

WebRelay™

Users Manual

Revision: 3.8



Covers: X-WR-1R12-1I5-5
X-WR-1R12-1I5-I
X-WR-1R12-1I24-I
X-WR-1R12-1I5-E

CONTROL by **WEB**™
www.ControlByWeb.com

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

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Limitation

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FCC Statement

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

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

Warning: This equipment has been tested and found to comply with the limits for a Class B (Class A for POE models) digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

Notice:

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

Installation Guidelines (Read Before Installing)

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

Security Notes

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

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

Section 1: Introduction

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

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

In addition, WebRelay™ is designed to function as a high-end reboot controller and offers many reboot 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 WebRelay™. There are three ways that WebRelay™ can be wired to a device for reboot. First, WebRelay™ can be wired in series with the power source of the device and simply switch the power on and off. Second, WebRelay™ can be wired 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. The third option is to connect WebRelay™ to the reset circuit of a device. In this configuration, WebRelay™ does not power down the device, but simply causes the device to reset. All three reboot methods have different requirements in physical connection and relay timing.

1.1 Features

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

- No programming required.
- Easy to use as a stand alone device or as part of a large control system.
- Built-in web server provides simple, web based configuration and control.
- Control page can be customized with appropriate text and buttons.
- 10/100 Ethernet connectivity.
- 12 Amp/240VAC relay for direct connection to load.
- Removable terminal connectors (included) simplifies wiring and service.
- Custom applications can control WebRelay™ with simple text commands and read XML formatted status.
- Modbus/TCP protocol support provides inter-interoperability with devices/software from other manufacturers.
- Password protection.
- Selectable TCP ports.
- Built-in automatic reboot controller.
- Optically-isolated input can be used for status monitoring, local relay control, or remote relay control.
- On/Off or pulse mode.
- Reboot Counter (XML readable only).

1.2 WebRelay™ Models Available

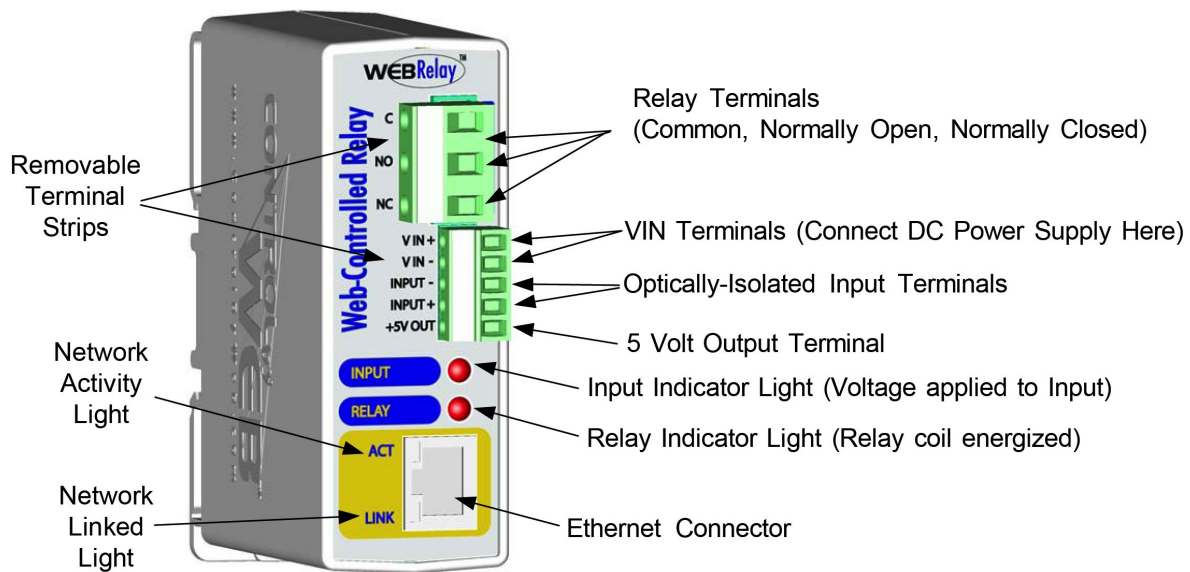
WebRelay™ is currently available in four models. There are only two differences between the four models. One difference is the power supply requirements and the other difference is the input voltage range on the optically-isolated input.

Part Number	Power Supply Requirements	Optically-Isolated Input Voltage Range
X-WR-1R12-1I5-5	5VDC	4-12VDC
X-WR-1R12-1I5-I	9-28VDC	4-12VDC
X-WR-1R12-1I24-I	9-28VDC	11-26VDC
X-WR-1R12-1I5-E	Power Over Ethernet or 5VDC	4-12VDC

1.3 Connectors & Indicators

WebRelay™ has two removable terminal connectors and an Ethernet connector. One terminal connector is a large, 3-terminal connector which is used to connect the load to the relay. The other terminal connector is a smaller, 5-terminal connector which is used to provide power to the internal web server, connect the optically isolated input, and provide a 5VDC output.

There are four LED indicators on WebRelay™ labeled INPUT (green), RELAY (green), LINK (green), and ACT (amber). Note that the LINK and ACT LEDs are located on the Ethernet connector. The INPUT LED indicates that there is a voltage applied to the optically-isolated input. The RELAY LED indicates that the internal relay coil 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. LINK means WebRelay™ is properly connected to an Ethernet network. It also indicates that the unit is properly powered. The ACT LED flashes when activity is detected on the network.

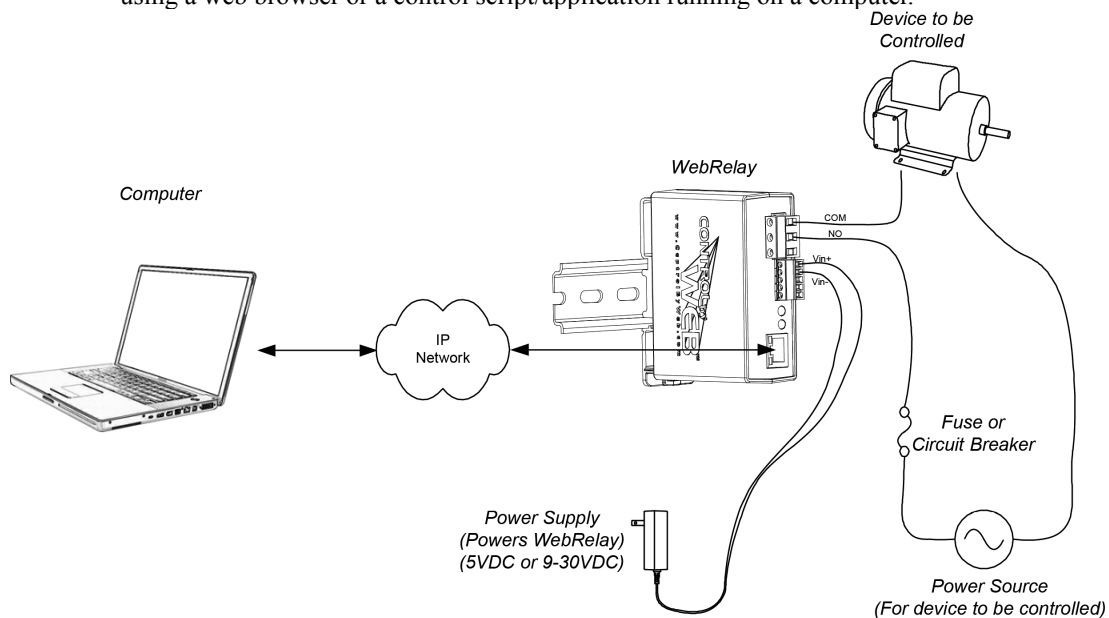


1.4 Example Configurations and Applications

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

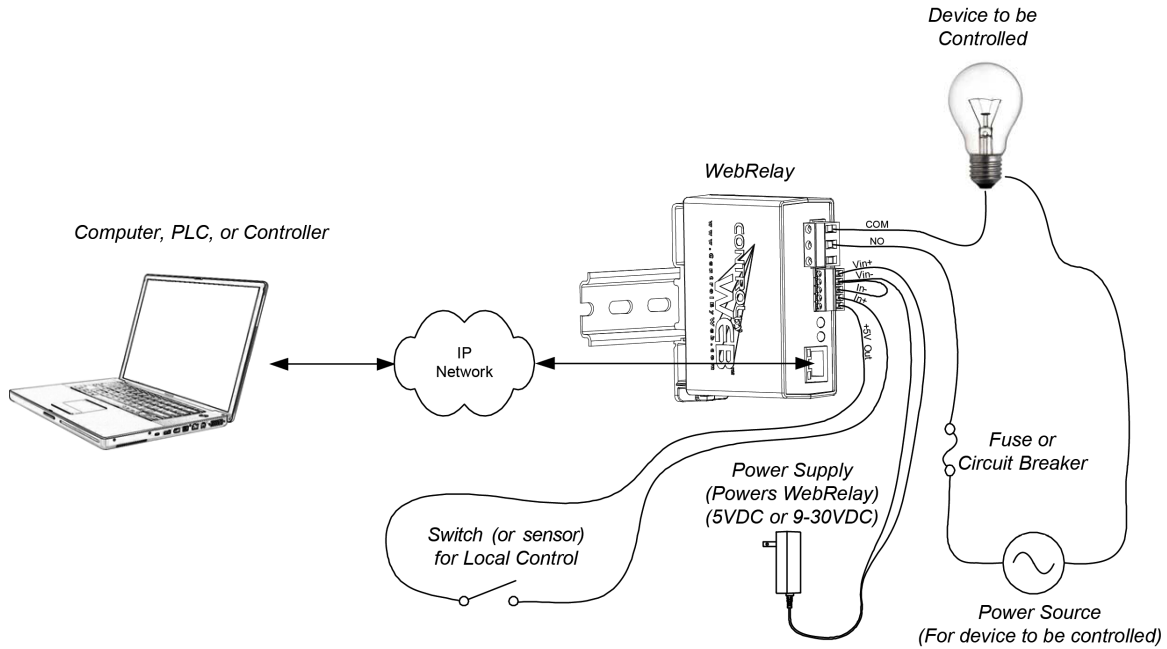
1.4.1 Single WebRelay™ Device (IP Network Control Only)

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.



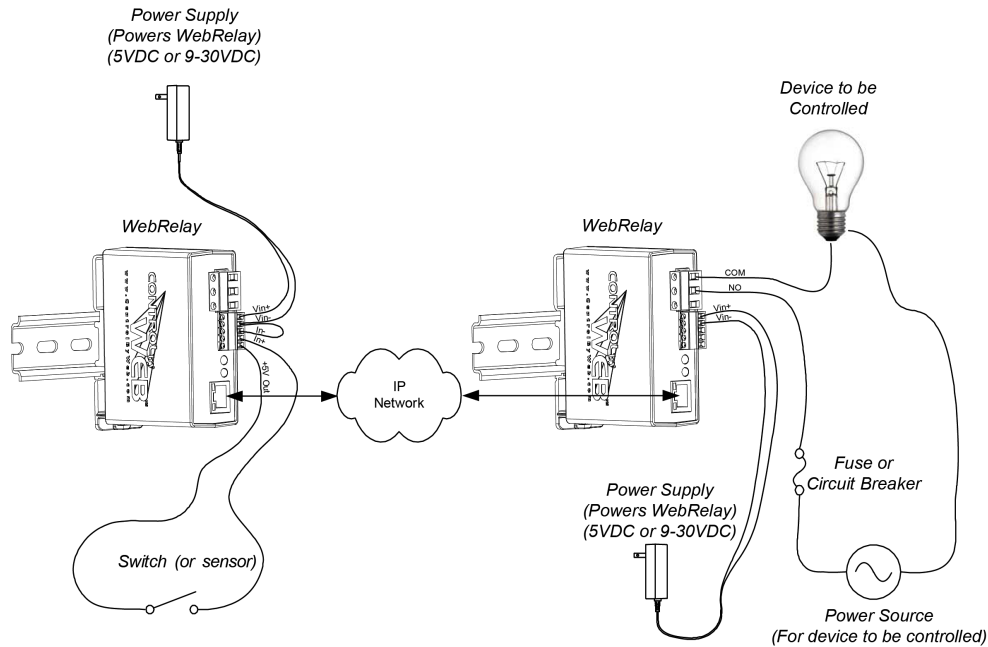
1.4.2 Single WebRelay™ Device (Voltage and/or IP Network Control)

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 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.



1.4.3 Dual WebRelay™ Devices (No Computer Required for Operation)

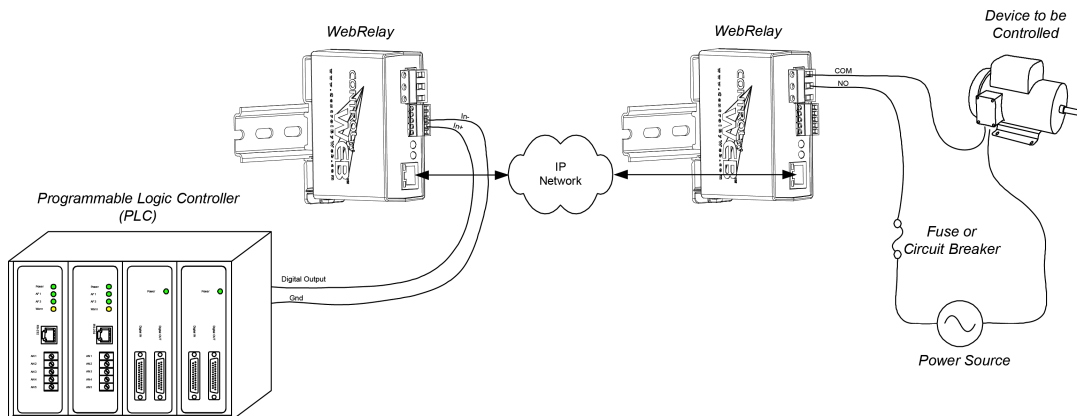
This configuration is used to control devices remotely without a browser, or to extend a digital signal to a remote location on the network. A control voltage applied to one unit controls the relay contacts of another unit at a remote location.



This configuration has many uses. It allows a switch to be placed very far away from the device that it controls.

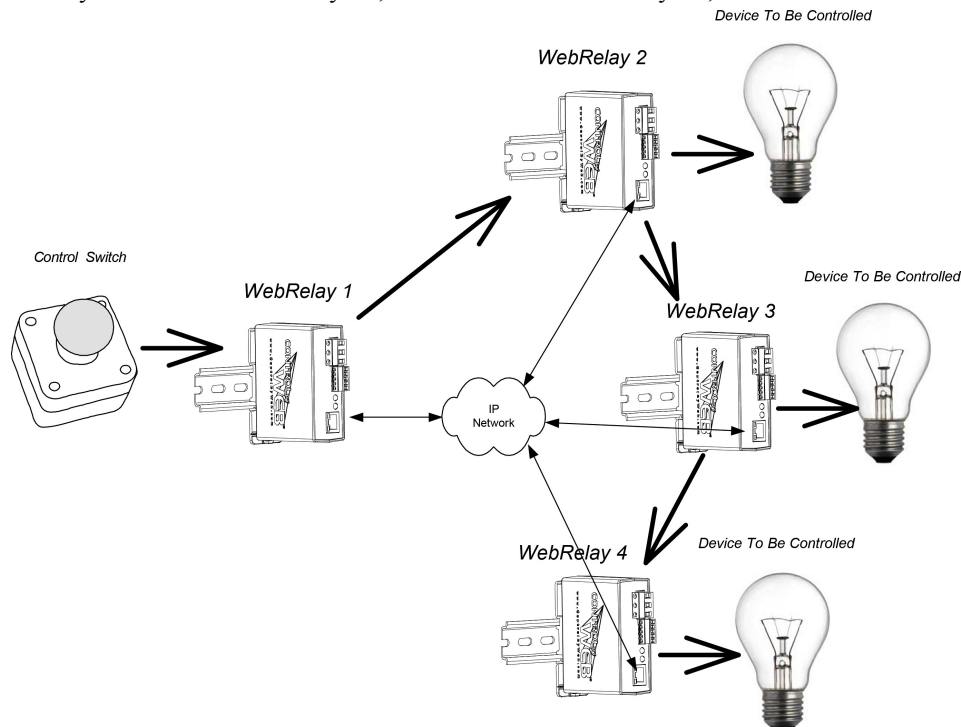
For security applications, the switch in the example could be replaced with a sensor, and the device to be controlled could be a buzzer or chime. A business owner, for example, could set up a sensor at his/her office and a chime at his/her home. The chime at the home would announce each time the sensor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



1.4.4 Multiple WebRelay™ Operation (No Computer Required for Operation)

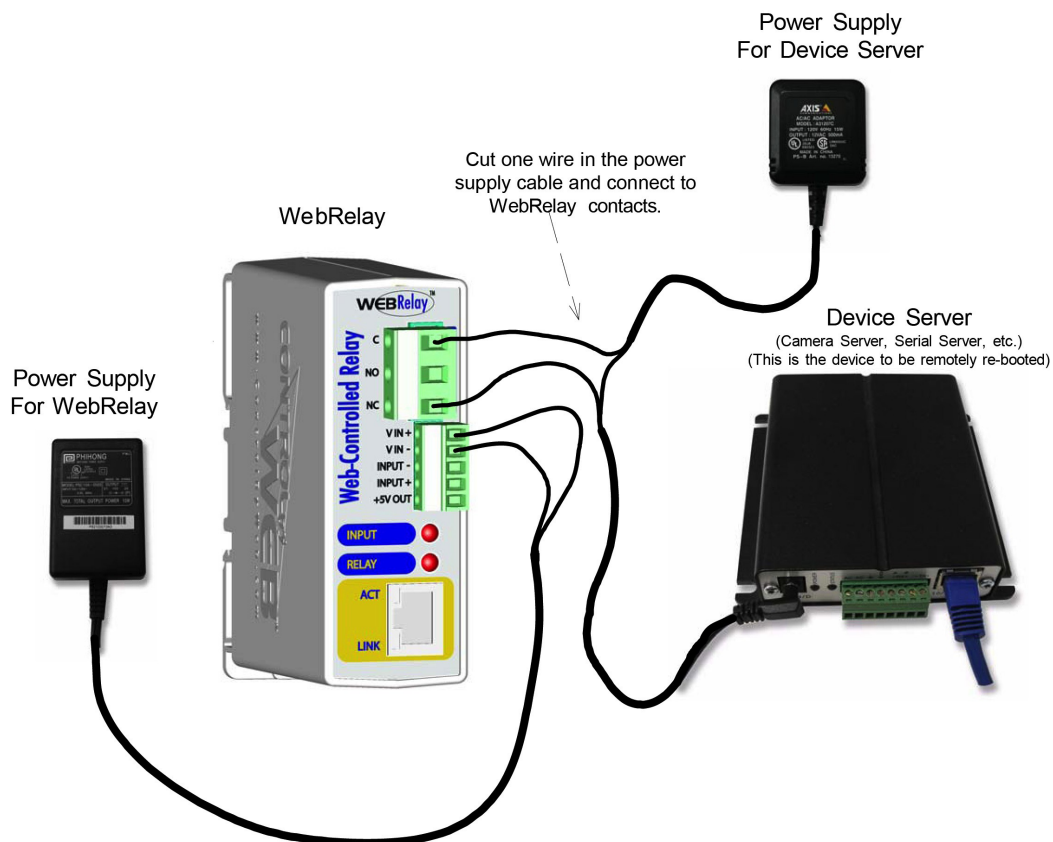
For some applications, it is useful for one WebRelay™ to control multiple WebRelays at remote locations. There is not a way to configure a single WebRelay™ to control multiple WebRelays directly, but it is possible to set up multiple WebRelays in a daisy-chain mode so that one WebRelay™ controls a second 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, and WebRelay™ 1 controls WebRelay™ 2, which controls WebRelay™ 3, which 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. Note also that in this example, WebRelays 2, 3, and 4 are each controlling load devices and WebRelay™ 1 is not, but a load could be connected to WebRelay™ 1 as well.

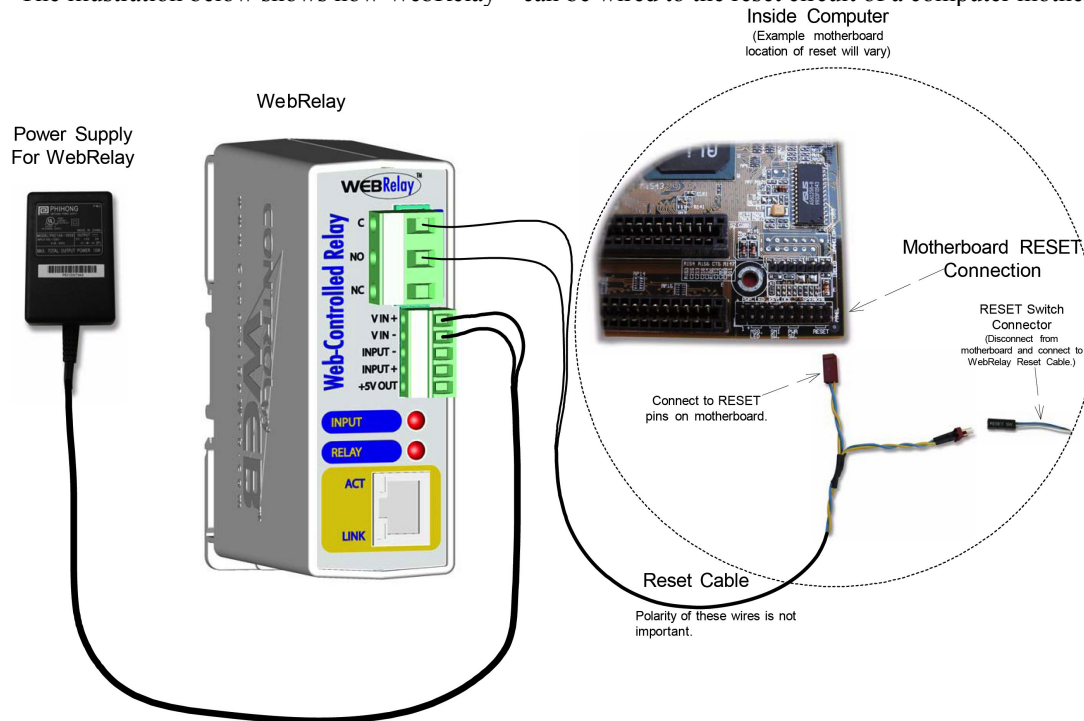
1.4.5 WebRelay™ Used for Reboot (Wired in series with Power)

The illustration below shows one example of how WebRelay™ can be used to reboot a server. WebRelay™ is wired in series with the servers power source which allows it to turn the server on and off.



1.4.6 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 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 pushbutton switch for reset, the relay contacts may be wired in parallel with the pushbutton switch. This allows both local and remote reset.

1.4.7 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 that describes connecting WebRelay™ to the reset circuit can be used to illustrate connection. Instead of connecting 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 power.

Section 2: Installation and Setup

Installation consists of mounting WebRelay™, connecting to an IP network, providing power, configuring via a web browser, and wiring relay contacts to the device that will be controlled. Optionally, a control signal may be connected to the optically-isolated input.

2.1 Mounting

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

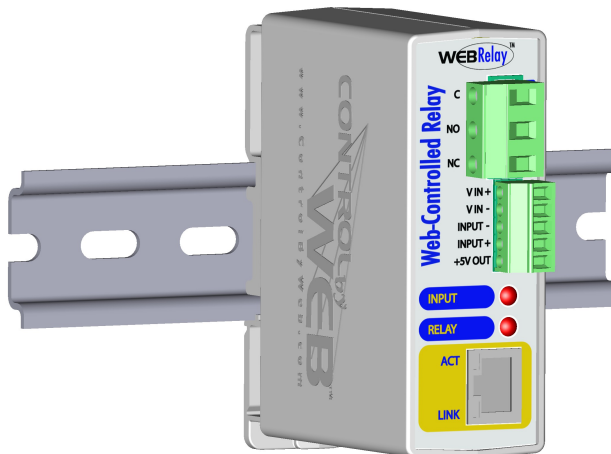
2.1.1 Wall Mounting

Mount 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 screws should be about 1/10 inch away from the wall. See Appendix D for mechanical details.



2.1.2 DIN-Rail Mounting

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



2.2 Connection

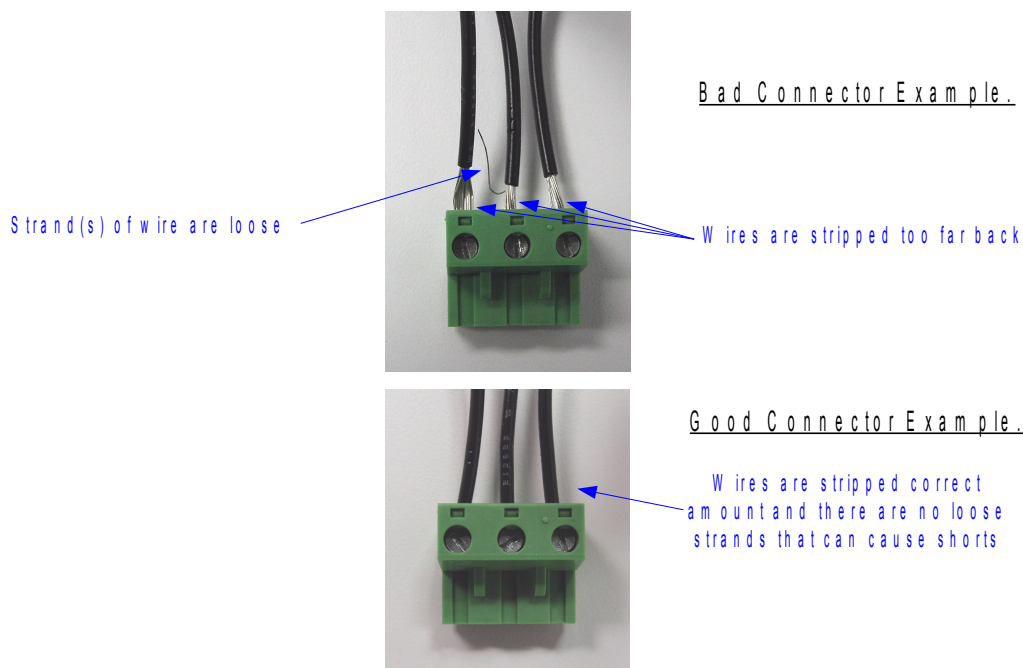
CAUTION: MAKE SURE POWER IS SHUT OFF BEFORE WIRING!

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

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

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

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



3-pin connector pinout:

Pin	Description
C	Relay Common
NO	Relay Normally Open
NC	Relay Normally Closed

5-pin connector pinout:

Pin	Description
V IN+	Power supply input +. Connect to the positive side of the appropriate power supply. DO NOT EXCEED MAXIMUM POWER SUPPLY VOLTAGE. <u>Model X-WR-1R12-1I5-5</u> 5VDC Power supply <u>Model X-WR-1R12-1I5-I or X-WR-1R12-1I24-I</u> 9-28VDC Power supply <u>Model X-WR-1R12-1I5-E</u> Power Over Ethernet model. These units do not require a power supply to be connected to this pin when the unit is connected to an 802.3af compliant network. Alternatively, this model can be powered using a 5VDC power supply.
V IN-	Power supply input -. Connect to the negative side of the appropriate power supply.
INPUT -	Digital Input - : This is the negative side of the optically-isolated input. Internally, this terminal connects directly to an opto-isolator.
INPUT +	Digital Input +: This is the positive side of the optically-isolated input. Internally, this terminal connects to an opto-isolator through a resistor (resistor is internal).
+5V OUT	+5VDC Out. This voltage is provided as a convenient voltage source for the optically-isolated input (only for 4-12V input models). This is used, for example, when dry contacts (such as a switch) are needed to control the input state. This can be used by connecting the INPUT- directly to VIN-, and then connecting this terminal to INPUT+ through a switch. Do not use this output for other purposes.

2.2.1 Power Supply Connection

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

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 (see specifications for current requirements for a specific model number).

WebRelay™ units with the Power Over Ethernet option may be connected to an 802.3af compliant Ethernet port instead of connecting to an external power supply. In this case, WebRelay™ is powered through the network port. In 802.3af compliant networks, a 48 Volt power source is injected into the Ethernet line. This power source is provided by an 802.3af compliant hub, switch, or power injector which may be located in a utility closet which could be a distance away from WebRelay™. This option is very useful for installations where local power is not available. The power injector may inject the 48 Volt power source through the data lines or the spare lines in the Ethernet cable.

DO NOT USE A POWER INJECTOR THAT APPLIES A VOLTAGE TO BOTH THE DATA LINES AND THE SPARE LINES.

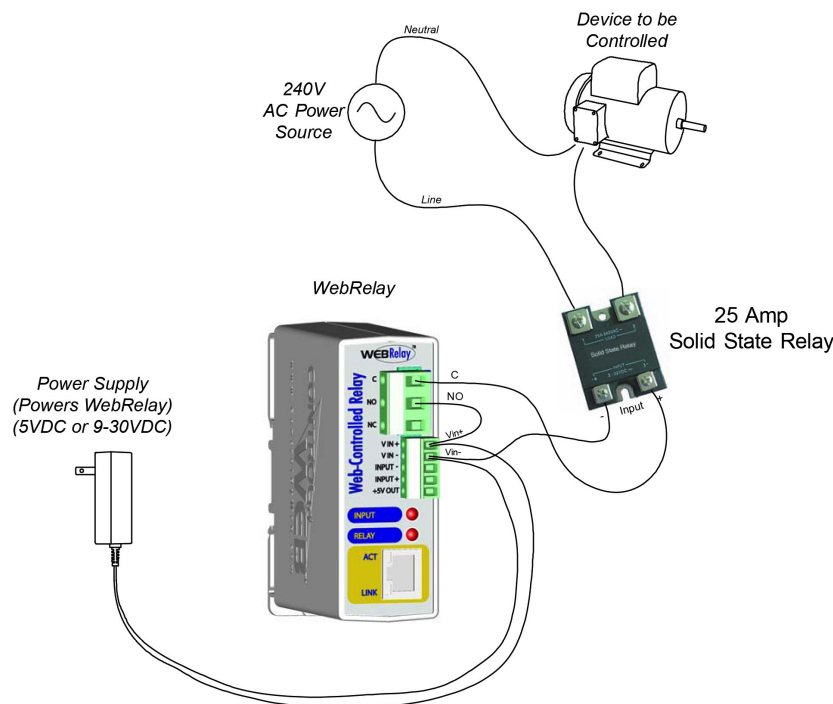
2.2.2 Network Connection

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

2.2.3 Relay Connection

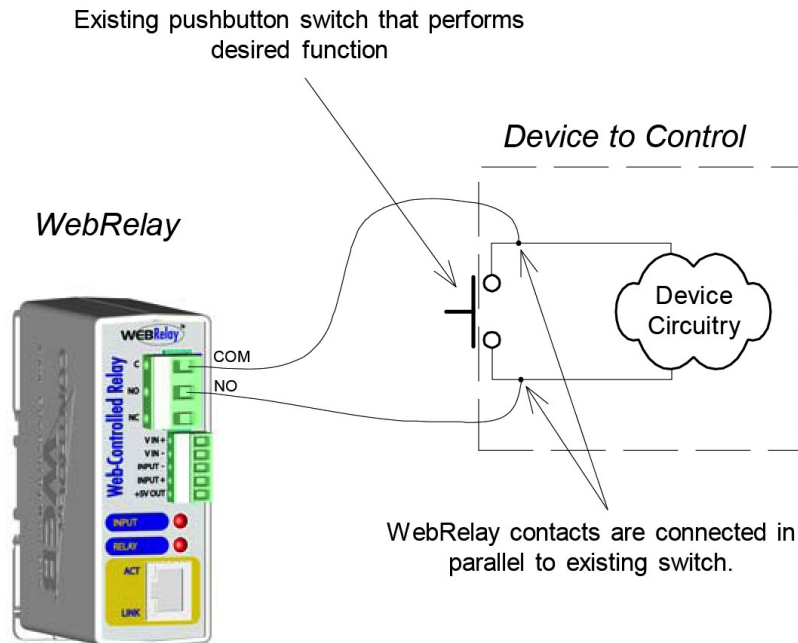
The relay contacts internally connect directly to the terminal connector. No internal fuse is provided. If the power source connected to the relay contacts can deliver more than rated maximum contact current, an external fuse or circuit breaker must be used. Direct access to Common, Normally Open, and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

For loads greater than the maximum relay contact rating, an external relay may be used. The illustration below shows how a 20-Amp motor can be controlled using an external relay. In the example, WebRelay™ controls the external relay and the external relay controls the load.



Many of the illustrations in this manual show 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 pushbutton switches within a device. An example is useful to illustrate this. Suppose you have a gate controller system that has a pushbutton 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 from a room on the other side of the building. Since the building is pre-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. In doing this, users can now operate the gate with the existing pushbutton, or users

can operate the gate from another room using a web browser. Another option (not shown here), is to connect another pushbutton switch to the input of a second WebRelay™ device in a room across the building. The second device could be configured to send control messages to the first device each time the new pushbutton is pressed. As a result, there is a second pushbutton that could operate the gate.

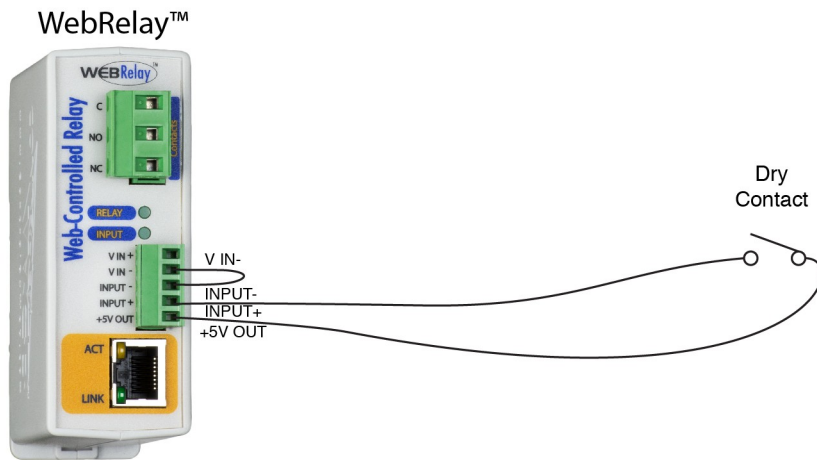


2.2.4 Optically-Isolated Input Connection

The optically-isolated inputs can be used to control the internal relays, control remote relays (over the network), or simply to monitor the state of a discrete device. To use these inputs, connect a DC control voltage directly to the input and ground, 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.

Connecting "dry contacts" to the optically-isolated inputs:

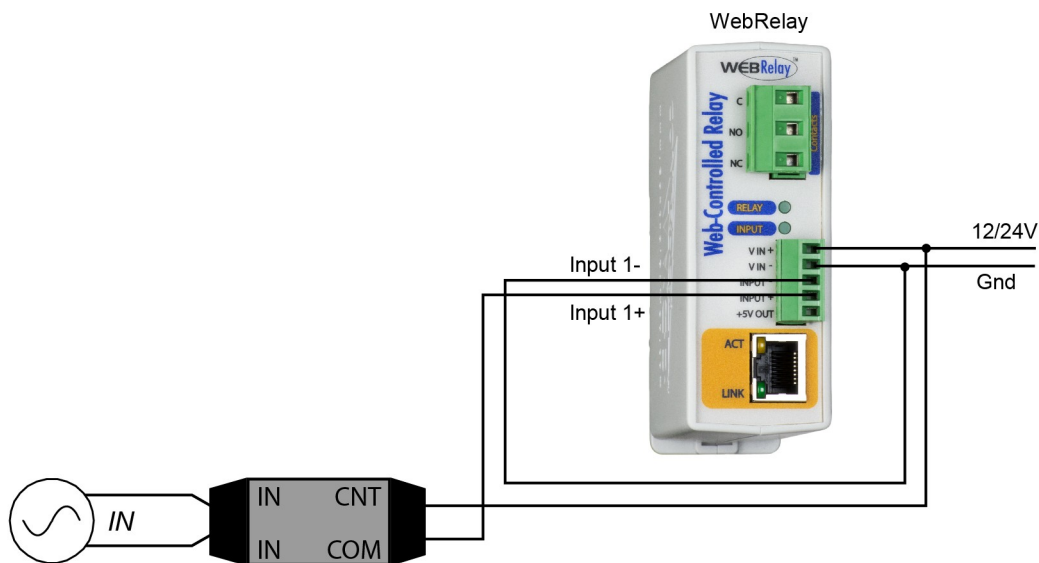
A dry contact switch can be connected to the input of the WebRelay™. One side of the contact is connected to +5V OUT, the other side is connected to Input+, and a jumper cable connects the V IN- to the INPUT-. When the contact is closed, it applies 5V to the input terminals.



Connecting voltages to the optically-isolated inputs:

AC Inputs:

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. Prepackaged signal converters are available as accessories at industrial automation distributors. A simple voltage converter module manufactured by www.redlion.net 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's input. The converter module accepts AC (50/60 Hz) or DC voltages at input cycles 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 input of the WebRelay as shown in the example below:



DC Inputs:

With DC inputs, no external components are required as long as the maximum input voltage is not exceeded (See Specifications). A DC voltage can be reduced with an external resistor of the appropriate value and

power rating to reduce the input current.

The formulas to calculate external resistor values are provided below:

X-WR-1R12-1I5-I and X-WR-1R12-1I5-E models with a **4-12VDC** input range have an internal 680 ohm resistor. The forward voltage drop of the photo-coupler is approximately 1.2V and works well with an input current of 10mA.

$$R = (V_{in} - 1.2) / 0.01 - 680$$

Where:

- R = External resistor value required
- V_{in} = Desired input voltage
- 1.2V = forward voltage drop of the LED in the photo coupler
- .01A = workable LED current
- 680ohm = Internal resistor

For example:

To connect a 24VDC signal voltage to the WebRelay™ with a 4-12VDC input range:

$$R = ((24 - 1.2) / 0.01) - 680 = 1600 \text{ Ohms (use a 1600 ohm resistor)}$$

Check the power dissipated by the resistor:

$$P = I \times I \times R, \text{ The resistor must be at least } .01 \times .01 \times 1600 = 0.16 \text{ Watts, so use a } 1/2 \text{ Watt resistor}$$

X-WR-1R12-1I24-I with a **11-26VDC** input range have 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 10mA.

$$R = (V_{in} - 1.2) / 0.01 - 3000$$

Where:

- R = External resistor value required
- V_{in} = Desired input voltage
- 1.2V = forward voltage drop of the LED in the photo coupler
- .01A = workable LED current
- 3000ohm = Internal resistor

For example:

To connect a 48VDC signal voltage to the WebRelay™ with a 11-26VDC input range:

$$R = ((48 - 1.2) / 0.01) - 3000 = 1680 \text{ Ohms (use a 1600 ohm resistor)}$$

Check the power dissipated by the resistor:

$$P = I \times I \times R, \text{ The resistor must be at least } .01 \times .01 \times 1600 = 0.16 \text{ Watts, so use a } 1/2 \text{ Watt resistor}$$

2.3 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. The first way (Option 1), is to change the IP address of WebRelay™ to an address that is on the same network as the computer. The second way (Option 2) is to change the IP address of the computer to an address that is on the same network that WebRelay™ is set to by default.

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

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

To assign the temporary IP address...

1. Make sure WebRelay™ and the configuration computer are connected to the same physical network. This will not work through routers or gateways.
2. Assign the address as follows...

Windows:

Open a Command Prompt (on Windows XP, select START, then RUN, then type "cmd").
Type...

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

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

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

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

Next, type...

```
ping -l 102 {new IP address}
```

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

```
ping -l 102 10.10.10.40
```

Linux/Unix:

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

Type...

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

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

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

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


Next, type...

```
ping -s 102 {new IP address}
```

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

```
ping -s 102 10.10.10.40
```

Mac OS X

Open a terminal,

Note that the terminal is in the “Utilities” directory which is in “Applications” directory.

type

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

Note: Administrator password is required.

IP address format is: xxx.xxx.xxx.xxx

Serial number format is: ss:ss:ss:ss:ss

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

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

Next, type...

```
ping -s 102 {new IP address}
```

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

```
ping -s 102 10.10.10.40
```

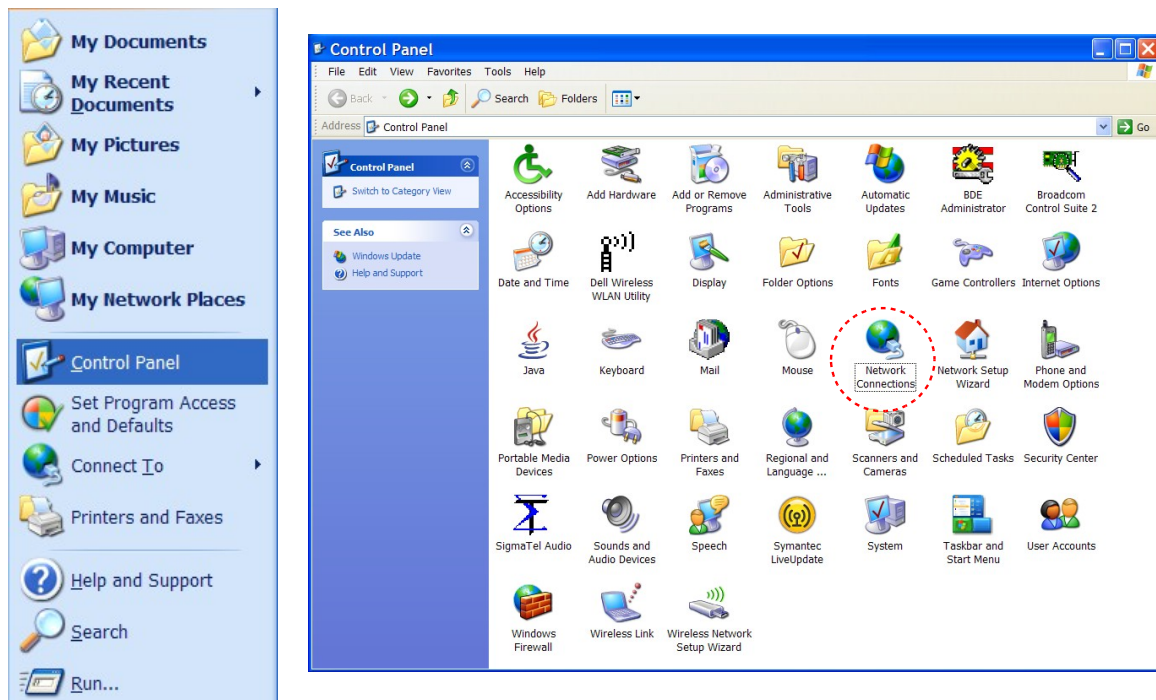
2.3.2 Option 2: Assign a temporary IP address to configuration computer

If the first option above is not used, you can use this option to communicate with WebRelay™. By default, WebRelay™ comes from the factory with an IP address of 192.168.1.2. Communications with WebRelay™ may be established by assigning an IP address to the configuration computer that is on the same network as WebRelay™ (for example, the configuration computer could be assigned to 192.168.1.5).

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

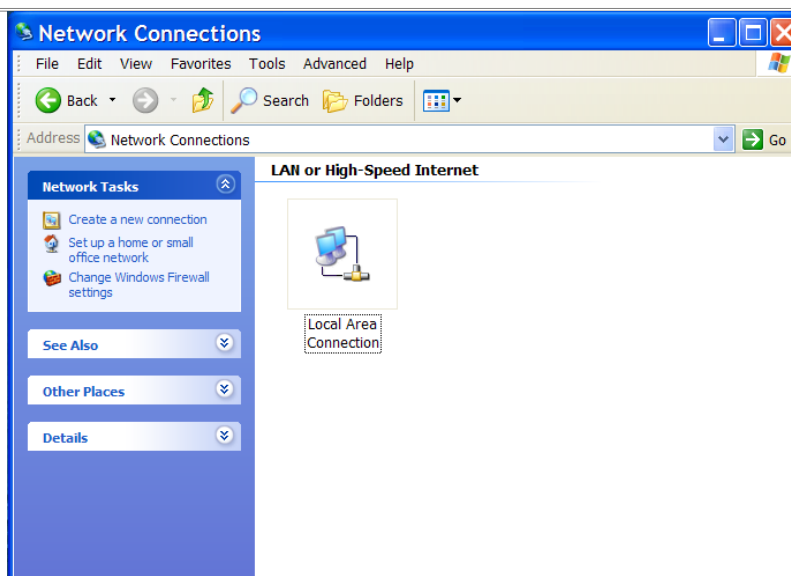
Step 1:

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

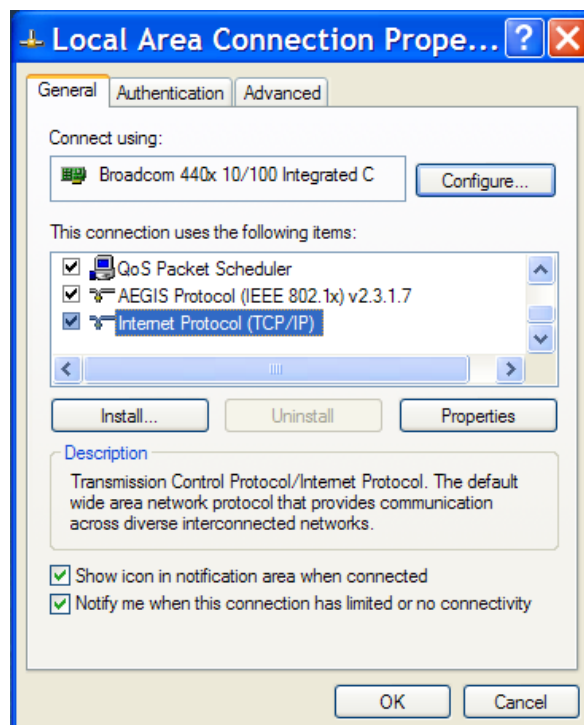


Step 2:

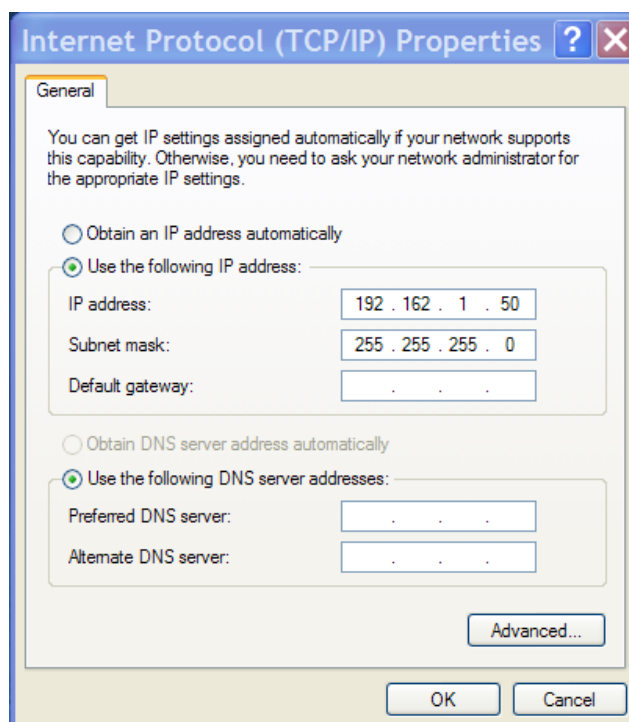
Double click on the icon labeled Network Connections. The following menu will pop up.

**Step 3:**

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

**Step 4:**

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

**Step 5:**

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

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.

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

2.4 Web-Based Setup

WebRelay™ 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 which has been designed to allow the unit to be easily configured.

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

Before proceeding, make sure a network connection has been established between the computer and WebRelay™. This is done by typing the following URL into the web browser:

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

Another way to check communications is to ping WebRelay™

From the command prompt, type:

```
ping 192.168.1.2
```

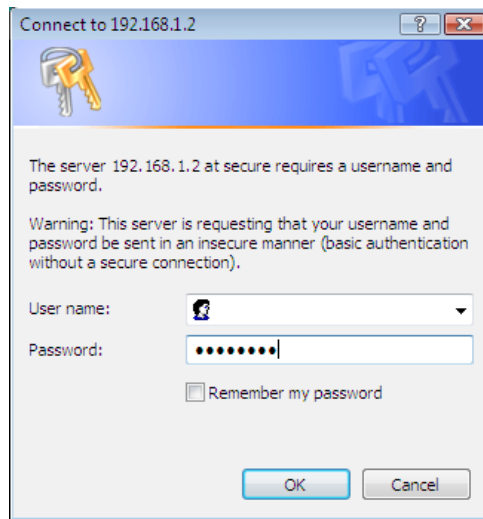
Each setup page is described below.

2.4.1 Main Setup Page

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



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

2.4.2 Network Setup Page

The network parameters are changed on this page. Note that if multiple WebRelay™ 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.

http://192.168.1.2/setup.html - Windows Internet Explorer

http://192.168.1.2/setup.html

Live Search

http://192.168.1.2/setup.html

WEBRelay™

Setup

Network Password Relay/Input Control Page Setup Relay Control Page

Network:

Network parameters require reboot before they take effect.

IP Address: 192 . 168 . 1 . 2

Netmask: 255 . 255 . 255 . 0

Broadcast: 192 . 168 . 1 . 255

Gateway: 192 . 168 . 1 . 1

TCP Port: 80

Modbus Port: 502

Speed: 10 Mbps ☒ 100 Mbps ☐

Mode: Half Duplex ☒ Full Duplex ☐

Submit Reset

IP Address

WebRelay™ requires a static IP address. This is a unique address that identifies WebRelay™ on the network. Dynamic IP address assignment 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.

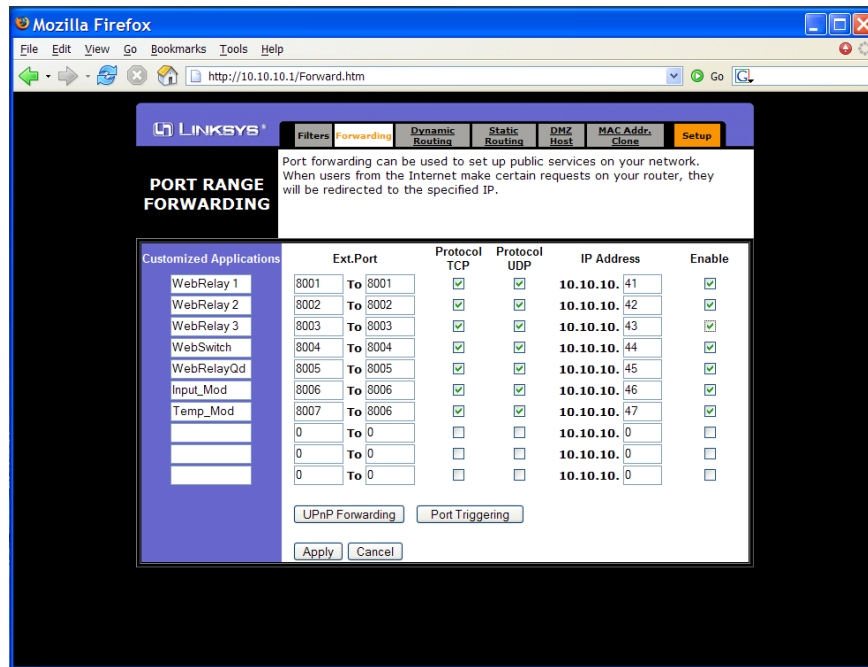
TCP Port

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>.

An example screenshot of a gateway router configuration is given below. This setup allows seven ControlByWeb™ products to be accessed on a private network behind a gateway router. Note that this screenshot is simply an example of a typical router setup page. Routers will vary.



In the example, the seven ControlByWeb™ products are assigned IP addresses of 10.10.10.41 to 10.10.10.47. The first device labeled WebRelay 1 has an IP address of 10.10.10.41 and is assigned port 8001.

Note: In the WebRelay™ setup page (under Network settings tab), TCP Port 8001 must be specified for this device.

The second device, labeled WebRelay 2 has an IP address of 10.10.10.42 and is assigned port 8002. This WebRelay™ must have its TCP Port set to 8002 in its network settings page. This pattern continues through 10.10.10.77 which is assigned the port 8007. To access the ControlByWeb™ units from the Internet, enter the IP address of the gateway plus the port number of the desired device.

Modbus Port

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

Speed

This option sets the data rate of the Ethernet port. Both 10Mbps and 100Mbps can be selected. The 100Mbps option offers faster communications but the amount of data to and from WebRelay™ 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 translate into a longer product life. IT IS RECOMMENDED THAT THIS SETTING BE LEFT AT 10MBPS UNLESS THE USER HAS A SPECIFIC REASON TO USE 100MBPS.

Mode

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

MTU Setting

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

2.4.3 Password Setup Page

The password setup page is used to change and enable passwords. A password is required for the setup pages but is optional for the control page. The password is enabled or disabled for the control page by using the **Yes** or **No** radio buttons. Enabling the control page password also enables the requirement for a password when reading/writing XML pages. Enabling the control page password also disables the ability to communicate with WebRelay™ 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.

http://192.168.1.2/setup.html - Windows Internet Explorer

http://192.168.1.2/setup.html

Live Search

http://192.168.1.2/setup.html

WEBRelay™

Setup

Network Password Relay/Input Control Page Setup Relay Control Page

Password:

Setup Password:

Re-enter Setup Password:

Enable Control Password: Yes ☐ No ☒

Control Password:

Re-enter Control Password:

Submit Reset

2.4.4 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. Also note that in this manual the input is considered to be *on* when a voltage is applied to the input. The LEDs on the front panel of WebRelay™ will illuminate whenever the relay or input are in the *on* state.

http://192.168.1.2/setup.html - Windows Internet Explorer

http://192.168.1.2/setup.html

Live Search

http://192.168.1.2/setup.html

WEBRelay™

Setup

Network Password Relay/Input Control Page Setup Relay Control Page

Relay/Input:

Relay Mode: Standard ☒ Automatic Reboot ☐

Pulse Duration: 1.5 secs

Relay Options: set relay equal input (init at powerup)

Remote Relay Options: no remote relay control

Remote Relay IP Address: 192 . 168 . 1 . 3

Remote TCP Port: 80

Relay #: 0

Password:

Keep Alive: YES(No TX State)

Submit Reset

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 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 change. In **Automatic Reboot** mode, 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. 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. 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. Note that when

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 when 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 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.

The following parameters (2-3) are available when WebRelay™ is set to **Standard** relay mode.

Pulse Duration

When 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). Note that each time WebRelay™ receives a pulse command, the relay will be turned *on* (if not *on* already) and the pulse timer will be reset. If 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 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 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 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 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 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.

The following parameters (4-13) are available only when 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 WebRelay™ to determine in less time that the device is not functioning. After each unsuccessful ping, 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 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).

http://192.168.1.2/setup.html - Windows Internet Explorer

http://192.168.1.2/setup.html

Live Search

http://192.168.1.2/setup.html

Page Tools

WEBRelay™

Setup

Network Password Relay/Input Control Page Setup Relay Control Page

Relay/Input:

Relay Mode: Standard ☐ Automatic Reboot ☒

Ping IP Address: 192 . 168 . 1 . 15

Successful Ping Period: 60 secs

Unsuccessful Ping Period: 10 secs

Delay Before First Ping After Reboot: 120 secs

Reboot Timer 1 (T1): 10 secs

Reboot Timer 2 (T2): 5 secs

Reboot Timer 3 (T3): 2 secs

Reboot Options: pulse off T1 secs

Failed Pings Before Reboot: 5

Max Reboot Attempts: 10

Remote Relay Options: no remote relay control

Remote Relay IP Address: 192 . 168 . 1 . 3

Remote TCP Port: 80

Relay #: 0

Password:

Keep Alive: YES(No TX State)

Submit Reset

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 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 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). WebRelay™ can be wired in parallel with the power button and can momentarily close the power button to turn the device on or off.

With the above reboot methods explained, each option in the Reboot Options drop-down list will be discussed.

-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, 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 WebRelay™ loses power, it is assumed that the device which 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, WebRelay™ will automatically power the device on each time power is 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, 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 WebRelay™ will no longer attempt to reboot the device. At this point, 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.

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, WebRelay-Quad™ has 4 relays. To send commands to third relay on WebRelay-Quad™, this option would be set to 3. To send commands to the first relay on 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).

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

Once 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 WebRelay™ in any way. This section describes the 'Control Page Setup' page when the relay mode is set to **Standard**. The next section will describe the setup page for **Automatic Reboot** mode.

The screenshot shows the 'Control Page Setup' page in a web browser. The page has a blue header with the 'WEBRelay™' logo and a 'Setup' title. Below the header are five tabs: 'Network', 'Password', 'Relay/Input', 'Control Page Setup' (selected), and 'Relay Control Page'. The 'Control Page Setup' section is divided into two columns. The left column lists various settings, and the right column contains the corresponding input fields or radio buttons. At the bottom are 'Submit' and 'Reset' buttons.

Main Header Text:	WebRelay
Relay Description:	Relay Description
Display Relay Status:	Yes <input checked="" type="radio"/> No <input type="radio"/>
Status ON Color:	Gr <input checked="" type="radio"/> Rd <input type="radio"/>
Status ON Text:	Relay ON
Status OFF Color:	Gr <input type="radio"/> Rd <input checked="" type="radio"/>
Status OFF Text:	Relay OFF
ON/OFF Buttons:	0 <input type="radio"/> 1 <input checked="" type="radio"/> 2 <input type="radio"/>
Button1 Label	ON OFF
Button2 Label	TURN OFF
Pulse Button:	Yes <input checked="" type="radio"/> No <input type="radio"/>
Pulse Button Label	Pulse
Display Input Status:	Yes <input checked="" type="radio"/> No <input type="radio"/>
Input Description:	Input Description
Input ON Color:	Gr <input checked="" type="radio"/> Rd <input type="radio"/>
Input ON Text:	Input ON
Input OFF Color:	Gr <input type="radio"/> Rd <input checked="" type="radio"/>
Input OFF Text:	Input OFF
Auto Refresh Page:	Yes <input checked="" type="radio"/> No <input type="radio"/>
Duration:	3 sec

Submit Reset

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 that this 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.

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

Once 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 WebRelay™ in any way. This section describes the 'Control Page Setup' page when the relay mode is set to **Auto Reboot**.

The screenshot shows a web browser window titled "http://192.168.1.2/setup.html - Windows Internet Explorer". The address bar shows "http://192.168.1.2/setup.html". The page features the WebRelay™ logo and a "Setup" title. Below the logo is a navigation bar with tabs: "Network", "Password", "Relay/Input", "Control Page Setup" (selected), and "Relay Control Page". The main content area is titled "Control Page Setup:" and contains various configuration options:

- Main Header Text:** WebRelay
- Relay Description:** Relay Description
- Display Relay Status:** Yes ☒ No ☐
- Status ON Color:** Gr ☒ Rd ☐
- Status ON Text:** Relay ON
- Status OFF Color:** Gr ☐ Rd ☒
- Status OFF Text:** Relay OFF
- Display Input Status:** Yes ☒ No ☐
- Input Description:** Input Description
- Input ON Color:** Gr ☒ Rd ☐
- Input ON Text:** Input ON
- Input OFF Color:** Gr ☐ Rd ☒
- Input OFF Text:** Input OFF
- ON/OFF Buttons:** Yes ☒ No ☐
- Reboot Button:** Yes ☒ No ☐
- Auto Refresh Page:** Yes ☒ No ☐
- Duration:** 3 sec

At the bottom of the form are "Submit" and "Reset" buttons.

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 (3-7) are used to set up the way the relay status is displayed.

Note: Please be aware that when WebRelay™ is used for re-boot purposes, the relay status may or may not be the same as the device status. When 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

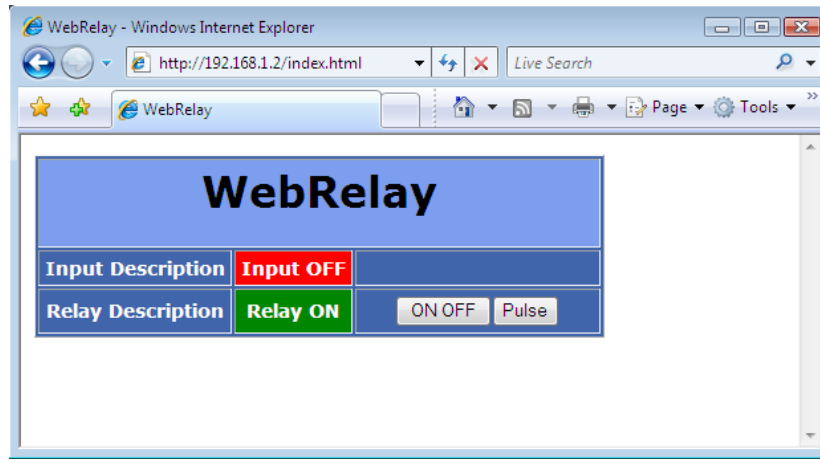
If the 'Auto Refresh Page' option is set to **Yes**, this field specifies the time interval in seconds that the page will be refreshed. It can be set from 1 to 32 seconds.

Section 3: Operation

WebRelay™ can be operated by applying a voltage to the optically-isolated input, using a web browser, by sending text commands to an XML status/control page, or by sending Modbus/TCP requests. Using a control voltage was described throughout previous sections and will not be described here.

3.1 Browser Operation (Standard Relay Mode)

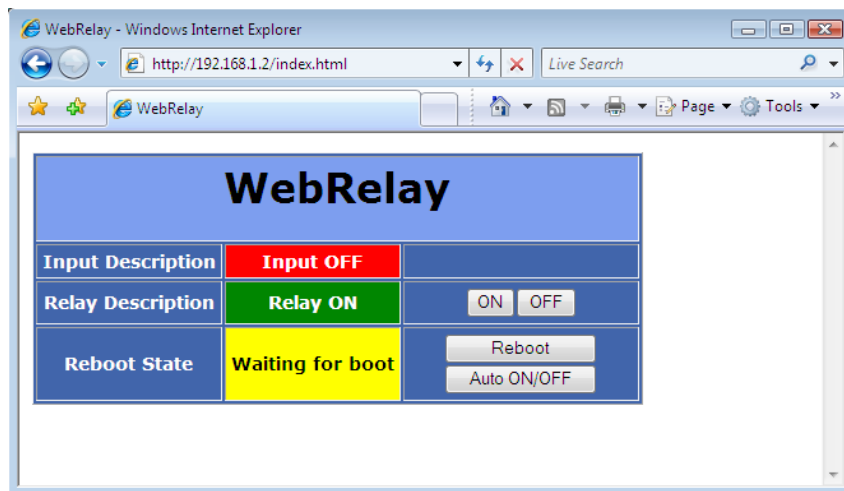
Once the unit is set up, the control page may be accessed by typing the following URL into the web browser: <http://192.168.1.2> (Note that if the IP address was changed, replace the default IP address shown with the new address that was assigned. Note also that if any port is used other than port 80,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



3.2 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 3.1 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 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 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, 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 device. This indicates normal operation.
Waiting Reply	This indicates that a ping request has been sent out and 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 WebRelay™ receives a successful ping response. The counter is also reset each time WebRelay™ re-boots the device. The bottom line (Reboot Attempts) indicates the number of consecutive times that 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 WebRelay™ is currently performing a reboot. This may be a single pulse or two pulses with a delay between them depending upon how WebRelay™ is configured.
Auto Reboot OFF Reboot Attempts:10	This indicates that 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 WebRelay™

Reboot Button

This button may be included on the control page (as specified in the setup). When the user presses this button, 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, WebRelay™ will stop pinging the device. Automatic reboot will be disabled until a user re-enables it or 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.

3.3 XML Operation

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.

3.3.1 state.xml

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

This will return the following XML page.:

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

The tags <relaystate> , <inputstate>, <rebootstate>, and <totalreboots> indicate the current state of the WebRelay™ unit. Values for each tag is described below.

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
<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.

3.3.2 XML Control

Commands can be sent to WebRelay™ that control the relay and change its state. Commands are sent using a variable called relayState. 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)

Message Acknowledgment

When commands are sent to WebRelay, its current stat 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

3.3.3 GET Requests

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

No Password Enabled

GET requests to the device for specific files.

Example: Request home.html

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

Example: Turn Relay ON

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

Password Enabled:

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

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

The html request header with the password looks like this:

```
GET /state.xml?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.

3.4 Modbus Operation

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

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

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

- Read Coils (Modbus function 01) - read the status of the relay (and/or the input).
- Read Discrete Inputs (Modbus function 02) - read the status of the input
- Write Single Coil (Modbus function 05) - change the relay state
- Write Multiple Registers (Modbus function 16) - pulse the relay

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. To keep the connection open, a read request can be sent periodically. Two TCP sockets are available for Modbus communications. If two masters each have a socket open (or a single master using two sockets) and a third master attempts to open a socket for Modbus communications, the request to open a third socket will be rejected.

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

This function returns the state of the relay coil. In addition, the optically isolated input can be read using

this function which allows full state of WebRelay™ to be read in a single transaction.

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)

Request

Modbus/TCP:

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

Modbus:

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

Character String Example:

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

Response

Modbus/TCP:

Transaction identifier (2 Bytes): 0x0001
 Protocol identifier (2 Bytes): 0x0000
 Length (2 Bytes): 0x0004
 Unit identifier (1 Byte): 0xff

Modbus:

Function code (1 Byte): 0x01 (Read coils)
 Byte count (1 Byte): 0x01
 Coil status (1 Byte): 0x00, 0x01, 0x02, or 0x03 (bit 0 = relay state, bit 1 = input state)

Data Byte (hex)	LS Data Bits (binary)	Input State	Relay State
0x00	00	off	off
0x01	01	off	on
0x02	10	on	off
0x03	11	on	on

Modbus Error:

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

Exception codes:

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

Character String Example:

```
char read_coils_mb_response[] = {0x00, 0x01, 0x00, 0x00, 0x00, 0x04, 0xff, 0x01, 0x01, 0x01};
```

3.4.2 Read Discrete Inputs (Modbus Function Code 02 (0x02))

This function returns the state of the optically-isolated input.

Request

Modbus/TCP:

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

Modbus:

Function code (1 Byte): 0x02 (read inputs)
 Starting address (2 Bytes): 0x0000 (always 0x0000)
 Quantity of inputs (2 Bytes): 0x0001 (always 0x0001)

Character String Example:

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

Response

Modbus/TCP:

Transaction identifier (2 Bytes): 0x0001
 Protocol identifier (2 Bytes): 0x0000
 Length (2 Bytes): 0x0004
 Unit identifier (1 Byte): 0xff

Modbus:

Function code (1 Byte): 0x01 (Read coils)
 Byte count (1 Byte): 0x01
 Input status: 0x00 (input off), 0x01 (input on)

Modbus Error:

Function code (1 Byte): 0x82
 Exception code (1 Byte): 0x01 or 0x02

Exception codes:

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

Character String Example:

```
char read_coils_mb_response[] = {0x00, 0x01, 0x00, 0x00, 0x00, 0x04, 0xff, 0x01, 0x01, 0x01};
```

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

Request:

Modbus/TCP

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

Modbus

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

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

Response:

Modbus/TCP

Transaction identifier (2 Bytes): 0x0001

```

Protocol identifier (2 Bytes): 0x0000
Length(2 Bytes): 0x0006
Unit identifier (1 Byte): 0xff
Modbus
Function code (1 Byte): 0x05 (write coil)
Output address (2 Bytes): 0x0000
Output value (1 Byte): 0xff - relay on, 0x00 - relay off
Padding (1 Byte): 0x00
Modbus Error:
Function code (1 Byte): 0x85
Exception code (1 Byte): 0x01 or 0x02
Exception codes:
0x01 - Function code not supported
0x02 - Incorrect starting address / quantity of outputs combination
Character String Example:
char write_coil_mb_response[] = {0x00, 0x05, 0x00, 0x00, 0x00, 0x06, 0xff, 0x05, 0x00, 0x00,
0xff, 0x00 };

```

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

This is used to pulse the relay for a specified time. When 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 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.

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

Request:

Modbus/TCP

```

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

```

Modbus

```

Function code (1 Byte): 0x10 (Write Multiple Registers)
Starting address (2 Bytes): 0x0010 (always start at this address)
Number of registers (2 Bytes): 0x0002 (always 2 registers)
Byte count (1 Byte): 0x04 (always 4 bytes)
Registers value (4 Bytes): 00 00 41 20 (10 second pulse time)

```

Character String Example:

```

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

```

Response:

Modbus/TCP

```

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

```

Modbus

Function code (1 Byte): 0x10 (Write Multiple Registers)

Starting address (2 Bytes): 0x0010

Number of registers(2 Bytes): 0x0002

Modbus Error:

Function code (1 Byte): 0x90

Exception code (1 Byte): 0x01 or 2 0x02

Exception codes:

0x01 - Function code not supported

0x02 - Incorrect starting address / byte count combination

```
char write_registers_mb_response[] = {0x00, 0x01, 0x00, 0x00, 0x00, 0x06, 0xff, 0x10, 0x00, 0x10,  
0x00, 0x02 };
```

Appendix A: Restoring Factory Default Settings

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

CAUTION: DO NOT USE METAL OBJECTS FOR THIS FUNCTION.



Appendix B: Installing New Firmware

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

Requirements

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

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

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

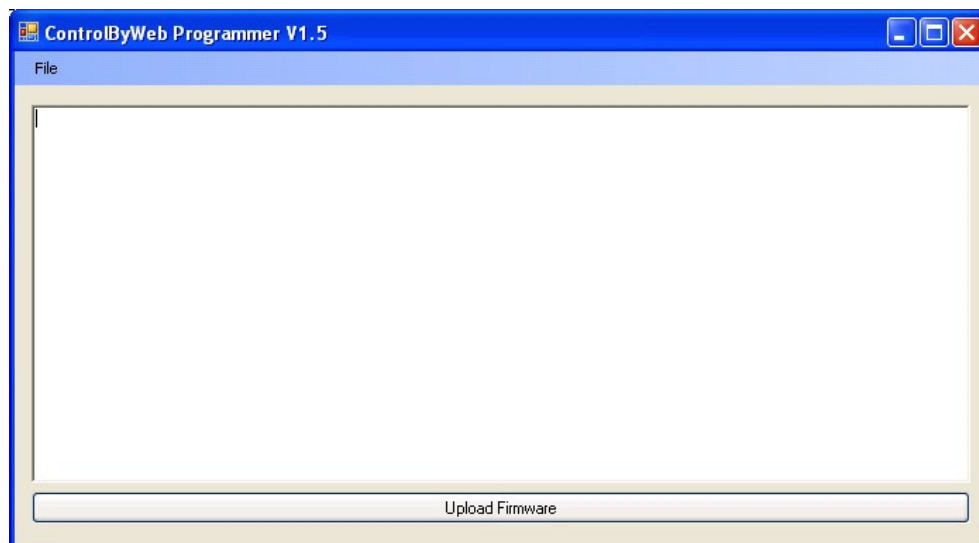
Setup

1. Download the firmware zip file from the ControlByWeb website. Only a WebRelay™ image can be installed on WebRelay™ so make sure the correct image is being downloaded.
2. bootloader.exe will connect to WebRelay™ using default IP address 192.168.1.2, not the address currently assigned to 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 2.3 Establishing Communications for Setup.

Note: The IP address of 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.

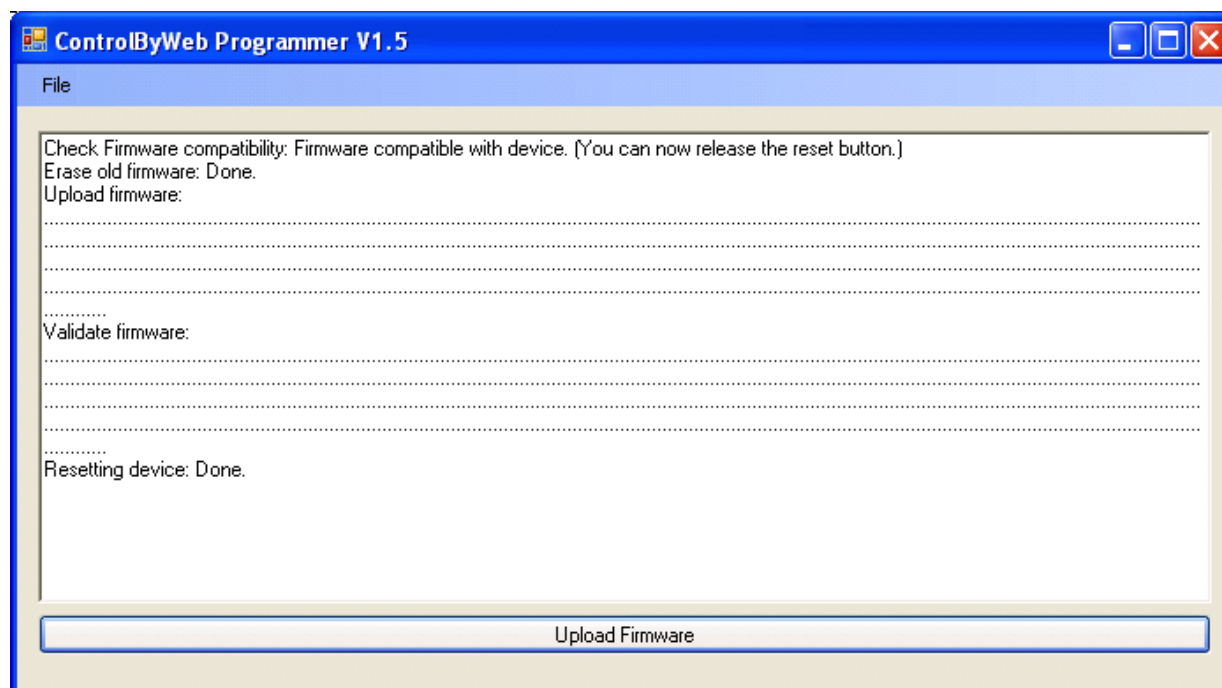
3. Open the bootloader.exe utility on the computer by double clicking on the downloaded file (Figure Appendix B.1).
4. Within the ControlByWeb™ Programmer utility programmer, select File, then Open. Specify the firmware image downloaded from the ControlByWeb™ web site.



Device Upgrade Procedure

Carefully follow the following steps to put WebRelay™ 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
5. ControlByWeb™ Programmer window. After the programming process begins, the reset button can be released
6. Programming will take approximately 20-30 seconds. The LINK LED will stop flashing and remain lit during this time. WebRelay™ will be set to factory defaults with an IP address of 192.168.1.2.6. Refer to section **2.3 Establishing Communication for Setup** to reconfigure the WebRelay™. 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>).



Firmware update complete

Appendix C: Specifications

Power Requirements:

Model X-WR-1R12-1I5-I and X-WR-1R12-1I24-I

Voltage: 9-28VDC

Current: see table below

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

Model X-WR-1R12-1I5-E

POE Class 1 (0.44Watt to 3.84Watt range). Optionally can be powered with external 5VDC power supply.

I/O: 1 Optically Isolated Input, 1 Relay Output

Relay Contacts:

Contact Form: SPDT (form c)

Contact Material: AgSnO₂

Max Voltage: 240VAC, 30VDC

Max Current: 12A

Relay Control Options: ON/OFF or Pulsed

Pulse Timer Duration: 100ms to 86400 Seconds (1 day)

Accuracy of pulse timer: 99.99%

Optically Isolated Input:

Input Voltage: 4-12VDC (5V Input models)

Input Current: 4.7mA – 25mA (5V Input models)

Input Voltage: 11-26VDC (24V Input models)

Input Current: 4.9mA – 13.4mA (24V Input models)

Input Isolation: 1500V

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

Network: 10/100 Base-T Ethernet

Network Setup: static IP address assignment, TCP port selectable

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

LED Indicators: 4

-Input voltage applied

-Relay coil engaged

-
- Network linked
 - Network activity

Physical:

Operating Temperature: -40°C to 65.5°C (-40°F to 150°F)

Size: 1.41in (35.7mm) wide X 3.88in (98.5mm) tall X 3.1 in(78.0mm) deep

Weight: 5oz (142 grams)

Enclosure Material: Lexan 940 (UL94 V0 flame rated)

Password Settings:

Password protection on setup page: Yes

Password protection on control page: Optional

Password Encoding: Base 64

Max password length: 10 characters

Regulatory Compliance:

Electromagnetic Compliance:

IEC CISPR 22, CISPR 24

FCC 47CFR15 (-I and -5 Models class B, POE Model Class A)

EU EN55024, EN55022

Product Safety:

IEC 60950-1 / EN 60950-1



Appendix D: Mechanical Information