X-332™ Users Manual

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X-332™ Users Manual Trademark and Copyright Information **Trademark and Copyright Information**

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Warranty X-332™ Users Manual **Warranty**

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X-332™ Users Manual FCC Statement **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 a relay on a circuit different from where the receiver is connected. - Consult the dealer or an experienced radio/TV technician for help.

**Notice**

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

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Installation Guidelines (Read Before Installing) X-332™ Users Manual **Installation Guidelines (Read Before Installing)**

- 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.

**Security Notes**

X-332™ does not employ a general purpose computer operating system and does not have features, such as telnet, FTP, SSH, nor uncontrolled open ports. This means it is unlikely for someone to ‘break in’ to X-332™ and access other devices on your local network. The simplicity of X-332™ makes it a inherently secure device. Nevertheless, as with any device installed on a network, appropriate security precautions should be observed.

If X-332™ is installed on the Internet, it is recommended that passwords be enabled for the **Control Page**. Passwords should be at least 8 characters in length and use a combination of upper and lower case letters and numbers. For additional security, a firewall may be used to limit access to selected IP addresses. Another option may be to set up a Virtual Private Network (VPN) between the network where X-332™ resides and the client machine (web browser, another, ControlByWeb™ product, etc.).

**Final Installation Notes**

This ControlByWeb™ product supports connection to *10 Mbps* and *100 Mbps* networks. Although *100 Mbps* 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 *100 Mbps*. There are advantages, however, to operate this device at *10 Mbps*. At *10 Mbps*, less power is required, the unit runs cooler, and the lifetime of the product will be extended.

Any changes to the Ethernet settings will require a removing and re-applying power to X-332™. Page 8 Xytronix Research & Design, Inc.

X-332™ Users Manual Introduction **Section 1: Introduction**

X-332™ is a multi-function web-enabled module for control and monitoring. The X-332™ includes sixteen dry-contact relays, sixteen optically-isolated digital inputs, two counter inputs (inputs 17 and 18), four analog inputs and 1-wire bus with support for up to 4 temperature/humidity sensors. It can be controlled and/or monitored over any IP network including private networks, IP-based industrial control networks, and the Internet. Users can operate the X-332™ using a web browser, or custom applications can be written to control the X-332™ from a computer, PLC, or other automation controller. In addition, custom control scripts can be written and executed using BASIC programming language.

Other outstanding features of other ControlByWeb products are also included, such as email notification, BASIC scripting, scheduling, and logging. The X-332™ can also control up to 16 remote relays and can graph logged data with any HTML 5 compliant web browser.

The X-332™ supports a number of protocols, including HTTP, XML, Modbus/TCP, SNMP, SMTP, NTP, and Remote Services.



*Figure 1.1 - Product Image*

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Introduction X-332™ Users Manual

**1.1 X-332™ Features**

**Relay Outputs (16)**

Control relays with a web browser, timers, input changes, or programmable logic. The relays are isolated from all other circuitry in the device and from each other.

**Digital Inputs (16)**

View state of inputs with a web browser. Inputs are optically isolated and can be used for 28 volt industrial sensors. Use inputs to control relays, trigger email messages.

**Counter Inputs (2)**

Two discrete, 5V counter inputs (inputs 17 and 18). These inputs are considered “On” when asserted low, and can also be used as counters.

**One-Wire bus (connect up to four temperature/humidity sensors)**

Monitor temperature and/or humidity sensors - control relays or trigger email messages based upon temperature and humidity values.

**Analog Inputs (4)**

Monitor analog inputs. Control relays or trigger email messages based upon the analog reading. Each analog input has a 0 to 5 volt range, and offers 12 bits of resolution.

**Remote Relays**

Control relays on other ControlByWeb products.

**Real-time Clock**

Manual or NTP capability.

**Event Scheduler**

Program up to 100 control events based on time and date conditions.

Automatically switch from weekday to weekend or holiday schedules.

**Logging**

Configurable logging of digital inputs, temperature, humidity, analog inputs, and relay states. System logging of device operating parameters and events, such as power reset and NTP requests.

**Graphing**

Logged data can be graphed directly inside any HTML 5 compatible web browser.

**Email Notification**

Send email alerts based on any sensor or input conditions, such as temperature, time, digital inputs, analog inputs, and more. Send text messages (using a wireless carrier's email bridge).

**BASIC Script**

Additional flexibility is provided through custom scripts using a BASIC interpreter.

**Built-in Web Server**

All configuration is done through the built-in, password protected web server.

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X-332™ Users Manual Introduction

**1.2 Applications**

X-332™ was designed to meet a broad range of industrial applications. It works very well as a standalone device that can be controlled using a web browser, or as a convenient way to add I/O to a computer. It can easily be configured using simple menus and drop-down lists, or it can run simple BASIC scripts. Many of its features such as scheduling, logging, input state monitoring, and the ability to control up to 32 relays (16 internal and 16 remote relays on other devices) make the X-332™ a very powerful, yet simple controller.

You can use the X-332™ to control motors, lights, coils, pumps, valves, bells, etc. You can also use it to monitor alarms sensors, switches, fluid level switches, battery voltage, temperature, humidity, and much more. A few example applications include:

- Bell Controller

- I/O Extender

- Industrial Thermostat

- Solar Energy Controller

- Process Controller

- Process Monitor

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Introduction X-332™ Users Manual

**1.3 X-332™ Models Available**

| **Part Number** | **Power Supply Requirements** |
| --- | --- |
| X-332-24I | 9-28VDC |

**1.3.1 Optional Accessories**

| **Accessory** | **Description** | **Part Number** |
| --- | --- | --- |
| DIN-Rail Power Supply | *Output :* 24V DC, 1.75Amp  *Input Voltage:* 100-240V AC, Input Frequency: 45-66 Hz | 2868648 |
| Temperature Sensor | Digital temperature sensor with 3-foot wire leads. Note: Leads may be extended | X-DTS-S3C |
| Temperature Sensor (Wall Mount) | Digital temperature sensor housed in vented plastic enclosure | X-DTS-WM |
| Temperature/Humidity Sensor (Wall Mount) | Digital temperature and humidity sensor housed in vented plastic enclosure | X-DTHS-WM |
| DIN Rail Mounting Clips | Removable mounting clips to attach the X-332 to a DIN rail. | DRC-12C |

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X-332™ Users Manual Introduction **1.4 Connectors & Indicators**

*****Figure 1.4a - Connections & Indicators*

***I/O Connectors***

X-332™ has nine 8-position removable screw terminal connectors, one 5-position removable screw terminal connector, one 3-position removable screw terminal connectors and an Ethernet connector.

These connectors are used to connect relay contacts, digital inputs, counters, analog inputs, power and network.

***Network Connector***

The Ethernet connector is a standard, 8-position modular receptacle.

***Module Power Indicator***

The green Power LED indicator is illuminated whenever the module is powered.

***Relay Indicators***

Sixteen green LEDs illuminate when the corresponding relays are energized (when a relay is energized, the common and normally open contacts are closed).

***Optically-Isolated Digital Input Indicators***

Sixteen green LEDs illuminate when a voltage is applied to the corresponding optically-isolated digital inputs.

***Ethernet Indicators***

The LINK LED 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 yellow when activity is detected on the network.

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Introduction X-332™ Users Manual **1.5 Accessing X-332™**

**Standard Access Using a Web Browser**

X-332™ has a built-in web server that 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 just about any computer or smart phone.

*Note: Network routers may need to be configured to allow access from computers outside of the local network (see* ***Appendix C: Accessing X-332TM Over The Internet****).*

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X-332™ Users Manual Installation and Setup **Section 2: Installation and Setup**

Installation consists of mounting the X-332™, connecting it to an Ethernet network, providing power, and configuring via a web browser, wiring the relays, digital inputs, analog inputs and temperature and/or humidity sensors.

**2.1 Mounting**

X-332™ can sit on a shelf or be mounted to a wall or DIN Rail (35mm by 7.55mm). It should be mounted in a clean, dry location where it is protected from the elements. Ventilation is recommend for installations where ambient air temperatures are expected to be high

See **Appendix J: Mechanical Information** for additional mechanical details.

**2.1.1 Shelf Installation**

When sitting the X-332™ on a shelf, attach the self-adhesive rubber feet to the bottom of the X-332™, and place on a shelf or flat surface.

**2.1.2 Wall Mounting**

Omit/remove the rubber feet, attach the wall mount bracket (shown below) to the side of the X-332™ by using two #6 screws. Mount the X-332™ to a wall by using two additional #6 screws. Repeat steps for additional wall mount.



*Wall mount brackets*

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Installation and Setup X-332™ Users Manual **2.1.3 DIN-Rail Mounting**

Attach a wall mount bracket (shown above) to the side of the X-332™ by using two #6 screws. Attach the DIN-Rail mounting clips [Part number DRC-12C sold separately] to the wall mount bracket by using two additional #6 screws (pictured below). Repeat for the additional DIN-Rail clip.

| *X-332™ mounted to a DIN-Rail using wall mount brackets and DIN-Rail mounting clips* |
| --- |



*DIN-Rail Mounting Clips*

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X-332™ Users Manual Installation and Setup

**2.2 Connection**

**CAUTION: MAKE SURE POWER IS SHUT OFF BEFORE WIRING!**

**CAUTION: THIS UNIT SHOULD BE INSTALLED BY A QUALIFIED TECHNICIAN.**

**MIS-WIRING OR MIS-CONFIGURATION COULD CAUSE PERMANENT DAMAGE TO THE X-332™, THE EQUIPMENT TO WHICH IT IS CONNECTED, OR BOTH.**

Removable terminal connectors are provided for simple wiring. The correct wiring procedure is as follows:

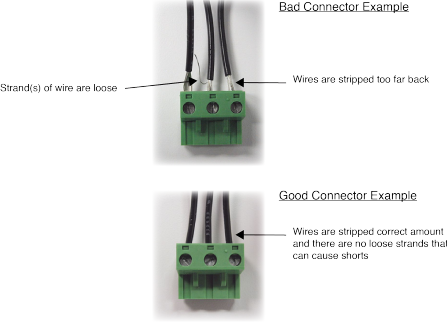
1. Make sure power is turned off.

2. Remove the terminal connector from the X-332™ and make wiring connections to the terminals. 3. Reconnect the terminal connector.

4. Apply power.

It is recommended that the load (device to be controlled) not be connected to the X-332™ until after the X-332™ has been configured and tested. By doing this, wiring and configuration mistakes will not cause the load device to turn on unexpectedly.

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

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Installation and Setup X-332™ Users Manual **2.2.1 Power Supply Connection**

| **3-pin Connector Pinout** | |
| --- | --- |
| **Pin** | **Description** |
| Vin+ | Power Supply VDC+  9-28 VDC for model X-332-24I  DO NOT EXCEED MAXIMUM POWER SUPPLY VOLTAGE. |
| Vin- | VDC- (Ground) power supply input. |
| Egnd | Earth ground *Important Note: Connect this to Earth ground.* |

X-332™ requires power for its internal logic circuits. Connect a 9-28 VDC power supply to the Vin+ and Vin- terminals. Note that a regulated power supply is recommended. Verify that the power supply is rated for the operating current of X-332™ (See **Appendix H: Specifications** for current requirements.) Multiple X-332™ units may be connected to a single power supply by connecting the power supply input terminals in parallel. The power supply must have a high enough current rating to power all units connected. (See **Appendix H: Specification**s for current requirements.)

**2.2.2 Relay Connection**

The relay contacts are internally connected directly to the terminal connectors. Four relays are connected to each 8-pin connector. A Common contact (A) and Normally Open contact (B) are provided for each relay. The relay contacts may be wired in series with the power source for the load (device to be controlled) as long as the load does not exceed the maximum current and voltage rating of the relay contacts.

For loads greater than 2 Amps, an external interposer relay should be used. The illustration below (Figure 2.2a) shows how a 20-Amp motor can be controlled using an external relay. In the example, the X-332™ controls the external relay and the external relay controls the load.

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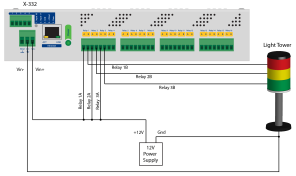
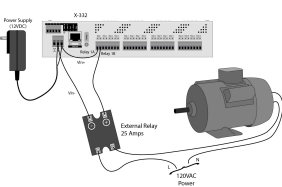
X-332™ Users Manual Installation and Setup 

Figure 2.2a—External Relay Connections / Figure 2.2b-High Side Switch Wiring

When mechanical relays switch inductive loads such as motors, transformers, relays, etc., the current will arc across the internal relay contacts each time the contacts open. Over time, this causes wear on the relay contacts which can shorten their life span. When switching an inductive load, it is recommended that relay contact protection devices are used. Note that the X-332™ does include an internal MOV (40V) across its relay contacts, which offers some protection. Additional relay contact protection may be required. Below is an example of relay contact protection for a DC circuit (Figure 2.2c) and an AC circuit (Figure 2.2d). For component values required to provide sufficient contact protection for your application, refer to appropriate references.

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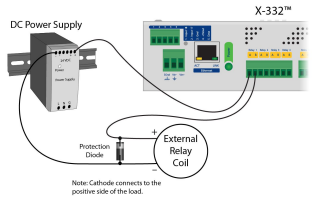
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Figure 2.2c—DC Contact Protection

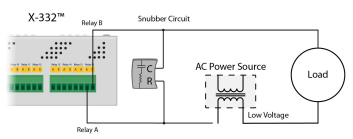


Figure 2.2d—AC Contact Protection

**2.2.3 Optically-Isolated Input Connections**

Internally each input connects directly to an opto-isolator. There are four optically isolated inputs connected to each 8-pin connector. The optically-isolated inputs can be used to control the internal relays, control remote relays (over the network), or simply to monitor the state of a discrete device. To use these inputs, connect a DC control voltage directly to the input and ground, and set up the function of the input using the configuration pages. A current limiting resistor is provided internally, so no external resistors are required as long as the maximum input voltage is not exceeded. If an AC signal, or a signal greater than the rated input voltage needs to be detected by the X-332™, use a signal conditioner to convert the signal to a DC signal within the input range.

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

Figure 2.2e illustrates how a dry contact switch can be connected to the input (or inputs) of the X-332™. One side of the contact is connected to Vout, and the other side is connected to In+. When the contact is closed, it applies 5V to the input terminals.

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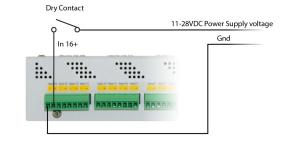
X-332™ Users Manual Installation and Setup 

Figure 2.2e—Connecting Dry Contacts to the X-332™

**Connecting voltages to the optically-isolated inputs:**

**AC Inputs:**

If an AC signal voltage needs to be detected, use a signal conditioner to convert the AC signal to a DC voltage within the input range. An AC signal conditioner can be made using a diode (or bridge rectifier) and a capacitor. Prepackaged signal converters are available as accessories at industrial automation distributors. A simple voltage converter module manufactured by www.redlion.net is shown below. These are available in two input voltage ranges that cover the spectrum from 4-270VAC/DC. These devices have a MOSFET output (solid state DC contact closure) which is compatible with the X-310 input. The converter module accepts AC (50/60 Hz) or DC voltages at input cycles up to 30 Hz. The converter provides isolation between the input and output using an opto-isolator. You must provide a voltage source for the input of the X-332 as shown in the example below:

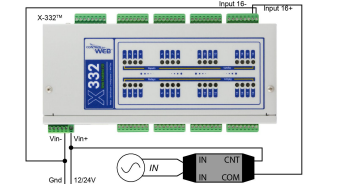


Figure 2.2f

**DC Inputs:**

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

The formulas to calculate external resistor values are provided below:

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X-332-24I with a **11-26VDC** input range has an internal 3K ohm resistor. The forward voltage drop of the photo-coupler is approximately 1.2V and works well with an input current of 10mA.

**R =( (Vin-1.2)/0.01)-3000**

Where:

• R = External resistor value required

• Vin = Desired input voltage

• 1.2V = forward voltage drop of the LED in the photo coupler

• .01A = workable LED current

• 3000ohm = Internal resistor

**For example:**

To connect a 48VDC signal voltage to the X-332™ with a 11-26VDC input range:

R = ((48-1.2)/0.01)-3000 = 1680 Ohms (use a 1600 ohm resistor)

Check the power dissipated by the resistor:

P = I x I x R, The resistor must be at least .01 x .01 x 1600 = 0.16 Watts, so use a 1/2 Watt resistor

**2.2.4 Temperature/Humidity Sensor and Counter Input Connection**

| **5-pin Connector Pinout** | |
| --- | --- |
| **Pin** | **Description** |
| 1. Input 18 | 5V Counter Input |
| 2. Input 17 | 5V Counter Input |
| 3. Gnd | Ground connection for Discrete Inputs. |
| 4. +5Vout | This output voltage is used to provide power for the digital temperature/humidity sensors |
| 5. Data | Temperature/Humidity Data. This is the data line connection for the digital temperature/humidity sensors. |

The 5-pin connector is used to connect temperature and humidity sensors, as well as to connect low voltage sensors. Inputs 17 and 18 found on the 5-pin connector can also be used as counters.

Temperature or humidity sensors can be used for monitoring environmental conditions. The digital sensors use a one-wire data bus, which allows up to four sensors to share the same terminals (+5V, Ground, Data). 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.

The sensors have three wires; the wire color is show in the table below.

*Figure 2.2g - Temperature Sensor*

| **Sensor Wire Color Connection** |  |
| --- | --- |
| Red | 5V Out |
| Black | Gnd |
| Blue, White, Yellow Data |  |

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*Figure 2.2h- Direct Connection (Star) and Daisy Chain Connection(Linear)*

Multiple sensors can be connected in two ways: directly connected to the unit (star topology) or “daisy chained” (linear topology) as shown in Figure 2.2g. Many factors will determine the maximum length of the cable. Some of these factors include, but are not limited to, the type of cable used, the number of sensors, ambient electromagnetic noise, and sensor network topology. Combined cable lengths to all sensors of 600 ft using Cat 5e cable have been successful. However, due to the uniqueness of installation environments, results may vary. Please test in the desired environment before permanent installation.

The following are general recommendations that will maximize sensor runs and minimize problems. Cat 5 and Cat 5e network cable has proven to be an effective and low-cost solution for long runs. Other cable types can be used, but cable capacitance may limit the length. Figure 2.2h shows the recommended connection using Cat 5 network cable. Connect all unused conductors to ground.

*Figure 2.2i - Recommended connection using Cat 5 cable*

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A linear (daisy chain) topology will minimize signal reflections, providing a more reliable connection and will allow longer cable length than a star topology.

Appropriate strain relief should be used at the X-332™ and other connections that may be subjected to vibration, movement, or repeated handling.

• Avoid sensor runs adjacent to industrial equipment power cables. These cables can have the potential for high voltage spikes that may induce noise on the sensor signals. Similarly, avoid running sensor cables near any radio transmission antennas or coaxial feed-lines.

• Protect any electrical connections with appropriate weather shielding.

• Due to the broad range of applications and environments where the X-332™ may be employed, successful installations of long sensor runs may vary significantly.

Two counter inputs (inputs 17 and 18) 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, you can also control outlets by connecting switches to these inputs, and configuring them to control the outlets. Each input can also function as a counter *(for configuration see section 2.5.4).*

**

*Figure 2.2j- Input Schematic*

Connect one terminal of the sensor or switch to the input terminal (Input 17 or Input 18) on X-332™. Connect the other terminal to the ground terminal on X-332™. When contacts are closed the input is connected to ground and the input is considered to be “ON” *(see figure 2.2e).*

*Figure 2.2k - Input Connection Figure 2.2l - Recommended connection using Cat 5 cable*

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X-332™ Users Manual Installation and Setup **2.2.5 Network Connection**

*Figure 2.2m - Network Connection*

**

Connect the Ethernet port to a 10 Base-T, 10/100 Base-T, or 10/100/1000 Base-T Ethernet connection. This typically connects to an Ethernet hub, switch, or router. For configuration, X-332™ 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. X-332™ can be used on a wireless network by connecting through an Ethernet bridge or a wireless router.

*Figure 2.2n - Wireless Connection*

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

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**2.3 Establishing Communications for Setup**

In order to configure the X-332™ on its built-in, web browser interface, the X-332™ and computer must be addressed on the same network. This can be done by one of two methods:

Method 1 – Assign a temporary IP address to the X-332™ to work on an existing network. -or

Method 2 – Temporarily change the IP address of a computer connected to the X-332™ to match the network of the default IP address used by the X-332™.

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

**2.3.1 Method 1: Assign a Temporary IP address to X-332™**

This option is used to TEMPORARILY assign an IP address to the X-332™ without the need to change the IP address of the configuration computer. The X-332™ will use this IP address as long as power is maintained. Once power is lost, the X-332™ will use the IP address assigned in the setup page and not the temporary address assigned here.

Make sure that the X-332™ and the configuration computer are connected to the same network. This will not work through routers or gateways.

**Microsoft Windows Instructions**

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

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

2. Type:

arp -s {new IP address} {serial number of X-332™ }

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

For example, to set X-332™ (with serial number 00-0C-C8-01-00-01 ) to 10.10.10.40 the following command would be used:

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

3. Next, type:

ping -l 102 {new IP address}

For example, if the new IP address is 10.10.10.40, the following command would be used: ping -l 102 10.10.10.40

4. Proceed with X-332™ setup in section 2.4.

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

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X-332™ Users Manual Installation and Setup **Linux/Unix Instructions**

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

2. Type:

arp -s {new IP address} {serial number of X-332™ }

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

For example, to set X-332™ (with serial number 00-0C-C8-01-00-01 ) to 10.10.10.40 the following command would be used:

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

3. Next, type:

ping -s 102 {new IP address}

For example, if the new IP address is 10.10.10.40, the following command would be used: ping -s 102 10.10.10.40

4. Proceed with X-332™ setup in section 2.4.

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

**Mac OS X Instructions**

1. Open a terminal.

*Note: The terminal is in the “Utilities” directory, which is in the “Applications” directory.* 2. Type:

sudo arp -s {new IP address} {serial number of X-332™ }

Administrator password may be required.

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

For example, to set a X-332™ (with serial number 00-0C-C8-01-00-01 ) to 10.10.10.40 the following command would be used:

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

3. Next, type:

ping -s 102 {new IP address}

For example, if the new IP address is 10.10.10.40, the following command would be used: ping -s 102 10.10.10.40

4. Proceed with X-332™ setup in section 2.4.

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

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**2.3.2 Method 2: Assign a Temporary IP Address to the Configuration Computer**

If the first option above is not used, you can use this option to communicate with the X-332™. By default, X-332™ comes from the factory with an IP address of 192.168.1.2. Communication with the X-332™ may be established by assigning an IP address to the configuration computer such that it is on the same network as X-332™ (for example, the configuration computer could be assigned to 192.168.1.50)

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

1. Window Vista/7 – Select the Windows Icon (Start Menu) and enter 

ncpa.cpl into the search bar and press Enter (Figure 2.3a).

Windows XP – Open the control panel by clicking on the start menu

and then on Control Panel.

*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- Vista/7 Start* 

*Menu*

*Figure 2.3b- Control Panel*

2. Double click on the icon labeled Network Connections. The Network Connections window will open (Figure 2.3b).

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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 (Figure

2.3c).

*Figure 2.3c- Network Connection*

4. In the Local Area Connection Properties window 

in the Connection Uses box, scroll down and

highlight “Internet Protocol (TCP/IP).” Click the

button labeled “Properties.” The “Internet Protocol

(TCP/IP)” Properties menu appears (Figure 2.3e).

*Note: If “Use the following IP address” is already*

*selected, the computer has been setup with a*

*static IP address. Record these values so that the*

*IP address of the computer can be restored once*

*the IP address of the X-332™ has been*

*successfully changed.*

*Figure 2.3d- Local Area Connection*

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5. Select the radio button labeled "Use the following 

IP address" and type in the IP address:

192.168.1.50

6. Type in the subnet mask:

255.255.255.0

No need to change the default gateway or DNS

fields. Click OK to accept the new settings.

7. Open the setup pages as described in section

2.4. If the setup pages are not accessible, verify

that X-332™ is powered on and that the LINK

light is illuminated. Check all network connections

and settings.

Another way to check communications is to ping

X-332™ from the command prompt by typing

ping *{X-332™ IP address}*.

*Figure 2.3e- TCP/IP Properties*

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**2.4 X-332™ General Settings Setup Pages**

X-332™ 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://192.168.1.2/setup.html

The setup pages are divided into two sections: General Settings and I/O Setup. A third section is for monitoring and controlling the device.

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

To access the general settings setup pages choose *General Settings* on the menu bar on the left side of the setup screen.



*Figure 2.4a - Main Tab*

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Installation and Setup X-332™ Users Manual **2.4.1 Information Tab**

This is the initial page that is displayed when setup.html is entered into the address bar of the browser. It displays the part number, firmware revision, and serial number of the unit. It also allows the user to select the desired temperature units.

*Figure 2.4b- Information Tab*

***Units***

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.

***Part Number***

This displays the full model number of X-332™.

***Firmware Revision***

This is the current product revision of the unit's firmware.

***Serial Number***

This is the serial number of this unit. The serial number is also the MAC address of the unit. Page 32 Xytronix Research & Design, Inc.

X-332™ Users Manual Installation and Setup **2.4.2 Network Tab**

The network parameters are set on this page.

*Figure 2.4c - Network Tab*

Note: X-332™ 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.

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***Use DHCP***

This option allows DHCP to be enabled or disabled. If this option is set to ***Yes***, X-332™ 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). To use DHCP, click the **Yes** radio button, then press submit. Once this is complete, power cycle the X-332™ – Once restarted, the IP address will be assigned. When the X-332™ is assigned an IP address using DHCP, the new IP address can be found through the list of clients kept by the DHCP server. For most instances, the DHCP server is in 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. X-332™ is a server and manual IP address assignment is usually recommended.

***IP Address***

Enter the IP address for X-332™ in this field. The IP address is specific to the network where X 332™ will be installed, and must be obtained from the network administrator. For more information on IP addresses and remotely accessing X-332™ over the Internet, see **Appendix C: Accessing X 332™ Remotely Over the Internet**. The default setting for this field is 192.168.1.2.

***Subnet Mask***

The subnet mask defines the size of the local network. This can 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.

***Gateway***

This specifies the IP address of the gateway router. This can be obtained from the network administrator. The default setting for this field is 192.168.1.1.

***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).

***Alternate DNS Server***

This field is used to specify the IP address of a Secondary DNS server. This is used when X-332™ requires DNS services and the preferred DNS server is not available. The default setting for this field is 192.168.1.1.

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***HTTP Port***

The TCP port used for HTTP communications (web browser, xml, get commands) with X-332™ is specified here. The default setting for this field is 80, which is the standard HTTP port. It is recommended that the port be left unchanged unless the user has an understanding of TCP/IP and ports. For more information on TCP ports and IP addressing see **Appendix C: Accessing X-332™ Remotely Over the Internet**.

***Speed***

This option sets the data rate (clock rate) of the Ethernet port. Either ***10 Mbps*** or ***100 Mbps*** can be selected. The ***100 Mbps*** option offers faster communications but the amount of data to and from X 332™ is so small that users will not likely notice much (if any) difference. When the X-332™ is set

to ***10 Mbps***, it draws less power and runs a little cooler, which may translate into a longer product life. The default setting for this field is ***10 Mbps***.

IT IS RECOMMENDED THAT THIS SETTING BE LEFT AT **10 Mbps** UNLESS THE USER HAS A SPECIFIC REASON TO USE **100 Mbps.**

***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***.

***Email Server Name/IP (SMTP)***

The name of the SMTP (Simple Mail Transfer 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. There is no default setting for this field.

*Note: If the server name is entered and not the IP address, the address of a DNS server will be required in the DNS field.*

***Email Server Port***

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

***User Name (If Required)***

If the SMTP mail server requires authentication, the user name must be entered here (40 character limit). There is no default setting for this field.

***Password (If Required)***

If the SMTP mail server requires authentication, the password must be entered here. There is no default setting for this field.

***Return Email***

X-332™ will not receive email messages, but when X-332™ sends email messages, it must include a return email address. This field is used to specify the return email address. Note that although X 332™ 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.

***Email 1 to Email 3***

Enter the email addresses of up to three recipients for alarm messages in these fields. There are no default settings for these fields.

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***Email Message***

Choose either “Control Page Content” or “Trigger Only” email formats. When “Control Page Content” is selected, all visible fields in the control page will be included in the email message to be sent out; however if “Trigger Only” is selected, the email content will only be a brief description of what triggered the email message.

***Testing Email Functionality***

Once the email settings are entered, the email functionality can be tested by entering the following command: http://IP address/state.xml?testEmail=1

For example, using the default IP address, enter:

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

This will cause an email message to be sent immediately. If the messages don't get through, the system log file may have some clues to assist in diagnosing the problem

(http://192.168.1.2/syslog.txt). See **Appendix D: Log Files** for additional Logging Information.

***MTU Setting***

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

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**2.4.3 Adv. Network Tab**

*Note: These settings are not used for most installations.*

*Figure 2.4d - Advanced Network Tab*

***Modbus Enabled***

X-332™ 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. The default setting for this field is ***No.*** (See **3.4 Modbus Operation** for more information on using X-332™ on a Modbus network.)

*Note: Modbus communications are disabled whenever the Control Password is enabled.* Xytronix Research & Design, Inc. Page 37

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***Modbus Port***

This specifies the port used for Modbus/TCP communications with X-332™. 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.

***Endianness***

32-bit data is treated as two individual 16-bit words using IEEE 754 floating point format. Floating point format is used for sensor, pulse counter, and analog data as well as for setting output pulse duration.

If the checkbox is set, the X-332™ will use big-endian architecture, and the most significant 16-bit word (big end) is sent first. If the box is cleared, then the X-332™ will use little-endian architecture, and the least significant word (little end) is sent first. The default setting for this box is ***unchecked,*** use little-endian.

For example, in little-endian format, a 32-bit floating point number represented by '1234 ABCD' is sent as 'ABCD 1234'.

***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 X-332™ 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. (See **Remote Services** at the end of this section for more information.)

***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.

***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.

***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 [<Serial Number>]:ControlByWeb,X-332.

***Connection Interval***

This field specifies the periodic interval in which X-332™ attempts to connect to the remote server, or if X-332™ is already connected, it is the interval in which X-332™ 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 Enabled***

When this option is set to ***Yes***, X-332™ will support SNMP. The default setting for this option is ***No***. (See **SNMP** at the end of this section for more information.)

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***SNMP Server 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.

***SNMP Server Port***

When SNMP is used, this field is used to specify the SNMP port that X-332™ listens on. The default setting for this field is 161.

***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.

**Remote Services**

Remote Services initiates an outgoing connection to a server at a remote location. This can be used in an environment where a web server on the Internet provides a custom web page to X-332™ and other ControlByWeb products. Users access X-332™ through the web server rather than communicating directly with it. This method is sometimes referred to as “web services” and allows programmers to create powerful, custom web pages to multiple devices using the web programming languages of their choice.

Remote Services initiates the connection to the external web server (rather than the web server initiating communications to X-332™). This has two main benefits. First, the web server does not need to know the IP address of X-332™. This means that X-332™ can get its IP address dynamically from a DHCP server, simplifying the installation. Second, since the connection from X-332™ is outgoing, rather than incoming, the local router on the network where X-332™ resides doesn't need to be configured to forward sockets. This also simplifies the installation. 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: External Server and Remote Services**.

**SNMP**

Simple Network Management Protocol (SNMP) is used to manage and administer network devices. X 332™ supports SNMP V1.0 and can be configured here. Using SNMP, the I/O states of X-332™ 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 X-332™ using an SNMP manager, as well as where to find MIB files for X-332™.

*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 X-332™ does not check for the community string when issued a Get or GetNext request from the SNMP manager.*

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**2.4.4 Password Tab**

X-332™ requires a password to log into the setup pages. The password can be changed on this page. Additionally, a password can be enabled for the **Control Page**.



*Figure 2.4e - Password Tab*

***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 (13 characters max) with both alphabetic and numeric characters are recommended (A-Z, 0-9). For security purposes, the password will not be displayed as it is entered. Note: the username required for accessing the setup pages is admin (all lower case). The default Setup Password is webrelay (all lower case).

***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.

***Enable Control Password***

The **Control Page** can be viewed without entering a password. For security purposes, a password can be set to access 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***. *Note: Since Modbus has no provision for passing passwords, the* ***Control Page*** *password will not take effect if Modbus is enabled.*

***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. (A-Z, 0-9). For security purposes, the password will not be displayed as it is entered. Note: X-332™ requires a password, but does not require a user name to access the **Control Page**. However, some browsers require a user name. In this instance enter none as the user name. The default Control Password is webrelay.

***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.

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**2.4.5 Date/Time Tab**

X-332™ uses the time of day for scheduled events, such as turning the Outputs ***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. X-332™ has a capacitor-backed real-time-clock circuit that will keep track of time for several days in the event of a power failure.



*Figure 2.4f - Date/Time Tab - Set Time Manually*

***Date/Time***

This is the current date and time stored in X-332™. The time is stored and displayed in 24-hour format.

***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*** requires the user to enter the time and date.

- ***Sync with NTP server*** allows the user to set the clock automatically by using an NTP (Network Time Protocol) server.

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**Manual Time Configuration**

***Date***

The current date is entered by first selecting the correct month and year,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, select the correct day, which will then be highlighted.

***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].)



*Figure 2.4g - Date/Time Tab - Sync with NTP Server*

**NTP Time Configuration**

***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.

Many NTP Internet servers are available. In addition, many desktop computers will function as an NTP server (both Mac and PC). If a desktop computer is used, firewall settings may need to be adjusted to allow for NTP communications on port 123.

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Public NTP servers can be found at www.pool.ntp.org. Some of these are listed below. US Servers (http://www.pool.ntp.org/zone/us):

0.us.pool.ntp.org

1.us.pool.ntp.org

2.us.pool.ntp.org

3.us.pool.ntp.org

North America (http://www.pool.ntp.org/zone/north-america):

0.north-america.pool.ntp.org

1.north-america.pool.ntp.org

2.north-america.pool.ntp.org

3.north-america.pool.ntp.org

Europe (http://www.pool.ntp.org/zone/europe):

0.europe.pool.ntp.org

1.europe.pool.ntp.org

2.europe.pool.ntp.org

3.europe.pool.ntp.org

Australia (http://www.pool.ntp.org/zone/au):

0.au.pool.ntp.org

1.au.pool.ntp.org

2.au.pool.ntp.org

3.au.pool.ntp.org

South America (http://www.pool.ntp.org/zone/south-america):

0.south-america.pool.ntp.org

1.south-america.pool.ntp.org

2.south-america.pool.ntp.org

3.south-america.pool.ntp.org

Africa (http://www.pool.ntp.org/zone/africa):

1.africa.pool.ntp.org

1.pool.ntp.org

3.pool.ntp.org

***Sync With Server***

This option allows the user to specify how often the time on X-332™ will be synchronized with the time server. When the submit button on this page is pressed, X-332™ will immediately synchronize with the time server. If Daily, Weekly, or Monthly options are selected, X-332™ 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).

***Sync on Power Up***

When this option is set to ***Yes*,** X-332™ will be synchronized with the time server each time it is powered.

*Note: If X-332™ will lose power on a frequent basis, it may be beneficial to set this option to* ***No****; some servers are configured to dis-allow access from client devices that excessively request their services. The default value of this setting is* ***No.***

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***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

***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 X-332™ will automatically be shifted forward by one hour between the hours of 12:00 AM – 5:00 PM on the Daylight Savings Start date set below, and it will shift back to standard time between the hours of 12:00 AM – 5:00 PM on the Daylight Savings End date set below. The time change is made at a random time within the previously mentioned, five-hour time frame, in order to prevent several different devices from simultaneously requesting a time and overwhelming the NTP server. The default setting is ***Yes.***

*Note: Enabling the daylight savings time adjustment, scheduled events will be adjusted for the new time. 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.*

***Daylight Savings Start Day***

This is the date that daylight savings will start. Note that on this date, between the hours of 12:00 AM – 5:00 PM, the current time will be shifted forward by one hour (i.e. The 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.

***Daylight Savings End Day***

This is the date that daylight savings will end. On this date, between the hours of 12:00 AM – 5:00 PM, the current time will be shifted backward by one hour (i.e. The 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 U.S.

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**2.4.6 Logging Tab**

X-332™ can be configured to record data such as changes in I/O state, sensor data, and events. Both periodic and event-based logging are supported. The logged data is stored in internal nonvolatile memory and can be retrieved by entering the URL, http://{X-332 IP address}/log.txt. For more information on logging, see **Appendix D: Log Files**.

The log is stored in non-volatile, flash memory using a circular buffer (old date is over written). 512 kB of memory space is reserved for logging. Log entries are composed of the following components, 14-byte header, and 4 bytes for each log feature selected, except relays and inputs, which add eight bytes regardless of how many are logged. A log of Ain1 (4 bytes) and 4 digital inputs will occupy 26 bytes per entry.

*Note: Changing the log settings will erase the current log file.*

**

*Figure 2.4h - Logging Tab*

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***Logging Enabled***

When this option is set to ***Yes***, X-332™ will record data as configured on this page. The default setting for this option is ***No***.

*Note: This option controls data logging, but not system logging. System logging is always enabled. Note: Logging of the Pulse Counter 1 or 2 will reduce the maximum counter rate to 10 Hz. Enabling other options can lower this rate even more.*

***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.

***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.

***Configuration***

This section is used to select which inputs, relays, pulse counters, sensors, analog inputs and events get logged and which events trigger the logging. There are five configuration tables. The first column in each table identifies the elements to be logged . The second column is used to specify which events can cause a log entry to be created. The last column is used to specify the Trigger Delta for the corresponding counters and sensors.

When relays are selected as an ***Event Trigger***, logging will occur whenever the selected relays turned ***ON*** or ***OFF***. When inputs are selected as an ***Event Trigger***, logging will occur whenever the input state changes. When pulse counters, sensors and analog inputs are selected as an ***Event Trigger***, logging will occur whenever the input or sensor changes by the trigger delta. The following ***Log/Event Trigger*** options are available:

- Inputs (1-18)

- Relays (1-16)

- Sensors (1-4)

- Pulse Counters (1-2)

- Analog Inputs (1-4)

- Events

- XML Requests

- MODBUS Requests

- SNMP Requests

*Note: Logging activity will lower the highest possible pulse counter rates.*

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***Sensor Trigger Delta***

X-332™ can be configured to log data when the count, analog input, temperature, or humidity measured by a sensor changes by the amount specified in this field. This can be set from 1.0 to 9999 units, in 0.1 increments. The default setting for these fields is shown below.

| **Sensor** | **Trigger Delta** |
| --- | --- |
| Counters | 2 |
| Analog Inputs | 2.0 V |
| Temperature | 2º |
| Humidity | 2% |

***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 Digital I/O states via an XML request) or **Writes** (such as changing the output 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 filtering out **Reads**, refresh requests will not be shown in the log. Likewise, by selecting **Writes**, any log created by changing the state of the output will not be shown in the log file. The default selection is **None**.

***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.*

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**2.4.7 Events Scheduler Tab**

Events can be programmed to turn the Outputs ***ON*** and ***OFF*** at specific times. Up to 100 events can be created. Each event can occur one time or multiple times.

*Figure 2.4i - Events 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 columns are 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.

- ***Event #***: The number and name of events that are listed.

- ***Schd #***: The schedule where the event is located (0 is the default schedule).

- ***Start Date/Time***: The start date and time (24-hour) of the event.

- ***Period***: The time between the start of successive events.

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- ***Count***: The number of times the event will occur.

- ***Action***: What action the outputs or schedule will take

- ***Act #(s)***: Which of the outputs or schedules, if any, will be affected by the event.

- ***Value***: If an output pulse event is programmed, the Pulse Duration will be displayed. If a set extVar(s) event is programmed, the new extVar value is 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 status.

- Gray – Event has 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 2.4j - Event Setup*

***Current Date/Time***

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

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***Schedule #***

X-332™ can be setup to use multiple schedules. The master event schedule is schedule 0. (See following section, **Schedules** for more information.)

***Description***

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

***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 selecting the day.

***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.

***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 the beginning of events. This time can be specified in **Seconds**, **Minutes**, **Hours**, **Days,** or **Weeks** by selecting the appropriate option in the drop down menu. Default settings is 0 Days. Note that selecting 0 will disable the event.

***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.

***Count***

The number of times the event will occur is specified. The default text is 0. Note that entering 0 in this field will cause the event to occur continuously.

***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 relay(s) on**: This option causes the relay(s) specified in the Affected Relays(s) field to turn ***ON*** when event occurs.

- ***turn relays(s) off***: This option causes the relays(s) specified in the Affected Relays(s) field to turn ***OFF*** when event occurs.

- ***pulse relays(s)***: This option causes the relays(s) specified in the Affected Relays(s) field to turn ***ON*** when the event occurs, and then turn ***OFF*** after the Pulse Duration time (specified below) expires.

- ***toggle relays(s)***: This option causes the relays(s) specified in the Affected Relay(s) field to change states.

- ***change schedules***: This option causes the schedule(s) specified in the Affected field to be enabled or disabled. (See **Schedules** at the end of this section for more information). - ***set extVar(s)***: 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 extvar(s) specified in the Affected External Variables field to a specified value when the event occurs.

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***Affected Relay(s), Affected Schedules, Affected External Variables***

Depending on the Action selected in the Action field, another field will appear with 4 check boxes. This field selects which relays,schedules,or external variables are affected by the action.

***Pulse Duration***

If the Output Action has been set to **pulse output(s)**, the **Pulse 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. The default time is 1.5 seconds.

***ExtVar(s) Value***

If the Action has been set to the Set ExtVar(s) action, then the new value for the extVar(s) is specified here.

**Schedules**

Events can be assigned to one of five schedules. The schedules are useful for creating complex events that vary with calendar dates, such as work shift alarms. Schedule 0 is always active, it cannot be disabled. Other schedules can be enabled and disabled by schedule events. Multiple schedules may be active at one time. The following is an example of how schedules and events might be used.

Schedule 0 – Events 1 & 2: Communication device is enabled daily at 8 pm and disabled at 6 am, Monday through Friday. (The web interface could be used to disable the system for any authorized exceptions.)

| **Field Name** | **Event 1** | **Event 2** | **Application Description** |
| --- | --- | --- | --- |
| Schedule # | 0 | 0 | Schedule 0 cannot be disabled by other events. |
| Description | SCADA ON | SCADA OFF | User description of event. |
| Start Date | Current Day | Current Day | Set to current or previous day. |
| Start Time | 20:00:00 | 06:00:00 | Start time in 24 hr format. |
| Period | 1 Days | 1 Days | Event occurs daily. |
| Days | M-F | M-F | Security system is disabled during work hours and remains on over weekend. |
| Count | 0 | 0 | Event is always in effect, set to zero. |
| Action | turn output on turn output off |  | Security system is controlled through Output 1. |
| Affected | 1 | 1 | Output 1 receives the Action |
| Pulse Duration | n/a | n/a | The value is ignored except for a pulse action. |

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Schedule 1 and 2 – Events 3-8: Radio transmission reports triggered at 8 am and 5 pm Monday through Friday, during winter months but, shifts to 6 am start time during summer.

| **Field Name** | **Event 3** | **Event 4** | **Event 5** | **Event 6** | **Event 7** | **Event 8** |
| --- | --- | --- | --- | --- | --- | --- |
| Schedule # | 1 | 1 | 1 | 2 | 2 | 2 |
| Description | Summer AM Report | Summer AM Report | End Summer Winter AM | Report | Winter AM Report | End Winter |
| Start Date | 30 May | 30 May | 01 Sep | 01 Sep | 1 Sep | 30 May |
| Start Time | 08:00:00 | 17:00:00 | 00:00:00 | 06:00:00 | 03:00:00 | 00:00:00 |
| Period | 1 Days | 1 Days | 1 Days | 1 Days | 1 Days | 1 Days |
| Days | M-F | M-F | All | M-F | M-F | All |
| Count | 0 | 0 | 0 | 0 | 0 | 0 |
| Action | pulse output pulse output |  | change  schedules | pulse output | pulse output | change  schedules |
| Affected | 1 | 1 | 2 | 1 | 1 | 1 |
| Pulse Duration | 3 | 3 | n/a | 3 | 3 | n/a |

In the above example, the **Affected** row applies to Outputs. When an output action is selected, or when a change schedule action is selected. The security system example could also be changed to schedules 1 and 2, allowing for different hours of operation for summer and winter schedules. Additional lunch or break bells could also be added to schedules 1 and 2 or added in schedules 3 and 4. Events 5 and 8 enable and disable schedules. Event 5 would enable schedule 2, and disable schedules 1,3,4. Event 8 would enable schedule 1, and disable schedules 2,3,4. Additional equipment could be controlled by event schedules such as lighting, compressors, and magnetic door locks.

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**2.4.8 Script Tab**

X-332™ 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 the X-332™, a script must first be written as a .txt file. The file must then be uploaded to X-332™ via the Basic Script tab (the maximum size of script that can be uploaded to the device is 2K bytes). Information on writing a basic program for X-332™ can be found in **Appendix G: Basic Scripts**.

*Figure 2.4k - Script Tab*

*Note: An ASCII standard text file format should be used, such as Windows Notepad, Programmer's Notepad, vi, or other text editor that output the file as a .txt. Rich Text Format (.rtf) used by Microsoft WordPad is NOT compatible.*

***BASIC Script***

This field displays the .txt file that is uploaded to X-332™. 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.

***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.

***Upload BASIC Script***

This field displays the script selected to be uploaded to the device. To upload a script to X-332™, click the 'Choose File' button, find the .txt file previously created, and select 'Open.' The location of the file should appear in the neighboring field. To upload the script to the unit, select 'Submit.'

***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.

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**2.4.9 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 2.4l - Control Page Setup Tab*

***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 X-332.

***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 on the control page.

***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. The default Refresh Rate is 3 seconds.

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***Display***

This section is used to select which inputs, relays, external variables, pulse counters, sensors get displayed on the control page. There are six configuration tables. Some tables, such as the digital inputs table, have one column of check boxes. Each check box determines whether or not the status of the element is displayed. Other tables, such as the relays table, have multiple columns. The first column determines if the relay status is displayed on the control page. Other columns determine what control buttons are displayed on the control page.

- Inputs (1-18) – Determines if the input status is visible on the control page.

- Relays (1-16) – Determines if the relay status is visible on the control page. Also, the visibility of On/Off buttons and Pulse buttons can be configured through the check boxes in columns two and three.

- External Variables (1-5) – Determines if the external variables are visible on the control page. On/Off buttons, Up/Down arrows, and Input boxes can all be enabled/disabled through the check boxes in columns three through five.

- Sensors (1-4) – Determines the visibility of the sensor readings on the control page. - Pulse Counters (1-2) – Determines the visibility of the counter values on the control page. - Analog Inputs (1-4) – Determines whether or not the analog measurement is displayed on the control page.

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**2.5 X-332™ I/O Setup Pages**

The second set of setup pages, the I/O Setup pages, are used to configure all the I/O related settings of the device. Accessing these setup pages is the same as all the other setup page. The X-332™ 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://192.168.1.2/setup.html

When initially accessing the device, the browser will request a username and password. The default username is admin and the default password is webrelay (password is case sensitive).

To access the I/O setup pages, choose I/O Setup on the menu bar on the left side of the setup screen. 

*Figure 2.5a - Setup Page*

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**2.5.1 Digital Input Tab**

This page provides configuration options for the sixteen digital inputs built into the X-332™. *Figure 2.5b - Digital Inputs Tab - Input Configuration*

***Digital Input***

A drop-down menu is used to select the digital input to configure.

***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 14 characters long. The default text is Input #.

***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***. Up to 10 characters may be entered in this field. The default text is ON.

***On Status Color***

This field specifies the color that will be displayed on the control page when the input is considered On. Options are Green, Red, Yellow, Blue and White. The default color is Green.

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***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***. Up to 10 characters may be entered in this field. The default text is OFF.

***Off Status Color***

This field specifies the color that will be displayed on the control page when the input is considered Off. Options are Green, Red, Yellow, Blue and White. The default color is Red.

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

- ***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: Email notification will work only if the email settings are correctly set up in the* ***Network*** *setup page.*

***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.

***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.

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**2.5.2 Counters Tab**

This page provides configuration options for the two counter inputs. Inputs 17 and 18 *(refer to page 22)* can be configured to be used as counters, counter one corresponds to input 17 and counter two corresponds to input 18.

*Figure 2.5c - Counters Tab - Input Configuration*

***Counter***

A drop-down menu is used to select the counter to configure.

***Mode***

This settings determines what triggers the counter to increment.

- ***Counter off:*** No input transitions will be counted.

- ***Increment when input on:*** The counter will increment when the input is asserted (input tied to ground).

- ***Increment when input off:*** The counter will increment when the input is no longer asserted (input open).

- ***Increment when input changes:*** The counter will increment each time the input changes on or off.

*Note the default setting for this field is* ***Counter off****.*

***Description***

This text field is used to describe the counter. The text appears to the left of the corresponding counter on the Control Page, and in email messages when email alerts are enabled. This field may be up to 14 characters long. The default text is Count #.

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***Units***

This text field is used to describe the units counted. The text appears to the right of the counter reading. This field may be up to 6 characters long.

***Slope (Multiplier)***

The counter can be scaled to represent “real-world” units. X-332™ reads the “raw” value from each counter, and calculates the number that represents the “real-world” measurement. This scaled value is calculated using the following linear formula. (Range: -86400.000 to +86400.000).

*Scaled Value = Slope \* Count + Offset*

The calculated scaled value is used for trigger logs, email messages, control page, XML page, and returned when Modbus values are read.

The “slope” in the formula above is provided by the user and is entered in this field. When both the slope and offset are set to their default values, 1 and 0, respectively, the scaled value equals the actual count.

When the counter is set to whole number mode, the slope multiplier is truncated, all digits to the right of the decimal place are ignored.

***Offset***

The “offset” in the formula above is provided by the user and is entered in this field. The default value for this field is 0. (Range: -86400.000 to +86400.000).

***Reset Counter***

This button will reset the counter to zero.

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X-332™ Users Manual Installation and Setup **2.5.3 Analog Inputs Tab**

This page provides configuration options for the four analog inputs built into the X-332™. **Note:** All 4 Analog Inputs have an input range of 0-5 VDC

*Figure 2.5d – Analog Inputs Tab - Input Configuration*

***Description***

This text field is used to describe the analog input. By default it is set to “Analog #.” The text appears to the left of the analog input status on the **Control Page**. This text will also appear in email messages when email alerts are enabled. This field may be up to 14 characters long.

***Units***

This text field is used to define the units of the sensor connected to the analog input. This text appears after the analog input status on the **Control Page**. This text will also appear in email messages when email alerts are enabled. This field may be up to 6 characters long.

***Decimal Places:***

This text field is used to specify the number of digits shown on the right of the decimal point on the control page. The minimum number of decimal places shown is 0. The maximum number of decimal places shown is 3. The default for this field is 3.

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***Alarm 1 Color***

The selected color that will be displayed on the Control Page when Alarm 1 is reached. Options are Green, Red, Yellow, Blue and White. The default setting is Green.

***Alarm 2 Color***

The selected color that will be displayed on the Control Page when Alarm 2 is reached. Options are Green, Red, Yellow, Blue and White. The default setting is Red.

***Normal Color***

This field specifies the color that will be displayed on the Control Page when the input voltage is in a Normal condition. Options are Green, Red, Yellow, Blue and White. The default setting is White.

***Slope (Multiplier)***

The analog inputs have an input range from 0-5 VDC. In many cases, the inputs must be scaled to represent “real-world” measurements that are outside the range of 0-5 VDC. The X-332™ reads the “raw” value from each input, and calculates the number that represents the “real-world” measurement that the user is actually interested in. This real-world value (referred to as the “scaled” value in this manual) is calculated using the following linear formula.

Scaled Value = Slope \* Input Voltage + Offset

The Scaled Value is displayed on the Control Page, used to determine alarm conditions, and shown in email messages.

“Slope” in the formula above is provided by the user and is entered in this field. The value is used to scale the 0-5 VDC input to the range of detected condition. For example, a pressure sensor may have a 0.1-4.5 VDC output representing 0 to 50 psi. The multiplier would be calculated as follows. 50 V / (4.5 V - 0.1 V) = 11.36

11.36 would be entered in the multiplier field.

The default value for this field is 1.

When the slope is set to 1 and offset is 0 (default values), the Scaled Value equals the Input Voltage value.

The Scaled Value is also used for the Digital Mode thresholds.

***Offset***

The “Offset” is used for the “zero” measurement. In the above example the offset would be set at 0.1.

The default value for this field is 0. When both the slope and offset are set to their default values, the Scaled Value equals the Raw Voltage.

***Alarm 1***

This setting is used to set the trigger point for an alarm condition. The number field specifies a static value at which the alarm is triggered. An external variable can also be chosen as the alarm value. 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 Scaled Value of the analog input exceeds the Alarm 1 set point. A low alarm occurs when the Scaled Value of the analog input is lower than the alarm set point.

***Alarm 2***

This is a second alarm trigger that works identical to Alarm 1.

***Deadband***

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The Deadband prevents alarms from triggering excessively when the analog measurement vacillates around the trigger point. With high alarms, the measurement must fall below the high alarm point minus the deadband before the high alarm will be triggered again. Likewise the deadband on the low alarm requires the measurement to rise above the low alarm point plus the deadband before the low alarm will be triggered again.

For example, if the deadband is set to 0.5 V, and a high alarm occurs at 5 V, the alarm will not trigger again until the voltage first drops below 4.5 V (5 V - 0.5 V).



***Delay***

The range for the Analog Input Delay is 0 to 3600 seconds. This allows the user to set a time period that the device will wait before triggering an alarm. For example, if sensor 1 is configured to trigger an alarm when the sensor is above 4.000 V and the *Delay* has been set to 20 seconds, then there will be a delay of 20 seconds after the sensor goes above 4.000 V before the alarm is triggered. At the end of the 20 second delay, before the alarm is triggered, the sensor reading will be checked again, if the reading has dropped below 4.000 V, no alarm will be triggered.

***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. 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.

***Use Email Address***

If email messages are to be sent 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.

***Remote Service/SNMP***

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Installation and Setup X-332™ Users Manual 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.

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.*

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**2.5.4 1-Wire Sensors Tab**

This tab is used to configure temperature/humidity sensors and associated alarms. X-332™ will automatically detect whether a temperature or humidity sensor is connected.

***Sensor***

Up to four sensors can be connected to X-332™. This drop-down list selects the sensor to be configured. The fields below are the same for each sensor.

*Figure 2.5e – 1-Wire Sensors Tab*

***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 13 characters in length. The default text in this field is Sensor #.

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***Sensor Address***

Each sensor connected to X-332™ 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), X-332™ 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.

***Alarm 1 Color***

This field specifies the color that will be displayed on the Control Page when Alarm 1 is reached. Options are Green, Red, Yellow, Blue and White. The default color is Green.

***Alarm 2 Color***

This field specifies the color that will be displayed on the Control Page when Alarm 2 is reached. Options are Green, Red, Yellow, Blue and White. The default color is Red.

***Normal Color***

This field specifies the color that will be displayed on the Control Page when the sensor is in a Normal condition. Options are Green, Red, Yellow, Blue and White. The default color is White.

***Offset***

*The value of the offset will be added to the sensor's reading. Normally this should be set to zero.*

***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. Generally this value will be static, but an external variable can be used as a trigger point for an alarm condition as well. To use an external variable select the desired external variable using the drop down box. The value of an external variable can be changed by the event scheduler, through a basic script, and directly through the control page.

***Alarm 2***

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

***Deadband***

The Deadband prevents alarms from triggering excessively when the sensor measurement vacillates around the trigger point.

With high alarms, the measurement must fall below the high alarm point minus the deadband before the high alarm will be triggered again. Likewise the deadband on the low alarm requires the measurement to rise above the low alarm point plus the deadband before the low alarm will be triggered again.

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For example, if the deadband is set to 1 degree, and a high alarm is occurs at 95 degrees, the dead band ensures that once the high alarm is triggered, it won't trigger again until the temperature first drops below 94 degrees (95 – 1).



*Figure 2.5f - Alarm Deadband*

***Delay***

The range for the Email/Action Delay is 0 to 3600 seconds. This allows the user to set a time period that the device will wait before triggering an alarm. For example, if sensor 1 is configured to trigger an alarm when the temperature is above 80 degrees and the *Delay* has been set to 20 seconds, then there will be a delay of 20 seconds after the temperature goes above 80 degrees before the alarm is triggered. At the end of the 20 second delay, before the alarm is triggered, the temperature will be checked again, if the temperature has dropped below 80 degrees, no alarm will be triggered.

***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.

***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.

***Remote Service/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.

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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.

**2.5.5 Relay Setup Tab**

*****Figure 2.5g - Relays Tab*

***Relay***

This drop down menu is used to select the relay to configure.

***Description***

This text field is used to describe the function of the selected relay. The text appears to the left of the corresponding relay status on the **Control Page** and in the email message when email alerts are

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X-332™ Users Manual Installation and Setup enabled. Up to 12 characters may be entered in this field. The default text is Relay #.

***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 relay is ***ON***. Up to 10 characters may be entered in this field. The default text is ON.

***On Status Color***

This field specifies the color that will be displayed on the control page when the relay is considered On. Options are Green, Red, Yellow, Blue and White. The default color is Green.

***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 relay is ***OFF***. Up to 10 characters may be entered in this field. The default text is OFF.

***Off Status Color***

This field specifies the color that will be displayed on the control page when the relay is considered Off. Options are Green, Red, Yellow, Blue and White. The default color is Red.

***On Button Label***

The text entered in this field appears in the 'On' button for the corresponding output on the **Control Page**. Up to 8 characters may be entered in this field. The default text is ON.

***Off Button Label***

The text entered in this field appears in the 'Off' button for the corresponding output on the **Control Page**. Up to 8 characters may be entered in this field. The default text is OFF.

***Pulse Button Label***

The text entered in this field appears in the 'Pulse' button for the corresponding output on the Control Page. Up to 8 characters may be entered in this field. The default text is PULSE.

***Email Option***

Simple email messages can be sent in response to relay state changes. This parameter is used to specify what relay state 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 relay state changes. - ***Send Email when input on***: Email notifications will be sent when relay state changes to ON.

- ***Send Email when input off***: Email notifications will be sent when relay state changes to *OFF*.

- ***Send Email when input changes state***: Email notifications will be sent when relay changes state to *ON* or *OFF*.

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

***Use Email Address***

If email messages are to be sent out based on relay state 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.

***Remote Service/SNMP***

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When this box (Send State Msg/Trap on Relay Change) is checked, SNMP traps and/or State messages will be sent whenever the relay state changes. Remote Services or SNMP must be enabled and properly configured for this feature to be effective.

***Pulse Duration***

When X-332™ receives a pulse command for the relay (through the web page or through a command), the relay 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. The default time is 1.5 seconds.

***State at Powerup***

This drop down menu lets the user specify the state of each of the relays when the X-332™ is powered up. The following options can be selected:

- ***off (unless overridden by event):*** The relay will be off upon power up. This is the default setting.

- ***on (unless overridden by event):*** The relay will be on when power is applied to the X 332™.

- ***last state (unless overridden by event)*:** Upon power up, the relay will return to its last state when the X-332™ was powered off.

***Control Source and #***

These drop down menus specify what input/sensor/relay controls the state of the relay. The following options can be selected:

- ***Digital Input:*** The state of the relay will be controlled by a digital input.

- ***Analog Input:*** The state of the relay will be controlled by a analog input.

- ***1-Wire Sensor*:** The state of the relay will be controlled by a 1-Wire Sensor (temperature or humidity)

- ***Relay*:** The state of the relay will be controlled by the state of another relay.

Depending on the Control Source selected, the # drop down menu will change. For example, when Digital Input is selected, the # drop down menu will have options 1-18. If Analog Input is selected, the # drop down menu will have options 1-4. If a Relay control source is selected then the # drop down menu will have options 1-16 accept for the number of the relay currently being configured. Relays cannot be configured to control themselves.

***Relay Action – when –***

These drop down menus specify what action to take when a criteria is met. The available actions are the same regardless of the control source. The options in this drop-down list change depending on which control source has been selected. The following table describes the options available.

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| **Control Source** | **Available Options** | **Description** |
| --- | --- | --- |
| **Digital Input** | no action **when** input on | Input has no effect on relay |
|  | no action **when** input off | Input has no effect on relay |
|  | no action **when** input  changes | Input has no effect on relay |
|  | turn on **when** input on | Relay turns on when input turns on. Relay turns off when input turns off. |
|  | turn on **when** input off | Relay turns off when input turns on. Relay turns on when input turns off. |
|  | turn on **when** input changes | Relay turns turns when input changes state. Input change does not turn relay back off. |
|  | turn off **when** input on | Relay turns off when input turns on. Relay turns on when input turns off. |
|  | turn off **when** input off | Relay turns off when input turns off. Relay turns on when input turns on. |
|  | turn off **when** input changes | Relay turns off when input changes state. Input change does not turn relay back on. |
|  | latch on **when** input on | Relay turns on when input turns on. Once on, the relay can only be turned off through other means. (Control page, modbus, etc.) |
|  | latch on **when** input off | Relay turns on when input turns off. Once off, the relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch on **when** input  changes | Relay turns on when input changes state. Once off, the relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch off **when** input on | Relay turns off when input turns on. Once off, the relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch off **when** input off | Relay turns off when input turns off. Once off, the relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch off **when** input  changes | Relay turns on when input changes state. Once off, the relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | toggle **when** input on | Relay toggles state when input turns on. Relay maintains current state when input turns off. |
|  | toggle **when** input off | Relay toggles state when input turns off. Relay maintains current state when input turns on. |
|  | toggle **when** input changes | Relay toggles state when input turns off. Relay toggles state when input turns on. |
|  | pulse **when** input on | Relay pulses on when input turns on. Uses pulse duration setting. |
|  | pulse **when** input off | Relay pulses on when input turns off. Uses pulse duration setting. |

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|  | pulse **when** input changes | Relay pulses on when input changes state. Uses pulse duration setting. |
| --- | --- | --- |
|  |  |  |
| **Analog Input/ 1- Wire Sensors** | no action **when** alarm 1 | Sensor has no effect on relay. |
|  | no action **when** alarm 2 | Sensor has no effect on relay. |
|  | no action **when** alarm 1 or alarm 2 | Sensor has no effect on relay. |
|  | turn on **when** alarm 1 | Relay turns on when there is an alarm 1 condition for sensor. Relay turns off when there is no alarm 1 condition. (Alarm 1 condition configured on sensor tab) |
|  | turn on **when** alarm 2 | Relay turns on when there is an alarm 2 condition for sensor. Relay turns off when there is no alarm 2 condition. (Alarm 2 condition configured on sensor tab) |
|  | turn on **when** alarm 1 or alarm 2 | Relay turns on when there is either an alarm 1 or alarm 2 condition for sensor. Relay turns off when there is no alarm 1 or alarm 2 condition. (Alarm conditions configured on sensor tab) |
|  | turn off **when** alarm 1 | Relay turns off when there is an alarm 1 condition for sensor. Relay turns on when there is no alarm 1 condition. (Alarm 1 condition configured on sensor tab) |
|  | turn off **when** alarm 2 | Relay turns off when there is an alarm 2 condition for sensor. Relay turns on when there is no alarm 2 condition. (Alarm 2 condition configured on sensor tab) |
|  | turn off **when** alarm 1 or alarm 2 | Relay turns of when there is either an alarm 1 or alarm 2 condition for sensor. Relay turns on when there is no alarm 1 or alarm 2 condition. (Alarm conditions configured on sensor tab) |
|  |  |  |
|  | latch on **when** alarm 1 | Relay turns on when there is an alarm 1 condition for sensor. Once on, the relay stays on until reset by other means. (Alarm 1 condition configured on sensor tab) |
|  | latch on **when** alarm 2 | Relay turns on when there is an alarm 2 condition for sensor. Once on, the relay stays on until reset by other means. (Alarm 2 condition configured on sensor tab) |
|  | latch on **when** alarm 1 or alarm 2 | Relay turns on when there is either an alarm 1 or alarm 2 condition for sensor. Once on, the relay stays on until reset by other means. (Alarm conditions configured on sensor tab) |
|  | latch off **when** alarm 1 | Relay turns off when there is an alarm 1 condition for sensor. Once off, the relay stays off until reset by |

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|  |  | other means. (Alarm 1 condition configured on sensor tab) |
| --- | --- | --- |
|  | latch off **when** alarm 2 | Relay turns off when there is an alarm 2 condition for sensor. Once off, the relay stays off until reset by other means. (Alarm 2 condition configured on sensor tab) |
|  | latch off **when** alarm 1 or alarm 2 | Relay turns of when there is either an alarm 1 or alarm 2 condition for sensor. Once off, the relay stays off until reset by other means. (Alarm conditions configured on sensor tab) |
|  | toggle **when** alarm 1 | Relay toggles state when there is an alarm 1 condition for sensor. (Alarm 1 condition configured on sensor tab) |
|  | toggle **when** alarm 2 | Relay toggles state when there is an alarm 2 condition for sensor. (Alarm 2 condition configured on sensor tab) |
|  | toggle **when** alarm 1 or alarm 2 | Relay toggles state when there is either an alarm 1 or alarm 2 condition for sensor. (Alarm conditions configured on sensor tab) |
|  | pulse **when** alarm 1 | Relay pulses on when there is an alarm 1 condition for sensor. Uses pulse duration setting. (Alarm 1 condition configured on sensor tab) |
|  | pulse **when** alarm 2 | Relay pulses on when there is an alarm 2 condition for sensor. Uses pulse duration setting. (Alarm 2 condition configured on sensor tab) |
|  | pulse **when** alarm 1 or alarm 2 | Relay pulses on when there is either an alarm 1 or alarm 2 condition for sensor. Uses pulse duration setting. (Alarm conditions configured on sensor tab) |
|  |  |  |
| **Relay** | no action **when** relay on | Control relay has no effect on relay |
|  | no action **when** relay off | Control relay has no effect on relay |
|  | no action **when** relay  changes | Control relay has no effect on relay |
|  | turn on **when** relay on | Relay turns on when control relay turns on. Relay turns off when control relay turns off. |
|  | turn on **when** relay off | Relay turns off when control relay turns on. Relay turns on when control relay turns off. |
|  | turn on **when** relay changes | Relay turns on when control relay changes state. Control relay change does not turn relay back off. |
|  | turn off **when** relay on | Relay turns off when control relay turns on. Relay turns on when control relay turns off. |
|  | turn off **when** relay off | Relay turns off when control relay turns off. Relay turns on when control relay turns on. |
|  | turn off **when** relay changes | Relay turns off when control relay changes state. Control relay change does not turn relay back on. |

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|  | latch on **when** relay on | Relay turns on when control relay turns on. Once on, the relay can only be turned off through other means. (Control page, modbus, etc.) |
| --- | --- | --- |
|  | latch on **when** relay off | Relay turns on when control relay turns off. Once off, the relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch on **when** relay  changes | Relay turns on when control relay changes state. Once off, the relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch off **when** relay on | Relay turns off when control relay turns on. Once off, the relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch off **when** relay off | Relay turns off when control relay turns off. Once off, the relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch off **when** relay  changes | Relay turns on when control relay changes state. Once off, the relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | toggle **when** relay on | Relay toggles state when control relay turns on. Relay maintains current state when control relay turns off. |
|  | toggle **when** relay off | Relay toggles state when control relay turns off. Relay maintains current state when control relay turns on. |
|  | toggle **when** relay changes | Relay toggles state when control relay turns off. Relay toggles state when control relay turns on. |
|  | pulse **when** relay on | Relay pulses on when control relay turns on. Uses pulse duration setting. |
|  | pulse **when** relay off | Relay pulses on when control relay turns off. Uses pulse duration setting. |
|  | pulse **when** relay changes | Relay pulses on when control relay changes state. Uses pulse duration setting. |

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**2.5.6 Remote Relays Tab**

X-332 can be configured to control relays on other ControlByWeb devices across the network. These relays are called remote relays.

*Figure 2.5h - Remote Relays Tab*

***Remote Relay***

This option allows you to select which remote relay to configure.

***IP Address***

The IP address of the remote relay is entered here. The default value is 192.168.1.15

***TCP Port***

The TCP port number used to access the remote relay is entered here. This must match the TCP port (HTTP port) set in the remote relay. The valid range is 0 to 65530. The default port number is 80

***Password***

If the remote relay requires a password for control, the password must be entered here

***Relay #***

The remote relay device may have multiple relays. This field is used to identify the specific relay to be controlled on a remote device. If the remote device is a single WebRelay™, this field should be zero. If the remote device has multiple relays, this field should be set to the relay number. For example if relay 2 is to be controlled on another ControlByWeb™ product, the Relay # would be set to 2. This field by be set from 0 to 16.

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***Control Source and #***

These drop down menus specify what input/sensor/relay controls the state of the remote relay. The following options can be selected:

- ***Digital Input:*** The state of the remote relay will be controlled by a digital input.

- ***Analog Input:*** The state of the remote relay will be controlled by an analog input.

- ***1-Wire Sensor*:** The state of the remote relay will be controlled by a 1-Wire Sensor (temperature or humidity)

- ***Relay*:** The state of the remote relay will be controlled by the state of another relay.

Depending on the Control Source selected, the # drop down menu will change. For example, when Digital Input is selected, the # drop down menu will have options 1-18. If an analog input is selected, the # drop down menu will have options 1-4. If a Relay control source is selected then the # drop down menu will have options 1-16.

***Relay Action – when –***

These drop down menus specify what action to take when a criteria is met. The available actions are the same regardless of the control source. The criteria change depending on what control source has been selected. The following table details the options available based on the control source selected.

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| **Control Source** | **Available Options** | **Description** |
| --- | --- | --- |
| **Digital Input** | no action **when** input on | Input has no effect on remote relay |
|  | no action **when** input off | Input has no effect on remote relay |
|  | no action **when** input  changes | Input has no effect on remote relay |
|  | turn on **when** input on | Remote relay turns on when input turns on. Remote relay turns off when input turns off. |
|  | turn on **when** input off | Remote relay turns off when input turns on. Remote relay turns on when input turns off. |
|  | turn on **when** input changes | Remote relay turns on when input changes state. Input change does not turn remote relay back off. |
|  | turn off **when** input on | Remote relay turns off when input turns on. Remote relay turns on when input turns off. |
|  | turn off **when** input off | Remote relay turns off when input turns off. Remote relay turns on when input turns on. |
|  | turn off **when** input changes | Remote relay turns off when input changes state. Input change does not turn remote relay back on. |
|  | latch on **when** input on | Remote relay turns on when input turns on. Once on, the remote relay can only be turned off through other means. (Control page, modbus, etc.) |
|  | latch on **when** input off | Remote relay turns on when input turns off. Once off, the remote relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch on **when** input  changes | Remote relay turns on when input changes state. Once off, the remote relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch off **when** input on | Remote relay turns off when input turns on. Once off, the remote relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch off **when** input off | Remote relay turns off when input turns off. Once off, the remote relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch off **when** input  changes | Remote relay turns on when input changes state. Once off, the remote relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | toggle **when** input on | Remote relay toggles state when input turns on. Remote relay maintains current state when input turns off. |
|  | toggle **when** input off | Remote relay toggles state when input turns off. Remote relay maintains current state when input turns on. |
|  | toggle **when** input changes | Remote relay toggles state when input turns off. Remote relay toggles state when input turns on. |
|  | pulse **when** input on | Remote relay pulses on when input turns on. Uses pulse duration setting on remote device. |

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|  | pulse **when** input off | Remote relay pulses on when input turns off. Uses pulse duration setting on remote device. |
| --- | --- | --- |
|  | pulse **when** input changes | Remote relay pulses on when input changes state. Uses pulse duration setting on remote device. |
|  | pulse (heartbeat mode) **when** input on | Remote relay pulses on when input turns on and continues to pulse on periodically (periodic state interval) until the input turns off at which point the  remote relay turns off. Uses pulse duration setting of remote device. |
|  | pulse (heartbeat mode) **when** input off | Remote relay pulses on when input turns off and continues to pulse on periodically (periodic state interval) until the input turns on at which point the  remote relay turns off. Uses pulse duration setting of remote device. |
|  | pulse (heartbeat mode) **when** input changes | Remote relay pulses on when input changes state and continues to pulse on periodically (periodic state interval). Uses pulse duration setting of remote device. |
|  |  |  |
| **Analog Input/ 1- Wire Sensors** | no action **when** alarm 1 | Sensor has no effect on remote relay. |
|  | no action **when** alarm 2 | Sensor has no effect on remote relay. |
|  | no action **when** alarm 1 or alarm 2 | Sensor has no effect on remote relay. |
|  | turn on **when** alarm 1 | Remote relay turns on when there is an alarm 1 condition for sensor. Remote relay turns off when there is no alarm 1 condition. (Alarm 1 condition configured on sensor tab) |
|  | turn on **when** alarm 2 | Remote relay turns on when there is an alarm 2 condition for sensor. Remote relay turns off when there is no alarm 2 condition. (Alarm 2 condition configured on sensor tab) |
|  | turn on **when** alarm 1 or alarm 2 | Remote relay turns on when there is either an alarm 1 or alarm 2 condition for sensor. Remote relay turns off when there is no alarm 1 or alarm 2 condition. (Alarm conditions configured on sensor tab) |
|  | turn off **when** alarm 1 | Remote relay turns off when there is an alarm 1 condition for sensor. Remote relay turns on when there is no alarm 1 condition. (Alarm 1 condition configured on sensor tab) |
|  | turn off **when** alarm 2 | Remote relay turns off when there is an alarm 2 condition for sensor. Remote relay turns on when there is no alarm 2 condition. (Alarm 2 condition configured on sensor tab) |
|  | turn off **when** alarm 1 or alarm 2 | Remote relay turns of when there is either an alarm 1 or alarm 2 condition for sensor. Remote relay turns on when there is no alarm 1 or alarm 2 condition. (Alarm conditions configured on sensor tab) |

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|  | latch on **when** alarm 1 | Remote relay turns on when there is an alarm 1 condition for sensor. Once on, the remote relay stays on until reset by other means. (Alarm 1 condition configured on sensor tab) |
| --- | --- | --- |
|  | latch on **when** alarm 2 | Remote relay turns on when there is an alarm 2 condition for sensor. Once on, the remote relay stays on until reset by other means. (Alarm 2 condition configured on sensor tab) |
|  | latch on **when** alarm 1 or alarm 2 | Remote relay turns on when there is either an alarm 1 or alarm 2 condition for sensor. Once on, the remote relay stays on until reset by other means. (Alarm conditions configured on sensor tab) |
|  | latch off **when** alarm 1 | Remote relay turns off when there is an alarm 1 condition for sensor. Once off, the remote relay stays off until reset by other means. (Alarm 1 condition configured on sensor tab) |
|  | latch off **when** alarm 2 | Remote relay turns off when there is an alarm 2 condition for sensor. Once off, the remote relay stays off until reset by other means. (Alarm 2 condition configured on sensor tab) |
|  | latch off **when** alarm 1 or alarm 2 | Remote relay turns of when there is either an alarm 1 or alarm 2 condition for sensor. Once off, the remote relay stays off until reset by other means. (Alarm conditions configured on sensor tab) |
|  | toggle **when** alarm 1 | Remote relay toggles state when there is an alarm 1 condition for sensor. (Alarm 1 condition configured on sensor tab) |
|  | toggle **when** alarm 2 | Remote relay toggles state when there is an alarm 2 condition for sensor. (Alarm 2 condition configured on sensor tab) |
|  | toggle **when** alarm 1 or alarm 2 | Remote relay toggles state when there is either an alarm 1 or alarm 2 condition for sensor. (Alarm conditions configured on sensor tab) |
|  | pulse **when** alarm 1 | Remote relay pulses on when there is an alarm 1 condition for sensor. Uses pulse duration setting of remote device. (Alarm 1 condition configured on sensor tab) |
|  | pulse **when** alarm 2 | Remote relay pulses on when there is an alarm 2 condition for sensor. Uses pulse duration setting of remote device (Alarm 2 condition configured on sensor tab) |
|  | pulse **when** alarm 1 or alarm 2 | Remote relay pulses on when there is either an alarm 1 or alarm 2 condition for sensor. Uses pulse duration setting of remote device. (Alarm conditions configured on sensor tab) |
|  | pulse (heartbeat mode) **when** alarm 1 | Remote relay pulses on when alarm 1 condition occurs and continues to pulse on periodically (periodic state interval) until the alarm condition clears at which point the remote relay turns off. Uses |

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|  |  | pulse duration setting of remote device. |
| --- | --- | --- |
|  | pulse (heartbeat mode) **when** alarm 2 | Remote relay pulses on when alarm 2 condition occurs and continues to pulse on periodically (periodic state interval) until the alarm condition clears at which point the remote relay turns off. Uses pulse duration setting of remote device. |
|  | pulse (heartbeat mode) **when** alarm 1 or alarm 2 | Remote relay pulses on when alarm 1 or alarm 2 condition occurs and continues to pulse on periodically (periodic state interval) until the alarm condition clears at which point the remote relay turns off. Uses pulse duration setting of remote device. |
|  |  |  |
| **Relay** | no action **when** relay on | Control relay has no effect on remote relay |
|  | no action **when** relay off | Control relay has no effect on remote relay |
|  | no action **when** relay  changes | Control relay has no effect on remote relay |
|  | turn on **when** relay on | Remote relay turns on when control relay turns on. Remote relay turns off when control relay turns off. |
|  | turn on **when** relay off | Remote relay turns off when control relay turns on. Remote relay turns on when control relay turns off. |
|  | turn on **when** relay changes | Remote relay turns on when control relay changes state. Control relay change does not turn remote relay back off. |
|  | turn off **when** relay on | Remote relay turns off when control relay turns on. Remote relay turns on when control relay turns off. |
|  | turn off **when** relay off | Remote relay turns off when control relay turns off. Remote relay turns on when control relay turns on. |
|  | turn off **when** relay changes | Remote relay turns off when control relay changes state. Control relay change does not turn remote relay back on. |
|  | latch on **when** relay on | Remote relay turns on when control relay turns on. Once on, the remote relay can only be turned off through other means. (Control page, modbus, etc.) |
|  | latch on **when** relay off | Remote relay turns on when control relay turns off. Once off, the remote relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch on **when** relay  changes | Remote relay turns on when control relay changes state. Once off, the remote relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch off **when** relay on | Remote relay turns off when control relay turns on. Once off, the remote relay can only be turned on through other means. (Control page, modbus, etc.) |
|  | latch off **when** relay off | Remote relay turns off when control relay turns off. Once off, the remote relay can only be turned on through other means. (Control page, modbus, etc.) |

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