AC PCWER *Sentinel*® 2˙Ủ bX˙D` i g

Users Manual

Covers:

XRDI-WS3:BT
XRDI-WS3P:BT

Contents

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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 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. There is no guarantee, however, 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 AC POWER *Sentinel*® 2 enclosure. This could damage the unit or cause personal harm and 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.
- This unit must not be used in any way where its function or failure could cause significant loss or property damage.

Notes about security:

By design, AC POWER *Sentinel*® 2 is very secure. It does not support terminal or file transfer programs such as telnet, FTP, SSH, etc. This means it is not possible for someone to 'break in' to AC POWER *Sentinel*® 2 and access other devices on your local network. The simplicity of AC POWER *Sentinel*® 2 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 AC POWER *Sentinel*® 2 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 AC POWER *Sentinel*® 2 resides and the client machine (web browser, another AC POWER *Sentinel*® 2 product, etc.).

Final installation note:

This 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

AC POWER *Sentinel*® 2 is a self contained, remote power controller with two electrical outlets and a built-in web server. Each outlet can be individually controlled and/or monitored over any IP network including private networks, IP-based industrial control networks, and the Internet.

Users can operate AC POWER *Sentinel*® 2 using a web browser, or applications (custom or off the shelf) can be used to control AC POWER *Sentinel*® 2 from a computer, PLC, or other automation controller.

1.1 Features

AC POWER *Sentinel*® 2 includes the following features:

- ✔ Two individually controlled AC outlets with selectable power-on state.
- ✔ Designed for Worldwide use; accepts an input voltage range of 100-240V AC.
- ✔ Control from a standard web browser; no special software required.
- ✔ Automatic Reboot mode can be used to reboot devices when they fail to respond to PING requests.
- ✔ Built-in web server provides direct access to the device; no external servers, services, or subscriptions required.
- ✔ Supports SNMP and Modbus/TCP for interoperability with other devices and/or software.
- ✔ "Remote Services" provides a convenient mechanism for connection with external servers and web services for special applications.
- ✔ Control page can be customized with appropriate text for descriptions and buttons.
- ✔ Password protection.
- ✔ IP filter provides simple firewall functionality for added security.
- ✔ Selectable TCP Ports.
- ✔ 10/100 Mbps Ethernet connectivity.
- ✔ Field re-programmable; users can install firmware updates when available.
- ✔ Attractive, rugged enclosure made of flame resistant plastic.
- ✔ Designed for performance and reliability rather than lowest production cost.
- ✔ Wall mountable, or optional rack mounting kit is available.

AC POWER *Sentinel*® 2 Plus (model XRDI-WS3P:BT) also includes the following features:

- ✔ Temperature and/or humidity sensors can be connected for environmental monitoring. (One temperature sensor is included, use up to three sensors.)
- ✔ Dry-contact sensors or switches can be connected for local control of outlets or for monitoring external devices such as access doors (two discrete inputs).
- ✔ Real-time clock can automatically adjust for daylight savings time and can be synchronized with NTP server.
- ✔ Event scheduler with yearly calendar; automatically turn outlets on/off or reboot at pre-scheduled times.
- ✔ Email alerts can be configured to send email or text messages when outlets/inputs change or when temperature goes out of range.
- ✔ Logging; log outlet changes, automatic reboots, high/low temperatures, network traffic, and more.
- ✔ Simple scripts can be written in BASIC for advanced functionality.
- ✔ System log provides detailed diagnostic information.
- ✔ Configure manually or with DHCP.

Note: AC POWER Sentinel® 2 Plus sends out email messages only. Most wireless carriers provide free services to convert email messages to text messages.

1.2 Applications

AC POWER *Sentinel*® 2 can be used with servers, computers, routers, etc., to provide remote control, automatic reboot, or scheduled control of these devices. When configured for automatic reboot, AC POWER *Sentinel*® 2 will periodically ping a designated IP address and wait for a response. If there is no response to the ping, AC POWER *Sentinel*® 2 will attempt to bring the device back to normal operation by rebooting the device. There are two common scenarios where the Automatic Reboot feature is useful.

1. AC POWER *Sentinel*® 2 may be set up to ping a server directly and reboot the server if it fails to respond.

2. AC POWER *Sentinel*® 2 could be used to reboot a network or communications device if pings to a remote address fail. In this case, AC POWER *Sentinel*® 2 controls the power to a network router, switch, radio, modem, etc., but pings a device elsewhere on the network. The assumption is that if the pings cannot reach the remote device, the local communications device may be at fault, so rebooting the device will hopefully restore network communications.

1.3 **AC POWER** *Sentinel®* **2** Models Available

AC POWER *Sentinel®* 2 is currently available in two models. The main differences between each model are listed below.

XRDI-WS3:BT	Standard AC POWER *Sentinel®* 2 with two individually controlled outlets, built-in web server, and automatic reboot functions.
XRDI-WS3P:BT	AC POWER *Sentinel®* 2 Plus includes all features of standard model plus temperature/humidity monitoring (humidity monitoring requires optional humidity sensor), discrete inputs, event scheduling, logging, and additional relay contact protection.

1.3.1 Optional Accessories

| Accessory	Description	Part Number
Temperature Sensor	Digital temperature sensor with 12 inch wire leads. (Model XRDI-WS3P:BT only) *Note: Leads may be extended*	X-DTS-U
Temperature Sensor (Wall Mount)	Digital temperature sensor housed in vented plastic enclosure (Model XRDI-WS3P:BT only)	X-DTS-WM
Temperature/Humidity Sensor	Digital temperature and humidity sensor housed in vented plastic enclosure. (Model XRDI-WS3P:BT only)	X-DTHS-WM
Rack Mount Kit	Rack mount hardware for mounting AC POWER *Sentinel®* 2 in a standard 19 inch rack.	X-WS-RMK

1.4 Connectors & Indicators
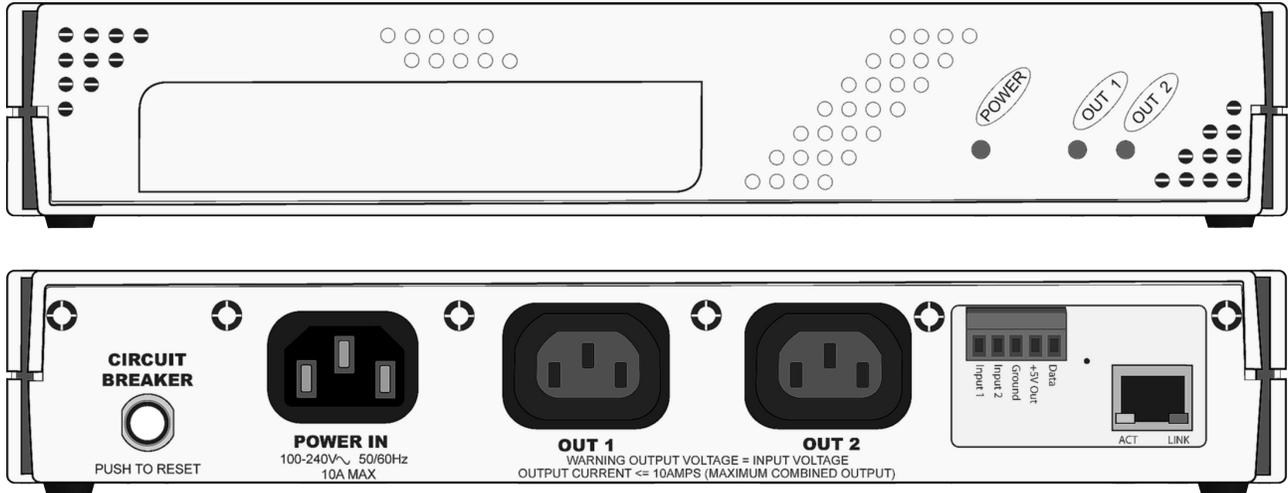
Figure 1.4a- Connectors and Indicators

AC POWER *Sentinel®* 2 has two AC power outlets (IEC 320 C13 female connectors), one AC power input (IEC 320 C14 male connector) and one Ethernet connector. AC POWER *Sentinel®* 2 Plus also includes a 5-position removable terminal connector to provide connection to discrete inputs and temperature or humidity sensors.

AC POWER *Sentinel®* 2 has five LED indicators. Three LEDs are located on the front panel. One LED is labeled Power and is illuminated green when the module is powered. Two LEDs are labeled Out 1 and Out 2. These are illuminated when the associated outlet is powered. The other two LEDs are located on the Ethernet connector on the back panel. They are labeled LINK and ACT. LINK is illuminated green when the module is properly connected to an Ethernet network and is ready to communicate. Network communications will only occur if this LED is illuminated. The ACT LED flashes amber when activity is detected on the network.

1.5 Accessing **AC POWER** *Sentinel®* **2**

Standard Access Using a Web Browser
AC POWER *Sentinel®* 2 has a built-in web server and provides simple web pages that can be accessed directly using a standard web browser. This allows users to access the unit with NO SPECIAL SOFTWARE installed on their computer. This is ideal for applications that require a quick, simple solution that does not need to be accessible to more than a few people. This configuration is simple to setup, simple to use, and can be accessed from any computer.

Note: Computers that are not on the local network may only access AC POWER Sentinel® 2 if the local network router is configured to allow access from users beyond the local network (see Appendix B).

Note: This manual assumes standard access. Other methods of accessing AC POWER Sentinel® 2 are explained in Appendix C.

Section 2: Installation and Setup

Installation consists of mounting AC POWER *Sentinel®* 2, connecting to an IP Network, providing power, and configuring via a web browser.

For AC POWER *Sentinel®* 2 Plus models, inputs and sensors can be wired to the device using the 5-position terminal connector.

2.1 Mounting

AC POWER *Sentinel®* 2 can be placed upon a table top, wall mounted, or rack mounted (with optional rack mount kit). It should be mounted in a clean, dry location where it is protected from the elements. Ventilation is recommend for installations where ambient air temperature is expected to be high.
To mount AC POWER *Sentinel®* 2 to a wall, use two #8 screws. Attach the screws to the wall horizontally spaced 6 3/8 inches (162 mm) apart. The head of the screws should be about 1/10 inch away from the wall. See **Appendix I** for additional mechanical details.

If AC POWER *Sentinel®* 2 is to be rack mounted, the rack mounting kit should be purchased separately. Insert the rack mount ears on both sides of AC POWER *Sentinel®* 2. Secure the rack mount ears by inserting the two pins on the bottom of the unit. Place AC POWER *Sentinel®* 2 in the desired location on the rack. Use four rack mount screws to secure AC POWER *Sentinel®* 2 to the rack.
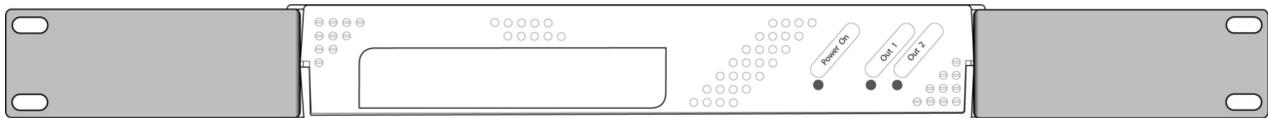
Figure 2.1a - AC POWER Sentinel® 2 Shown with Optional Rack Mount Ears
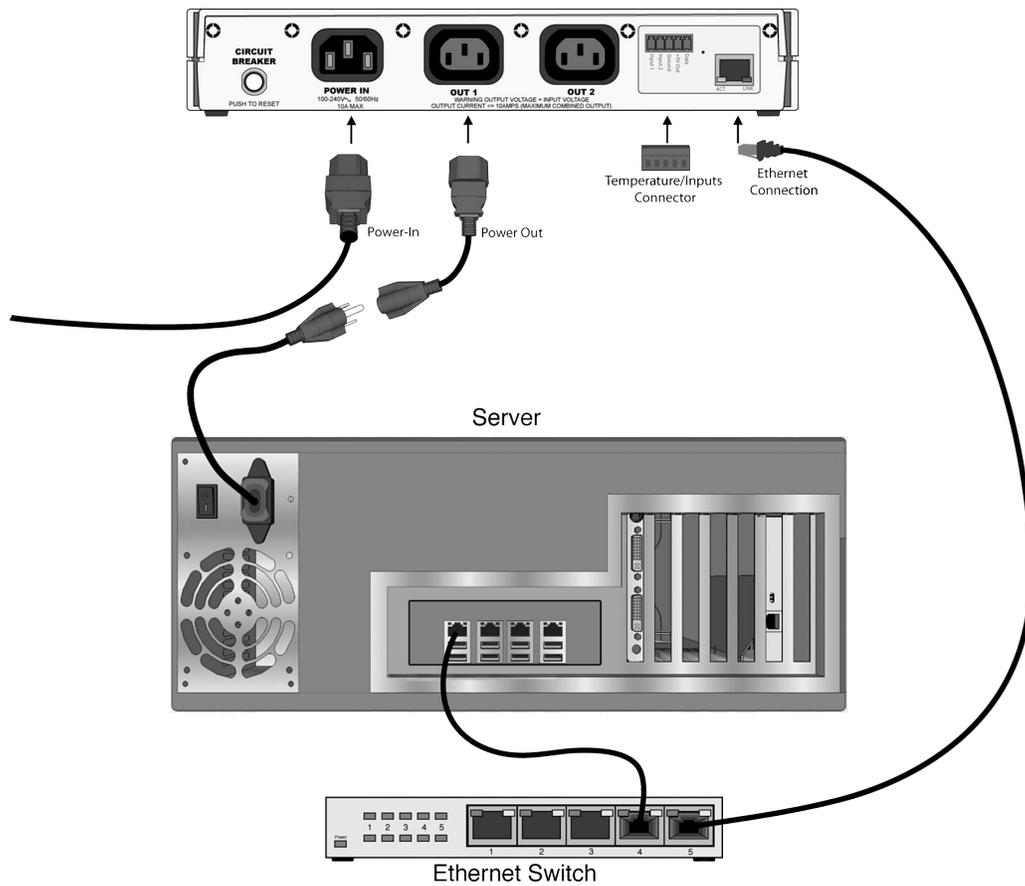
Figure 2.2a - Connections

2.2 Connection

2.2.1 Power Supply Connection
Connect the IEC 320 C14 Male Connector Power Input of AC POWER *Sentinel*® 2 to a power source (120-240V AC).

2.2.2 Outlet Connection
Connect one or both of the outlets on AC POWER *Sentinel*® 2 using the IEC 320 C13 Female Connectors to the device(s) to be controlled.

WARNING: DO NOT USE AC POWER *Sentinel*® 2 TO CONTROL A COMBINED LOAD OF MORE THAN 10 AMPS

2.2.3 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, AC POWER *Sentinel*® 2 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-through" cable should be used.
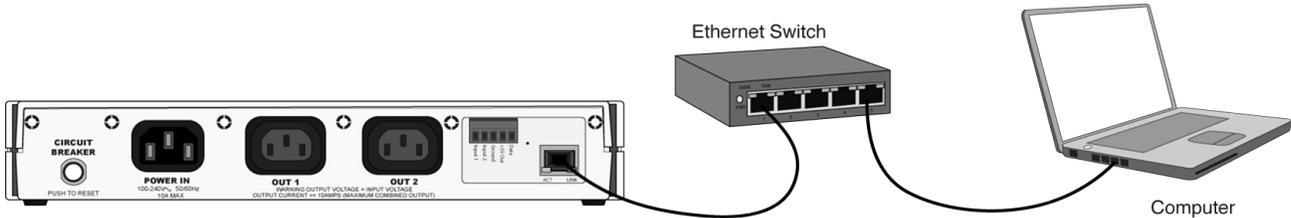
Figure 2.2b - Network Connection

AC POWER *Sentinel*® 2 can be used indirectly on a wireless network. This is done by using a wireless Ethernet bridge or a wireless router. The network connection of AC POWER *Sentinel*® 2 is connected to the wireless device and the wireless device makes the connection to the wireless network.

Note: The wireless Ethernet bridge or router must be properly setup for the wireless network used. Refer to the installation instructions that came with the wireless device.
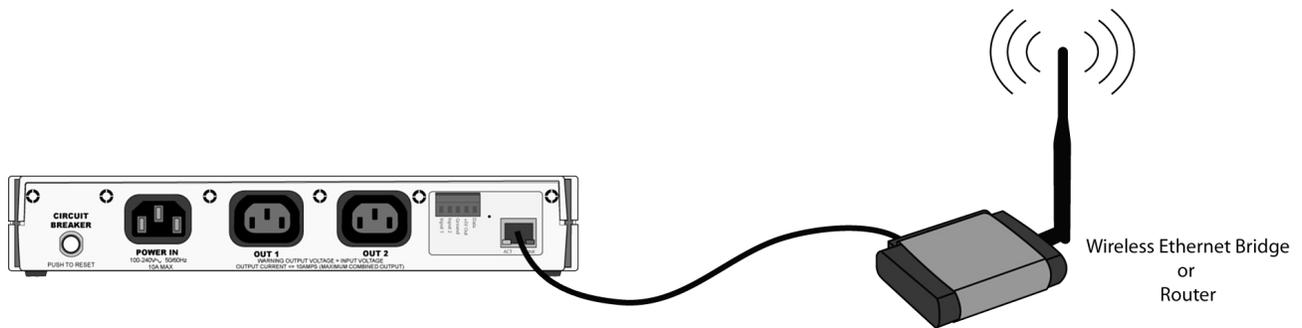
Figure 2.2c - Wireless Connection

2.2.4 Terminal Connector (XRDI-WS3P:BT only)
The AC POWER *Sentinel*® 2 Plus model includes a removable 5-position terminal connector which is used for connecting temperature sensors, humidity sensors, or discrete inputs. The terminals are described in the table below.

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

5-pin connector pinout for XRDI-WS3P:BT Only	
Pin	**Description**
Data	Temperature/Humidity Data. This is the data line connection for the digital temperature/humidity sensors.
+5V Out	This output voltage is used to provide power for the digital temperature/humidity sensors.
Ground	Ground connection for 5V DC output, and Inputs.
Input 1 & 2	Discrete Inputs.

2.2.4.1 Input Connection (Model XRDI-WS3P:BT only)
Two discrete inputs are provided which can be connected to dry contact sensors or switches. Sensors can be used for monitoring alarm conditions such as access or thresholds. Alternatively, if local control of the outlets is needed, switches can be connected to the inputs and the unit can be configured such that they control the outlets.
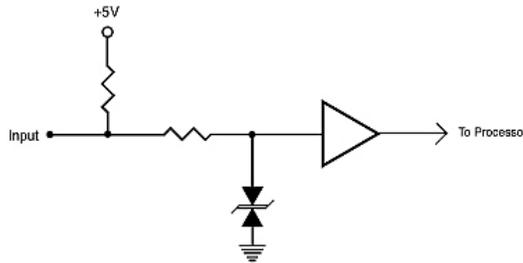
Figure 2.2d - Input Schematic

Connect one terminal of sensor or switch to the input terminal (Input 1 or Input 2) on AC POWER *Sentinel*® 2 Plus. Connect the other terminal to the ground terminal on AC POWER *Sentinel*® 2 Plus. When contacts are closed the input is connected to ground and the input is considered to be "ON".
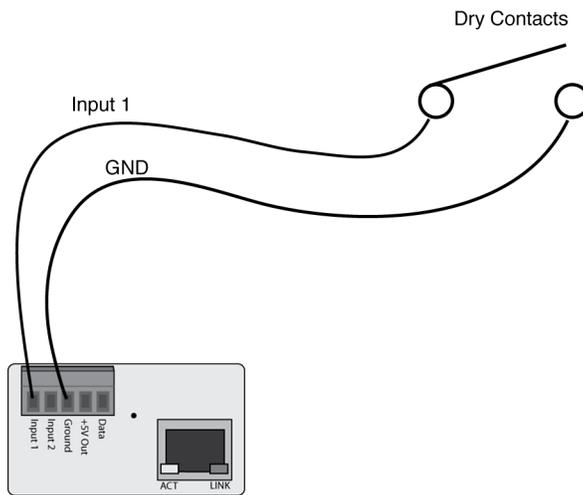
Figure 2.2e - Input Connection

2.2.5 Temperature/Humidity Sensor Connection(Model XRDI-WS3P:BT only)
Temperature and/or humidity sensors can be used for monitoring environmental conditions. The sensors all share the same terminals (+5V, Ground, Data) and up to three sensors can be connected. The sensors are able to share the same terminals without interference because they communicate with AC POWER *Sentinel*® 2 Plus using a digital bus called the "one-wire bus" which was developed by Dallas Semiconductor. Every sensor on the one-wire bus is assigned a unique serial number when it is manufactured. That number is used to address the device during communication.

Many factors will determine the maximum length of cable used to connect sensors to AC POWER *Sentinel*® 2 Plus. Some of these factors include, but are not limited to, the gauge and type of wire used, and the number of sensors used. When 1-3 sensors are used, sensor leads can generally be extended up to a length of 60 feet.

The sensors have three wires; the wire color is explained below.

Sensor Wire Color	Connection
Red	Vout
Black	Gnd
Blue (or White)	Data

Figure 2.2f - Temperature Sensor

Multiple sensors can be connected in two ways. They can all be directly connected to the unit, or they can be "daisy chained" as shown in Figure 2.2g.
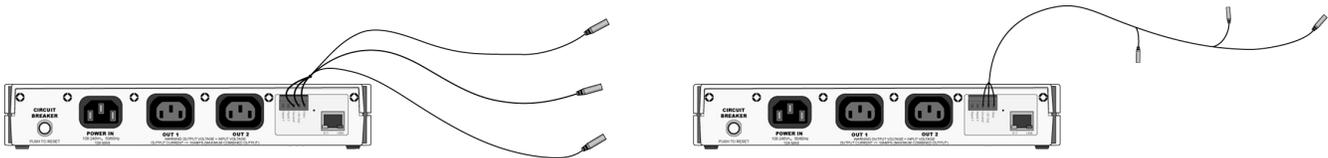
Figure 2.2g - Direct Connection and Daisy Chain Connection

2.3 Establishing Communications for Setup

AC POWER *Sentinel*® 2 is set up using a web browser. The first task is to establish communications between a computer and AC POWER *Sentinel*® 2 so that the browser-based configuration can begin. To do this, the computer and the AC POWER *Sentinel*® 2 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 AC POWER *Sentinel*® 2 so that they are on the same network. The first (Option 1) is to change the IP address of AC POWER *Sentinel*® 2 to an address that is on the same network as the computer. The second (Option 2) is to change the IP address of the computer to an address that is on the same network that AC POWER *Sentinel*® 2 is set to by default.

2.3.1 Option 1: Assign a temporary IP address to **AC POWER** *Sentinel*® **2**

This option is used to TEMPORARILY assign an IP address to AC POWER *Sentinel*® 2 without the need to change the IP address of the configuration computer. Note that AC POWER *Sentinel*® 2 will only use this IP address as long as power is maintained. Once power is lost and restored, AC POWER *Sentinel*® 2 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 tab using the browser.

To assign the temporary IP address...

    1. Make sure AC POWER *Sentinel*® 2 and the configuration computer are connected to the same network. This will not work through routers or gateways.

    2. Assign the address as follows:

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

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

Type:
>   *arp -s {new IP address} {serial number of AC POWER Sentinel® 2 }*
>
>   *Note: IP address format is xxx.xxx.xxx.xxx*
>   *Serial number format is ss-ss-ss-ss-ss-ss*
>
>   For example, to set AC POWER *Sentinel*® 2 (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 AC POWER Sentinel® 2 }*
>
>   *Note: IP address format is xxx.xxx.xxx.xxx*
>   *Serial number format is ss:ss:ss:ss:ss:ss*
>
>   For example, to set AC POWER *Sentinel*® 2 (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: The terminal is in the "Utilities" directory, which is in the "Applications" directory.

Type:
>   *sudo arp -s {new IP address} {serial number of AC POWER Sentinel® 2 }*
>
>   *Note: Administrator password is required.*
>   *IP address format is xxx.xxx.xxx.xxx*
>   *Serial number format is ss:ss:ss:ss:ss:ss*
>
>   For example, to set a AC POWER *Sentinel*® 2 (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 AC POWER *Sentinel*® 2. By default, AC POWER *Sentinel*® 2 comes from the factory with an IP address of 192.168.1.55. Communications with AC POWER *Sentinel*® 2 may be established by assigning an IP address to the configuration computer that is on the same network as AC POWER *Sentinel*® 2 (for example, the configuration computer could be assigned to 192.168.1.50)

The following example is for those running the Windows operating system:

> **Step 1**: Open the control panel by clicking on the start menu and then clicking on Control Panel (Figure 2.3a).
> *Note: The control panel shown (Figure 2.3b) is in "Classic View." If the control panel is in "Category View," select the "Classic View" option before proceeding.*

Figure 2.3a- Start Menu
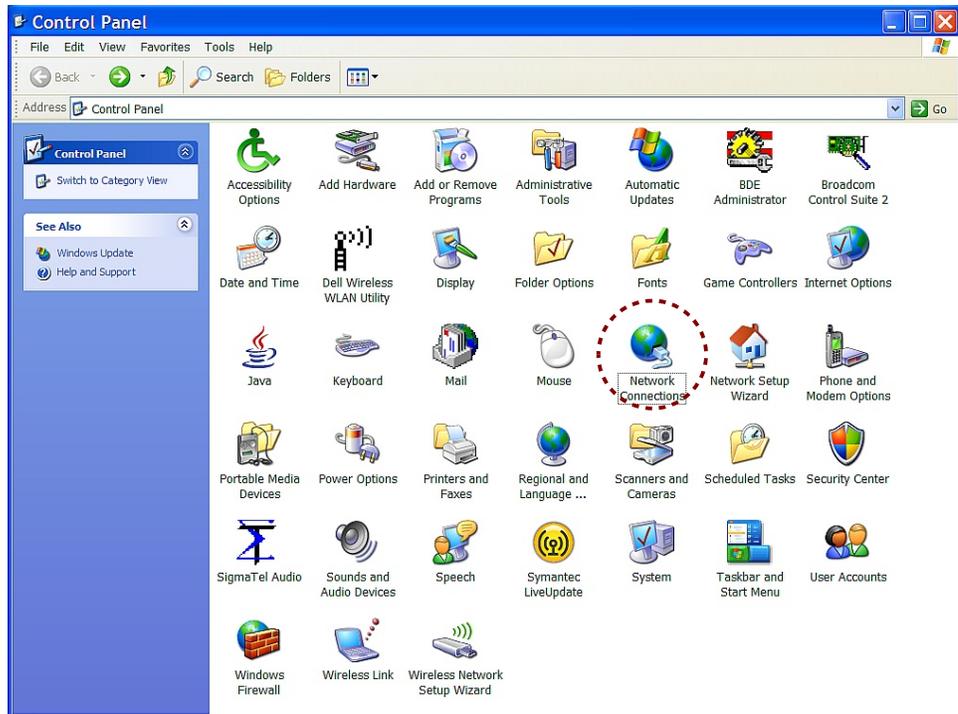
Figure 2.3b- Control Panel

Step 2: Double click on the icon labeled Network Connections. The window shown below will pop-up.

Note: To access the Network Connections folder in Windows Vista, select the Windows Icon (Start Menu) and enter ncpa.cpl into the search bar and press Enter.
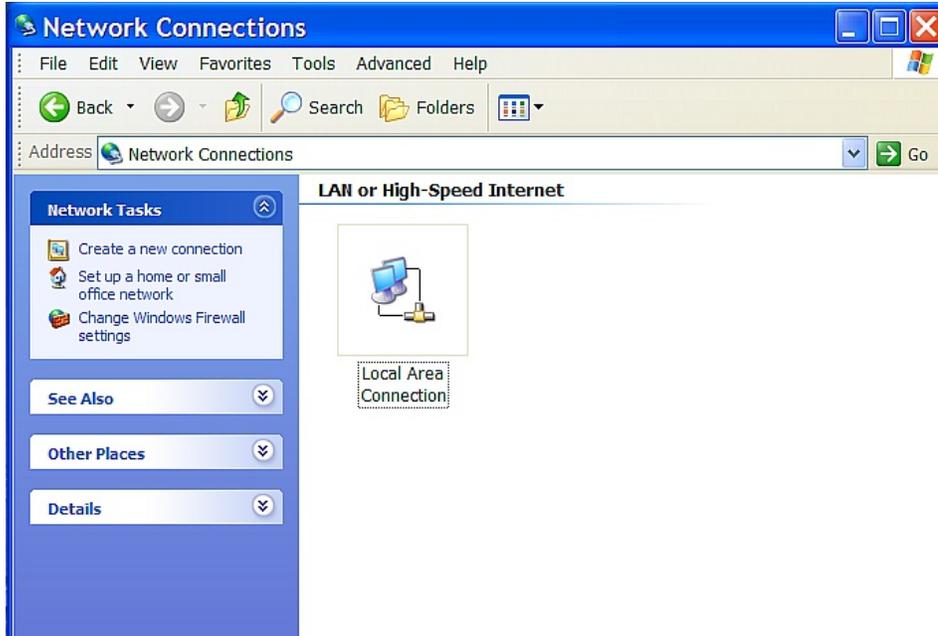
Figure 2.3c- Network Connection
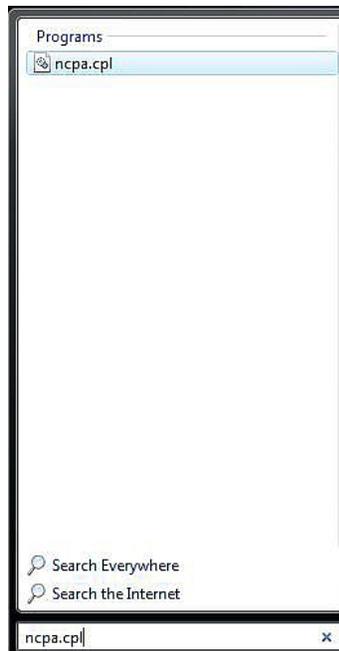
Figure 2.3d- Vista Start Menu

Step 3: Right click on the icon labeled Local Area Connection. In the menu that follows, select the option at the bottom of the menu labeled Properties. The Local Area Connection Properties window will appear. Scroll down to and highlight "Internet Protocol (TCP/IP)," then click the button labeled "Properties."
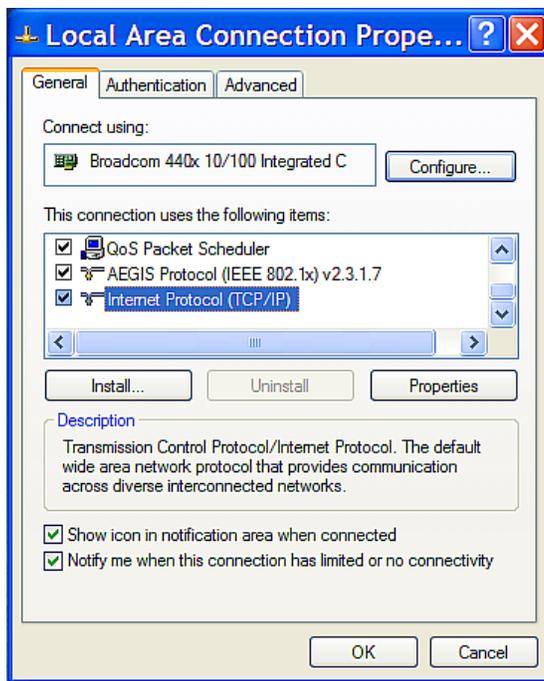
Figure 2.3e- Local Area Connection

Step 4: The following "Internet Protocol (TCP/IP)" Properties menu appears:
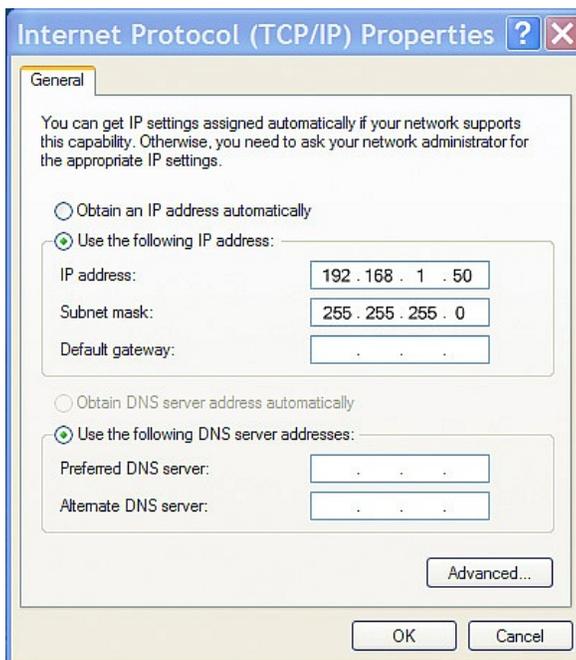
Figure 2.3f- TCP/IP Properties

Step 5: 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`. No need to change the default gateway field. Click OK to accept the new settings.

Note: If "Use the following IP address" is already selected, the values need to be recorded, then re-entered once the IP address of AC POWER Sentinel® 2 is successfully changed.

2.3.3 Open Configuration Web Page

Once the network is set up, open the setup page as described in section 2.4. If the setup pages are not accessible, verify that AC POWER *Sentinel*®2 is powered on and that the LINK light is illuminated. Check all network connections and settings. Another way to check communications is to ping AC POWER *Sentinel*®2 (from the command prompt by typing `ping` *{AC Power Sentinel 2 IP address}*).

2.4 **AC POWER** *Sentinel*® **2** Setup Pages

AC POWER *Sentinel*® 2 is configured using a web browser. To access the setup pages, enter the following URL in the address bar of a web browser:

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

For example, using the default IP address, enter:

```
http://192.168.1.55/setup.html
```

After the page is requested, a password prompt will appear. Enter the username and password.

Note: The default username is `admin` *and the default password is* `1234` *(password is case sensitive).*

2.4.1 Main Tab

This is the initial page that is displayed when setup.html is entered into the address bar of the browser. It displays model and serial number information, and allows the user to select the desired temperature units.
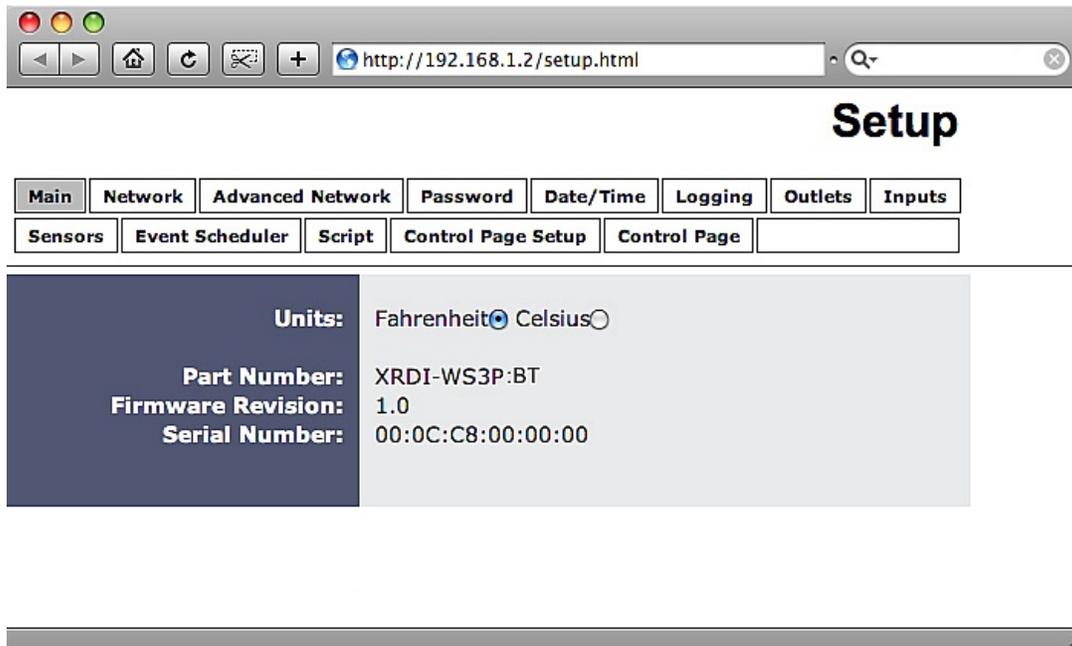
Figure 2.4a- Main Tab

1. Units (Model XRDI-WS3P:BT only):
   This allows the user to select between the temperature units of Fahrenheit and Celsius. All settings entered and displayed on subsequent pages will be in the units selected.

2. Part Number:
   This is the full model number of AC POWER Sentinel® 2.

3. Firmware Revision:
   This is the current product revision of the unit's firmware.

4. Serial Number:
   This is the serial number of this unit. The serial number is also the MAC address of the unit.

2.4.2 Network Tab

The network parameters are set on this page. Note that if multiple AC POWER *Sentinel*® 2 products are used on the same network, install one at a time and set the IP address of each unit before connecting the next unit to the network. This avoids having multiple devices being installed on the network with the same factory default IP address at the same time. It may be necessary to clear the 'arp' cache each time you swap AC POWER *Sentinel*® 2 products 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 ("`sudo arp -d -a`" as a super user in the terminal of Mac OS X).

Note: AC POWER Sentinel® 2 must be power-cycled (power disconnected, then reconnected) before network settings take effect. Only the settings on the **Network** *tab require power-cycling before taking effect.*
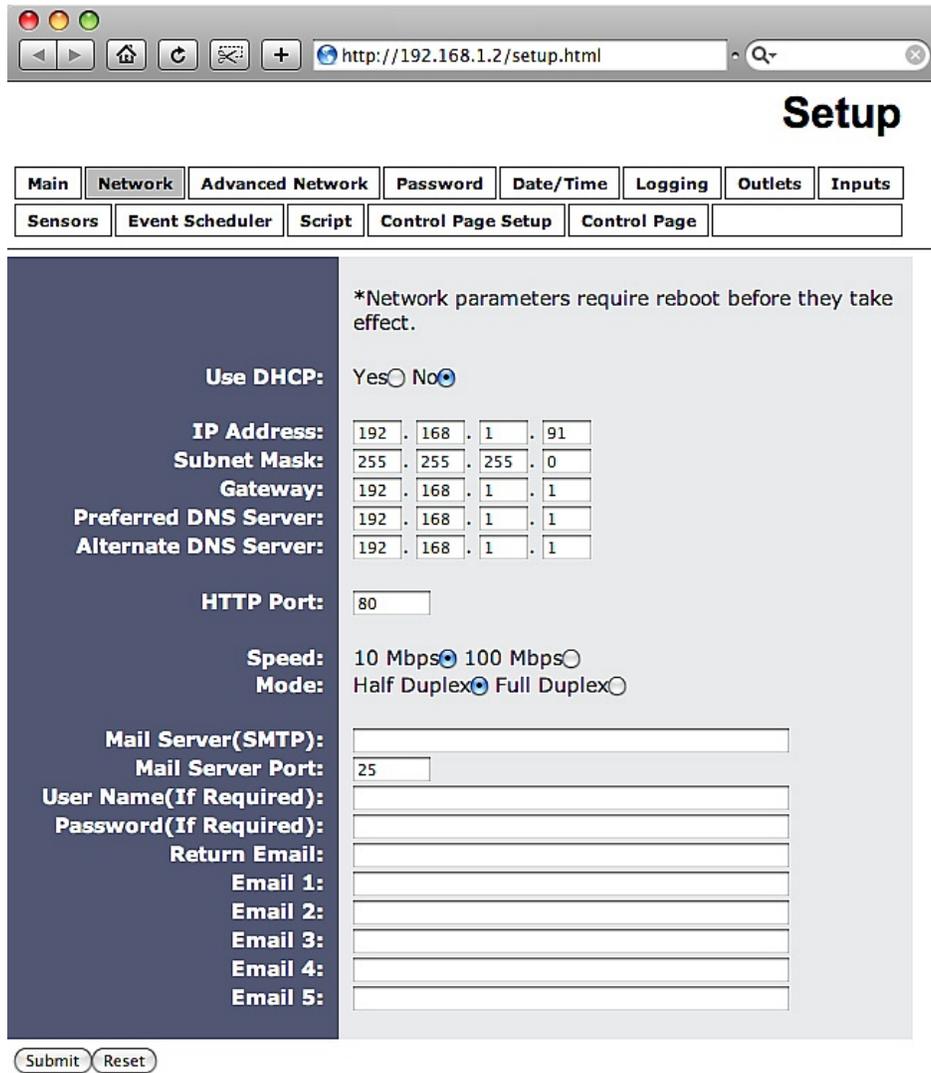
Figure 2.4b- Network Tab

1. Use DHCP (model XRDI-WS3P:BT only):
This option allows DHCP to be enabled or disabled. If this option is set to *Yes*, AC POWER *Sentinel*® 2 will wait for an IP address from a DHCP server each time it is powered. The default setting is *No* (this is recommended for most installations). If DHCP is set to *Yes*, the **Network** page must be submitted and AC POWER *Sentinel*® 2 must be rebooted before an IP address will be assigned. Once the **AC POWER** *Sentinel*® **2** is assigned an IP address by the DHCP, the new IP address can be found through the clients list kept by the DHCP server. For most instances, this is found on the local gateway or router.

Brief notes about DHCP:
All devices on an IP network require an IP address. This is a unique address that identifies each device on the network. DHCP (Dynamic Host Control Protocol) is a mechanism that automatically assigns an IP address to a computer (or other devices) when it is connected to a network. This eliminates the need to manually enter the IP address. When a computer is connected to the network, another device on the network called a DHCP server detects the presence of the computer and dynamically assigns the IP address to that computer. On many small networks, the DHCP server is built into the router.

DHCP works well for "client" devices such as computers, but is not ideal for servers. This is because servers usually don't initiate communications with other devices, but rather they wait for a request from "clients." To make this request, the client must know the IP address of the server. If a server gets its IP address dynamically, the IP address may not always be the same so client devices may not be able to find the server. For this reason, servers usually use an IP address that is fixed and does not change. The AC POWER *Sentinel*® 2 is a server and manual IP address assignment is usually recommended.

2. IP Address:
Enter the IP address for AC POWER *Sentinel*® 2 in this field.
The IP address is specific to the network where AC POWER *Sentinel*® 2 will be installed, and must be obtained from the network administrator. For more information on IP addresses and remotely accessing AC POWER *Sentinel*® 2 over the Internet, see **Appendix B: Remote Access**. The default setting for this field is `192.168.1.55`.

3. Subnet Mask:
The subnet mask defines the size of the local network. This must be obtained from the network administrator. For additional information about sub-netting and IP networking, many tutorials are available on the Internet. The default setting for this field is `255.255.255.0`.

4. Gateway:
This specifies the IP address of the gateway router. This must be obtained from the network administrator. The default setting for this field is `192.168.1.1`.

5. Preferred DNS Server:
The IP address of the Primary DNS server is specified here. When DNS services are required, this is the address that will be used. The default setting for this field is `192.168.1.1`.

This field is only required when the following options are used:
> -Remote Services (when server is specified by name and not IP address).
> -Sync time clock with remote NTP server (when server name is specified by name and not IP address).
> -Mail Server (when server name is specified by name and not IP address).

6. Alternate DNS Server:
This field is used to specify the IP address of a Secondary DNS server. This is used when the AC POWER *Sentinel*® 2 requires DNS services and the preferred DNS server is not available. The default setting for this field is `192.168.1.1`.

7. HTTP Port:
The TCP port used for HTTP communications (web browser, xml, get commands) with AC POWER *Sentinel*® 2 is specified here. It is recommended that the port not be changed without an understanding of TCP/IP and ports. For more information on TCP ports and IP addressing see **Appendix B: Remote Access**. The default setting for this field is 80, which is the standard HTTP port.

8. Speed:
This option sets the data rate (clock rate) of the Ethernet port. Either **10Mbps** or **100Mbps** can be selected. The **100Mbps** option offers faster communications but the amount of data to and from AC POWER *Sentinel*® 2 is so small that users will not likely notice much (if any) difference. When AC POWER *Sentinel*® 2 is set to **10Mbps**, it draws less power and runs a little cooler which translates 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**. The default setting for this field is **10Mbps**.

9. 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. The default setting for this field is **Half Duplex**.

The remaining fields on the **Network** tab are required only if AC POWER *Sentinel*® 2 is configured to send email messages when alarm conditions occur **(Model XRDI-WS3P:BT only)**.

10. Mail Server (SMTP):
The name of the SMTP (Simple Network Transport Protocol) mail server (for example mail.example.com) or the IP address of the mail server (for example 192.10.10.10) should be entered in this field.

Note: if the server name is entered and not the IP address, the address of a DNS server will be required. There is no default setting for this field.

11. Mail Server Port:
This field is used to specify the SMTP Mail Server Port. The default setting is 25, which is the standard SMTP port.

12. User Name (If Required):
If the SMTP mail server requires authentication, the user name must be entered here.
There is no default setting for this field.

13. Password (If Required):
If the SMTP mail server requires authentication, the password must be entered here.
There is no default setting for this field.

14. Return Email:
AC POWER *Sentinel*® 2 will not receive email messages, but when AC POWER *Sentinel*® 2 sends email messages, it must include a return email address. This field is used to specify the return email address. Note that although AC POWER *Sentinel*® 2 will send email messages with any email address specified in this field, some email filters (spam filters) will not allow messages through that include an invalid email address. There is no default setting for this field.

15. Email 1 to Email 5:
Enter the email addresses of up to five recipients for alarm messages in these fields. There are no default settings for these fields.

2.4.3 Advanced Network Tab

Note that these settings are not used for most installations.
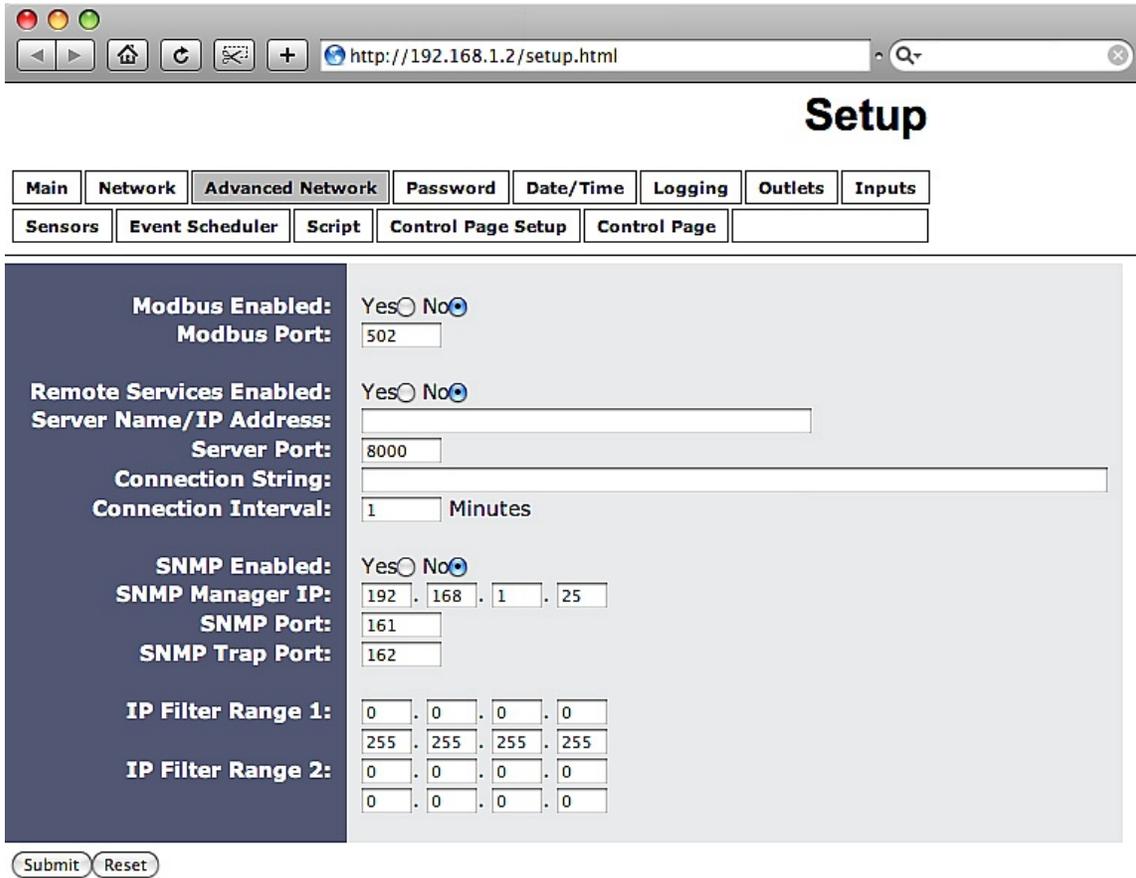
Figure 2.4c- Advanced Network Tab

Modbus:

1. Modbus Enabled:
AC POWER *Sentinel®* 2 can support Modbus/TCP. 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. This is enabled by selecting **Yes** in this field.

Note: Modbus communications are disabled whenever the control password is enabled. The default setting for this field is No.

2. Modbus Port:
This specifies the port used for Modbus/TCP communications with AC POWER *Sentinel®* 2. By default this is set to port `502` which is the standard Modbus port. It can be set within the range of `0` to `65535`.

Remote Services:
Remote Services initiates an outgoing connection to a server at a remote location. This can be used, for example, in an environment where a web server on the Internet provides a custom user interface and users access AC POWER *Sentinel*® 2 through the web server rather than communicating directly with AC POWER *Sentinel*® 2. This is sometimes referred to as "web services". As mentioned elsewhere in this users manual, using an external web server allows users to access one or many AC POWER *Sentinel*® 2 units through a custom web page. This has the benefits of being able to combine multiple devices seamlessly into a single web page, and it allows programmers to create powerful, custom web pages using the web programming languages of their choice.

Using the Remote Services configuration so that AC POWER *Sentinel*® 2 units initiate the connection to the external web server (rather than having the web server initiate communications to AC POWER *Sentinel*® 2 units) has two main benefits. First, the web server does not need to know the IP address of AC POWER *Sentinel*® 2. This means that AC POWER *Sentinel*® 2 can get its IP address dynamically from a DHCP server which simplifies the installation. Second, since the connection from AC POWER *Sentinel*® 2 is outgoing, rather than incoming, the local router on the network where AC POWER *Sentinel*® 2 resides doesn't need to be configured to forward sockets. This also has the benefit of simplifying the installation. In addition, since the router configuration is not modified, the risk of compromising security on the local network is eliminated. For more information about the Remote Services see **Appendix E**: **Remote Services**.

3. Remote Services Enabled:
This option enables or disables Remote Services. If **Yes** is selected, Remote Services will be enabled as soon as the submit button is pressed and AC POWER *Sentinel*® 2 will immediately attempt to make a connection with the remote server (power cycle not required). Once a connection is established, the connection will remain until it is disconnected by the remote server. Proper connection with the remote server can be verified by viewing the system status log file (see **Appendix D: Log Files**). The default setting for this field is `No`. Most users should leave this setting at its default.

4. Server Name/IP Address:
Specify the name or IP address of the Remote Services server here. If the IP address is specified, enter it in this format `aaa.bbb.ccc.ddd`. For numbers that are less than 100, preceding zeros should not be included (for example, enter 80 rather than 080). This field can be up to 40 characters long and has no default setting.

5. Server Port:
Enter the TCP port used for the Remote Services server. This can be set within the range of `0-65535`. The default setting for this field is `8000`.

6. Connection String:
This text is sent to the Remote Services server when the connection is established. This string should include any information required by the server at connection. For example, it may include an ID number, customer number, password, etc. The format is entirely dependent upon the server requirements. This field can be up to 80 characters long. Default text is provided only as an example placeholder. The default text is `[<serialAddress>]XRDI-WS3P:BT`.

7. Connection Interval:
This field specifies the periodic interval in which AC POWER *Sentinel*® 2 attempts to connect to the remote server, or if AC POWER *Sentinel*® 2 is already connected, it is the interval in which AC POWER *Sentinel*® 2 sends the connection string. This field can be set within the range of `1` to `34452` minutes. The default setting for this field is `1` minute.

SNMP
Simple Network Management Protocol (SNMP) is used to manage and administer network devices. AC POWER *Sentinel®* 2 supports SNMP V1.0 and can be configured here. Using SNMP, the input and power outlet states of AC POWER *Sentinel®* 2 can be read as well as some basic information about the device.
See **Appendix F**: **SNMP Requests** for information about how to request information from AC POWER *Sentinel®* 2 using an SNMP manager, as well as where to find MIB files for AC POWER *Sentinel®* 2.

*Note: The read and write community strings used for SNMP are actually the control password found on the **Password** setup tab (see Section 2.4.4). If the control password is disabled, then AC POWER Sentinel® 2 does not check for the community string when issued a Get or Get Next request from the SNMP manager.*

8. SNMP Enabled:
When this option is set to **Yes***, AC POWER Sentinel® 2* will support SNMP. The default setting for this option is **No**.

9. SNMP Manager IP:
When SNMP is used, this field is used to specify the IP address of the SNMP manager. The default setting for this field is `192.168.1.25`.

10. SNMP Port:
When SNMP is used, this field is used to specify the SNMP port that AC POWER *Sentinel®* 2 listens on. The default setting for this field is `161`.

11. SNMP Trap Port:
When SNMP is used, this field is used to specify the SNMP Trap port of the SNMP manager. The default setting for this field is `162`.

12. IP Filter Range 1 and IP Filter Range 2
For additional security, AC POWER *Sentinel®* 2 has a simple built-in firewall. If desired, AC POWER *Sentinel®* 2 can be configured to only allow access to client devices (computers, servers, etc) with certain IP addresses. Two IP address ranges are provided and only client devices with addresses that fall within those two ranges will be allowed to communicate. Devices with IP addresses that fall outside of those ranges will not receive any response from AC POWER *Sentinel®* 2.

Examples:

        To allow access from any device (this is the default setting):

    IP Filter Range 1:   `0.0.0.0`
                            `255.255.255.255`

    IP Filter Range 2:   `0.0.0.0`
                            `0.0.0.0`

        To limit access to only one device (address 192.168.1.33):

    IP Filter Range 1:   `192.168.1.33`
                            `192.168.1.33`

    IP Filter Range 2:   `0.0.0.0`
                            `0.0.0.0`

        To limit access to only devices on the local network and one device on the internet (address 10.143.100.32):

    IP Filter Range 1:   `192.168.1.0`
                            `192.168.1.255`

    IP Filter Range 2:   `10.143.100.32`
                            `10.143.100.32`

Note: The address specified for the Remote Services server (if applicable) is automatically allowed through the firewall no matter how this is set.

2.4.4 Password Tab
AC POWER *Sentinel*® 2 requires a password to log into the setup pages. The password can be changed on this page. Additionally, the installer can enable the requirement for a control page password.

Figure 2.4d- Password Tab

1. Setup Password:
The setup password, which is required to access the setup pages, can be modified by entering a new password here. Passwords that are 8 characters or longer (up to 13 characters can be entered in this field) with both alphabetic and numeric characters are recommended. For security purposes, the password will not be displayed as it is entered. Note that the user name required for accessing the setup pages is `admin` (all lower case). The default setup password is `1234` (also all lower case)*.*

2. Re-enter Setup Password:
When the setup password is changed, it must be entered twice. One time in the previous field and a second time in this field. If the password is not entered identically in both fields, the password will not be changed.

3. Enable Control Password:
The **Control Page** can be viewed without entering a password. For security purposes, a password can be required for access to the **Control Page**. When this field is set to *Yes*, a password will be required to view the **Control Page**. The default setting for this field is *No*.

4. Control Password:
When the Enable Control Password option above is set to *Yes*, this field is used to specify the password which will be required to access the **Control Page**. Passwords that are 8 characters or longer with both alphabetic and numeric characters are recommended. For security purposes, the password will not be displayed as it is entered. Note that AC POWER *Sentinel*® 2 requires a password, but does not require a user name to access the **Control Page**. However, some browsers require that a user name be entered. In this instance enter `none` as the user name. The default control password is `1234`.

5. Re-enter Control Password:
When the control password is changed, it must be entered twice. One time in the previous field, and a second time in this field. If the password is not entered identically in both fields, the password will not be changed.

2.4.5 Date/Time Web (Model XRDI-WS3P:BT only)
AC POWER *Sentinel*® 2 Plus uses the time for scheduled events, such as turning the outlets on or off at scheduled times and for logging (a time stamp is included with each logged event). The time is stored and displayed in 24-hour time format. AC POWER *Sentinel*® 2 Plus has a capacitor-backed real-time-clock circuit that will keep track of time for several days in the event of a power failure.

1. Current Date/Time:
This is the current date and time stored in AC POWER *Sentinel*® 2 Plus. The time is stored and displayed in
24-hour format.

2. Set Time:
This drop-down list offers two options for setting the time: ***Manually* or *Sync with NTP server****.
The options that follow this field will change based upon how this option is set.
> -***Manually*** is selected when the user needs to manually enter the time and date. When this option is selected, parameters 3-4 appear.
> -***Sync with NTP server*** allows the user to set the clock automatically by using an NTP (Network Time Protocol) server. Many NTP servers are available for use on the Internet. In addition, many desktop computers will function as an NTP server (both Mac and PC). Note that if a desktop computer is used, firewall settings may need to be adjusted to allow for NTP communications (port 123). When this option is selected, parameters 5-8 appear.
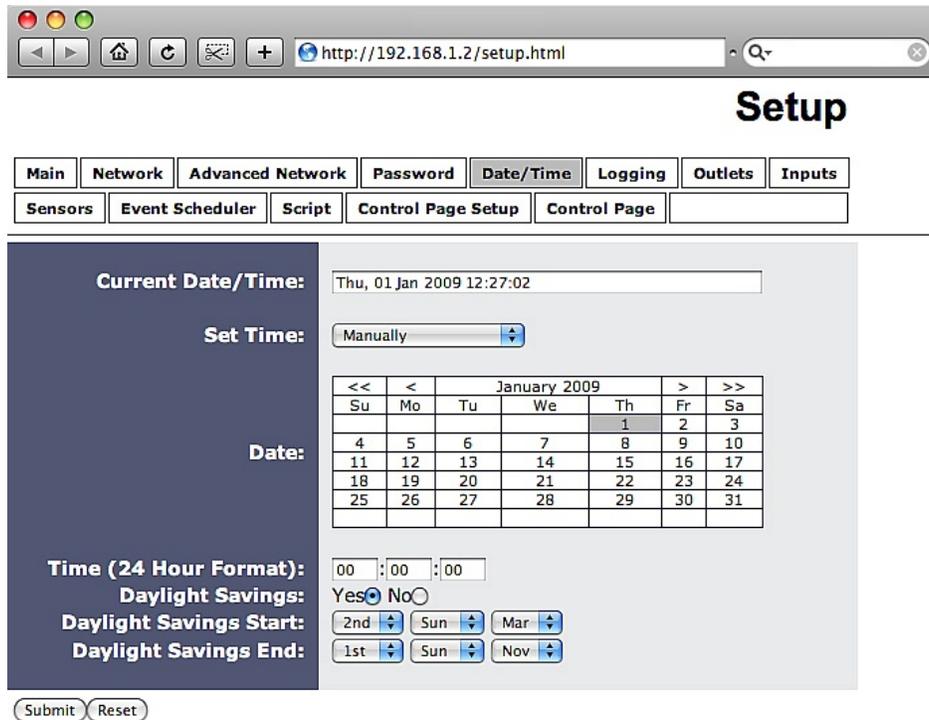
Figure 2.4e- Date/Time Tab-Manually

The following parameters (3-4) are available when the Set Time is set to ***Manually:***

3. Date:
This field is used to enter the current date. The date is entered by first selecting the correct month and year by using the left and right arrows at the top of the calender. The single arrows
(< and >) change the month and the double arrows (<< and >>) change the year. Once the current month and year are displayed, the date should be entered by moving the mouse pointer over the correct day and clicking the (left) mouse button to highlight that date.

4. Time (24 Hour Format):
Enter the time as HH:MM:SS. (HH represents hours in 24-hour format [00-23], MM represents minutes [00-59], SS represents seconds [00-59].)

The following parameters (5-8) are available when Set Time is set to ***Sync with NTP server:***
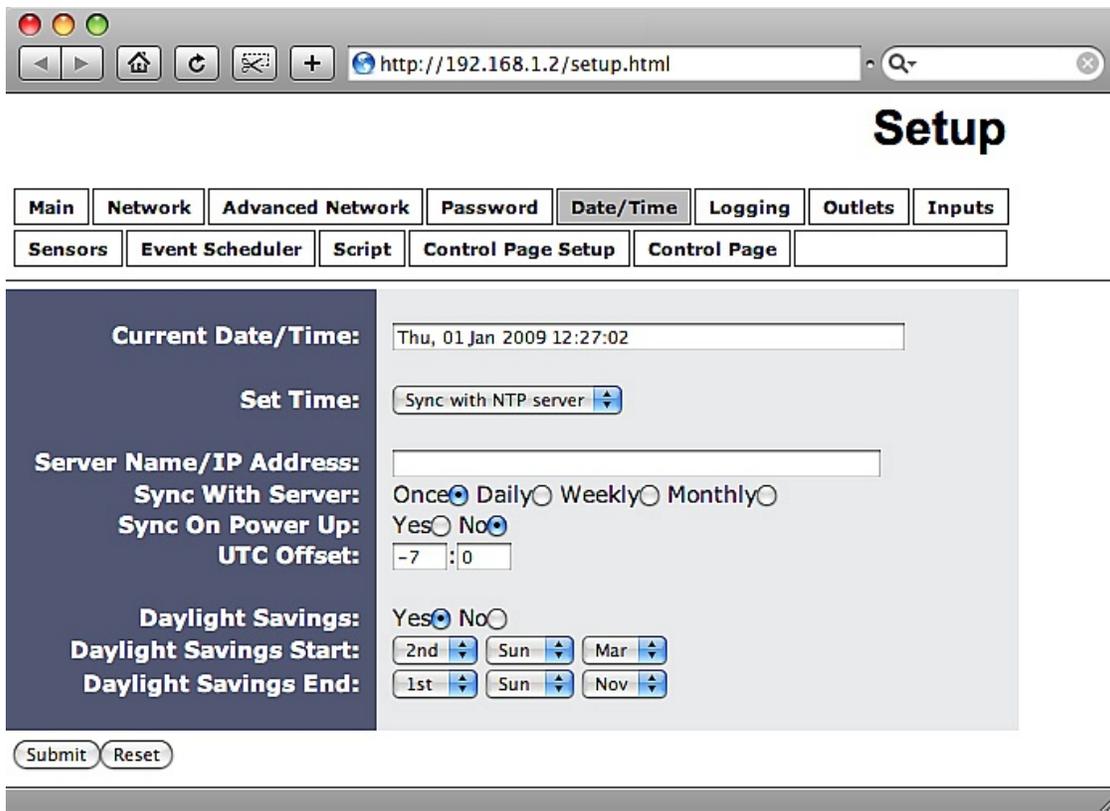
Figure 2.4f- Date/Time Tab-NTP Server Synchronization

5. Server Name/IP Address:
This field is used to specify the name or IP address of the NTP server. If a name is specified, a working DNS server address must be entered into the **Network** settings. If the IP address is specified, it should be entered in the following format `aaa.bbb.ccc.ddd` where each of the letters represents a number between `0` and `255`. This field can be up to 40 characters. There is no default value for this field.

6. Sync With Server:

This option allows the user to specify how often the AC POWER *Sentinel*® 2 Plus time will be synchronized with the time server. When the submit button on this page is pressed, the AC POWER *Sentinel*® 2 Plus will immediately synchronize with the time server. If **Daily**, **Weekly**, or **Monthly** options are selected, AC POWER *Sentinel*® 2 Plus will thereafter re-synchronize with the time server at the period interval specified starting at 12:00 AM (00:00). The exact time the NTP Request occurs is 12:00 AM (00:00) plus the minute equivalent of the last two digits in the models serial number. For example, if the last two digits in the model's serial number were -09, the NTP Request will occur 9 minutes after 12:00 AM. The default value of this setting is **Once** (the unit will immediately sync with the NTP server, but will not automatically sync again).

7. Sync on Power Up:

When this option is set to **Yes**, AC POWER *Sentinel*® 2 Plus will be synchronized with the time server each time it is powered. Note that if it is expected that AC POWER *Sentinel*® 2 Plus will lose power on a frequent basis, it may be beneficial to set this option to **No**; some time servers are configured to dis-allow access from client devices that excessively request their services. The default value of this setting is **No**.

8. UTC Offset:

Time servers return the current time in Universal Time (GMT). It is common for many servers and data loggers to use GMT as their official time, even when they are not located within the GMT time zone. The default value for this field is −7 (Mountain Standard Time). For convenience, the time can be converted to local standard time by entering the offset here. This manual cannot include the UTC Offset for all parts of the world, but the offset for GMT time and the four major US Time zones are listed here.

GMT Time: 0
Eastern Standard Time: -5
Central Standard Time: -6
Mountain Standard Time: -7
Pacific Standard Time: -8

9. Daylight Savings:

In many parts of the United States and in some other countries, the time is shifted forward by one hour during the summer months. This is an effort to conserve energy by making the daylight last longer into the evening hours. If this option is set to **Yes**, the time on AC POWER *Sentinel*® 2 Plus will automatically be shifted forward by one hour at 12:02 AM (00:02) on the Daylight Savings Start date set below, and it will shift back to standard time at 12:02 AM (00:02) on the Daylight Savings End date set below. The default setting is **Yes.**

Please note that by enabling the daylight savings time adjustment, scheduled events will be adjusted for the new time. Also note that logged data includes a time stamp based upon the current time in the device so it is possible to duplicate log times in the spring and miss log times in the fall. To avoid confusion, many servers and data loggers are set to remain on GMT time and do not shift for daylight savings.

10. Daylight Savings Start:

This is the date that daylight savings will start. Note that on this date, at 12:02 AM (00:02) the current time will be shifted forward by one hour (time will jump from 12:02 AM [00:02] to 1:02 AM [01:02]). By default this is set to the 2nd Sunday in March which is the date used in the United States.

11. Daylight Savings End:

This is the date that daylight savings will end. Note that on this date, at 12:02 AM (00:02) the current time will be shifted backward by one hour (time will jump from 12:02 AM [00:02] to 11:02 PM [23:02] the day before). By default this is set to the 1st Sunday in November which is the date used in the United States.

2.4.6 Logging Tab (Model XRDI-WS3P:BT only)
AC POWER *Sentinel®* 2 Plus can be configured to record data such as changes in outlet and input state, sensor data, and events. Both periodic and event-based logging are supported. The logged data is stored in internal non-volatile memory and can be retrieved by entering the command `http://{AC Power Sentinel 2 IP address}/log.txt`. AC POWER *Sentinel®* 2 Plus can be configured to log on a periodic basis and on event triggers. For more information on logging, see **Appendix D: Log Files.**

Note: Changing the log settings will erase the current log file.
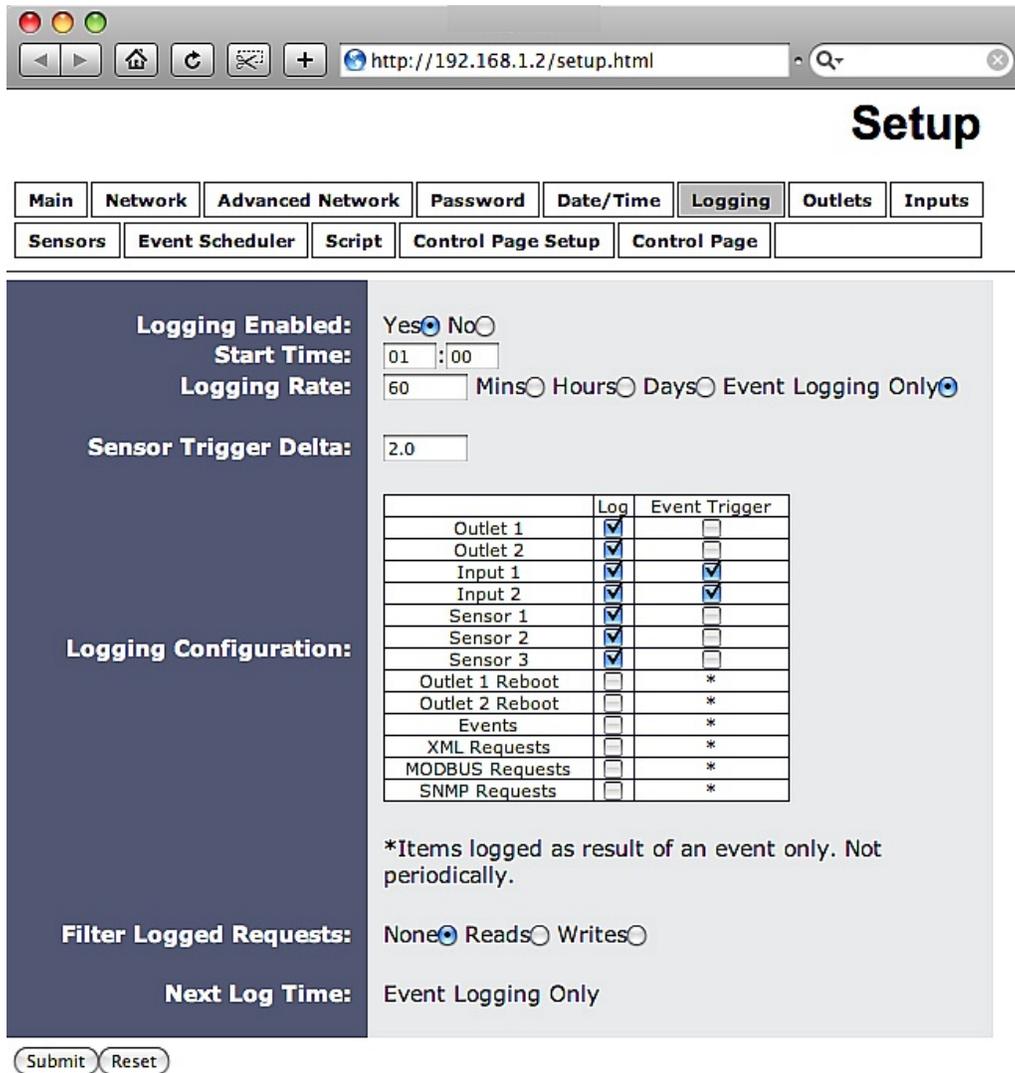
Figure 2.4g- Logging Tab

1. Logging Enabled:
When this option is set to **Yes**, AC POWER *Sentinel®* 2 Plus will record data as configured on this page.

*Note: This option controls data logging but not system logging. System logging is always enabled. The default setting for this option is **No**.*

2. Start Time:
If a logging interval is specified (periodic logging rather than event logging), logging will occur relative to this start time. For example, if the start time is 01:00 and the logging rate is 6 hours, logging will occur at 01:00, 07:00, 13:00, and 19:00. Start time is specified in 24-hour time format. The default setting for this field is `01:00`.

3. Logging Rate:
This field is used to specify the time period of logging. A numerical value is entered into the text field, and the unit of time is selected using the adjacent radio buttons. The range of values in this field is `1-20864`. Time units are **Minutes**, **Hours**, and **Days**. Periodic logging can be disabled by selecting the **Event Logging Only** radio button.

4. Sensor Trigger Delta:
AC POWER *Sentinel*® 2 Plus can be configured to log data when the temperature/humidity measured by a sensor changes by the amount specified in this field. This can be set from `1.0` to `24.0` degrees in `0.1` increments. The default setting for this field is `2.0` degrees.

5. Logging Configuration:
This table is used to select which outlets, inputs, and sensors get logged and which events trigger the logging. The first column in the table identifies the outlets, inputs, sensors, etc. that can be logged or cause logging events. The second column is used to specify what gets logged. The third column is used to specify which events can cause a log entry to be created.

When outlets are selected as an event trigger, logging will occur whenever the selected outlet is turned on or off. When inputs are selected as an event trigger, logging will occur whenever the input state changes. When sensors are selected as an event trigger, logging will occur whenever the temperature/humidity changes by a set amount. When outlet reboots are selected as an event trigger, logging will occur whenever the selected outlet automatically reboots.

The following Log/Event trigger options are available:
Outlet 1
Outlet 2
Input 1
Input 2
Sensor 1
Sensor 2
Sensor 3
Events
Outlet 1 Reboot
Outlet 2 Reboot
XML Requests
Modbus Requests
SNMP Requests

6. Filter Logged Requests:
When logging is enabled for XML Requests, Modbus Requests, or SNMP Requests, the user can filter out **Reads** (such as reading the outlet or input state via an XML request) or **Writes** (such as changing the outlet state via an XML command).

On the **Control Page Setup** tab, the user can specify the refresh rate of the **Control Page**. Each time the page is refreshed, an XML request is sent and logged as a Read. Since the default refresh rate is 3 seconds, the log file can get cluttered by many XML request logs. By selecting ***Reads***, those XML requests will not be shown in the log. Likewise, by selecting ***Writes***, any log created by changing the state of the relay will not be shown in the log file. Default selection is ***None.***

7. Next Log Time:
This field displays the next periodic log time. If logging is disabled, the next log time will indicate "Disabled." If logging is enabled, but periodic logging is disabled (by selecting ***Event Logging Only***) the next log time will indicate "Event Logging Only."

Note: This information is updated only when the page is refreshed.

2.4.7 Outlets Tab
This page provides configuration options for the two outlets.
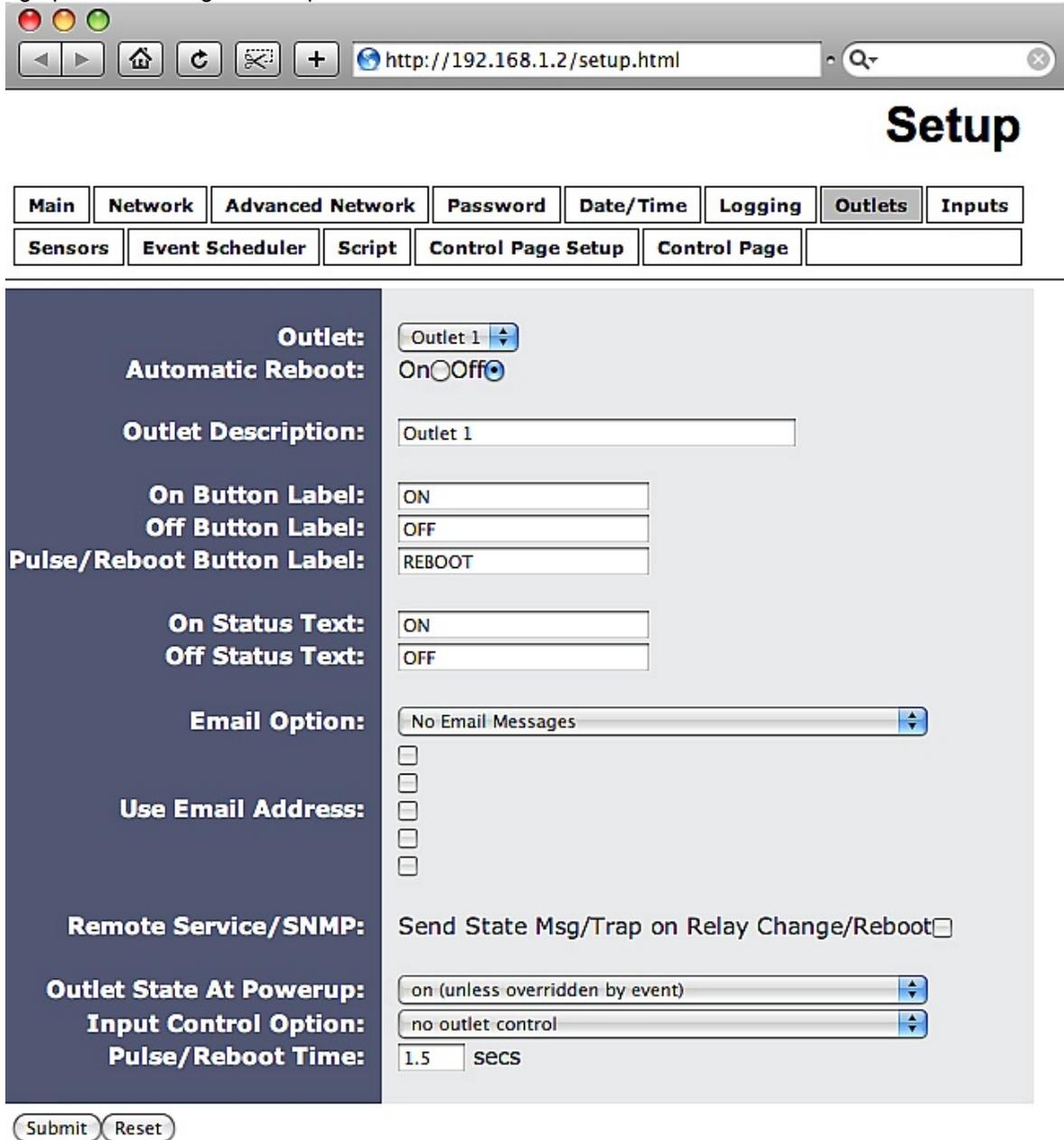
Figure 2.4h- Outlets Tab- Normal Mode (Automatic Reboot set to OFF)

1. Outlet:
This drop down menu is used to select the outlet for which the options below will apply.
        -**Outlet 1** or **Outlet 2**: Selects the built-in outlets.

2. Automatic Reboot:

When this option is set to *On*, AC POWER *Sentinel*® 2 will operate in *Automatic Reboot* mode. In *Automatic Reboot* mode, AC POWER *Sentinel*® 2 is configured to periodically confirm that another device (such as a server, computer, router, etc.) is working by sending ping requests to the device. AC POWER *Sentinel*® 2 expects a response after each ping. If a pre-set number of ping requests fail, it is assumed that the device is not functioning properly. AC POWER *Sentinel*® 2 will attempt to restore the device to normal operation by rebooting the device. In *Automatic Reboot* mode, users still have the ability to manually reboot the device from a remote location over the network. The default setting for this field is *Off*.

When automatic reboot is set to *Off*, AC POWER *Sentinel*® 2 will operate in *Normal* mode. In *Normal* mode, AC POWER *Sentinel*® 2 will only change the state of the outlets when commanded by a user.

3. Outlet Description:

This text field is used to describe the function of the selected outlet. The text appears to the left of the corresponding outlet status on the **Control Page**, and in the email message when email alerts are enabled. Up to 24 characters may be entered in this field. The default text is `Outlet #`.

4. On Button Label:

The text entered in this field appears in the 'On' button for the corresponding outlet on the **Control Page**. Up to 15 characters may be entered in this field. The default text is `ON`.

5. Off Button Label:

The text entered in this field appears in the 'Off' button for the corresponding outlet on the **Control Page**. Up to 15 characters may be entered in this field. The default text is `OFF`.

6. Pulse/Reboot Button Label:

The text entered in this field appears in the 'Pulse' button for the corresponding outlet on the **Control Page**. Up to 15 characters may be entered in this field. The default text is `REBOOT`.

7. On Status Text:

The text in this field specifies the text that will be displayed in the status field in the **Control Page** and in email messages when the corresponding outlet is on. Up to 15 characters may be entered in this field. The default text is `ON`.

8. Off Status Text:

The text in this field specifies the text that will be displayed in the status field in the C**ontrol Page** and in email messages when the corresponding outlet is off. Up to 15 characters may be entered in this field. The default text is `OFF`.

9. Email Option (Model XRDI-WS3P:BT only):

Simple email messages can be sent when outlets are turned on or off. This parameter is used to specify what conditions, if any, will cause email messages to be sent. Note that email notification will work only if the email settings are correctly set up in the **Network** setup page. The following options are available:

-*No Email Messages*: No email notifications will be sent when outlet changes.
-*Send Email when outlet on*: Email notifications will be sent when outlet state changes to *on*.
-*Send Email when outlet off*: Email notifications will be sent when outlet state changes to *off*.
-*Send Email when outlet changes state*: Email notifications will be sent when outlet changes state to *on* or *off*.
-*Send Email on pulse/reboot:* Email notifications will be sent when the outlet is pulsed or automatically rebooted.

Note: The default setting for this field is **No Email Messages***.*

10. Use Email Address (Model XRDI-WS3P:BT only):
If email messages are to be sent out when outlets change state, these check boxes specify to which email addresses the message will be sent. Email addresses specified on the **Network** setup tab will be displayed next to each check box. By default, no boxes are checked.

11. Remote Service/SNMP:
When this box (Send State Msg/Trap on Input Change) is checked, SNMP traps and/or State messages will be sent whenever the outlet state changes.

The following parameters (12-14) are available only in ***Normal*** mode

12.Outlet State at Powerup:
This drop down menu lets the user specify the state of each of the internal relays when the AC POWER *Sentinel*® 2 is powered up. The following options can be selected:
> -**on (unless overridden by event)**: the outlet will be on when power is applied to AC POWER *Sentinel*® 2.
> -**off (unless overridden by event)**: the outlet will not be off upon power up. This is the default setting.
> -**last state (unless overridden by event)** **(Model XRDI-WS3P:BT)**: upon power up, the outlet will return to its last state when AC POWER *Sentinel*® 2 Plus was powered off.

Note: These settings affect the Pulse/Reboot command as follows:

Outlet State at Powerup	Pulse/Reboot Command effect
On	Outlet will Pulse Off when a pulse command is received.
Off	Outlet will Pulse On when a pulse command is received.
Last State	Outlet will Pulse On when a pulse command is received.

Note: Each setting will be overridden by an active event.

13. Input Control Option (Model XRDI-WS3P:BT only):
The inputs can be configured to control the outlet. The options in this drop down menu are used to specify if and how the input affects the outlet, and are described below. Note that in all cases, input changes will only affect the outlet 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 outlet. In other words, if the input causes the outlet to go on, a user may turn the outlet off from the web browser, even if the input is still on.

> -**no outlet control**: The input has no effect on the outlet.
> -**set outlet equal input 1**: When the input is tied to ground, the outlet turns *on*. When the input is open, the outlet turns *off*.
> -**set outlet opposite of input 1**: When the input is tied to ground, the outlet turns *off*. When the input is open, the outlet turns *on*.
> -**latch outlet when input 1 on (reset via web)**: When the input is tied to ground, the outlet turns *on*. Once the outlet is *on*, it will stay *on* (unaffected by input change) until it is turned *off* manually via the web (or command) by a user or AC POWER *Sentinel*® 2 Plus is powered off. This option is useful for alarming functions.
> -**latch outlet when input 1 off (reset via web)**: When the input is open, the outlet turns *on*. Once the outlet is *on*, it will stay *on* (unaffected by input change) until it is turned *off* manually via the web (or command) by a user or AC POWER *Sentinel*® 2 Plus is powered off. This option is useful for alarming functions.

-*latch outlet when input 1 changes (reset via web):* Each time the input is tied to ground or when the input is open, the outlet turns *on*. Once the outlet is *on,* it will stay *on* (unaffected by input change) until it is turned off via the web (or command) by a user or AC POWER *Sentinel®* 2 Plus is powered off. This option is useful for alarming functions.

-*toggle outlet when input 1 on:* When the input is tied to ground, the outlet will change states. When the input is open, the outlet will remain in its current state.

-*toggle outlet when input 1 off:* When the input is open, the outlet will change states. When the input is tied to ground, the outlet will remain in its current state.

-*toggle outlet when input 1 changes:* Each time the input is tied to ground, or open, the outlet will change states.

-*pulse/reboot outlet when input 1 on:* When the input is tied to ground, the outlet will pulse for the Pulse/Reboot Time specified. The input may stay tied to ground and the pulse time will not be affected. If the input is tied to ground, opened, and then tied to ground again, before the end of the pulse time, the Pulse Duration timer will be restarted (it will re-start each time the input is tied to ground) and the outlet will continue to remain *on* until the timer expires.

-*pulse/reboot outlet when input 1 off:* When the input is open, the outlet will pulse for the Pulse/Reboot Time specified. The input can remain open and the pulse time will not be affected. If the input is tied to ground and re-opened before the end of the pulse time, the Pulse Duration timer will be re-started (it will re-start each time the input is open) and the outlet will continue to remain *on* until the timer expires.

-*pulse/reboot outlet when input 1 changes:* Each time the input is tied to ground or opened, the outlet will pulse for the Pulse/Reboot Time specified. If the state of the input changes before the end of the pulse, the timer will be re-started (it will re-start each time the input changes) and the outlet will continue to remain *on* until the timer expires.

14. Pulse/Reboot Time:

When AC POWER *Sentinel®* 2 receives a pulse command for the outlet (through the web page or the command interface), the outlet will pulse for the time specified in this field. Note that when a pulse command is sent through the command interface, the command can include a pulse time which will over-ride this value (for that pulse only). The time is specified in seconds and can range from `0.1` seconds to `86400` seconds in 0.1 second increments. Default time is `1.5` seconds.

The following parameters (15-21) are available only when ***Automatic Reboot*** is '***On***':
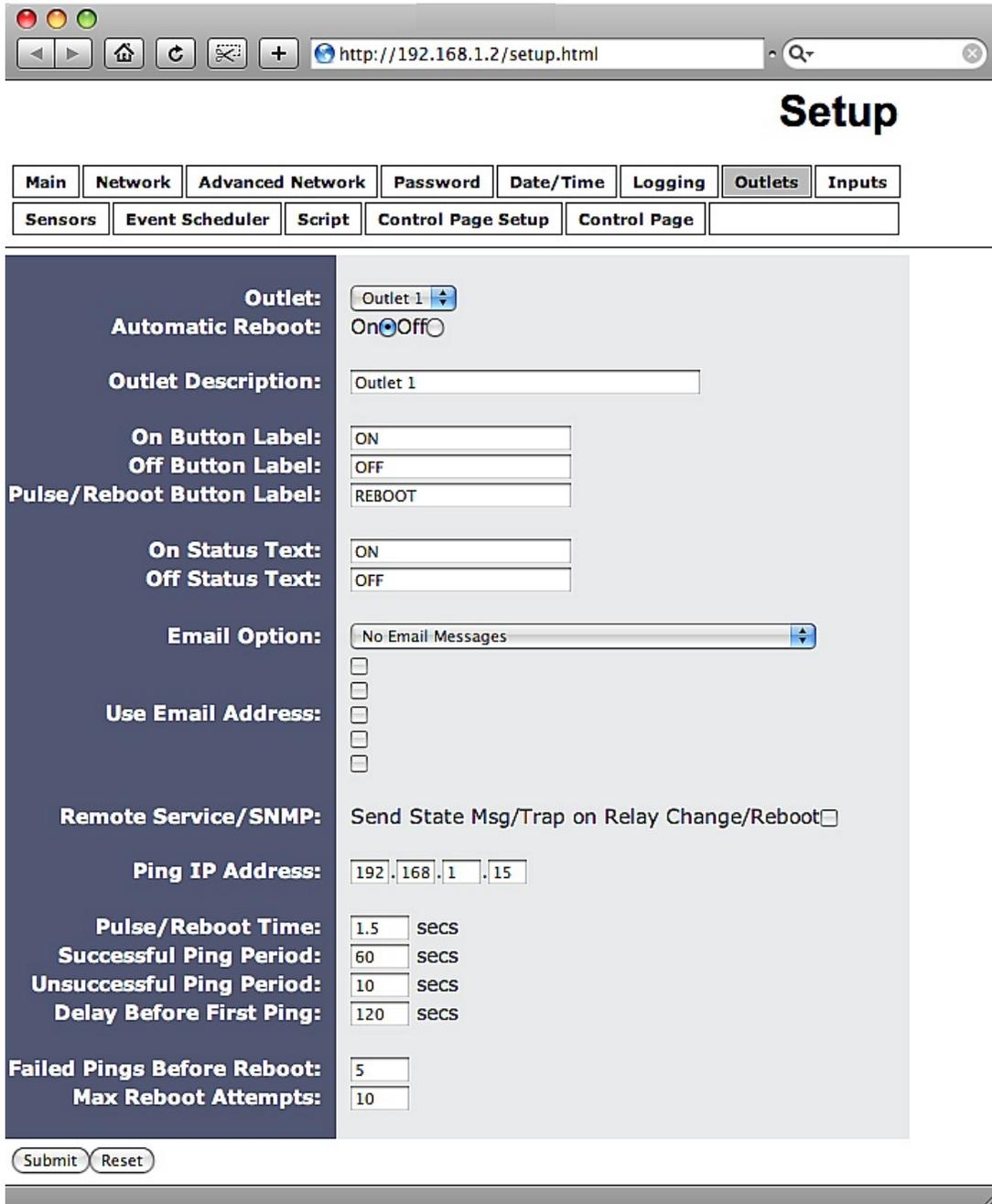
Figure 2.4i - Outlets Tab (Automatic Reboot On)

15. Ping IP Address:
This is the IP address of the device that AC POWER *Sentinel*® 2 will ping. This is typically the IP address of the device that will be rebooted 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 when AC POWER *Sentinel*® 2 is used to reboot a communication device that does not have an IP address, such as a CSU/DSU, satellite modem, router, etc.

16. Pulse/Reboot Time:

This is the time (in seconds) that AC POWER *Sentinel*® 2 pulses the outlet OFF and then back ON to reboot the device connected to the outlet. AC POWER *Sentinel*® 2 executes the reboot sequence when commanded by the user or when the automatic reboot controller determines that it is time to reboot. This time can be set from 1 second to 60000 seconds (1000 minutes). The factory default for this setting is 10 seconds.

17. Successful Ping Period:

This is the time interval (in seconds) between successful ping requests. This time can be set from 1 to 60000 seconds (1000 minutes or 16.6666 hours). The factory default for this setting is 60 seconds.

18. 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 AC POWER *Sentinel*® 2 to determine in less time that the device is not functioning. After each unsuccessful ping, AC POWER *Sentinel*® 2 will wait this time interval (in seconds) before the next ping attempt. This time can be set from 1 to 60000 seconds (1000 minutes or 16.666 hours). The factory default for this setting is 10 seconds.

19. Delay Before First Ping:

When AC POWER *Sentinel*® 2 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 60000 seconds (1000 minutes or 16.666 hours). The factory default for this setting is 120 seconds.

20. Failed Pings Before Reboot:

The device will be rebooted after this number of ping failures. This number can be set between 1 and 255. The factory default for this setting is 5.

21. Max Reboot Attempts:

After the device has been rebooted this number of times without any successful pings, it is assumed that there are problems with the device and AC POWER *Sentinel*® 2 will no longer attempt to reboot the device. At this point, AC POWER *Sentinel*® 2 will leave the device on and continue pinging the device, but will disable the auto-reboot feature. The auto-reboot feature will remain disabled until a user enables it through the C**ontrol Page**, AC POWER *Sentinel*® 2 is powered down and powered up once again, or the device starts to respond to pings. This number can be set between 1 and 255. The factory default for this setting is 10.

2.4.8 Inputs Tab (Model XRDI-WS3P:BT only)
This page provides configuration options for the two control inputs built into AC POWER *Sentinel*® 2 Plus.
*Note: In this manual, the input is considered to be **ON** when the input is tied to ground.*

Figure 2.4j- Inputs Tab

1. Input:
This drop down menu is used to select the control input to which the options below will apply.
        -**Input 1** or **Input 2**: Selects the control inputs.

2. Description:
This text field is used to describe the function of the selected input. The text appears to the left of the corresponding input status on the **Control Page**, and in email messages when email alerts are enabled. This field may be up to 24 characters long. The default text is `Input #`.

3. On Status Text:
The text in this field specifies the text that will be displayed in the **Control Page** and in email messages when the input is ON (input tied to ground). Up to 15 characters may be entered in this field. The default text is `ON`.

4. Off Status Text:
The text in this field specifies the text that will be displayed in the control page and in email messages when the input is OFF (input is open). Up to 15 characters may be entered in this field. The default text is `OFF`.

5. Email Option:

Simple email messages can be sent in response to input changes. This parameter is used to specify what input changes, if any, will cause email messages to be sent. Note that email notification will work only if the email settings are correctly set up in the **Network** setup page. The following options are available:

-**No Email Messages**: No email notifications will be sent due to input changes.
-**Send Email when input on**: Email notifications will be sent when input state changes to *on*.
-**Send Email when input off**: Email notifications will be sent when input state changes to *off*.
-**Send Email when input changes state**: Email notifications will be sent when input changes state to *on* or *off*.

*Note: The default setting for this field is **No Email Messages**.*

6. Use Email Address:

If email messages are to be sent out based on input changes, these check boxes specify to which email addresses the message will be sent. Email addresses specified on the **Network** setup tab will be displayed next to each check box. By default, no boxes are checked.

7. Remote Service/SNMP:

When this box (Send State Msg/Trap on Input Change) is checked, SNMP traps and/or State messages will be sent whenever the input state changes.

2.4.9 Sensors Tab (Model XRDI-WS3P:BT only)
This tab is used to configure temperature/humidity sensors and associated alarms. AC POWER *Sentinel*® 2 Plus will automatically detect whether a temperature or humidity sensor is connected.
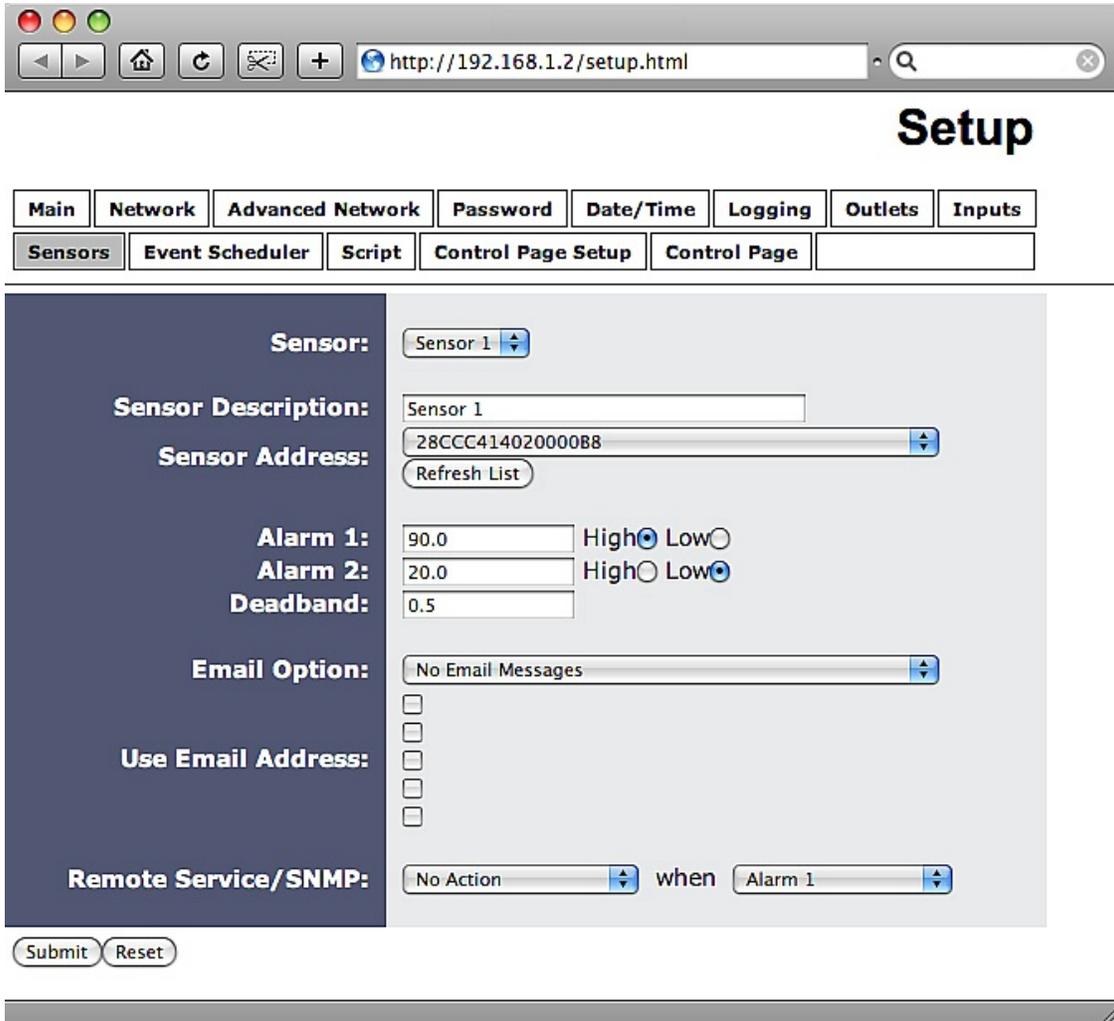
Figure 2.4k- Sensors Tab

1. Sensor:
Up to three sensors can be connected to AC POWER *Sentinel*® 2 Plus. This drop-down list selects the sensor to be configured. The fields below are the same for each sensor.

2. Sensor Description:
The text in this field appears to the left of the corresponding temperature/humidity reading on the **Control Page**. This text also appears in the email status message when email is enabled. This field can be up to 24 characters in length. The default text in this field is `Sensor #`.

3. Sensor Address:
Each sensor connected to AC POWER *Sentinel*® 2 Plus should be associated (or assigned) to a sensor number. This identifies the name, location, and function of the sensor. Every temperature/humidity sensor comes from the factory with a unique, non-changeable address. When the sensors tab is selected (or the Refresh List button is pressed), AC POWER *Sentinel*® 2 Plus scans the bus for sensors.

The addresses of the sensors that are found on the bus are listed in the drop-down list. For each sensor number (Sensor 1... Sensor 3), select the address of the appropriate sensor from the drop-down list.

Selecting sensors is simplest when the sensors are connected to the bus one at a time. The procedure is to start with one sensor and associate it with the appropriate sensor number by selecting the sensor address within the appropriate drop-down list. Submit the page, connect a second sensor, and press the Refresh List button. Associate the second sensor to the appropriate sensor number. Continue this procedure until all sensors are set up.

4. Alarm 1:
This setting is used to set the trigger point for an alarm condition. The number field specifies the temperature/humidity at which the alarm is triggered. The "High" and "Low" radio buttons indicate whether the alarm is triggered as a high or low alarm. A high alarm is triggered when the sensor reading exceeds the alarm value, and a low alarm is occurs when the sensor reading falls below the alarm value.

5. Alarm 2:
This is a second alarm trigger that works similar to Alarm 1.

6. Deadband:
This option sets the deadband used when evaluating alarm conditions. Deadband prevents alarms from triggering excessively when the sensor measurement vacillates quickly around the set point due to normal fluctuations. Deadband on high alarms requires the measurement to fall below the high alarm point minus the deadband before the high alarm can be triggered again. Likewise the deadband on the lower alarm requires the measurement to rise above the low alarm point plus the deadband before the low alarm can be triggered again   For example, if the deadband is set to 1 degree, and a high alarm is to occur at 95 degrees, the dead band ensures that once the high alarm is triggered, it won't go off until the temperature return below 94 degrees (95 – 1). This reduces problems with small fluctuations in sensor readings triggering multiple alarms.
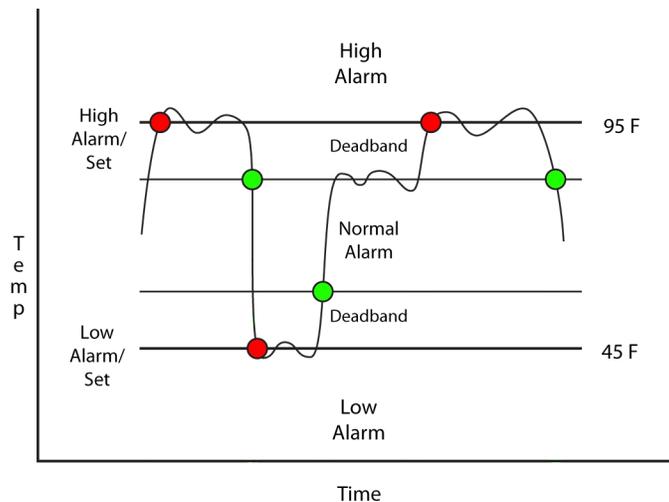
Figure 2.4l - Alarm Deadband

7. Email Option:
Simple email messages can be sent in response to alarm conditions. This parameter is used to specify what alarm conditions, if any, will cause email messages to be sent. Note that email notification will work only if email is correctly setup in the **Network** setup page.

> *-No Email Messages*: No email messages will be sent due to alarm conditions.
> *-Send Email on Alarm 1*: Email notifications will be sent due to Alarm 1 conditions.
> *-Send Email on Alarm 2*: Email notifications will be sent due to Alarm 2 conditions.
> *-Send Email on Alarm 1 and Alarm 2*: Email notifications will be sent due to Alarm 1 or Alarm 2 conditions.
> *-Send Email on Alarm 1, Alarm 2, and Normal*: Email notifications will be sent due to Alarm 1, Alarm 2, or when Normal conditions are regained.

8. Use Email Address:
If email messages are to be sent out based on alarm conditions, these check boxes specify to which email addresses the message will be sent. Email address specified on the **Network** setup tab will be shown next to each check box.

9. Remote Services/SNMP:
This field specifies the action with a remote server due to an alarm condition.

> *-No Action:* No action is taken.
> *-Send State Msg/Trap:* An event string will be sent to the remote server.

For more information regarding the event string or other commands, see **Appendix E**: **Remote Services**.

The second drop down box specifies the conditions that will cause an alarm trigger. The following alarm conditions are available:

> *-Alarm 1*: The specified action occurs due to Alarm 1.
> *-Alarm 2:* The specified action occurs due to Alarm 2.
> *-Alarm 1 or Alarm 2*: The specified action occurs due to Alarm 1 or Alarm 2.

2.4.10 Events Scheduler Tab (Model XRDI-WS3P:BT only)
Events can be programmed to turn the outlets on and off at specific times. Up to 50 events can be created. Each event can occur one time or multiple times.
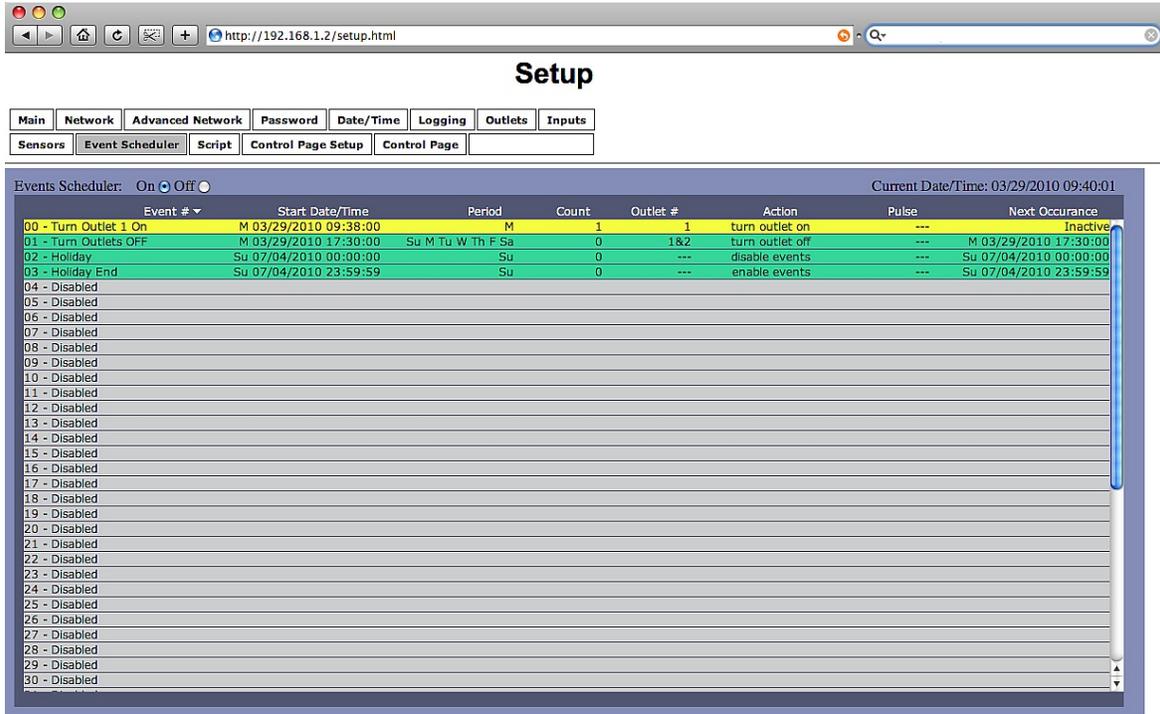
Figure 2.4m- Events Scheduler Tab

A list of all scheduled events and information about each event is displayed in a table. Events can be sorted according to each column, in ascending or descending order. The following is displayed.
  -**Events Scheduler: On/Off**: Turns scheduled events on or off. **On** is selected by default.
  -**Current Date/Time**: Displays the current date and time as specified in the **Date/Time** setup tab.
  -**Event #**: The number and name of events are listed.
  -**Start Date/Time**: The start date and time (displayed in 24-hour time) of the event is listed here.
  -**Period**: The duration of the event.
  -**Count**: The number of times the event will occur.
  -**Outlet #**: Which of the two outlets, if any, will be affected by the event.
  -**Outlet Action**: If either of the two outlets have been programmed to take action, that action will be displayed here.
  -**Pulse/Reboot**: The outlets can be programmed to pulse/reboot upon the trigger of the event, and the pulse duration will be displayed.
  -**Next Occurrence**: The date and time of the event's next occurrence will be displayed. If the event has already occurred, the event will be listed as "Inactive" here.

The events are color coded to indicate their current state. Gray events have not been set up. Green events are active and will occur sometime in the future. Red events have been temporarily disabled by the disable event action. Yellow events have already occurred and are not scheduled to happen in the future.

Configuration of events is accomplished by clicking on the appropriate event, which causes the following setup screen to be displayed:

Figure 2.4n- Event Setup

1. Current Date/Time:
This field displays the current date and time as specified in the **Date/Time** tab.

2. Description:
Text entered here is used to name and describe each event. Default text is `Event Description`.

3. Start Date:
This field is used to enter the start date of the event. The date is entered by first selecting the correct month and year by using the left and right arrows at the top of the calender. The single arrows (< and >) change the month and the double arrows (<< and >>) change the year. Once the current month and year are displayed, the date should be entered by moving the mouse pointer over the correct day and clicking the (left) mouse button to highlight that date.

4. Start Time (HH:MM:SS):
The start time of the event is entered in the drop down menus as HH:MM:SS (HH represents hours in 24-hour format [00-23], MM represents minutes [00-59], SS represents seconds [00-59]). Default setting is `00:00:00`.

5. Period:
When events are configured to occur more than one time (any entry other than 1 in the Count below), the period field specifies the time between events. For long events (pulse outlet), this is the time interval between the time the event begins and the next time the event begins. This time can be specified in

Seconds, ***Minutes***, ***Hours***, ***Days*** or ***Week***s by selecting the appropriate option in the drop down menu. Default settings is `0 Days`. Note that selecting `0` will disable the event.

6. Days:
When a *Period* of one day is selected, the day (or days) on which that event will occur can be specified by marking the appropriate check boxes.

7. Count:
The number of times the event will occur is specified. Default text is `0`. Note that entering `0` in this field will cause the event to occur continuously.

8. Action:
This drop down menu specifies which action will take place when the event occurs. The following options may be selected:

-no action: When this option is selected, nothing will happen when event occurs.
-turn outlet on: This option causes outlet(s) specified in the Affected Outlet(s) field to turn on (coil energized) when event occurs.
-turn outlet off: This option causes outlet(s) specified in the Affected Outlet(s) field to turn off (coil de-energized) when event occurs.
-pulse/reboot outlet: This option causes outlet(s) specified in the Affected Outlet(s) field to operate as follows:

Outlet State at Power up	Pulse/Reboot Outlet Action
On	Outlet will Pulse Off when event occurs and then turn on after the Pulse duration time expires.
Off	Outlet will Pulse On when event occurs and then turn off after the Pulse duration time expires.
Last State	Outlet will Pulse On when event occurs and then turn off after the Pulse duration time expires

Note: Pulse functionality depends on initial state of the outlet on power up, and whether the outlet is set in auto-reboot mode or normal mode (see section 2.4.7 for additional information).

-toggle outlet: This option causes the outlet(s) specified in the Affected Outlet(s) field to change states.
-disable events: This option causes all events to be disabled at the specified time. When this event occurs, no events will be executed until another event with the ***enable events*** option occurs. This option is useful, for example, to prevent prescheduled daily events from happening on holidays.

Note: Events that would have occurred while the events were disabled will not be executed once events are enabled. For example, if an event were scheduled to turn Outlet 1 on at 3:00 each day, but one day events were disabled until 3:10, the Outlet will not automatically turn on at 3:10 when the events are enabled. It will, however, turn on the next day at 3:00 (assuming events are still enabled).

-enable events: This option is used after an event with the ***disable events*** option occurs to allow events to resume.
-set extVar0: External variables provide a way for scripts written in BASIC to interact with users, and for scripts to execute as a result of event occurrences. This option sets the variable extvar0 to 1 when the event occurs. If a running script uses this variable, it will function as defined in the

script when the variable is set to 1.
-*clear extVar0:* This option clears extvar0 (sets it to 0) when the event occurs. *See description of set extVar0 for more information.*

9. Affected Outlet(s):
This drop down menu is used to specify which of the outlets turn on upon occurrence of the event. One of the following options may be selected:
-*outlet 1*
-*outlet 2*
-*both outlets*

10. Pulse/Reboot Duration:
If the *Outlet Action* has been set to *pulse/reboot outlet*, the Pulse/Reboot Duration is set in this field. The time is specified in seconds and can range from `0.1` seconds to `86400` seconds in `0.1` second increments. Default time is `1.5` seconds.

2.4.11 Script Tab (Model XRDI-WS3P:BT only)

AC POWER *Sentinel*® 2 Plus can be used to run simple custom programs written in a language similar to BASIC. This page is used to load and execute these programs. Before it can be loaded to AC POWER *Sentinel*® 2 Plus, a script must first be written as a .txt file. The file must then be uploaded to AC POWER *Sentinel*® 2 Plus. The maximum size of script that can be uploaded to the device is 2K bytes. Notes on writing a basic program for AC POWER *Sentinel*® 2 Plus can be found in **Appendix G: Basic Scripts.**

Figure 2.4o- Script Tab

1. BASIC Script:
This field displays the .txt file that is uploaded to AC POWER *Sentinel*® 2 Plus. Text displayed in this screen cannot be edited. In order to edit any script, it must be rewritten in the .txt file and uploaded to the unit again.

2. Interpreter Status:
This field displays whether the program is continuing to run, has stopped or finished, or if there are errors contained in the script. If there are errors in the script, the line on which the error occurred is displayed.

3. Upload BASIC Script:
This field displays the script selected to be uploaded to the device. To upload a script to AC POWER *Sentinel*® 2 Plus, click the 'Choose File' button, find the .txt file previously written, and select 'Open.' The location of the file should appear in the neighboring field. To upload the script to the unit, select 'Submit.'

4. Run Script:
This option selects whether or not the selected script will be run after it has been uploaded. The Submit button must be clicked to run the script.

5. External Variables:
External Variables are variables that can be used in BASIC scripts. They are called External Variables because their values can be changed externally to the BASIC script using xml requests, or through the **Control Page**. This allows basic scripts to react to user input. These variables are considered to be floating point numbers just like the other variables in the BASIC script.

The following page is displayed when configuring External Variables:

Figure 2.4p- External Variable Configuration

1. External Variable:
This drop down menu offers the option to configure each of the five External Variables.

2. Display State:
Checking this box will display the state of the selected External Variable on the **Control Page**.

3. Display Button 1:
Checking this box will display a button on the **Control Page**. Clicking this button on the **Control Page** will set the extVar to value 1.

4. Display Button 2:
Checking this box will display a button on the **Control Page**. Clicking this button will set the extVar to value 2.

5. Description:
Text entered here will be displayed in the left column of the control page. Up to 24 characters may be entered here. The default text is `extVar#`.

6. Button 1 Label:
This text field is used to describe the function of button 1 of the selected extVar. The text also appears to the right of the corresponding extVar status. Up to 15 characters may be entered here. By default, this text is `ON` for a value of 1.

7. Button 2 Label:
This text field is used to describe the function of button 2 of the selected extVar. The text also appears to the right of the corresponding extVar status. Up to 15 characters may be entered here. By default, this text is `OFF` with a value of 0.

8. Status 1 Text:
The text in this field specifies the text that will be displayed when the extVar is value 1, with a gray background. The text also appears in the status column on the **Control Page**. Up to 15 characters may be entered here. By default the text is `ON`.

9. Status 2 Text:
The text in this field specifies the text that will be displayed when the extVar is value 0, with a gray background. The text also appears in the status column on the **Control Page**. Note that if the extVar is any other value than 1 or 0, the value will be displayed in the same column, with a gray background. Up to 15 characters may be entered here. By default the text is `OFF`.

2.4.12 Control Page Setup Tab
The **Control Page Setup** page is used mainly to set parameters that affect the view of the **Control Page**, how often it will refresh, etc.

Figure 2.4q- Control Page Setup Tab

1. Main Header Text:
The text entered here appears at the top of the **Control Page**. It also appears in the header of the email text when the email notification is used. This field can be up to 40 characters in length. The default text is `AC Power Sentinel 2 (Plus)`.

2. Auto Refresh:
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. When set to *Yes,* the web page will be refreshed at the time interval specified in the Refresh Rate setting. When set to *No,* the web page will need to be manually refreshed to show the current status of the unit in the control page.

3. Refresh Rate:
When 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.

4. Display Configuration:
This field sets the options that are displayed on the **Control Page**.
  -*Display State:* For Outlets 1 and 2, Inputs 1 and 2, and Sensors 1-3, this controls whether the current states of the Outlet, Input, and Sensor are displayed.
  -*Display On/Off Buttons:* When checked, an ON/OFF button is displayed on the **Control Page** for direct user control.
  -*Display Pulse/Reboot Button:* When checked, a button allowing a user to manually pulse/reboot a specified outlet is displayed.
  -Display Auto Reboot On/Off Button: When checked, a button allowing a user to manually reboot is displayed.

Section 3: Operation

AC POWER *Sentinel*® 2 can be operated using a web browser, by sending text commands to an XML status/control page, and/or by sending Modbus/TCP requests. In addition the AC POWER *Sentinel*® 2 Plus model allows you to control the outlets using inputs, or events. (Using an input or event to control the outlets was described throughout previous sections of the manual, and will not be described here.)

3.1 Browser Operation

Once AC POWER *Sentinel*® 2 is set up, users can access the **Control Page** using a web browser by typing the IP address of AC POWER *Sentinel*® 2 into the web browser address bar. For example, using the default IP address, the user would enter `http://192.168.1.55`. If the IP address is changed from the default, the user must use the new IP address. Note that if any port is used other than the default port 80, the port must also be included in the request. For example, accessing the unit at port 8000 would be as follows: `http://192.168.1.55:8000`.

The following screen appears when the Control Page is Selected:
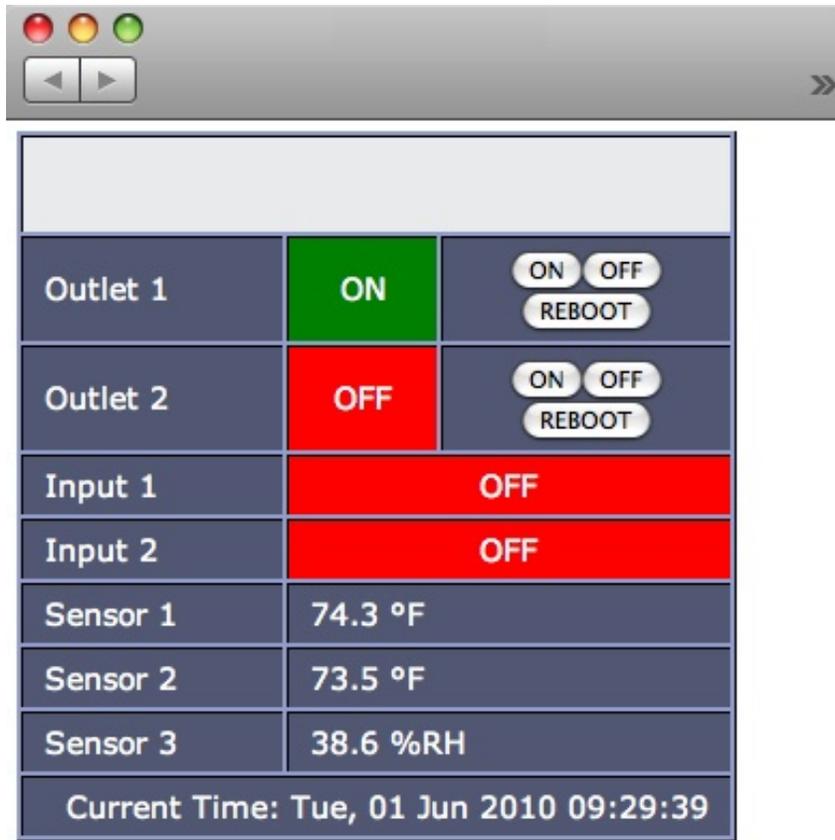
Figure 3.1a- Control Page

1. Header:
Displays the text entered in the **Main Header Text** field on the **Control Page Setup** tab in the setup pages.

2. Outlet 1 and 2:
These rows display the current state of the two outlets and allow the user to change the outlet state. Each of these rows can be displayed (as shown) or not displayed by checking or unchecking the appropriate boxes on the **Control Page Setup** tab in the setup pages. The text in the left column (by default reads `Outlet 1;` and `Outlet 2`) is specified in the Description field in the **Outlets** tab in the setup pages. The state of the outlet is shown to the right of the outlet description text. By default, the status text will read ON or OFF; however, the status text can be changed in the **Outlets** tab. To the right of the outlet status, buttons are provided to control the outlets. The buttons can be removed when needed (in the **Control Page Setup** tab) and the text within the buttons can be customized (in the **Outlets** tab).

3. Input 1 and 2 (Model XRDI-WS3P:BT only):
These rows display the current state of the two inputs. Each row can be displayed (as shown) or not displayed by checking or unchecking the appropriate boxes in the **Control Page Setup** tab in the setup pages. The text in the left column (by default reads `Input 1` and `Input 2`) is specified in the Description field in the **Inputs** tab in the setup pages.

4. Sensor 1-3 (Model XRDI-WS3P:BT only):
These rows display the current temperature or humidity measured by the associated sensors. Each row can be displayed (as shown) or not displayed by checking or unchecking the appropriate boxes under the **Control Page Setup** tab in the setup pages. The text in the left column (by default reads `Sensor 1` through `Sensor 3`), is specified in the Sensor Description field under the **Sensors** tab in the setup pages.

5. Current Time (Model XRDI-WS3P:BT only):
Displays the current time that is set using the **Date/Time** tab in the setup pages.

Note: If the sensors are not configured (sensor addresses selected for each sensor) or are unreadable, the display will read `x.x` rather than displaying a false numerical value.

3.2 XML Operation

Custom computer applications may be created to monitor and control AC POWER *Sentinel®* 2 without using a web browser. There are two XML pages that can be used to monitor and control AC POWER *Sentinel®* 2, `state.xml` and `eventX.xml` (where `X` is the event number).

3.2.1 Controlling the Unit Through state.xml

The state of the outlets, inputs, and sensors can be monitored by sending a request to port 80 (or port specified in setup) for the XML page state.xml. The outlets can be controlled 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 address bar of a web browser.

Request the current state: `http://192.168.1.55/state.xml`

This will return the following XML page:

```
<datavalues>
        <relay1state>0</relay1state>
        <relay2state>0</relay2state>
        <reboot1state>0</reboot1state>
        <reboot2state>0</reboot2state>
        <failures1>0</failures1>
        <failures2>0</failures2>
        <rbtAttempts1>0</rbtAttempts1>
        <rbtAttempts2>0</rbtAttempts2>
        <totalreboots1>0</totalreboots1>
        <totalreboots2>0</totalreboots2>
        <input1state>0</input1state>
        <input2state>0</input2state>
        <units>F</units>
        <sensor1temp>77.3</sensor1temp>
        <sensor2temp>H24.9</sensor2temp>
        <sensor3temp>x.x</sensor3temp>
        <extvar0>0.00</extvar0>
        <extvar1>0.00</extvar1>
        <extvar2>0.00</extvar2>
        <extvar3>0.00</extvar3>
        <extvar4>0.00</extvar4>
        <serialNumber> {AC Power Sentinel serial number} </serialNumber>
        <time>1253030401</time>
</datavalues>
```

The tags <relay1state>,<relay2state>,<reboot1state>,<reboot2state>,<input1state>,and <input2state> indicate the current state of AC POWER *Sentinel®* 2. Values for each tag are described below.

Note: <inputXstate>,<units>, and <sensorXtemp> are only used in model XRDI-WS3P:BT.

\<relayXstate\>	0= Outlet off (coil off) 1= Outlet on (coil energized)
\<rebootXstate\>	0= Auto-Reboot off 1= Pinging 2= Waiting for response 3= Rebooting 4= Waiting for Boot
\<failuresX\>	#= Number of reboot failures
\<rbtAttemptsX\>	#= Number of reboot attempts during a reboot period (Auto-Reboot only)
\<totalreboots\>	#= Total number of reboots (Auto-Reboot only)
\<inputXstate\>	0=Off (voltage not applied to input) 1=On (voltage applied to input)
\<units\>	F= Fahrenheit C= Celsius
\<sensorXtemp\>	x.x=Indicates that no digital temperature sensor is associated with the sensor. 77.3= Current temperature reading from associated digital temperature sensor. H24.9= Current humidity reading from associated humidity sensor.
\<extvarX\>	This displays the value of each External Variable.
\<serialNumber\>	00:00:00:00:00:00 The serial number of AC POWER *Sentinel*® 2.
\<time\>	1253030401=Time displayed in "epoch time" (number of seconds since January 1, 1970)

Commands can be sent to AC POWER *Sentinel*® 2 which control the outlet and change its state. Commands are sent using a variable called relayXState (X is replaced by 1 for outlet 1 or 2 for outlet 2). A few examples of using relayXState are given here.

Turn Outlet 1 'off:'	`http://192.168.1.55/state.xml?relay1State=0`
Turn Outlet 1 'on:'	`http://192.168.1.55/state.xml?relay1State=1`
Turn Outlet 2 'off:'	`http://192.168.1.55/state.xml?relay2State=0`
Turn Outlet 2 'on:'	`http://192.168.1.55/state.xml?relay2State=1`

All relayXState options are contained in the following list:

relayXState	0=Turn outlet off (when in Automatic Reboot mode, outlet turns off but auto-reboot is still enabled) 1=Turn outlet on (when in Automatic Reboot mode, outlet turns on but auto-reboot is still enabled) 2=Pulse outlet (reboot) 3= Disable automatic reboot (only when outlet is in Automatic Reboot mode) 4= Enable automatic reboot (only when outlet is in Automatic Reboot mode) 5=Toggle the state of the outlet (only when NOT in Automatic Reboot Mode)

When the pulse command is sent to AC POWER *Sentinel*® 2, the outlet 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 along with the desired pulse time.

The pulseTime variable does not change the pulse time specified in the setup page and 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 5 second pulses, and another 1.5 second pulse to outlet 1, you would issue the following commands:

```
state.xml?relay1State=2                      This will pulse Outlet 1 for the preset time (1.5 seconds)
state.xml?relay1State=2&pulseTime1=5         This will pulse Outlet 1 for 5 seconds
state.xml?relay1State=2&pulseTime1=5         This will pulse Outlet 1 for 5 seconds
state.xml?relay1State=2&pulseTime1=5         This will pulse Outlet 1 for 5 seconds
state.xml?relay1State=2                      This will pulse Outlet 1 for the preset time (1.5 seconds)
```

Note that `http://192.168.1.55/` or the new IP address would be included on all commands above. Also note that when commands are sent to AC POWER *Sentinel*® 2, its current state is returned in the form of an XML page. The commands can also be sent without having AC POWER *Sentinel*® 2 return the XML page. This is accomplished by adding the noReply field as follows:

Turn Outlet 1 'on' without returning state: `http://192.168.1.55/state.xml?relay1State=1&noReply=1`
Turn Outlet 1 'off' without returning state: `http://192.168.1.55/state.xml?relay1State=0&noReply=1`

Password:
If the control password is enabled in AC POWER *Sentinel*® 2 unit and the state.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?relay1State=1&noReply=1 HTTP/1.1` **(Ends with two \r\n)**

The html request header with the password looks like this:

`GET /state.xml?relay1State=1&noReply=1 HTTP/1.1`**(\r\n here)**
`Authorization: Basic bm9uZToxMjM0` **(Ends with two \r\n)**

where bm9uZToxMjM0 is the base 64 encoded version of the user name and password none:1234

3.2.2 Monitoring Events Through eventX.xml (Model XRDI-WS3P:BT only)
The outlets can be configured to turn on, turn off, or pulse at specified times. Instructions to change the outlet state at a given time (or periodically) are called events. AC POWER *Sentinel*® 2 Plus supports 50 events and these events can be monitored through an XML page called eventX.xml (where X is the event number 0-49). This can be demonstrated by entering commands into the address bar of a web browser.

Request the current state of event one: `http://192.168.1.55/event0.xml`

This will return the following XML page:

```
<event0>
    <active>yes</active>
    <currentTime>09/14/2009 15:14:09</currentTime>
    <nextEvent>09/15/2009 15:15:00</nextEvent>
    <period>1 s</period>
    <count>10</count>
    <relay>1</relay>
    <action>pulse relay</action>
    <pulseDuration>0.5 s</pulseDuration>
</event0>
```

For each event, the following tags are displayed in the XML page: <eventX>, <active>, <currentTime>, <nextEvent>, <period>, <count>, <relay>, <action>, and <pulseDuration>. Each of the tags are described below:

<eventX>   All of the XML tags for each event are encapsulated between opening and closing tags called eventX. The X in the tag represents the event number (0-49).

<active>   This field indicates whether or not the event is active. The text `yes` indicates that the event is active and the event will occur at the next event time (given that the next event time is in the future). The text `no` indicates that the event is inactive and the event will no longer take place.

<currentTime>   This field indicates the current date and time of the unit. The date and time are given as *MM/DD/YYYY HH:MM:SS* and is in 24-hour format.

<nextEvent>   This field indicates the next time the event is scheduled to occur. The format for the date and time is *MM/DD/YYYY HH:MM:SS*. Note that if an event is inactive, this field will display the date and time as *xx/xx/xxxx xx:xx:xx*.

<period>   For events that occur more than one time, this field indicates the period of the event (time between event occurrences). The unit of time is indicated after the value (seconds (s), minutes (m), hours (h), days (d), or weeks (w)). If this field is set to 0, then the event has been disabled.

<count>   This field indicates the number of remaining times the event will occur. If this field equals 0 and the event is active, then the event will occur continuously forever.

<relay>   1 = Event action will apply to Outlet 1.
                    2 = Event action will apply to Outlet 2.
                    1,2 = Event action will apply to both outlets.

<action>   on (Outlet will turn on when event occurs.)
                            off (Outlet will turn off when event occurs.)
                            pulse (Outlet will pulse when event occurs.)
                            toggle (Outlet will toggle state when event occurs.)

<pulseDuration>   When the event causes the outlet to pulse, this field indicates the time (in seconds) that
                            the outlet will pulse.

3.2.3 XML Diagnostics
There is a special XML page that can be requested for diagnostic purposes called diagnostics.xml. A request for this file (by typing `{AC Power Sentinel 2 IP Address/diagnostics.xml}` in the browser address bar) returns the following:

```
<datavalues>
      <memoryPowerUpFlag>1</memoryPowerUpFlag>
      <devicePowerUpFlag>1</devicePowerUpFlag>
      <powerLossCounter>1</powerLossCounter>
</datavalues>
```

The tags <memoryPowerUpFlag>, <devicePowerUpFlap>, and <powerLossCounter> are helpful parameters when trying to diagnose a problem with AC POWER *Sentinel*® 2.

<memoryPowerUpFlag> (Model XRDI-WS3P:BT only)	Indicates a loss of power to the capacitor-backed real-time clock. This field can be set to `0`. A value of `1` indicates that the real-time clock lost power. This should only happen if the device has lost power for several days. There is an internal capacitor that can power the real-time clock for an extended period of time, even if the main power is lost. If the real-time-clock loses power, the time will have to be reset. By default, this will read `1` until it is set to `0`.
<devicePowerUpFlag>	Indicates a loss of power to the device. This field can also be set to `0`. A value of `1` means AC POWER *Sentinel*® 2 has lost power at least one time since the flag was set to `0`.
<powerLossCounter>	This field is a count of how many times AC POWER *Sentinel*® 2 has lost main power.

The <devicePowerUpFlag> and <memoryPowerUpFlag> can be cleared by requesting the file diagnostics.xml and passing parameters along with this request. For example, to clear both flags, the following request can be sent to the device:

`http://192.168.1.55/diagnostics.xml?memoryPowerUpFlag=0&devicePowerUpFlag=0`

The powerLossCounter can also be cleared by using the request:

`http://192.168.1.55/diagnostics.xml?powerLossCounter=0`

Requests for the diagnostics.xml file do not require a password.

3.3 Configuring Events Through Get Requests (Model XRDI-WS3P:BT only)

Events can be configured using a Get request. For example, to configure event 5 to start on March 8, 2009 at 02:30:10 and continue periodically every second for 50 times, toggling the outlet each time, send the following request (using the default IP address):

```
http://192.168.1.55/eventSetup.srv?e5=1236479410;1;0;50;0;4;1.50;0;Event5Desc;127;
```

The basic format of the request is: e(event#)=epoch time;period;period units;count;outlet number;outlet action;pulse duration;0;description; days;

`e5=`	**Parameter Name:** Each event has a parameter name. In this case the parameter name is e5. For event 49 the parameter name would be e49.
`1236479410`	**Epoch Time:** This is the number of seconds up to the desired start date since January 1, 1970.
`1`	**Period:** The period value. In this example, 1
`0`	**Period Units:** The units of the period entered. 0-Seconds, 1-Minutes, 2-Hours, 3-Days, 4-Weeks
`50`	**Count:** Number of times the event will occur. (0=continuous)
`0`	**Outlet Number**: 0-Outlet 1, 1-Outlet 2, 2-Both Outlets
`4`	**Outlet Action:** 0-No Action, 1-Turn outlet on, 2-Turn outlet off, 3-Pulse outlet, 4-Toggle outlet, 5-Disable events, 6-Enable events, 7-Set extVar0, 8-Clear extVar0
`1.5`	**Pulse Duration:** Time outlet will pulse when using the pulse outlet action.
`0`	**Next Occurrence:** When setting an event leave this at 0. In the return string for this request, this value will be a number representing the next time this event will occur in seconds since January 1, 1970.
`Event5Desc`	**Description:** This is the text description of the event. Up to 20 characters can be entered.
`127`	**Days:** This number represents which days the event will occur on. This value is the base ten version of a binary number where each bit represents one day of the week. Bit 0 is Saturday and Bit 7 is Sunday.

The following table shows the base ten value for daily occurrences, occurrences on Monday-Friday, occurrences on Monday, Wednesday, and Friday, and occurrences on Tuesday and Thursday:

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
1	1	1	1	1	1	1	127
0	1	1	1	1	1	0	62
0	1	0	1	0	1	0	42
0	0	1	0	1	0	0	20

3.4 Modbus Operation

AC POWER *Sentinel*® 2 can be controlled (and read) using Modbus/TCP protocol. This provides a standard means of using AC POWER *Sentinel*® 2 in conjunction with devices and software from other manufacturers. This section contains the information necessary to communicate with AC POWER *Sentinel*® 2 using Modbus/TCP. This is not a tutorial on Modbus and it is assumed that the reader is already familiar with Modbus. Detailed Modbus information can be found at http://www.modbus.org.

AC POWER *Sentinel*® 2 functions as a Modbus server (slave). Client (master) devices and software open a connection with AC POWER *Sentinel*® 2 on port 502 (unless another Modbus port is selected) and sends commands or requests to read the state of the outlet, read the input, or change the outlet state. When AC POWER *Sentinel*® 2 receives a command, it will perform the desired function and return a response. The underlying structure of these commands can be found in the next sections, although most software and Modbus devices can be configured by reading through the following section only.

There are generally two ways that Modbus software and PLCs communicate with a Modbus device. The first is by specifying the Modbus function code/memory type and an address. The second, sometimes called PLC addressing, requires the address only. Under PLC addressing, the function code/memory type is a given based on the PLC address. Once the address is known, the data size must be specified. The inputs and outlets are discrete data types. The sensor readings are 32 bit floating point numbers. For these, a quantity of two registers must be read starting at the desired address. The table below gives commonly used function code/memory types, data sizes, and equivalent PLC addresses for accessing the device. The data size will be the same regardless of the addressing mode.

	Function Code and Address	Data Size	PLC Address Mode 485	PLC Address Mode 584/984
Read Outlet 1 State	Function code 01 Address 0	Discrete	1	1
Read Outlet 2 State	Function code 01 Address 1	Discrete	2	2
Write Outlet 1	Function code 05 Address 0	Discrete	1	1
Write Outlet 2	Function code 05 Address 1	Discrete	2	2
Read Input 1 State	Function code 02 Address 0	Discrete	1001	10001
Read Input 2 State	Function code 02 Address 1	Discrete	1002	10002
Read Sensor 1	Function code 03 Address 272	32 Bit Float (2 Registers)	4272	40272
Read Sensor 2	Function code 03 Address 274	32 Bit Float (2 Registers)	4274	40274
Read Sensor 3	Function code 03 Address 276	32 Bit Float (2 Registers)	4276	40276

Regardless of the addressing scheme used, it is important to note that when the control password in AC POWER *Sentinel®* 2 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 AC POWER *Sentinel®* 2. Also, Modbus functionality must be enabled on the **Advanced Network** tab before the device will respond to Modbus requests.

AC POWER *Sentinel®* 2 supports the following function code/memory types:

> Read Coils (Modbus function 01): Read the status of the outlets (and/or inputs).
> Read Discrete Inputs (Modbus function 02): Read the status of the inputs.
> Read Holding Registers (Modbus function 03): Read values of sensors.
> Write Single Coil (Modbus function 05): Change the outlet state.

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

	PLC Addressing 485 Mode	**PLC Addressing 584/984**
Read Coils (function 01)	Addr + 1	Addr + 1
Write Coils (function 05)	Addr + 1	Addr + 1
Read Discrete Inputs (function 02)	Addr + 1001	Addr + 10001
Read Holding Registers (function 03)	Addr + 4001	Addr + 40001

For example, to read the state of Outlet 1 (coil 1), the Modbus function code 01 is used. To convert this code/address pair to a PLC address, we look up the read coils row from the table above and see that adding 1 to the address gives us a PLC address of 2.

Multiple commands may be sent without closing and re-opening the connection, but if no data is transferred for 50 seconds, the connection will time out and close. To keep the connection open, a read request can be sent periodically. AC POWER *Sentinel®* 2 has two TCP sockets available for Modbus/TCP, which allows two connections to be open at one time. Request for more than two open connections will be rejected.

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

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

The remaining sections give a detailed, low-level description of the Modbus functions supported.

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

This function returns the state of the relay coils. 0 denotes that the coil is not energized, 1 denotes that the coil is energized. In addition, the discrete inputs can be read using this function which allows the full state of AC POWER *Sentinel*® 2 to be read in a single transaction.

<u>Valid Starting Address and Quantity of Coils combinations:</u>

Valid starting address can fall in the range of 0x0000 and 0x0004. Valid quantities can also fall in the range of 0x0000 and 0x0004. The only restriction is that the sum of the starting address and the quantity of coils must not be greater than 0x0004. For example, if you want to read 0x0004 bits, two coils and two inputs, then the starting address would be 0x0004. If you want to read the inputs only, you may read 0x0002 bits and use the starting address of 0x0002. On the other hand, you may want to read the second outlet state only. This can be achieved by starting at address 0x0001 and using a quantity of 0x0001.

<u>Request</u>
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 to 0x0004)
        Quantity of Coils (2 Bytes): 0x0004 (0x0001 to 0x0004)

Character String Example:
```
char read_coils_mb_request[ ]={0x00, 0x01, 0x00, 0x00, 0x00, 0x06,
0xff, 0x01, 0x00, 0x00, 0x00, 0x04 };
```

<u>Response</u>
Modbus/TCP:
        Transaction identifier (2 Bytes): 0x0001
        Protocol identifier (2 Bytes): 0x0000
        Length (2 Bytes): 0x0004
        Unit identifier (1 Byte): 0xff

Modbus:
        Function code (1 Byte): 0x01 (read coils)
        Byte count (1 Byte): 0x01
        Coil status (1 Byte): 0x00 to 0x0F (bit 0=outlet state 1, bit 1=outlet state 2, bit 3=input state 1, bit 4=input state 2)

Data Byte (hex)	LS Date Bits (binary)	Input 2 State	Input 1 State	Outlet 2 State	Outlet 1 State
0x00	0000	Low	Low	Off	Off
0x01	0001	Low	Low	Off	On
0x02	0010	Low	Low	On	Off
0x03	0011	Low	Low	On	On
0x04	0100	Low	High	Off	Off
0x05	0101	Low	High	Off	On
0x06	0110	Low	High	On	Off
0x07	0111	Low	High	On	On
0x08	1000	High	Low	Off	Off
0x09	1001	High	Low	Off	On
0x0A	1010	High	Low	On	Off
0x0B	1011	High	Low	On	On
0x0C	1100	High	High	Off	Off
0x0D	1101	High	High	Off	On
0x0E	1110	High	High	On	Off
0x0F	1111	High	High	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 outlets 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)) (Model XRDI-WS3P:BT only)
This function returns the state of the discrete inputs.

Valid Starting Address and Quantity of coils combinations:
Valid starting address can fall in the range of 0x0000 and 0x0001. Valid quantities can fall in the range of 0x0001 and 0x0002. The only restriction is that the sum of the starting address and the quantity of coils must not be greater than 0x0002. For example, if you want to read 0x0002 bits, both inputs, then the starting address must be 0x0000. On the other hand, you may want to read the second input only. This can be achieved by starting at address 0x0001 and using a quantity of 0x0001.

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 discrete input)
    Starting address (2 Bytes): 0x0000 (0x0000 or 0x0001)
    Quantity of inputs (2 Bytes): 0x0001 (0x0001 or 0x0002)

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

<u>Response</u>
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): 0x02 (Read discrete input)
    Byte count (1 Byte): 0x01
    Input status: 0x00 (input off), 0x01 (input on)

Data Byte (hex)	LS Data Bits (binary)	Input 2 State	Input 1 State
0x00	0000	Low	Low
0x01	0001	Low	High
0x02	0010	High	Low
0x03	0011	High	High

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 outlets combination.

Character String Example:
```
char read_inputs_mb_response[] = {0x00, 0x01, 0x00, 0x00, 0x00, 0x04,
0xff, 0x02, 0x01, 0x01 };
```

3.4.3 Read Holding Registers (Modbus Function Code 03 (0x03))
This function is used to read the temperature or humidity values of the sensors. One, multiple, or all values can be read at the same time using this function.

Valid Starting Addresses and Quantity of Coil Combinations:
Reading these registers requires that the address be in the decimal range of 272 to 276 (0x110 and 0x114). Also, the address must be evenly divisible by 2. In other words, only addresses 0x110, 0x112, and 0x114 are valid. Each value is returned as two registers in IEEE 754 floating point formats. The four data bytes are treated as two individual big endian 16-bit words with the least significant word being sent first. In other words, the 32-bit floating point number represented as '1234 ABCD' is sent as ABCD 1234.' For example, if we were to read two registers starting at address 0x110, and sensor 1 measured the temperature to be 81.25 degrees, then we would get the following value 800042A2. The least significant word would be 8000 hex and the most significant word would be 42A2. Using a conversion utility, we could then convert this hexadecimal value into the temperature reading of 81.25 degrees. Below are the addresses that correspond to each input.

> Starting Address: 0x110 to 0x114
> Quantity: 0x02 to 0x06 (must be divisible by 2)

The device returns a value of 0xffffffff (NaN) if there isn't a valid reading or when the sensor isn't active.

The following chart gives the addresses of each of the temperature sensors:

Sensor	Address
1	0x110
2	0x112
3	0x114

3.4.4 Write Single Coil (Modbus Function Code 05 (0x05))
This function allows you to turn Outlets 1 and 2 on and off, one at a time.

> 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)
> > Outlet address (2 Bytes): 0x0000 or 0x0001 (outlet 1 = 0x0000, outlet 2 = 0x0001)
> > Outlet value (1 Byte): 0xff - turn outlet on, 0x00 - turn outlet off
> > Padding (1 Byte): 0x00
>
> Character String Example:
> ```
> char write_coil_mb_request[] = {0x00, 0x01, 0x00, 0x00, 0x00, 0x06,
> 0xff, 0x05, 0x00, 0x00, 0xff, 0x00};
> ```

<u>Response</u>
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)
        Outlet address (2 Bytes): 0x0000
        Outlet value (1 Byte): 0xff - outlet on, 0x00 - outlet 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 outlets combination.

Character String Example:

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

3.5 Email Notification (Model XRDI-WS3P:BT only)

3.5.1 Email Notification Description

AC POWER *Sentinel*® 2 Plus can be configured to send an email message to up to five email addresses when certain events happen. Events that can trigger email messages include input state changes, outlet state changes, temperature/humidity changes, and commands sent from a BASIC script.

When an email message is sent, it looks similar to this:

AC Power Sentinel 2 Plus

Trigger: **Outlet 1**: **ON**

Outlet 1: **ON**
Outlet 2: **OFF**
I**nput 1**: **ON**
Input 2: **OFF**
Sensor 1: 73.5

Note: Text shown in bold is set by the user (installer).

1. Subject Line:
The top line (that reads AC Power Sentinel 2 Plus), appears in the subject line of the email message. This is the same text that appears as the header on the **Control Page**. It is set in the Main Header Text field under the **Control Page Setup** tab.

2. Trigger:
The first line displayed in the body of the message shows what triggered the message. The text "Trigger" will always appear and cannot be changed. The remaining text includes the Trigger, the current state of t he outlet and input, and the current temperature/humidity of the sensor. The text that describes the trigger and its current state are configured in the setup pages as described below.

3. Current Status of Outlets, Inputs, and Sensors:
The remainder of the email message will display the same information shown on the **Control Page**. Any information omitted from the **Control Page** will not be included in the email message. If inputs, outlets, or sensors are not displayed on the **Control Page**, the email message will not include anything except the Subject Line and the Trigger. The name for each input, outlet, and sensor is defined in the 'Description' fields for the inputs, outlets, and sensors. The text that describes the current status of the outlets, inputs, and sensors is defined in the 'On Status Text' and 'Off Status Text' within the setup tabs for the outlets, inputs, and sensors.

3.5.2 Email Notification Setup
Email notification requires that the following fields are properly set. See **Section 2** for a description of each field.

> **Network Tab:**
> IP Address
> Subnet Mask
> Gateway
> Preferred DNS Server (this is required if Mail Server is entered by name and not by IP address)
> Mail Server (SMTP)
> User Name (If Required)
> Password (If Required)
> Return Email
> Email 1 (additional Email addresses may be entered)

Once the settings under the **Network** tab are entered correctly, an email trigger(s) must be configured. An email trigger can be generated within a BASIC script (See **Appendix G** for information about BASIC scripts), or can be explicitly defined for each outlet, input, and sensor (under **Outlets, Inputs,** and **Sensors** tabs). For each outlet, input, and sensor trigger, the "Email Option' field should be set to the appropriate trigger. Finally, the appropriate email addresses should be selected for each outlet, input, and sensor trigger by checking the box next to the desired email address under the **Outlets, Inputs,** and **Sensors** tabs.

Once the email settings are entered, the email functionality can be tested by entering the following command:

```
http://192.168.1.55/state.xml?testEmail=1
```

This will cause an email message to be sent immediately. If the message doesn't get through, the system log file may have some clues to assist in diagnosing the problem (`http://192.168.1.55/syslog.txt`).

Appendix A: Restoring Factory Default Settings

In the event that the IP address or passwords are forgotten, AC POWER *Sentinel*® 2 may be restored to its original factory default settings. To do this, first remove the power from the unit. Next, carefully insert a thin object (such as a toothpick) through the small hole in the back of the unit to press the small button located inside the unit. When the object is inserted, a tactile feel can be detected as the button is pressed. 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.

Reset Button Access Hole
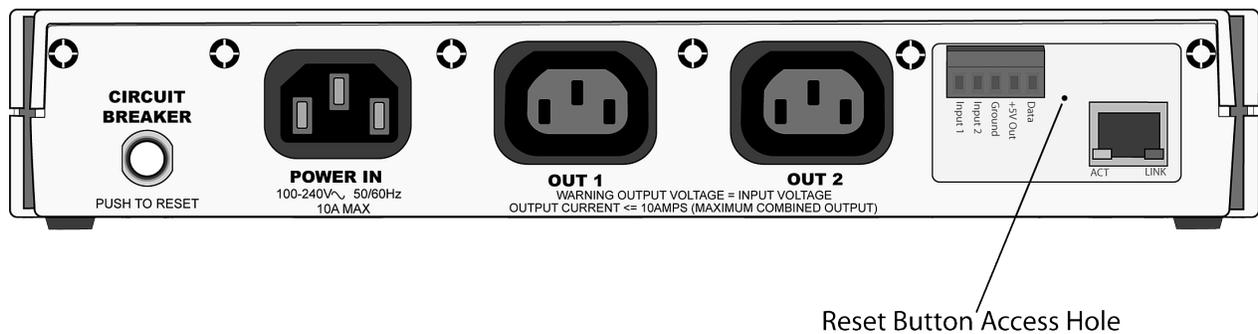
Figure Appendix A.1 - Restore Factory Defaults

Appendix B: Accessing **AC POWER** *Sentinel*® **2** Remotely Over the Internet

AC POWER *Sentinel*® 2 can be monitored and/or controlled from a remote location over the Internet. If access over the Internet is required, AC POWER *Sentinel*® 2 must be set up properly, and the router on the network where AC POWER *Sentinel*® 2 is installed must be configured for this. Note that once AC POWER *Sentinel*® 2 can be accessed on the local network, almost all of the settings required to provide remote access are in the router and not in AC POWER *Sentinel*® 2. This guide is not meant to be a tutorial in router setup, but rather to provide a basic overview of remote access. For specific details, the user should refer to the instruction manual for the router on his/her network. Users not familiar with basic IP networking should study one or more basic IP networking tutorials before proceeding (many tutorials are available on the Internet).

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

Every device that is "directly" connected to the Internet uses a "public" IP address. Public IP addresses are addresses described in the paragraph above that identify a specific device on the Internet. AC POWER *Sentinel*® 2 can be assigned a public IP address for direct connection to the Internet. Typically, those who are reading this section of the manual would only assign a public IP address to AC POWER *Sentinel*® 2 when AC POWER *Sentinel*® 2 is the only device on the local network. The IP address would be obtained from the Internet Service Provider (ISP).

Due to the limited number of public IP addresses, private networks can be set up with "private" IP addresses. Private IP addresses are blocks of IP addresses that have been set aside for private use by anyone. These addresses have no global designation and are not routed on the Internet. The following address blocks are designated for private networks (where x represents decimal numbers from 0 to 255): 192.168.x.x, 10.x.x.x, and 172.16.x.x.

A Simple Local Area Network:
A small Local Area Network (LAN), can be made up of two or more computers or other devices connected to an Ethernet switch. Each device on the network is assigned a unique private IP address. For example, consider a simple network that consists of a computer, and AC POWER *Sentinel*® 2. In this example, the computer is assigned an IP address of 192.168.1.10, AC POWER *Sentinel*® 2 has the IP address of 192.168.1.25. A person using the computer can access AC POWER *Sentinel*® 2 by entering its IP address in the URL line in the browser http://192.168.1.25.
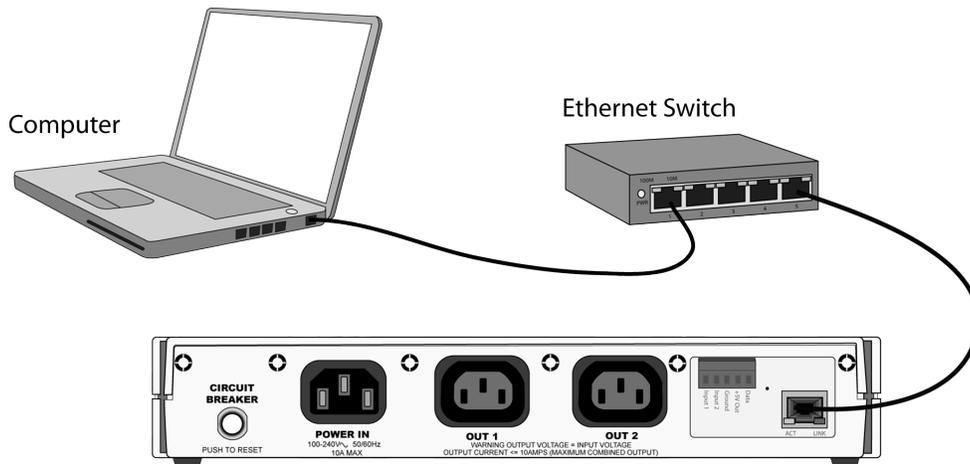
Figure Appendix B.1- Local Area Network

A Simple LAN connected to the Internet:
The LAN in the example above can be connected to the Internet by adding a router and an Internet connection. The router has two network connections. It has an Ethernet network connection that connects to the LAN, and it has another connection that connects to the Internet (this is called the WAN or Wide Area Network connection). Each network connection on the router has an IP address. In our example, the IP address on the LAN side of the router has an address of 192.168.1.1. The IP address on the WAN side of the router has an IP address that has been assigned by the Internet Service Provider such as 266.70.164.97 (note that this is not a valid IP address because each number cannot be larger than 255, but it is used in this example for illustration purposes only).
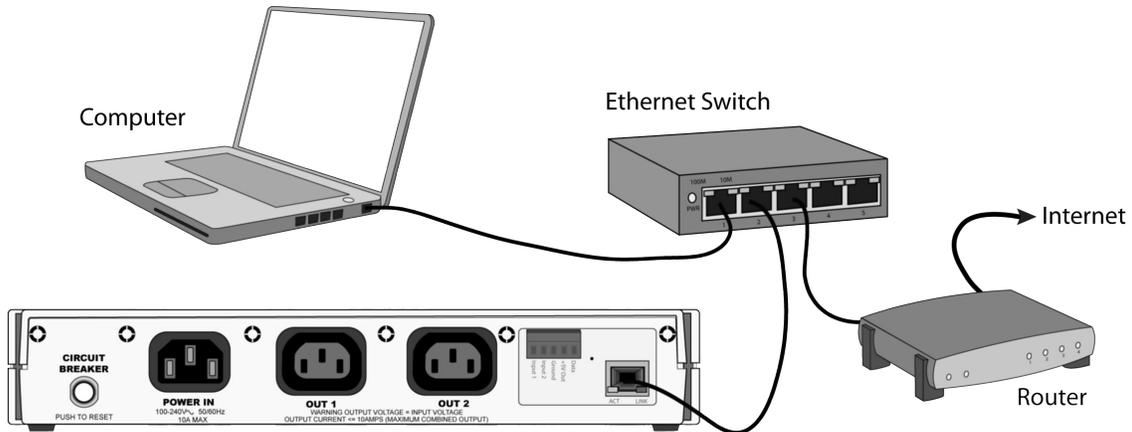
Figure Appendix B.2 - LAN connected to the Internet

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

Port Forwarding:
The network can be configured to allow outside access to AC POWER *Sentinel*® 2 . All requests to any device on the network use the public IP address (266.70.164.97). With only a single IP address, TCP ports are used to identify the specific devices the incoming message should be sent to. Using the mailing address analogy, the port is similar to a post office box. The IP address specifies the location, and the port specifies the specific recipient. Port numbers can be set to any number between 1 and 65235; however, many port numbers are reserved for specific applications and should be avoided. As a general rule, numbers above 8000 are safe to use. All of the AC POWER *Sentinel*® 2's come from the factory with the HTTP port set to 80 which is the standard port for HTTP. In this example, AC POWER *Sentinel*® 2 HTTP port will be changed to port 8000. Once the ports are changed, the router must be set up for port forwarding. The way this is setup is specific to the router, but many routers use a table. Port forwarding setup associates the IP address of each device with the assigned port. In this example, the address 192.168.1.25 (AC POWER *Sentinel*® 2) would be associated with port 8000. By doing this, AC POWER *Sentinel*® 2 can be accessed from the Internet by entering the public IP address of the router, plus the port number assigned to AC POWER *Sentinel*® 2 in the URL window of the browser. For example, the user would enter http://266.70.164.97:8000. When the router receives this request, it would look in its port forwarding table to find out what to do with a request for port 8000. It would find that it should forward the request to the local address of 192.168.1.25 and would then forward the request.

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

An example screen shot of a router configuration is given below. This setup allows the two AC POWER *Sentinel*® 2 in the above example to be accessed remotely from the Internet.
Note: This screen shot is simply an example of a typical router setup page. Routers will vary.
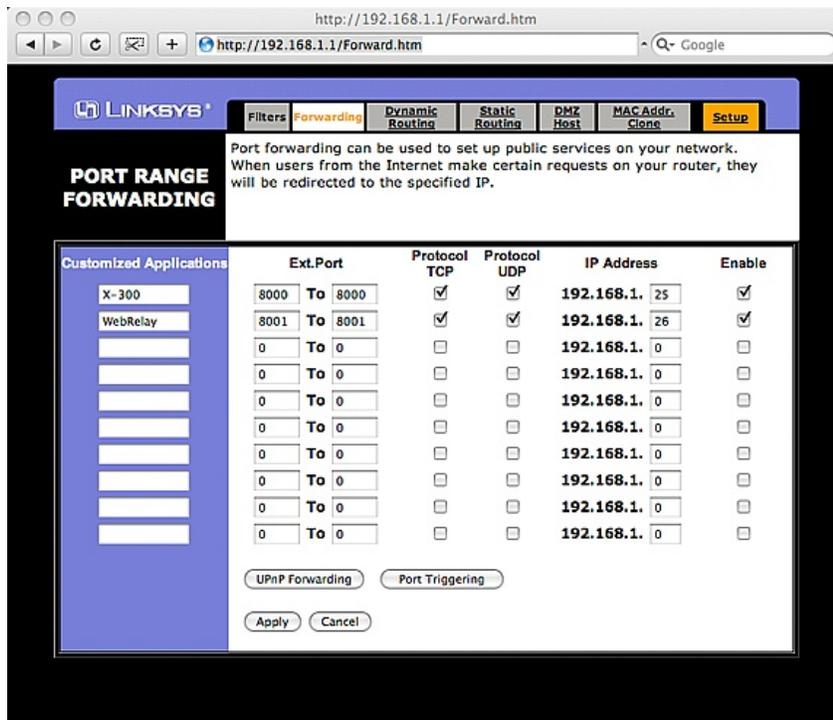
Figure Appendix B.3- Port Range Forwarding

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

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

For example, to access AC POWER *Sentinel*® 2 at the setup page above, the following command would be used:

        http://192.168.1.25:8000/setup.html

To access the AC POWER *Sentinel*® 2 units from the Internet, enter the public IP address of the router plus the port number of the desired device in the following format:

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

Using the example above, the following line would be used to access the setup page of AC POWER *Sentinel*® 2:

        http://266.70.164.97:8000/setup.html

Appendix C: Advanced Access Options to **AC POWER** *Sentinel*® **2**

Note: The following methods are supported by AC POWER Sentinel® 2; however, Broadcast Tools. does not provide or support custom third party applications, or external web servers.

Accessing AC POWER *Sentinel*® 2 with Custom Software or Third Party Applications:
AC POWER *Sentinel*® 2 provides a programming interface that allows applications running on a computer to have full access to it. Custom applications can send commands to AC POWER *Sentinel*® 2 for monitoring and control. They can also be used to provide a custom user interface, provide access to multiple units in a single screen, and allow for automation, logging, etc.

Using an External Web Server:
Rather than accessing AC POWER *Sentinel*® 2 directly from a computer, an external web server can be used. The term "external" web server is used here to mean a separate web server (such as Apache or IIS) that is not the web server built into AC POWER *Sentinel*® 2. In this scenario, users access custom web pages that reside on the external web server and the external web server communicates with AC POWER *Sentinel*® 2. This means users would not communicate directly with AC POWER *Sentinel*® 2.

Using an external web server to provide a custom user interface is beneficial because multiple AC POWER *Sentinel*® 2 devices can be integrated into a single control page or set of pages so they appear as part of a larger system rather than individual devices. In other words, the user may not be aware that he/she is using multiple AC POWER *Sentinel*® 2 devices, but rather the user sees a custom control page that shows the entire system. In addition, the use of an external web server allows programmers to create custom user interfaces that take advantage of the additional resources typically available on larger web servers, including more memory and various web programming languages.

There are two approaches that an external server can use to communicate with AC POWER *Sentinel*® 2 devices. The first approach is for the external server to create a TCP connection whenever it needs to access AC POWER *Sentinel*® 2. In this case, the external server opens the connection, sends commands and/or reads the device, and closes the connection. The second approach is for AC POWER *Sentinel*® 2 to initiate a connection. Using the "Remote Services" settings under the **Advanced Network** tab in the setup pages, AC POWER *Sentinel*® 2 can be configured to open a TCP connection with an external server. Once the connection is open, the external server can send commands and/or read the device. The external server can leave the connection open (so that it never closes) or close the connection.

Each of the two approaches is appropriate for different applications. The first approach is ideal when the the web server and all of the AC POWER *Sentinel*® 2 devices are on the same network (without routers between them). In this case, the server can communicate with AC POWER *Sentinel*® 2 devices directly and security concerns are minimal because data never has to leave the local network. When the server and AC POWER *Sentinel*® 2 are on different networks, the first approach can still be used, but routers that are installed between them must be configured to allow appropriate access. For companies that own or control the networks where all of these devices are installed, this is not a problem. Anytime a public network is used (the Internet), however, security precautions should be considered.

The second approach described above uses "Remote Services" features and is ideal for installations where the server and AC POWER *Sentinel*® 2 are installed on different networks. This is especially useful when each AC POWER *Sentinel*® 2 is installed on a separate private network. For example, if the user doesn't own or control any of the network connections where AC POWER *Sentinel*® 2 is to be installed, "Remote Services" may be enabled for AC POWER *Sentinel*® 2 to connect to their computer or server. By using the "Remote Services" configuration, AC POWER *Sentinel*® 2 initiates a TCP connection over the Internet with the control computer.

Since AC POWER *Sentinel*® 2 initiates the connection, the control computer doesn't have to know the IP address of AC POWER *Sentinel*® 2. This means that AC POWER *Sentinel*® 2 can be installed using DHCP to obtain a dynamic IP address. In addition, no special router configuration is required. This makes the network installation of AC POWER *Sentinel*® 2 very simple, and since no incoming ports need to be opened up in the router, security is not compromised. **See the description of the Advanced Network tab for more information.**

Appendix D: Log Files (Model XRDI-WS3P:BT only)

AC POWER *Sentinel*® 2 Plus logs information to two different log files; log.txt and syslog.txt. Both log files are text files and are stored in non-volatile memory; this data will not be lost due to power failure. The log files are stored in circular buffers which write from the beginning of the allocated memory space to the end, and then repeat from the beginning (over-writing the original data). The non-volatile memory is divided into 4K byte sectors. Each time data gets erased to make room for new data, a full sector (4K bytes) is erased at one time.

Data log file; log.txt:
This log file is user-configurable and stores real-world data such as temperatures and events such as relay contact changes. It can be up to 512K bytes long and is stored using a comma separated value formating scheme.

Outlet 1 and Outlet 2, Input 1 and Input 2, Sensor 1, Sensor 2, and Sensor 3 will only be displayed if they are selected in the log setup tab. This file is read by requesting the log.txt file from AC POWER *Sentinel*® 2. For example, using the default IP address the following command would be used to request the log file:

        http://192.168.1.55/log.txt

File format:
MM/DD/YYYY HH:MM:SS, Outlet 1, Outlet 2, Input 1, Input 2, Sensor 1, Sensor 2, Sensor 3, Source

Date and time of event:
MM - Month (1-12)
DD – Day (1-31)
YYYY – Year (1970 - 2106)
HH – Hour in 24 hour time (0 -23)
MM – Minutes (0-59)
SS – Seconds (0-59)

Example:

03/22/2010 12:19:09,1,0,0,0,079.0,xxx.x,xxx.x,Outlet01:(on)

The file can then be saved using the 'Save As...' option under the 'File' menu of the web browser. If the TCP port has been changed (not port 80), the port will be required to read the file. For example, using the default IP address, and port 8000, the log file would be read as follows:

        http://192.168.1.55:8000/log.txt

To erase the file, use the following parameter in the address bar:

        http://192.168.1.55/log.txt?erase=1

After erasing the file, it might be necessary to refresh the page.

Note: If the control password is enabled in the setup pages, the password (control password) will be required to access this file.

System log file; syslog.txt:
***The setup user name and password are required to access this file.
This log file records various system events which can be used for diagnostics and troubleshooting purposes. This file can be up to 16K bytes long.

File Format:
MM/DD/YYYY HH:MM:SS, (category to which message applies): (message)

Examples:
```
01/02/2010 04:08:13 DEVICE: Power Up.
01/01/2010 00:41:05 DEVICE: Reset factory defaults.
```

Listed below is a description of messages that a user may see:

Category:	Message:	Description:
DEVICE	Power Up	Device has been properly powered.
	Initialize	Device is ready.
	Reset Factory Defaults	Device has been reset to factory defaults.
EMAIL	Failed DNS Lookup	Unable to lookup mail server due to an incorrect DNS setting.
	Bad Username	Email was not sent due to an incorrect user name.
	Bad Password	Email was not sent due to an incorrect password.
	Authentication Required	A user name and password are required by the mail server.
	No Response	No response from SMTP server.
CLOCK	RTC Reset	Real Time Clock has been reset.
NTP SERVER	Request Attempt	Device attempting to connect to NTP Server
	Failed DNS Lookup	Unable to lookup NTP server name due to an incorrect DNS setting.
	Success	Device successfully connected to NTP Server.
REMOTE SERVER	Failed DNS Lookup	Unable to lookup Remote Server due to an incorrect DNS setting.
	Connection Attempt Started	Connection port with Remote Server has ben opened.
	Connection Closed	Connection port with the Remote Server has been closed.
DHCP	Address Acquired	IP address request successful, and IP address assigned.
	Lease Renewal	IP address assigned to device was renewed.
MAIN_MCU	New Firmware Loaded	New firmware has been loaded to the device.

This file is read by requesting the syslog.txt file. For example, using the default IP address the following command would be used:

```
http://192.168.1.55/syslog.txt
```

If the TCP port has been changed (not port 80), the port will be required to read the file. For example, using the default IP address, and port 8000, the log file would be read as follows:

```
http://192.168.1.55:8000/syslog.txt
```

To erase the file, use:

```
http://192.168.1.55/syslog.txt?erase=1
```

Appendix E: Remote Services

When remote services is enabled, a connection attempt will be made periodically according to the Connection Interval setting. If a connection has already been established, the connection string will be sent periodically according to the connection interval. The remote end is responsible for closing the connection when it is done. Once the connection has been established, the remote server can issue HTTP GET requests to the device as if it had established the connection. AC POWER *Sentinel*® 2 can also be configured to establish a connection as events occur, such as an outlet changing state.

Connection String:
The connection string is sent whenever a connection is made. The connection string is a user-defined string that is configurable in the **Advanced Network** tab. The string is also sent periodically if a connection has been established according to the Connection Interval setting.

HTTP GET Requests:
Once a connection has been established, the remote server can send requests for files found on AC POWER *Sentinel*® 2. These requests should follow the HTTP protocol.

Example: Request the file about.xml from AC POWER *Sentinel*® 2

```
GET /about.xml HTTP/1.1\r\n\r\n
```

Example: Turn outlet 1 on

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

Events:
When an event occurs a connection will be established if one does not already exist and the file state.xml will be sent following the connection id string. If a connection already exists then the file state.xml will be sent without the Connection String.

Appendix F: SNMP Requests, Objects and Community Strings

Outlet states, input states, some simple network parameters, and temperature/humidity measured by AC POWER *Sentinel*® 2 can be retrieved using SNMP. The states of the outlets can also be changed through SNMP SET requests when the device is configured correctly. For most cases, using SNMP is as simple as locating the appropriate MIB files and loading them into the SNMP manager software. Once the MIB files have been loaded, information from AC POWER *Sentinel*® 2 can be accessed. AC POWER *Sentinel*® 2 can make use of the following MIB files: RFC1213-MIB, and XYTRONIX_V1_0.mib.

Note: As new MIB file become available with support for other products, the older MIB files can be safely overwritten.

AC POWER *Sentinel*® 2 supports the following requests:

GET, GET NEXT, WALK, and SET

AC POWER *Sentinel*® 2 also supports a few objects found in MIB for network management of TCP/IP-based internets. The MIB for these objects usually come with SNMP manager software. If it does not, an internet search for
RFC1213-MIB will turn up multiple links for this MIB. The following objects are supported from this MIB. All of them are read only.

>   iso.org.dod.internet.mgmt.mib-2.system.sysDescr
> Returns the Octet String: WebSwitch - Automatic Reboot Controller
>
>   iso.org.dod.internet.mgmt.mib-2.system.sysObjectID
> Returns the object id of the WebSwitch: 1.3.6.1.4.1.30586.12
>
>   iso.org.dod.internet.mgmt.mib-2.system.sysUpTime
> Returns the time (in hundredths of a second) since AC POWER *Sentinel*® 2 has been running.
>
>   iso.org.dod.internet.mgmt.mib-2.system.sysName
> Returns the name of the device found in the Header Text Field: WebSwitch (default)

AC POWER *Sentinel*® 2 also supports some special objects that can be found in the MIB XYTRONIX_V1_0.mib. This MIB can be downloaded from our website. The following objects are supported from this MIB. Some are read only, while others have read/write capability.

Read Only Objects:

> Inputs (Model XRDI-WS3P:BT only)
>
>   iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.1 through
>   iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.2
> Returns an Octet String indicating the current state for Inputs 1 and 2. A 1 means the input is on. A 0 means the input is off.
>
> Sensors (Model XRDI-WS3P:BT only):
>
>   iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.3 through
>   iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.5
> Returns an Octet String indicating the current temperature or humidity for Sensors 1 through 3.

Outlet Reboots:
`iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.101` through
`iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.102`
Returns an Octet String indicating the number of reboot attempts for Outlets 1 and 2.

Read/Write Objects:

Outlets:
`iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.11` through
`iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.12`
Returns an Octet String indicating the current outlet state for Outlets 1 and 2. A 1 means the outlet is on. A 0 means the outlet is off. Writing to these objects can change the states of the outlets. Writing a 1 turns the outlet on while writing a 0 turns the outlet off.

TRAPS:

AC POWER *Sentinel*® 2 also has the capability to send information to the SNMP manager as a result of alarm conditions through the use of TRAPS. The following TRAPS are supported:

Sensors (Model XRDI-WS3P:BT only):
`iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.65` through
`iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.67`
These traps occur as a result of the temperature or humidity sensor reaching the alarm condition. They are configured on the **Sensors** setup tab. These traps will send an Octet String indicating the current temperature/humidity of the sensor.

Outlets:
`iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.75` through
`iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.76`
These traps occur as a result of the outlets changing states. They are configured on the **Outlets** setup tab. These traps will send an Octet String indicating the new state of the outlet. A 1 indicates the outlet is on and a 0 indicates the outlet is off.

Inputs (Model XRDI-WS3P:BT only):
`iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.95` through
`iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.96`
These traps occur as a result of the inputs changing states. They are configured on the **Inputs** setup tab. These traps will send an Octet String indicating the new state of the input. A 1 indicates the input is on and a 0 indicates the input is off.

Reboots:
`iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.115` through
`iso.org.odo.internet.private.enterprises.XYTRONIX.WEBSWITCH.116`
These traps occur as a result of the outlet being rebooted in automatic reboot mode. They are configured on the **Outlets** tab. These traps will send an Octet String indicating a reboot has occurred. The trap will always send a 0 indicating that the outlet has been turned off.

Community Strings:

AC POWER *Sentinel*® 2 uses the control password for both the read and write community strings. If the control password is disabled, any object can be read without the need for a correct community string. By default the control password is `1234`.

Appendix G: BASIC Scripts (Model XRDI-WS3P:BT only)

BASIC (Beginners All-purpose Symbolic Instruction Code) is a computer programming language that has been in use for many years. This product has an integrated BASIC interpreter for simple BASIC scripts. This provides a great deal of flexibility by allowing users to customize basic functions of the unit. Note that the interpreter only supports a small subset of the BASIC commands that are available for computers. Note also, that some non-standard commands have been added, and some commands may function differently on this BASIC interpreter than on other platforms. The following is a short tutorial on the supported BASIC functions. This tutorial is not meant as a tutorial for using the BASIC programming language and it assumes the user has already had some experience with programming. For more information on programming in BASIC, tutorials can be found on the Internet.

Structure:
A BASIC script is written as a .txt file, which is then uploaded to the device using the **Script** setup tab. The maximum script size is 2K bytes. Each line within the script contains a single statement. Line numbers are not used. Statements are not case sensitive; however, variables are. IF THEN, FOR loops, and DO loops can only be nested up to 5 times per command. For those not familiar with nesting, the following is an example of nested FOR loops:

```
FOR a = 0 to 100
FOR b = 0 to 100
NEXT b
NEXT a
```

Every program must end with an END statement. Subroutines would then follow after the the END statement, if required. The last line of the script should be left blank.

Line Format:
Every line follows the same format. The basic format is:

> *statement (variable) (=, <, >, <=, >=, <>) (expression) (THEN)*

The fields in parentheses are optional depending on the statement. Spaces must be used between all statements, numbers, variables, operators, expressions, etc. Multiple spaces are valid.

Examples:

```
LET a=1          'this will return an error because of insufficient spacing
LET a = 1        'this is valid
LET a  =  1      'this is valid
```

Only a single variable is allowed on the left side of any operator. The following example is incorrect and will return an error. The error occurs because there is more than a single variable to the left of the comparison operator (a + 2 is to the left of =).

```
IF a + 2 = 3 THEN  'this will return an error
```

To fix the above line, replace 'a + 2.' One of the following options may be used:

```
IF a = 1 THEN
...or...
LET b = a + 2
IF b = 3 THEN
```

<u>Supported Statements:</u>
The following are the statements supported by this BASIC interpreter, a short description of the statements, and their formats.

LET - The LET statement assigns a variable a value. The format is:

> *LET (variable) = (expression)*

IF THEN, ELSE, END IF - The IF THEN statement tests the truth of a condition. The ELSE statement defines a second function if the condition is found false. In other words, if the condition is true, then a function is performed. If it is not true, a second function may be performed. The second function may or may not be necessary depending on the application. The IF THEN (ELSE) statement must always be followed with an END IF statement. The format is:

> *IF (variable) (=, <, >, <=, >=, <>) (expression) THEN*
> > *(Function 1)*
>
> *ELSE*
> > *(Function 2)*
>
> *END IF*

Note: In most BASIC interpreters, 'Function 1' (see above) may be placed after the THEN statement. This interpreter requires 'Function 1' to be put on the following line.

FOR TO, NEXT - The FOR TO statement loops a section of code a predefined number of times. The NEXT statement always follows the section of code to be looped. The format is:

> *FOR (variable) = (expression) TO (expression)*
> > *(code to be looped)*
>
> *NEXT (variable)*

DO WHILE, LOOP - The DO WHILE statement loops a section of code while a condition is found true. The LOOP statement always follows the section of code to be looped. Note that if the condition is omitted, the code will be looped without end. The format is:

> *DO WHILE (variable) (=, <, >, <=, >=, <>) (expression)*
> > *(code to be looped)*
>
> *LOOP*

LOG - The LOG statement causes the device to log data according to the settings specified under the **Logging** setup tab. Note that in order to log, logging must be enabled in the **Logging** setup tab. The format is:

> LOG

EMAIL - The EMAIL statement causes the device to send an email. The format is:

> *EMAIL*
> *...or...*
> *EMAIL relayX*
> *...or...*
> *EMAIL inputX*
> *...or...*
> *EMAIL tempX*

The first option (EMAIL) sends an email message to all email addresses listed under the **Network tab**.

        EMAIL

The second option (EMAIL relayX, where relay represents the internal relay, and where X represents the relay number 1 or 2) sends an email message identical to the message that is sent when that relay changes state. The message indicates that the email was caused by the relay, and the message is only sent to the email addresses specified in the appropriate relay setup page under the **Outlets** tab

        EMAIL relay1

The third option (EMAIL inputX , where X represents the input number 1 or 2) sends an email message identical to the message that is sent when that input changes state. The message indicates that the email was caused by that input, and the message is only sent to the email addresses specified in the appropriate Input setup page under the **Inputs** tab

        EMAIL input1

The fourth option (EMAIL tempX, where X represents the sensor number 1-3) sends an email message identical to the message that is sent when that sensor's Alarm condition is reached. The message indicates that the email was caused by the temperature alarm being reached, and the message is only sent to the email addresses specified in the appropriate sensor setup page under the **Sensors** tab.

        EMAIL temp1

END - The END statement ends the main body of code.

CALL - The CALL statement is found within the main body of code, but requires the interpreter to skip to a subroutine found at the end of the program. After the subroutine is finished, the interpreter returns to the line immediately following the CALL statement. The format is:

        CALL (name of subroutine)

SUB, END SUB - The SUB statement defines the beginning and name of a subroutine. The END SUB statement defines the end of the respective subroutine. Subroutine names can be up to 20 characters long and are case sensitive. The SUB and END SUB statements always must follow the END statement. The format is:

        END
        SUB (name of subroutine)
                (contents of subroutine)
        END SUB

REM or **'** - The REM or (') statement designates remarks made by the programmer. The interpreter will disregard any characters following these statements.

PRINT - The PRINT statement outlets a variable or message (if contained within quotation marks). Note that the PRINT statement is only available for the PC version of the BASIC interpreter. The device will not recognize the command. The format is:

        PRINT (variable) 'outlet variable value to screen
        PRINT "(message)" 'outlet '(message)' to screen

Variables:
Two types of variables are available for use in this BASIC interpreter - user-defined variables, and useful predefined variables.

User-Defined Variables:
Up to 10 user-defined variables are allowed to be used in scripts. Variables are represented by single, lower-case characters ranging from the letter 'a' to the letter 'j' in the English alphabet. They are always global and stored internally as floating point numbers. Variables are defined using the LET statement.

Examples:
```
Let b = 5         'variable b will be set to 5
Let d = b + 2     'variable d will be set to 7
```

The following are useful predefined variables for this BASIC interpreter. Note that some models may not contain digital inputs, analog inputs and/or relays and thus would not have digital input, analog input and/or relay variables.

Timer Variables:
Six timers are available for use in BASIC scripts. They are designated as t0 through t5. Timers can be set to any positive integer (or 0) by using the LET statement. As soon as a value is assigned to a timer, it will begin to count down immediately by decrementing one count every 100ms until it reaches zero.

Examples:
```
Let t3 = 1500     'set timer 3 to 150 seconds
Let t1 = 0        'disable time 1
```

Internal Relay Variables:
The internal relays can be turned on, turned off, pulsed, toggled, or read in BASIC scripts. The LET statement is used to set the internal relay state. The state options available are 0 (turn outlet off), 1 (turn outlet on), 2 (pulse outlet), and 5 (toggle outlet). Note that the pulse time is specified in the **Outlets** setup tab. Internal relays are designated as relay1 and relay2, which correspond to Outlet1 and Outlet2.

Examples:
```
Let relay1 = 1    'turn on relay 1
Let relay2 = 0    'turn off relay 2
Let relay1 = 2    'pulse relay 1
Let relay2 = 5    'toggle relay 2
Let a = relay2    'read the state of relay 2, state will be 0 or 1
```

Input Variables:
The input states can be read in BASIC scripts. The inputs are designated as input1 and input2.

Example:
```
Let a = input1    'sets 'a' equal to value of input 1
```

Temperature/Humidity Sensor Variables:
Each sensor can be read in BASIC scripts. The sensors are designated as temp1, temp2, and temp3.

Example:
```
If temp 2 >= 80 Then    'If temperature sensor reads greater than 80
                        ' degrees, then
    Let relay2 = 1      'Turn on relay 2
End If
```

Event Variables:
Actions can be configured to occur at specified days and times. Five events may be configured for the unit. This is done by setting the day and time of the event and then comparing it to the current date and time. Note that the current date and time must be set in the **Date/Time** setup tab. The event date variables are designated ed1 to ed5. They are set using the LET command and setting the desired event date variable equal to the date the event should occur in the format mm/dd/yyyy. The event time variables are designated et1 to et5. They are likewise set using the LET command and setting the corresponding event time variable equal to the event time in the format hh:mm:ss in 24-hour time. The event date variables store the number of days that have passed since January 1, 1970. The event time variables store the number of seconds from the beginning of the day. If the event time variable is incremented more than the number of seconds in a day (86400 seconds), the counter is reset to 0 and the event date variable is incremented by one. The variables 'time' and 'date' are predefined variables that store the current date and time and can only be read. They can then be used to compare the event date and times. The following example demonstrates defining the event variables and comparing it to the current date and time. Assume current time is April 10, 2009 at 1:30 AM and the event should occur in one hour and every hour thereafter.

Example:
```
Let a = 1
Let ed1 = 04/10/2009           'sets the event date to April 10,
                               '2009.
Let et1 = 02:30:00             'sets the event time to 2:30
Do While a <> 0
If ed1 >= date Then            'Tests event date versus current date.
     If et1 >= time Then       'Tests event time versus current time.
           Let et1 = et1 + 3600 'Increments the event time by one hour
                               '(in seconds).
           Print "Event"       'Event to occur
     End If
End If
Loop
End
```

External Variables:
There are five external variables, extvar0 through extvar4. External variables are similar to general purpose variables and can be used in the same manner. The difference between general purpose variables and external variables is that external variables can be accessed by the user through a web browser and modified while the script is running. Scripts can use external variables as a method of retrieving user input. The following example demonstrates this by creating a script that will turn Outlet 1 on if extvar1 equals 1 and turn Outlet 1 off if extvar1 equals 0.

Example:
```
Do
     If extvar1 = 1 Then
           Let relay1 = 1
     Else
           Let relay1 = 0
     End If
Loop
End
```

Extvar1 can be set and cleared by entering the following requests into a web browser or by configuring on and off buttons to appear on the control page for extvar0:

```
http://192.168.1.55/state.xml?extvar1=1
http://192.168.1.55/state.xml?extvar1=0
```

Testing and Debugging:

Note that a copy of the BASIC interpreter for Windows is also available on our website for the use of testing and debugging. The device will only acknowledge errors as it runs. This means that if a path of the script is not encountered, errors may still exist. The Windows version of the interpreter, however, will check for errors before the script is run. Note also that the PRINT function is available for use with the Windows version of the BASIC interpreter. The interpreter on the device, however, will not recognize this command.

Note: The script will be restarted by submitting any of the setup pages or by power cycling the unit.

Appendix H: Specifications

Power Requirements:
Input Voltage: 100-240V AC
Input Frequency: 47-63Hz
Input Connector: IEC Appliance Connector (C14 Male)
Max Input Current: 10A (DO NOT USE AC POWER *Sentinel*® 2 TO CONTROL MORE THAN 10 AMPS)

Outlets:
Number of Outlets: 2
Outlet Connectors: IEC Appliance Connector (C13 Female)
Outlet Control Options: On/Off or Pulse

Accessory Connector (Model XRDI-WS3P:BT only):
5-position, removable terminal strip, 3.81 mm terminal spacing

Inputs (Model XRDI-WS3P:BT only):
Number of Inputs: 2
Input Type: Discrete Inputs (connect to dry contacts)

Temperature Sensors (Model XRDI-WS3P:BT only):
"1-Wire" Digital Thermometer (Dallas Semiconductor part DS18B20)
Temperature Range: -20°C to 40°C (-4°F to 104°F)
Accuracy: 0.5 from -10°C to +85°C
Maximum number of sensors: 3
Maximum Distance from AC POWER *Sentinel*® 2 to sensors: 120 feet with one sensor, 60 feet with three sensors

Additional Sensors (Model XRDI-WS3P:BT only):
Temperature/Humidity Sensor (X-DTHS-WM)
Humidity Sensor:
Humidity Range: 0-100%
Accuracy: ±1.8%

Network:
10Base-T or 100Base-T Ethernet IPv4
Setup: static IP address assignment or DHCP, HTTP port selectable
Network Connector: 8-pin RJ-45 socket

LED Indicators:
Power On
Outlet 1 On
Outlet 2 On
Network Linked
Network Activity

Real-Time Clock (Model XRDI-WS3P:BT only):
Manual or NTP (Network Time Protocol) setup
NTP Sync Period: Once, Daily, Weekly, On Power-up
Automatic Daylight Savings Adjustment
Battery (capacitor) Power Backup

Capacitor Power Backup (Model XRDI-WS3P:BT only):
Backup Functions: Retain Real-Time Clock, External Variables, Outlet State
Backup Duration: 3 days minimum

Nonvolatile Memory:
Memory Type: Flash
Function: All user settings are stored in nonvolatile memory. Settings will not be lost when power is disconnected.

Physical:
Operating Temperature: -20° C to 40° C (-4° F to 104° F)
Size: 10.65 Inches (27.11 cm) wide X 1.75 Inches (4.45 cm) tall X 3.29 Inches (8.36 cm) deep
Tolerance: ±0.03 Inches
Weight: 1 lb. 3 oz. (542 grams)
Enclosure Material: Lexan 940 (UL94 V0 Flame Rated)

Monitor/Control:
Web Browser, XML, Modbus/TCP, SNMP

Logging (Model XRDI-WS3P:BT only):
Storage: Nonvolatile Flash
Buffer Architecture: Circular Buffer
Log File Size: 512K (max 17272 logs)
Unlimited data storage from Web Monitoring Service

Password Settings:
Password protection on setup page: Yes
Password protection on control page: Optional
Password Encoding: Base 64
Max password length: 13 characters

Regulatory Compliance:
Electromagnetic Compliance:
IEC CISPR 22, CISPR 24
FCC 47CFR15
EU EN55024, EN55022
EN55022:2006: Class B
EN61000-3-2
EN61000-3-3
EN55024:2006

IEC 61000-4-2
IEC 61000-4-3
IEC 61000-4-4
IEC 61000-4-5
IEC 61000-4-6
IEC 61000-4-8
IEC 61000-4-11

ITE-Class B

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

Appendix I: Mechanical Information

Top

3.29

10.65

6.374

Bottom

Front

POWER   OUT1   OUT 2

1.75
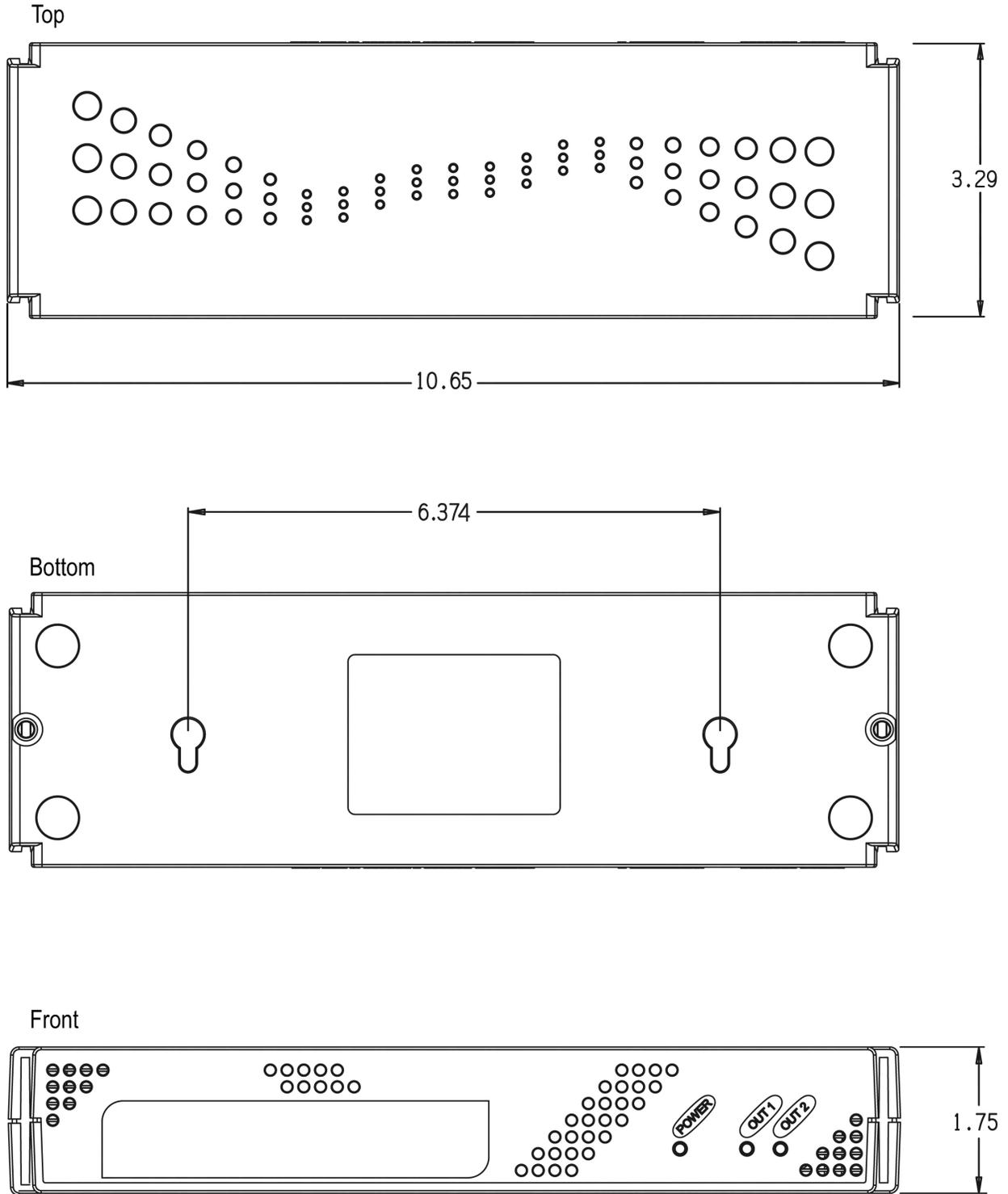
Dimensions in Inches
Tolerance: ± 0.03 In

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NOTES

Appendix J: Trademark and Copyright Information

Limited Warranty

The term "Buyer" as used in this document refers to and includes both (but only) (a) any person or entity who acquires such an item for the purpose of resale to others (i.e., a dealer or distributor of an item), and (b) the first person or entity who acquires such an item for such person's or entity's own use. Broadcast Tools warrants to each Buyer of any item manufactured by Broadcast Tools that the item will be free from defects in materials and workmanship at the time it is shipped by Broadcast Tools if the item is properly installed, used and maintained.

Exclusive Remedies

If Broadcast Tools is notified, in writing, of a failure of any item manufactured by Broadcast Tools to conform to the foregoing Limited Warranty within one (1) year following the date of the Buyer's acquisition of the item, and if the item is returned to Broadcast Tools in accordance with Broadcast Tools' instructions for confirmation by inspection of the defect (which at Broadcast Tools' election may include, without limitation, a requirement that the Buyer first obtain a Return Authorization number from Broadcast Tools, that the Buyer furnish proof of purchase in the form of an invoice and/or receipt, and that the Buyer prepay all freight charges associated with any return of the item to Broadcast Tools using such freight service as Broadcast Tools reasonably may specify), Broadcast Tools will repair or replace the defective item, or will refund the purchase price paid by the Buyer for the item. Broadcast Tools shall have the exclusive right to choose between these alternative remedies.