; however, the status text can be changed in the *Control Page Setup* tab. To the right of the relay status, buttons are provided to control the relay. The buttons can be removed when not needed (in the *Control Page Setup* tab) and the text within the buttons can be customized.

4.2   Browser Operation (Automatic Reboot Relay Mode)

The control page for automatic reboot mode is accessed the same as it is in standard mode. See Section 4.1 for information on accessing the control page.

Using the Automatic Reboot control page is simple and straightforward. Control pages will vary based upon options selected in setup. An example control page is shown below. A basic description of the control page follows.
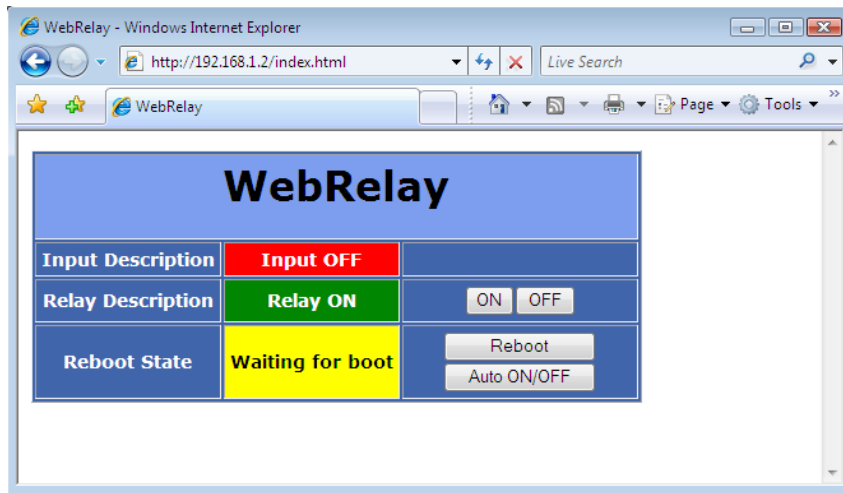
Input Description and Input State
The state of the optically-isolated input can be displayed on the control page. This may be useful to monitor the electrical state of a device. Most reboot applications will not use the optically-isolated input so it can be disabled in the setup so that it is not displayed.

Relay Description and Relay State
A brief user description of the relay (or device being controlled) and the relay state may be displayed on the control page. Note that the relay state represents the current state of the relay and may or may not represent the state of the device being controlled. This is due to the fact that there are multiple reboot configurations that function differently. It is recommended that in the WebRelay setup, appropriate text, state colors, and state labels be used that best represent the device being controlled.

ON/OFF Buttons
These buttons are available only when single pulse reboot options are selected in the 'Relay/Input' setup and the 'On/Off Buttons' field in the 'Control Page Setup' is set to **Yes**. When the WebRelay is wired to correctly match the reboot logic, these buttons will turn the device on and off.

Reboot State
This field provides important information about the current status of the automatic reboot controller. Each state is described below.

Reboot State	Description
Waiting for boot	After power-up, the WebRelay will wait for the device to boot before sending any ping requests. The "Waiting for boot" message is displayed during this wait time. The wait time is specified in the 'Delay Before First Ping After Reboot' parameter under the 'Relay/Input' tab.
Pinging	WebRelay is periodically pinging the selected device. This indicates normal operation.
Waiting Reply	This indicates that a ping request has been sent out and the WebRelay is waiting for a reply from the device. Usually under normal circumstances the device will reply very quickly and there will be no time to display this message.
Reboot Sequence Failures:0 Reboot Attempts:1	The status field looks like this when one or more ping requests have failed. The top line indicates the current state. It may be 'Pinging', 'Waiting Reply', 'Waiting for boot', or in its 'Reboot Sequence'. The next line (Failures) indicates the number of consecutive ping request have failed to respond. This counter is reset each time the WebRelay receives a successful ping response. The counter is also reset each time the WebRelay re-boots the device. The bottom line (Reboot Attempts) indicates the number of consecutive times that the WebRelay has re-booted the device. This counter is reset upon a successful ping response or when the user manually re-boots the device.
Reboot Sequence	This indicates that the WebRelay is currently performing a reboot. This may be a single pulse or two pulses with a delay between them depending upon how the WebRelay is configured.
Auto Reboot OFF Reboot Attempts:10	This indicates that the WebRelay has re-booted the device the maximum number of times specified in the 'Max Reboot Attempts' field under the 'Relay/Input' tab. The device failed to respond to any ping requests, even after being re-booted (possibly numerous times). Once the maximum number of attempts have been reached, WebRelay will leave the device powered on and quit trying to perform reboot attempts.
Auto Reboot OFF	This indicates that the user has turned the auto reboot feature off. Note that the auto reboot feature will automatically be re-enabled if power is lost and restored to the WebRelay

Reboot Button
This button may be included on the control page (as specified in the setup). When the user presses this button, the WebRelay will begin the reboot sequence as defined in the 'Reboot Options'.

Auto ON/OFF Button
This allows the user to temporarily disable the automatic reboot feature. When automatic reboot is disabled, the WebRelay will stop pinging the device. Automatic reboot will be disabled until a user re-enables it or the WebRelay is powered cycled. The user can re-enable this feature by pressing the 'Auto ON/OFF' button, or by changing any of the reboot parameters in the setup pages.

Section 5: Auxiliary Operations

5.1   XML

Custom computer applications may be created to monitor and control WebRelay without using a web browser. Monitoring the state of the input and the relay is done by sending a 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 on port 80 (or port specified in setup). This can be demonstrated by entering commands into the URL line of a web browser.

5.1.1   state.xml

XML Monitor All Functions

The state of the Relay and Input can be monitored by sending a request to port 80 (or port specified in setup). This can be demonstrated by entering the following URL into the address bar of a web browser (substituting the IP address as necessary):

```
http://192.168.1.2/state.xml
```

The following state.xml page is returned:

```
<?xml version="1.0" encoding="utf-8" ?>
-<datavalues>
      <relaystate>1</relaystate>
      <inputstate>0</inputstate>
      <rebootstate>0</rebootstate>
      <totalreboots>0</totalreboots>
</datavalues>
```

The numbers enclosed by the tags, `<tag>`, indicate the current state or value monitored by WebRelay. Values for each tag are described in the table below.

Custom Computer applications can open a TCP/IP connection with the WebRelay and send a `GET` request for the state.xml file to obtain the current state of the WebRelay. Parameters can be passed with the GET request to control relays on the WebRelay. (See *Section 5.2 HTTP Get Requests* for instructions on using GET requests to monitor and control the WebRelay.)

XML Tags*	Monitor Values
<relaystate>	0=off(coil off) 1=on (coil energized)
<inputstate>	0=off (voltage not applied to input) 1=on (voltage applied to input)
<rebootstate>	0=Auto Reboot off 1=Pinging 2=Waiting for response 3=Rebooting 4=Waiting for boot

XML Tags*	Monitor Values
<totalreboots>	This field indicates the number of times WebRelay has automatically rebooted the device that it is controlling. Note: This counter only increments when reboots are initiated by the automatic reboot controller. This value can be cleared by sending a clear command or is automatically cleared whenever WebRelay loses power.

5.1.2 XML Control

Commands can be sent to the WebRelay to control the relay. Commands are sent using a variable called relayState. A few examples of using relayState are given here.

Note: The IP address of the device would be included on all the following commands.

Example: http://192.168.1.2/state.xml?relayState=1

Turn the relay 'off': http://192.168.1.2/state.xml?relayState=0

Turn the relay 'on': http://192.168.1.2/state.xml?relayState=1

Command	Description
state.xml?relayState=0	Turn Relay 1 OFF
state.xml?relayState=1	Turn Relay 1 ON
state.xml?relayState=2	Pulse Relay (**Standard** mode)
state.xml?relayState=3	Reboot (**Automatic Reboot** mode)
state.xml?relayState=4	Disable automatic reboot (**Automatic Reboot** mode)
state.xml?relayState=5	Toggle the state of the relay (**Standard** mode)

In addition to the relayState command, there is a command to clear the totalreboots counter. To clear the counter, send the following command (note that 0 is the only valid number for this command).

Command	Description
state.xml?totalReboots=0	Clears the reboot counter

When WebRelay is in *Standard* mode and the pulse command is sent, the relay will pulse for the time specified in the setup page. It is possible however to specify a pulse time that is different than the pulse time configured in the setup page. This is done by sending an additional variable called pulseTime and the desired pulse time.

Command	Description
state.xml?relayState=2	Pulse the relay for the preset time
state.xml?relayState=2&pulseTime=5	Pulse the relay for 5 seconds
state.xml?relayState=2&pulseTime=10	Pulse the relay for 10 seconds

The pulseTime variable does not change the pulse time specified in the setup page and it is not stored or recorded. The pulseTime variable only changes the pulse duration for the single pulse initiated by that command. In other words, you must issue the pulseTime 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...

Command	Description
state.xml?relayState=2	This will pulse the relay for the preset time (1.5 seconds)
state.xml?relayState=2&pulseTime=5	This will pulse the relay for 5 seconds.
state.xml?relayState=2&pulseTime=5	This will pulse the relay for 5 seconds
state.xml?relayState=2&pulseTime=5	This will pulse the relay for 5 seconds
state.xml?relayState=2	This will pulse the relay for the preset time (1.5 seconds)

5.1.3 Message Acknowledgment

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

Note: The XML replay 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 XML commands can also be sent without having WebRelay return the XML page. This is accomplished by adding the noReply field as follows:

Command	Description
http://192.168.1.2/state.xml?relayState=1&noReply=1	Turn the relay 'ON' without returning state
http://192.168.1.2/state.xml?relayState=0&noReply=1	Turn the relay 'OFF' without returning state

5.2   HTTP GET Requests (for custom applications)

The WebRelay has a built-in web server that responds to HTTP GET requests. These GET requests are sent from web browsers when a web page is requested. They are fairly similar to the actual addresses seen in the browser's address bar. The following section describes the HTTP GET protocol and how it can be used to control and monitor the WebRelay.

5.2.1   Using GET for Control and Monitoring

No Password

Example: Request home.html

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

Example: Turn Relay ON

> GET /state.xml?relayState=1 HTTP/1.1\r\n\r\n

Password Enabled

If the control password is enabled in the WebRelay 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?relayState=1&noReply=1 HTTP/1.1 (Terminated with two
\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.

5.3   Modbus/TCP

The WebRelay can be controlled and monitored using Modbus/TCP protocol. This provides a standard means of using the WebRelay with devices and software from other manufacturers. This section is not a tutorial on Modbus and it is assumed that the reader is already familiar with Modbus. Detailed Modbus information can be found at http://www.modbus.org.

Note: Modbus communications are disabled whenever the Control Password is enabled. This is because Modbus/TCP does not provide a mechanism for password protection. Make sure the Control Password is disabled (default) and Modbus functionality is enabled on the Advanced Network. The automatic reboot functions are not available through Modbus.

The WebRelay functions as a Modbus slave. Host devices, such as PLCs, open a connection with the X-WebRelay on port 502 (configurable under *Advanced Network* tab) and then send requests to read the state of the relay, read the input, or change the relay. When the WebRelay receives a command, it will perform the desired function and return a response.

The following sections provide an overview and explanation of Modbus operation.

5.3.1   WebRelay Function Code Summary

The WebRelay supports the following function codes:

Code Name	Modbus Function	WebRelay Feature	WebRelay Start Address	
			Hexadecimal	Decimal
Read Coils	01	Relay state	0x0000	0
Read Discrete Inputs	02	Input status	0x0000	0
Write Single Coil	05	Change relay state	0x0000	0
Write Multiple Registers	16	Pulse the relay	0x0000	0

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

The WebRelay has two TCP sockets available for Modbus/TCP. This allows two connections to be open at one time. Requests for more than two open connections will be rejected.

When errors occur, an error code is returned. Most Modbus client software will interpret this code in a human readable form. The code is comprised of the original function code plus 0x80. For example, an error during the read coils function 0x01 would return 0x81. Each error has a qualifying exception number. The following are the possible exception codes and their meanings:

0x01 - Function code not supported (also when Modbus is disabled in the setup pages).
0x02 - Incorrect starting address/quantity of output combination.

5.3.2   PLC Device Addressing

There are generally two schemes for accessing Modbus devices, The first is by specifying the Modbus function code, memory type, and address. The second, sometimes called PLC addressing, requires only the address.

Modbus protocol uses four different address ranges for discrete inputs, coils, input registers, and holding registers. The function code determines the address range of the message. The following are common function codes and their respective address ranges.

Code Name	Modbus Function	Data Type*	PLC Address Mode 485	PLC Address Mode 584/984
Coils (Read/Write)	01, 05	Discrete	1-1000	1-10000
Discrete Inputs (Read only)	02	Discrete	1001-2000	10001-20000
Registers (Read only)	04	8-64 bits	3001-4000	30001-40000
Holding Registers	16	8-64 bits	4001-5000	40001-50000

* Data types may be implemented at the discretion of the manufacturer. Address ranges may also over lap. Discrete is a binary or boolean value, 1 or 0.

Function codes, memory types, and addresses can be converted to the PLC addressing equivalent using the table below. To use the table, look up the row corresponding to the Modbus function code. Then take the desired WebRelay feature address and add to it the address offset in the PLC address mode column.

Code Name	Modbus Function	WebRelay Addresses	Data Type	PLC Address Mode 485	PLC Address Mode 584/984
Read Coils	01	0 (Relay 1)	Discrete	Addr + 1	Addr + 1
Read Discrete Inputs	02	0 (Input 1)	Discrete	Addr + 1001	Addr + 10001
Write Coils	05	0 (Relay 1)	Discrete	Addr + 1	Addr + 1
Write multiple registers	16	784-791 (Relay 1)	32-bit float	Addr + 4001	Addr + 40001

5.3.3 WebRelay Full Address Table

The table below gives commonly used function codes, memory types, data sizes, and equivalent PLC addresses for accessing the WebRelay. The data size will be the same regardless of the addressing mode.

	Function Code	Address (Decimal)	Data Size	PLC Address Mode 485	PLC Address Mode 584/984
Read Relay Coil	01	0	Discrete	1	1
Write Relay Coil	05	0	Discrete	1	1
Read Discrete Input	02	0	Discrete	1001	10001
Pulse Relay	16	784	32-bit Float	4785	40785

5.3.4 Read Coils - Modbus Function Code 01 (0x01)

Read the state of the relay coil. In addition, the optically-isolated digital input can be read using this function which allows the full state of the WebRelay to be read in a single transaction.

Request

Start Address: 0x0000 or 0x0001
Coil Quantity: 0x0001 or 0x0002
Both Outputs may be read at the same time by specifying the correct starting address and quantity of coils to be read.

Valid Starting Address and Quantity of coils combinations
Starting address 0x0000 quantity of coils 0x0001 (read relay state only)
Starting address 0x0000 quantity of coils 0x0002 (read relay state and input state)
Starting address 0x0001 quantity of coils 0x0001 (read input state only)
Starting address 0x0001 quantity of coils 0x0002 (not valid)

Response

The WebRelay will respond to the request with a data field of one byte, each bit representing the coil status. A '1' indicates the Output is *ON*. A '0' indicates that the Output is *OFF*.

Coil State Byte							
Bit 7	6	5	4	3	2	1	Bit 0
x	x	x	x	x	x	input state	relay state

Errors

The sum of the start address and coil count cannot exceed the maximum coil count or an error response will be returned.

The following are possible error responses:

Coil Read Error Function Code (1 byte): 0x81

Exception Codes (1 byte):   0x01 – Function code not supported.
                               0x02 – Incorrect combination of start address and quantity of Relays

5.3.5 Read Discrete Inputs – Modbus Function Code 02 (0x02)

This function returns the state of the digital input.

Request

Start Address: 0x0000 (always 0x0000)
Input Quantity: 0x0001 (always 0x0001)

Response

The input state is indicated by bit one of the status byte. A "1" indicates that the input is *ON*. A "0" indicates that the input is *OFF*.

When reading the input, the following table shows the bit positions.

Discrete Input State Byte							
Bit 7	**6**	**5**	**4**	**3**	**2**	**1**	**Bit 0**
x	x	x	x	x	x	x	Input 1

Errors

Input Read Error Function Code (1 Byte): 0x82

Exception codes (1 Byte):   0x01 – Function not supported.
                                   0x02 – Incorrect combination of start address and input quantity.

5.3.6 Write Single Coil – Modbus Function Code 05 (0x05)

Control the relay

Request

Start Address (2 bytes):   0x0000 (Relay)
Output Value (1 byte):   0x00 (OFF), 0xFF(ON)
Padding (1 byte):   0x00

Response

The response mirrors the requested state, 0x00 or 0xFF.

Errors

Single Coil Write Error Function Code (1 Byte): 0x85

Exception codes (1 Byte):   0x01 – Function not supported.
                                0x02 – Address out of range.
                                0x03 – Padding value.

5.3.7   Write Multiple Registers – Modbus Function Code 16 (0x10)

The Modbus Write Multiple Registers function is used to pulse the relay for a specified time. When the WebRelay receives this command, it immediately turns the relay coil on (if it is not on already on) and starts the pulse timer.

The pulse time is specified in the register value field and the time 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 the WebRelay (commands may be modbus, xml, html, or electrical input) 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 (set pulse time)

Start Address (2 bytes):   0x0010 (always start at this address)
Register Quantity (2 bytes):   0x0002 (always 2 registers)
Byte Count (1 byte):   0x04 (always 4 bytes)
Register value (4 bytes):   0x00004120 = 10-second pulse

Response

The request is acknowledged by responding with the register quantity that was requested.

Errors

Pulse Function code Error (1 Byte):   0x90

Exception codes (1 Byte):   0x01 – Feature not supported.
                                        0x02 – Address quantity not an even number.
                                             Incorrect combination of start address and relay count.

Appendix A: Restoring Factory Default Settings

In the event that the IP address or passwords are forgotten, the WebRelay may be restored to its original factory default settings.

1. Remove the DC power from the unit.

2. Use a thin, non-conductive object (such as a toothpick) to press and hold the small button located on the bottom of the unit. When the object is inserted, a tactile feedback can be felt as the button is depressed.

    CAUTION: Do not use metal objects for this function

3. While depressing the button, apply power and wait for about 10 seconds before releasing the button. All settings will be back to the original factory defaults.

4. Refer to *Section 2.5: Establishing Communications for Setup* to begin reconfiguration of the device.

Reset Button Access Hole

Appendix B: Installing New Firmware

From time to time, updates are made to the WebRelay 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 7/8/10 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 image can be installed on the WebRelay so make sure the correct image is being downloaded.

2. bootloader.exe will connect to the WebRelay using default IP address 192.168.1.2, not the address currently assigned to the WebRelay. 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 2.5: Establishing Communications for Setup*.

   Note: The IP address of the WebRelay 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.

3. Open the bootloader.exe utility on the computer by double clicking on the downloaded file.

4. Within the ControlByWeb™ Programmer utility programmer, select File, then Open. Specify the firmware image downloaded from the ControlByWeb™ web site.
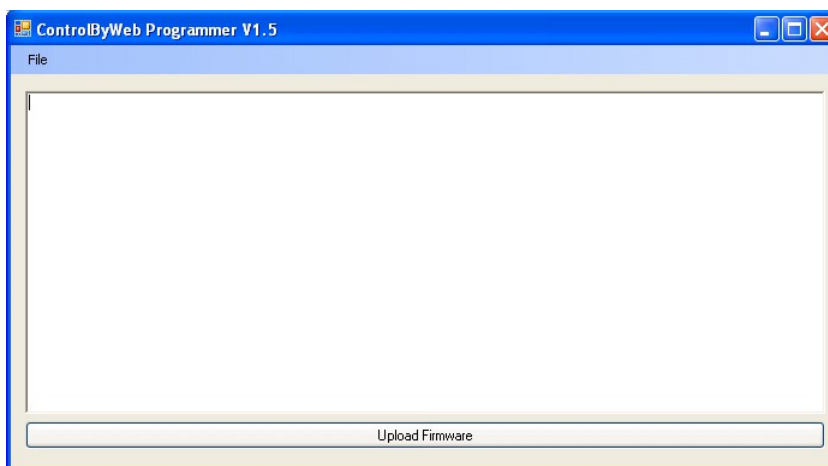
Device Upgrade Procedure

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

1. Remove DC power from WebRelay.

2. Using a small, non-conductive tool, press and hold the reset button.

3. While holding the reset button, apply power to WebRelay. 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. The WebRelay will be set to factory defaults with an IP address of 192.168.1.2.

6. Refer to S*ection 2.5: Establishing Communication for Setup* to reconfigure the WebRelay. 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).
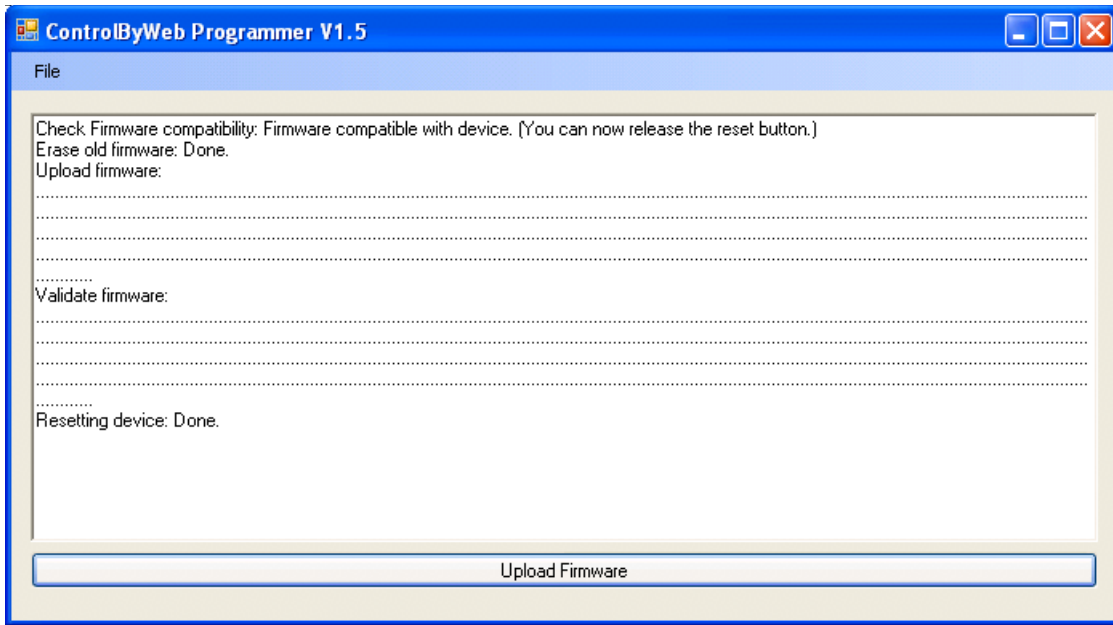
Appendix C: Accessing the WebRelay Over the Internet

The WebRelay can be monitored and/or controlled from a remote location over the Internet. Once the WebRelay can be accessed on the local network, almost all of the settings required to provide remote access are in the router and not in the WebRelay. This guide is not meant to be a tutorial in router setup, but rather to provide a basic overview of remote access.

For specific details, the user should refer to the instruction manual for the router on the local network. Users not familiar with basic IP networking should study one or more basic IP networking tutorials before proceeding (many tutorials are available on the Internet).

IP Addresses

Every device on the Internet is identified by a unique address called an IP (Internet Protocol) address. IP addresses are somewhat similar to mailing addresses in that they identify the precise logical location of the device on the Internet. The IP address identifies the global region down to the network and then the specific device on that network. IP addresses are globally maintained and assigned by an entity called the Internet Assigned Numbers Authority (IANA). IP addresses consist of four sets of numbers that range from 0 to 255 and are separated by a decimal. For example, 192.168.200.167 is an IP address.

Every device that is "directly" connected to the Internet uses a "public" IP address. The WebRelay can be assigned a public IP address for direct connection to the Internet. Typically, a public IP address to would only be assigned to the WebRelay when it is the only device on the local network. The IP address would be obtained from an Internet Service Provider (ISP).

Due to the limited number of public IP addresses, private networks can be set up with "private" IP addresses. These addresses are used within a local network and have no global designation, they are not routed on the Internet. The following address blocks are designated for private networks (where x represents decimal numbers from 0 to 255): 192.168.x.x, 10.x.x.x, and 172.16.x.x.

A Simple Local Area Network

A small Local Area Network (LAN), can be made up of two or more computers or other devices connected to an Ethernet switch. Each device on the network is assigned a unique private IP address. For example, consider a simple network that consists of a computer, an X-310S, and a WebRelay. In this example, the computer is assigned an IP address of 192.168.1.10, the X-310S has the IP address of 192.168.1.25 and a WebRelay has and IP address of 192.168.1.26. A person using the computer can access the X-310S by entering its IP address in the URL line in the browser, http://192.168.1.25. Similarly, the WebRelay can be accessed by entering its unique private IP address in the URL line in the browser, http://192.168.1.26.

X-310™

WebRelay™

Ethernet Switch

Computer
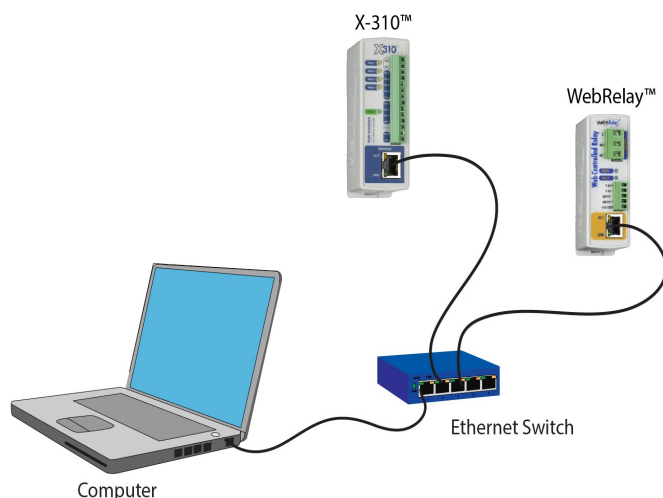
A Simple LAN connected to the Internet

The LAN in the example above can be connected to the Internet by adding a router and an Internet connection. The router has two network connections. It has an Ethernet network connection to the LAN and another connection to the Internet. Often the Internet connection is called a Wide Area Network (WAN) connection. Each network connection on the router has an IP address. In our example, the IP address on the LAN side of the router has an address of 192.168.1.1. The IP address on the WAN side of the router has an IP address that has been assigned by the Internet Service Provider, such as 266.70.164.97. (This is not a valid IP address because each number cannot be larger than 255. It is used in this example for illustration purposes only.)

In the example, when a user on the computer needs to access a server on the Internet, the computer sends the request to the router at 192.168.1.1. The router sends the request to the ISP server on the Internet. The ISP server does not send the response directly to the computer on the LAN, but to the router at the IP address of 266.70.164.97. The router then forwards the response to the computer. This way, all devices on the LAN share a single public IP address. This is called Network Address Translation (NAT).

Port Forwarding

The router can be configured to allow outside access to the X-310S and the WebRelay. All requests from the Internet to any device on the local network must use the public IP address (266.70.164.97). With only a single IP address, TCP ports are used to identify the intended device for the incoming message.

Using the mailing address analogy, the port is similar to a post office box. The IP address specifies the location, and the port specifies the specific recipient. Port numbers can be set to any number between 1 and 65235. However, many port numbers are reserved for specific applications and should be avoided. As a general rule, numbers above 8000 are safe to use. All of the ControlByWeb products come from the factory with the HTTP port set to 80, which is the standard port for HTTP. In this example, the X-310S HTTP port will be changed to port 8000 and WebRelay port will be changed to 8001. Once the ports are changed in the two ControlByWeb™ devices, the router must be set up for port forwarding.

Port forwarding associates the IP address of each local device with an assigned port. In this example, the address 192.168.1.25 for the X-310S would be associated with port 8000. The address 192.168.1.26 for WebRelay would be associated with port 8001. The X-310S would be accessed from the Internet by entering the public IP address of the router, plus the port number assigned to the X-310S in the URL window of the browser, http://266.70.164.97:8000. All Internet requests to the router for port 8000 would be forwarded to the X-310S. Similarly, all request for port 8001 would be forwarded to WebRelay.

Note: When an HTTP request comes in to the router without the specific port specified (http://266.70.164.97), the router will handle this as a port 80 request (default HTTP port). In other words, http://266.70.164.97 is exactly the same as http://266.70.164.97:80.

Router configuration can vary widely. Some routers have the capability of translating the addresses and the ports, which would require no port configuration change on the WebRelay. For example, the router would be configured so that messages sent to http://266.70.164.97:8000 would be forwarded to http://266.70.164.97:80, which is the default HTTP port.

An example screen shot of a router configuration is given below. This setup allows the two ControlByWeb products in the above example to be accessed remotely from the Internet.
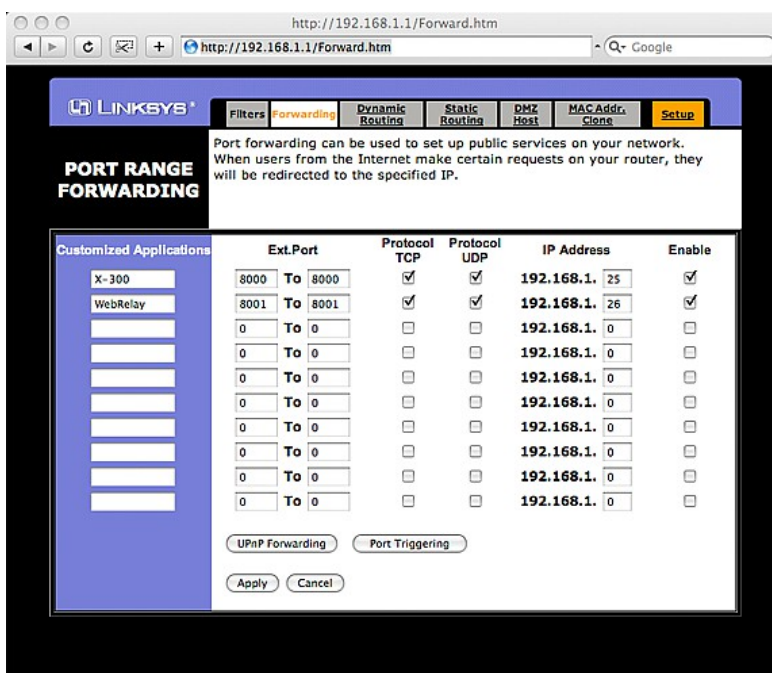
Example of Port Range Forwarding

Note: This screen shot is simply an example of a typical router setup page. Routers will vary.

Accessing Setup Pages

After changing ports, the setup pages are accessed on a local network as described below:

```
http://(Local IP Address):(Port Number)/setup.html
```

For example, to access the setup pages of the WebRelay when the port is set to 8001, the following command would be used:

```
http://192.168.1.26:8001/setup.html
```

To access the ControlByWeb units from the Internet, enter the public IP address of the router plus the port number of the desired device in the following format:

```
http://(Public IP Address of Router):(Port Number of Device)/setup.html
```

Using the example above, the following line would be used to access the setup page of the WebRelay:

```
http://266.70.164.97:8001/setup.html
```

Appendix D: Specifications

Power Requirements

Input Voltage:

X-WR-1R12-1I-I:	9-28 VDC
X-WR-1R12-1I5-I:	9-28 VDC
X-WR-1R12-1I24-I:	9-28 VDC
X-WR-1R12-1I-E:	Power Over Ethernet and/or 9-28VDC
	48V injected into Ethernet Line as per 802.3af specification
	POE Class 1 (0.44Watt to 3.84Watt range)
X-WR-1R12-1I5-E:	Power Over Ethernet or 5VDC
	48V injected into Ethernet Line as per 802.3af specification
	POE Class 1 (0.44Watt to 3.84Watt range)

Current: See table below for typical values at 25°C.

Power Supply	Relay OFF		Relay ON	
	10 Mbps	**100 Mbps**	**10 Mbps**	**100 Mbps**
9 VDC	104 mA	183 mA	229 mA	313 mA
12 VDC	79 mA	141 mA	169 mA	233 mA
24 VDC	43 mA	73 mA	88 mA	119 mA
28 VDC	38 mA	64 mA	76 mA	103 mA

Relay Contacts

Load Type:	General purpose
Contact Form:	SPDT (form C)
Contact Material:	Silver Nickel
Max Voltage:	277 VAC (general purpose)
	30 VDC (NC contact, resistive)
Max Current:	12A
Electrical Life:	100K cycles, typical @ full-rated load (higher with smaller load)
Mechanical Life:	10M cycles, typical
Control Options:	On/Off or Pulsed
Pulse Timer Duration:	100ms to 86400 Seconds (1-day)
Accuracy of pulse timer:	99.99%

Digital Input

Number of Inputs:	1
Minimum Pulse Time (high or low):	25mS
Isolation (Viso):	1,500 Vrms
Reverse voltage (Vr):	6V max

X-WR-1R12-1I-I and X-WR-1R12-1E

Input Current (Iin):	950uA @ 4V, 8.5mA @ 26V
Vin:	26V (max)
Vin Hi:	4V (min)
Vin Lo:	1.5V (max)

X-WR-1R12-1I5-I and and X-WR-1R12-1I5-5 and X-WR-1R12-1I5-E
    Input Current (Iin):   4mA @ 4V, 16mA @ 12V
    Vin: 4-12 VDC

 X-WR-1R12-1I24-I
    Input Current (Iin):   3.2mA @ 11V, 8.2mA @ 26V
    Vin: 11-26 VDC

Input Functions: Monitor, local relay control, remote relay control
Input to Local Relay Settings: Equal, invert, toggle, latch, pulse, none
Input to Remote Relay Settings: Equal, invert, toggle, latch, pulse, none

Connectors:

Power/Input: 5-position, removable terminal strip, 3.81mm terminal spacing
(Replacement part number, Phoenix Contact 1803604)
Relay: 3-position, removable terminal strip, 7.62mm terminal spacing
(Replacement part number, Phoenix Contact 1767012)
Network: 8-pin RJ-45 socket

Relay Connector Specifications:

Type: 3-position, removable, 7.62 mm (.30") pitch
Connection wire: Use wire rated for 95ºC (min) for field wiring connections to the relay terminal block
     (MTW Machine Tool Wire rated for 105ºC is recommended)
Stripping Length: 7mm
Connection capacity: $2.5mm^2$ stranded, $2.5mm^2$ solid
Conductor minimum: 30AWG (UL/CUL)
Conductor maximum: 12 AWG (UL/CUL)
Conductor Type: Copper
Tightening torque: 0.5 Nm min, 0.6 Nm max, (5.0 lb-in)

Power Connector Specifications:

Type: 5-position, removable, 3.81 mm pitch
Connection wire: Use wire rated for 75ºC (min) for connections to the terminal block
Stripping Length: 7mm
Connection capacity: $1.5mm^2$ stranded, $1.5mm^2$ solid
Conductor minimum: 30AWG (UL/CUL)
Conductor maximum: 14 AWG (UL/CUL)
Conductor Type: Copper
Tightening torque: 0.22 Nm min, 0.25 Nm max, (2.2 lb-in)

Network

10 Base-T or 100 Base-T Ethernet IPv4 (10 Mbit/s or 100 Mbit/s)
Static IP address assignment, TCP port selectable, (DHCP is not supported)
Standard 8-pin RJ-45 modular socket
Supports Web Browser (HTTP), XML, Modbus/TCP protocols

LED Indicators (7)

Digital Input: O*n*
Relay coil: O*n*
Network: *Linked*
Network: *Activity*

Nonvolatile Memory

All user settings are stored in nonvolatile Flash memory. Settings will not be lost when power is disconnected.

Password Settings

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

Environmental

Operating Temperature:	-40ºC to 57ºC (-40ºF to 135ºF)
Storage Temperature:	-40ºC to 85ºC (-40ºF to 185ºF)
Humidity:	5% to 95% non condensing
Altitude:	Up to 2000 meters
Environmental Rating:	Pollution Degree 2
Installation:	Must be installed inside an NRTL certified industrial control panel or similar NRTL certified fire/electrical enclosure.

Mechanical

Size: 1.41in (35.7mm) wide X 3.88in (98.5mm) tall X 3.1 in(78.0mm) deep
Weight: 5oz (142 grams)
Enclosure Material: Lexan 940 (UL94 V0 flame rated)

Electromagnetic Compliance

IEC CISPR 22, CISPR 24
EU EN55024, EN55022
FCC 47CFR15 (-I Models class B, -E POE Model Class A)

Product Safety Compliance

Models: X-WR-1R12-1I-I and X-WR-1R12-1I-E
UL 61010-1 (Electrical Equipment for Measurement, Control, and Laboratory Use)

PROCESS CONTROL EQUIPMENT
E468316

Appendix E: Trademark and Copyright Information

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Appendix F: Warranty

This Xytronix Research & Design, Inc. product is warrantied against defects in material and workmanship for a period of five years from the date of shipment. During the warranty period, Xytronix Research & Design, Inc. will, at its option, either repair or replace products that prove to be defective. This warranty is extended to the original purchaser of the equipment only.

For warranty service or repair, customer must contact Xytronix Research & Design, Inc. technical support (support@ControlByWeb.com) and obtain a Return Authorization number (RA#). Before issuing an RA#, a support technician will work with customer to try to resolve the issue without returning the product. If technician determines that product must be returned for service an RA# will be issued. Next, the product must be properly packaged and returned to Xytronix Research & Design, Inc. with the RA# clearly marked on the package. The purchaser shall prepay all charges for shipping to Xytronix Research & Design, Inc. For warranty repairs of products less than one year old, Xytronix Research & Design, Inc. will pay the shipping charges to return the product to the purchaser as long as the product is shipped within the continental United States. If the product is shipped outside of the continental United States or the product was shipped more than one year earlier, the purchaser shall pay all shipping charges both ways.

Limitation

The foregoing warranty shall not apply to defects or damage resulting from improper use or misuse, unauthorized repair, tampering, modification, improper connection, or operation outside the electrical/environmental specifications for the product. Further, the warranty does not cover damage from Acts of God, such as lightning, fire, flood, hurricanes and tornadoes. This warranty does not cover damage to property, equipment, direct, indirect, consequential, or incidental damage (including damage for loss of business profit, business interruption, loss of data, and the like) arising out of the use or misuse of this product.

UNDER NO CIRCUMSTANCES WILL THE LIABILITY OF XYTRONIX RESEARCH & DESIGN, INC. TO THE PURCHASER OR ANY OTHER PARTY EXCEED THE ORIGINAL PURCHASE PRICE OF THE PRODUCT, REGARDLESS OF THE FORM OF THE CLAIM. No other warranty is expressed or implied. Xytronix Research & Design, Inc. specifically disclaims the implied warranties or merchantability and fitness for a particular purpose. Some jurisdictions may not allow the exclusion of limitation of liability for consequential or incidental damage.

Appendix G: FCC Statement

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

1. This device may not cause harmful interference.
2. 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 digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not in-stalled and used in accordance with the instructions, may cause harmful 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 a relay on a circuit different from where 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.

Appendix H: Mechanical Dimensions

Note: A 3D-CAD model is available at www.ControlByWeb.com

Use #8 Pan Head Screws