X22s

Eight, Analog Input Expansion Module

USERS MANUAL

Revision 2.0

For models: X-22s

Eight, 16-Bit Analog Inputs - Programmable Input Ranges

▶ **Pressure**

▶ **Fluid level**

▶ **Mechanical position**

▶ **Transducer current**

▶ **Temperature**

X-22s User Manual Revisions	
Revision	**Description**
1.0	Initial release
2	Fixed typos

          Xytronix Research & Design, Inc.

Section 1: Introduction

The X-22s™ expansion module is used in conjunction with the X-400™ master controller. Currently the X-600M™ does not support the X-22s.

Configurable Analog Inputs

Each X-22s has eight inputs that can be used in various modes including single-ended analog, differential analog, or digital (on/off). When the inputs are used in single-ended or digital input mode each input references the AGND terminal. When the inputs are used in differential mode, the inputs are paired together (In1 pairs with In2, In3 pairs with In4, etc) so the two inputs reference each other instead of AGND. This means that the X-22s offers up to eight, single-ended inputs (analog or digital), or up to four differential inputs and they can be used in any combination (some configured as single ended and some configured as differential).

The analog inputs can be configured to measure different voltage ranges from ±1.28V to ±10.24V (or up to ±20.48V for differential inputs). The X-22s provides a 5.0V reference output that can be used to power potentiometers or other resistance sensing sensors. The X-22s is ideal for measuring precision analog voltages in industrial environments. One or more X-22s expansion modules can be connected to the control module (X-400) with a ribbon cable. The ribbon cable provides both power and communications.

X-400 Master Controller

The X-400 together with the X-22s provide an easy, flexible and reliable way to monitor sensors and devices over a network. The X-22s is suitable for use with pressure sensors, flow meters, current transducers and position sensors – anywhere where precision analog voltage sensing is required.

The X-22s' inputs can be used to trigger email alerts based on a voltage level and can be used to control the relay contacts of other ControlByWeb™ products (such as WebRelay™) that are located at a remote location.

1.1   Features

- Eight analog input channels

- Inputs can be configured as single ended, differential, 4-20mA, or pseudo digital

- Programmable input ranges from ±1.28V to ±10.24V (±20.48V differential)

- 16-bit, SAR ADC

- High input impedance (>500 Meg Ohm) facilitates scaling input voltage with external resistors

- Removable terminal connectors (included) simplify making wiring connections

- Apply a different slope and offset for each raw input reading (via X-400)

- Combine X-22s modules with other ControlByWeb modules for a custom mixture of I/O

- Utilize the vast features of the X-400 controllers including logging, alerts, scheduling, control, Modbus/TCP communications, and much more.

Connectors & Indicators

Analog Inputs

The X-22s has eight analog inputs. Four analog ground (Agnd) terminals provide convenient connection points for making sensor wiring connections. The X-22s can be setup to input either eight single-ended analog signals, four differential analog signals, or a combination both.

Reference Output

Two 5.0V reference terminals can be used to power resistance sensing sensors such as potentiometers and bridge sensors. The reference output can provide up to 25mA (the two reference terminals are connected together internally).

Expansion Bus

The expansion bus allows for a family of expansion modules to be connected directly to the controller (X-400) without the need for an Ethernet switch. The cable can be a daisy chain with multiple connectors. The ribbon cable expansion bus provides both power and communications connections.

Power Supply

The expansion bus can provide up to 1.7 Amps for powering up to 32 expansion modules; however, the maximum number of expansion modules depends on the module type and power source attached to the X-400.

The X-22s employs a modern switch-mode power supply. With this type of power supply the current draw _decreases_ as the voltage increases; therefore, you can add more expansion modules by using a 24-volt power supply than you can with a 12-volt power supply. See the _X-400 User Manual_ for more details.

Indicators

The green Power LED indicator is illuminated whenever the module is powered. To identify the module during installation, the X-400 can send a blink command which will cause the power LED to blink for three seconds.

1.2   Part Numbers and Accessories

Accessory	Description	Part Number
X-22s	8-Channel analog input module, 0-5VDC inputs	X-22s
Spare Connector	14-Position, screw-terminal connector	X-1803691

# Section 2: Installation and Connections

Installation consists of mounting the X-22s and connecting it to an X-400 controller with a 10-conductor ribbon cable. Programming and testing is done by using a web browser to configure the web pages, inputs, and outputs for your specific needs.

2.1   Installation Guidelines

- This unit must be installed by qualified personnel.

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

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

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

2.2   Mounting

X-22s can be mounted to a standard (35mm by 7.55mm) DIN-Rail. Normally expansion modules are mounted to the left side (embossed logo side of the enclosure) of the X-400 controller so that the ribbon cable doesn't cover the power connector. The X-22s should be located in a clean, dry location where it is protected from the elements. Ventilation is recommend for installations where high ambient air temperatures are expected to be high. See *Appendix D: Mechanical Information* for additional mechanical details.
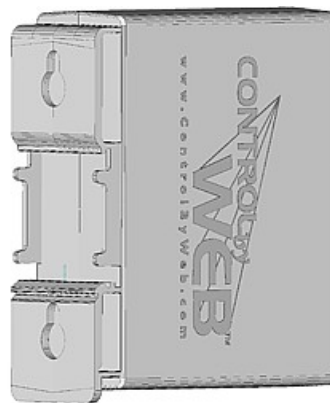
2.2.1   DIN-Rail Mounting

Attach the X-22s to the DIN-Rail by hooking the top hook on the back of the enclosure to the DIN-Rail and then snap the bottom hook into place. To remove the X-22s from the DIN-Rail, use a flat-head screwdriver. Insert the screw driver into the notch in the release tab and pry against the enclosure to release the bottom hook.

2.3 Making Connections

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

CAUTION: Miswiring or misconfiguration could cause permanent damage to the X-22s, the equipment to which it is connected, or both.

A removable terminal connector is provided for making the power connections. The correct wiring procedure is as follows:

1. Make sure power is turned off.

2. Remove the terminal connector from the X-22s and make wiring connections to the terminals. This technique avoids stressing the internal components while torquing the screws.

3. Reconnect the terminal connector.

4. Apply power.

It is recommended that any load (device to be controlled) not be connected to the expansion modules until after the X-400 has been configured and tested. By doing this, wiring and configuration mistakes will not cause the load device to turn on unexpectedly.

Make certain the wires are properly inserted into to the terminals and that the screws are tight.

Wire Specification:

Use wire rated for 75ºC (min) for connections to the terminal blocks

Connector Specifications:

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

| 14-Pin Connector Pinout	
Terminal	**Description**
Agnd	Analog Ground
Ain8	Analog Input 8+ (single-ended mode) or Analog Input 7- (differential mode) ±1.28V, ±2.56V, ±5.12V, ±10.24V and 0-20mA
Ain7	Analog Input 7+ ±1.28V, ±2.56V, ±5.12V, ±10.24V and 0-20mA
Agnd	Analog Ground
Ain6	Analog Input 6+ (single-ended mode) or Analog Input 5- (differential mode) ±1.28V, ±2.56V, ±5.12V, ±10.24V and 0-20mA
Ain5	Analog Input 5+ ±1.28V, ±2.56V, ±5.12V, ±10.24V and 0-20mA
Agnd	Analog Ground
Ain4	Analog Input 4+ (single-ended mode) or Analog Input 3- (differential mode) ±1.28V, ±2.56V, ±5.12V, ±10.24V and 0-20mA
Ain3	Analog Input 3+ ±1.28V, ±2.56V, ±5.12V, ±10.24V and 0-20mA
Agnd	Analog Ground
Ain2	Analog Input 2+ (single-ended mode) or Analog Input 1- (differential mode) ±1.28V, ±2.56V, ±5.12V, ±10.24V and 0-20mA
Ain1	Analog Input 1+ ±1.28V, ±2.56V, ±5.12V, ±10.24V and 0-20mA
+5Vref	+5.0V reference output
+5Vref	+5.0V reference output, internally connected to above

2.4   Analog Input Connections

The X-22s features a high performance, 8-channel, 16-bit analog data acquisition system. The inputs are high impedance (>500 Meg ohms.) Each channel is configurable for single-ended or differential operation. Programmable voltage ranges include; ±1.28V, ±2.56V, ±5.12V and ±10.24V and ±20.48V (differential). Each channel can also be configured for 0-20mA input operation. The input mode and voltage range is configured in the web-based setup pages in the controller (X-400).

The analog inputs work with industrial sensors, wind direction sensors, pyranometers, pressure transducers, and much more. Since the input impedance is very high and if an input is left unconnected, the voltage measurement will float and drift.

The analog inputs can be configured to send an email, log, or control a remote relay (over the network using peer-to-peer communication).

2.4.1 Single-Ended Mode

The analog data acquisition system can accept bipolar input signals. Single-ended signals are referenced to the AGnd terminals. Each channel can be independently programmed with a ±1.28V, ±2.56V, ±5.12V, ±10.24V voltage range. Do not share the sensor ground connection with the power supply input terminal. Consider how the sensor(s) are powered, arrange the sensor connections so no current flows in the ground reference connections between the X-22S and your sensor(s).
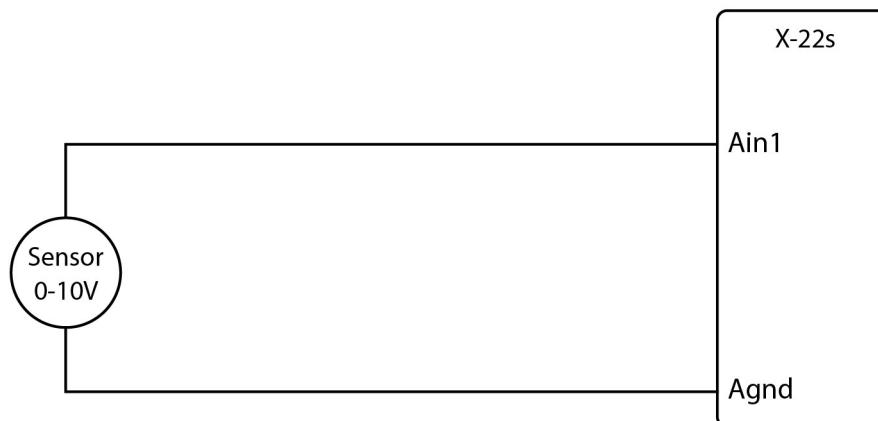
Sensors or Voltage Measurements above 10V

Voltages applied to the analog inputs must be within the range selected. Voltages above the highest range (10V for single ended inputs) may be connected to the analog inputs through external voltage divider resistors.

The following diagram shows a voltage divider circuit for a 0-50V sensor. In the example, resister values for R1 and R2 are chosen so that Vout will have a 0 to 10 volt range.
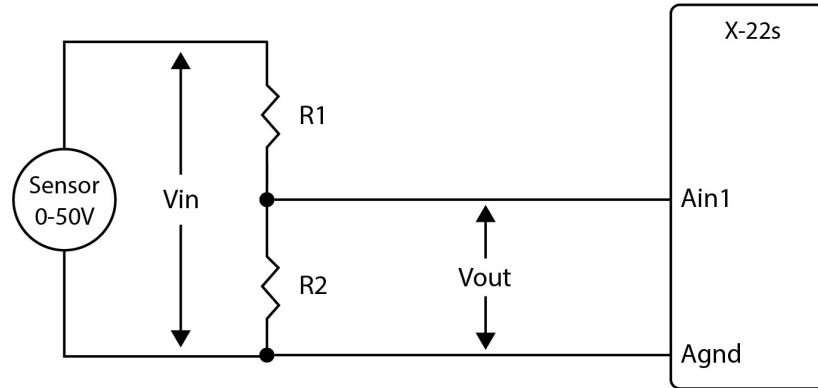
Generally, you can choose a 10K Ohm resistor for R2 and then calculate the value of R1 using the following formula.

Vout = Vin * (R2 / (R1 + R2))

To determine the proper resister value to use in the example above, use the maximum output of the sensor (50 VDC) as Vin in the equation, the maximum input value of the X-22s (10 VDC) as Vout, and R2=10K Ohms. Solving for R1 gives R1=40K ohms.

R1=40K, R2=10K

It may be difficult to find a 40K resistor with a low tolerance for the accuracy needed but 39K resistors with 0.1% tolerance are available.

R1=39K, R2=10K

Using a 39K R1 changes Vout slightly...

Vout = 50 * (10K / (39K + 10K)) = 10.204V. Fortunately, the maximum input voltage at that range is 10.24V so even we are still within the safe range.

The next step is to figure out the slope and offset for the voltage divider. These are the numbers that will be entered into the master controller (X-400) to set the scale.

The slope and offset for the voltage divider must calculated and entered into the setup pages of the X-400. The general term for the Slope is:

Slope = (Y2-Y1)/(X2-X1)

For the 50V input example:

Slope = (50Vin – 0Vin)/(10.204Vout – 0Vout) = 4.8999V/V

Once the slope is determined, calculate the offset using the Y=mX+b linear equation where b is the offset.

0Vout = 4.8999V/V * 0Vin + Offset

Offset = 0V – (4.8999V/V * 0V) = 0

See section 4 (Configuration and Setup) to enter slope and offset values into the X-400 controller.

2.4.2 Differential Mode

Differential sensors have two outputs that reference each other instead of ground. The differential mode uses two analog inputs instead of one.

>   For example, if Channel 1 is selected for differential operation, the differential signals are connected to Channel 1 and 2. If Channel 3 is selected for differential operation, the differential signals are connected to Channel 3 and 4, and so on.

Differential mode supports input ranges of up to ±20.48V. However, the absolute input voltages must be less than ±10V.

>   For example, if Input 1 is configured for differential operation and Input1 = +10V and Input2 = -10V, the measurement will read +20V. On the other hand, if Input1 = -10V and Input2 = +10V, the measurement will read -20V.

With differential connections, a ground connection is still required between the X-22s and your sensor to maintain the two input voltages within the common mode voltage range (-10V < Vin < +10V) of the X-22s.

The illustration below shows the connections for a Wheatstone bridge sensor with two output signals. The outputs are connected to Ain1 and Ain2. The X-22s must be programmed for differential mode on "Ain1". The analog measurement will be made by the voltage difference between the two inputs (Ain1-Ain2).

>   For example, if Ain1 is 2.0V and Ain2 is 3.0V, the differential measurement will be -1.0V.

In the illustration below the bridge is excited (driven) by the 5.0V reference output. Notice also that the bridge provides the necessary input bias.
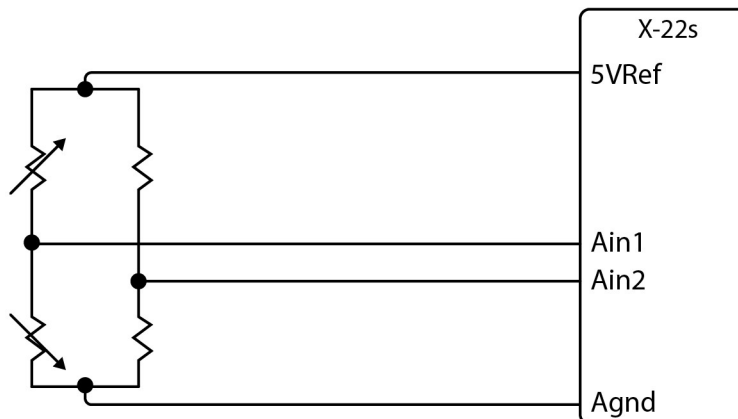

The low input bias and high resolution inputs of the X-22s together with the reference output make the X-22s workable with many bridge sensors without using a preamplifier or other circuitry.

2.4.3 Current Sensors (4-20mA Mode)

Some industrial sensors output a current instead of voltage levels. Normally, a shunt resistor is needed to measure the current. The X-22s contains internal shunt resistors which are automatically switched on when 4-20mA mode is selected. NO EXTERNAL SHUNT RESISTORS ARE REQUIRED.

The internal shunt resistors are 200-ohm, 0.1%, 25ppm, and the A/D is automatically configured for ±5V operation so at 20mA the maximum voltage across the X-22s is 4.0V. The resistor generates a voltage proportional to the sensor current which is in turn sensed by the X-22s. The following diagram shows how to connect a 4 to 20mA sensor to the X-22s.
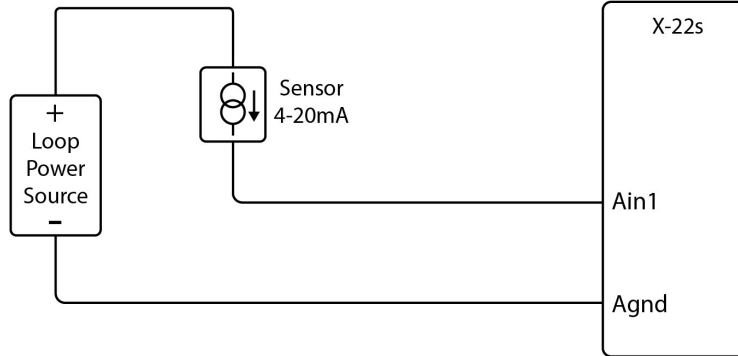
Loop powered current transmitters normally require 7 to 8 Volts across their terminals in order to work properly. The 200-ohm load resistor will drop 4V across the input terminal at 20mA. Allow 2-volts or so for voltage drops across the wiring, especially if the wires are small or long. In this example make certain your loop power source is at least 14-Volts (8+4+2).

2.4.4 Pseudo Digital Inputs

For applications where digital inputs are needed, specific analog inputs can be configured as a pseudo digital input with a boolean (true/false) state. The input voltage is compared to a fixed threshold to determine a true/false state. The input is considered "true" when the voltage rises above 3.5V and "false" when it falls below 1.5V. When an analog input is configured as a digital input, the input can be configured to send an email, control a remote relay (over the network), or monitor the state of a discrete device.

Section 3: Example Applications

3.1   Monitor Height, Position, etc. over an IP network

The illustration below shows an example of using the X-22s with a potentiometer position sensor.

Potentiometers are in essence a variable resistor with three connections. Typically the Vref reference from the X-22s is used to apply power across the potentiometer. The wiper terminal of the potentiometer is connected to any of the eight analog inputs.
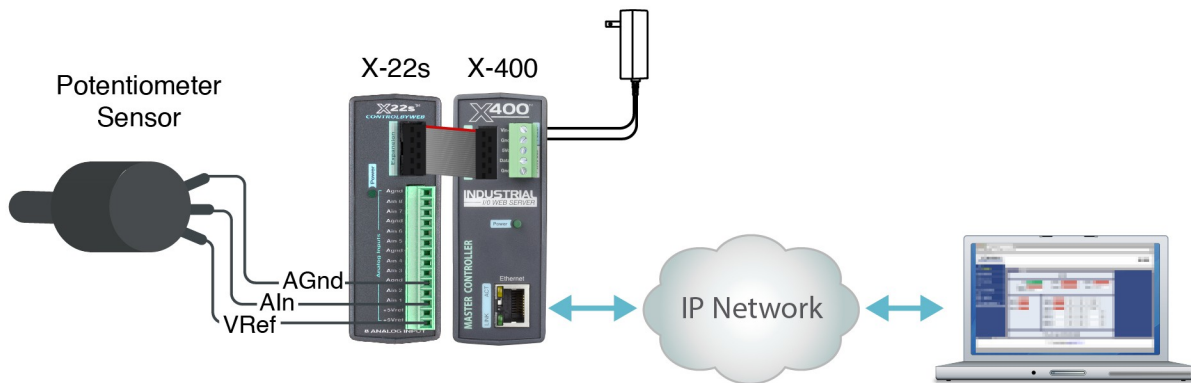
3.2   Monitor Flow, Distance, or Speed with a 4-20mA Sensor

Signal conditioners are available for measuring flow, distance, speed and many other industrial processes. Many popular signal conditioners employ a 4-20mA analog output. These transducers can be connected directly to the X-22s when 4-20mA mode is enabled.

Once the components are properly wired, the X-400 must be configured with the proper *Slope* and *Offset* to convert the voltage measurement into engineering units such as CFS (flow), Meters (distance) or Meters per Second (speed). For linear transducers this is normally done with a Y=mX+b equation.

> Engineering Value = (Measured Value * Slope) + Offset

The documentation for the sensor must be consulted for the calculations. For example, if the range of a laser rangefinder is 1Meters to 100Meters the transducer will output 4mA at 1M and 20mA at 100M. To convert this measurement to engineering units the voltage measurement must be processed with a *Slope* setting. The general term for the Slope is:

> Slope = (Y2-Y1)/(X2-X1)

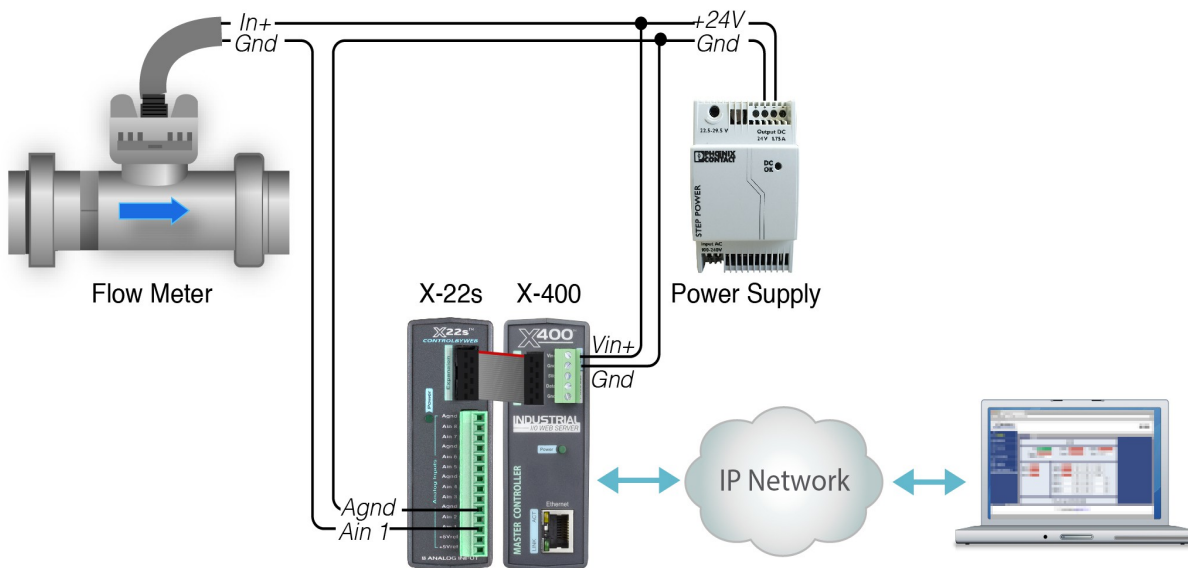> Slope = (100M – 1M)/(20mA – 4mA) = 6.1875 Meters/mA

Once the slope is determined, calculate the offset using the Y=mX+b linear equation where b is the offset.

> 1M = (6.1875M/mA * 4mA) + Offset

> Offset = 1M – (24.75M) = -23.75M
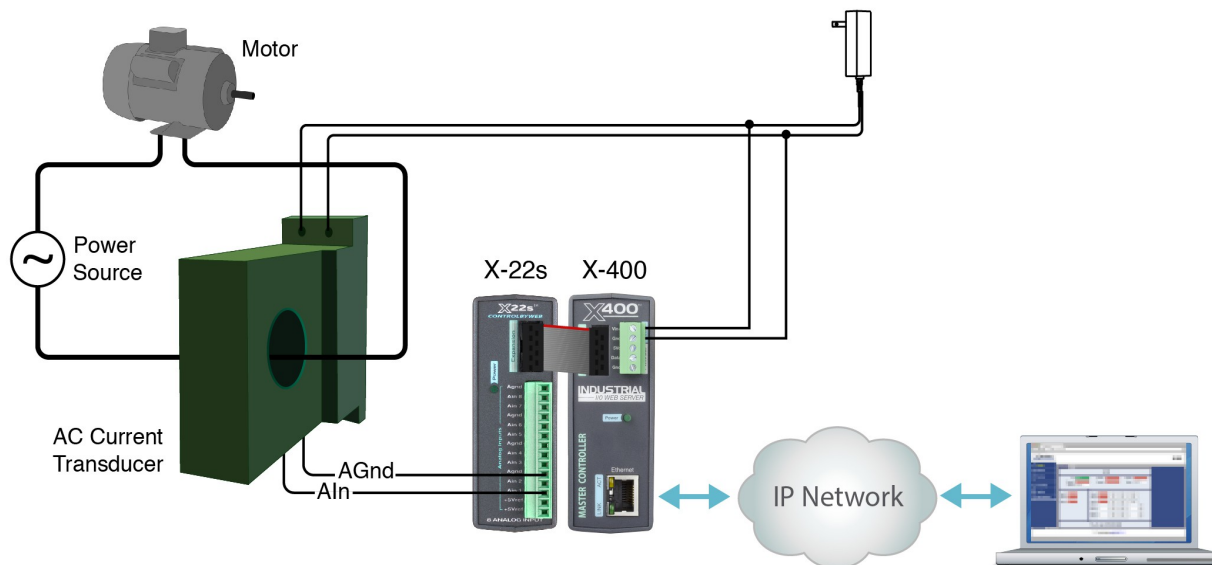
Configure the X-400 with the new settings as described in Section 4.

3.3 Monitor Motor Load Current

The illustration below shows an example of using the X-22s in conjunction with a current transducer to measure the current draw of a motor.

This example uses a current sensor that will measure current up to 20 Amps AC. The sensor produces a linear 0-5VDC output (0V represents 0A and 5V represents 20A) that it can be connected directly to one input of the X-22s analog module. The slope is calculated and entered into the setup pages of the X-400. The slope calculation is given below:

Slope = (Y2-Y1)/(X2-X1)

Slope = (20Amps – 0 Amps)/(5 VDC – 0 VDC) = 4 Amps/V

Configure the X-400 with the new settings as shown in Section 4.

3.4   Level Alarm at a Remote Location

The illustration below shows an example of using the X-22s to sense water (or other) liquid level and to sound an alarm at a remote location using a WebRelay module. This example is similar to the potentiometer example above except that the X-400 is configured to control a remote device. Each analog input can be configured to send messages to a remote ControlByWeb device when a high or low threshold is reached. In this example the X-400 is configured to send a remote message to sound an alarm when a certain level is exceeded.
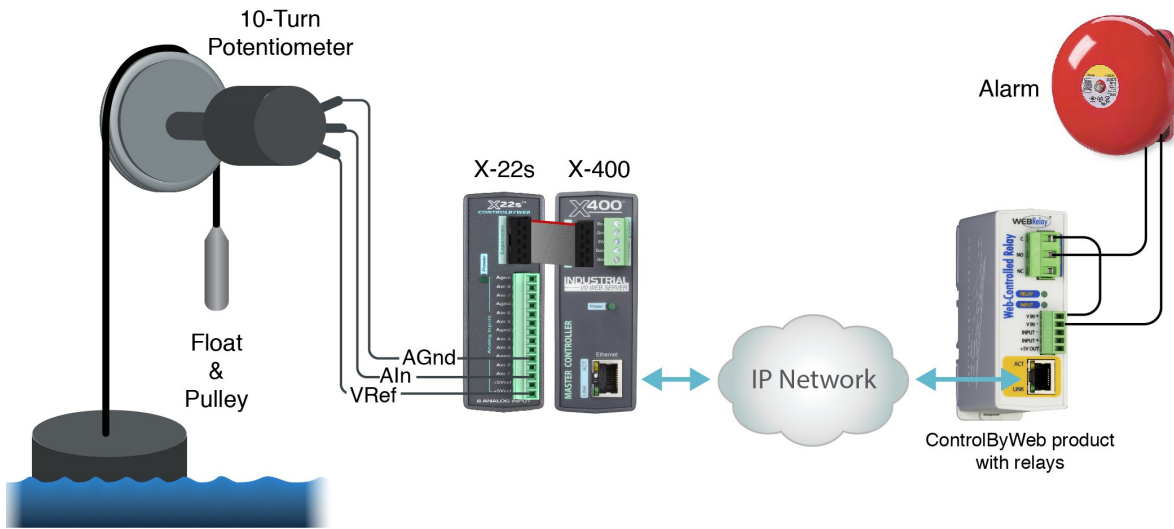
3.5   Dry Contact Switch

The illustration below shows an example of using the X-22s to monitor the status of a gate or door over an IP network. The status of the device is detected with a simple switch. These type of sensors are called "dry contacts" in that the device output is a bare switch with no power source.

The switch requires a power source and this could come from the +5Vref output. If other channels of the X-22s are being used for precision analog measurements, it may be a good idea to use another voltage source for this purpose rather than risk exposing the precision reference output to electrical noise.

A pull-down resistor must be provided to drive the input to a known state (0V) when the switch is open. In this example the measurement voltage will be 5.0V when the switch is closed and 0-V when the switch is open.

A conditional event can be defined to detect whether the input voltage is above or below a 2.5-V threshold to detect the state of the switch.
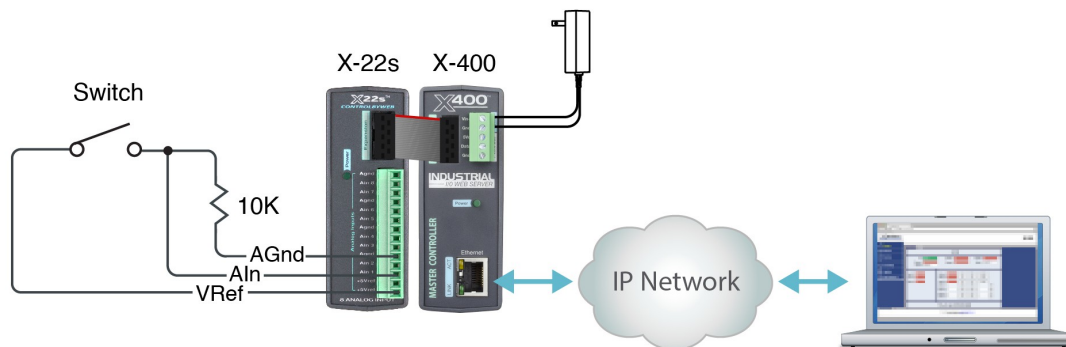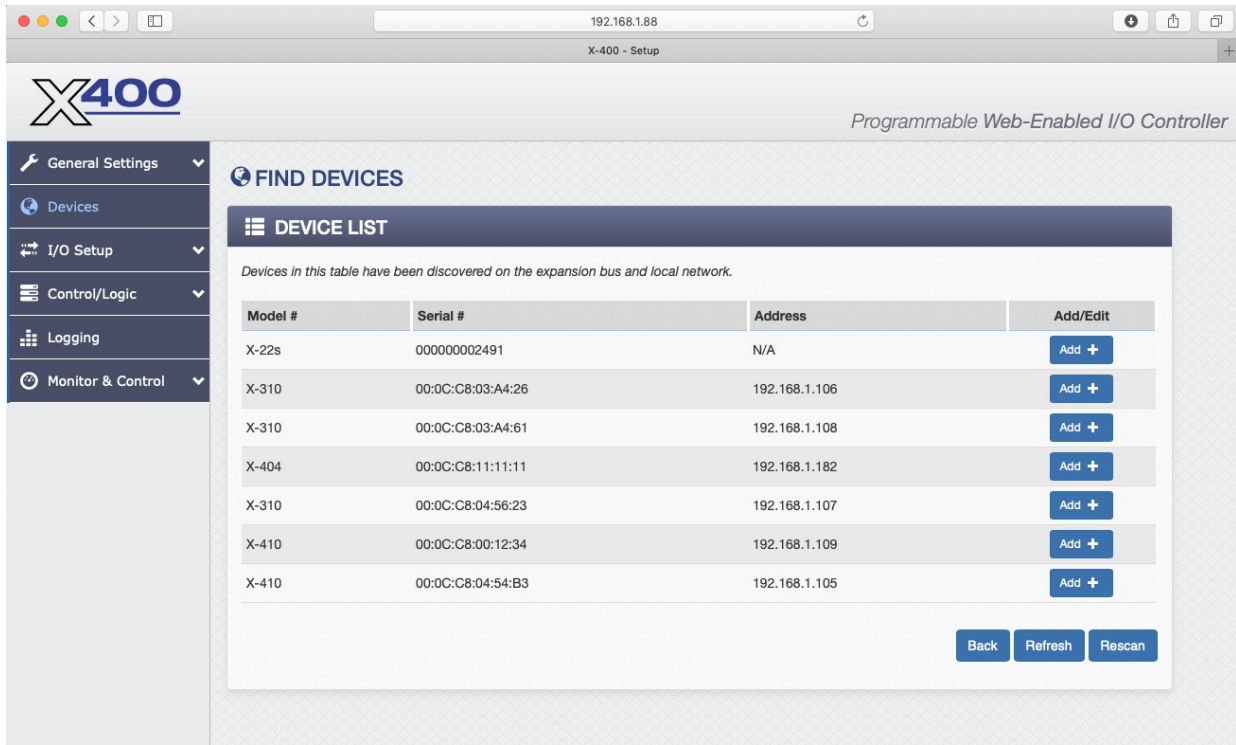
Section 4: Configuration and Setup

4.1   X-400 Setup Example

Follow the instructions to connect the X-400 to the network and access its setup pages:

1. Click on the **Devices** menu tab to pull up the *Devices Overview* page. Then click on the **Find Devices** button to scan the expansion bus and the local network for ControlByWeb devices and expansion modules.

2. Click the **Add** button for the X-22s. If multiple X-22s modules are connected to the expansion bus, use the serial number of the X-22s to determine which module you are working with. Here you can assign an appropriate name to the device.
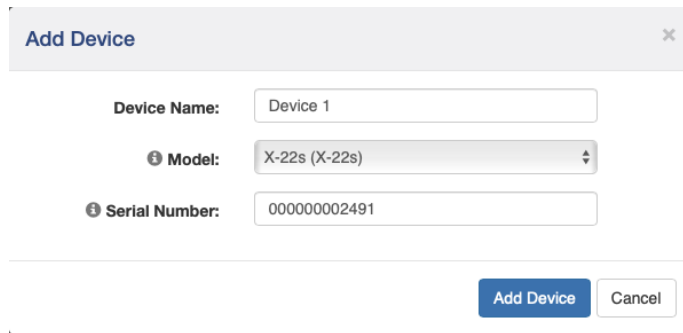
3. In the add device popup window, select the **Add Device** button. A window will appear that allows you to select the inputs that should be added to the X-400.
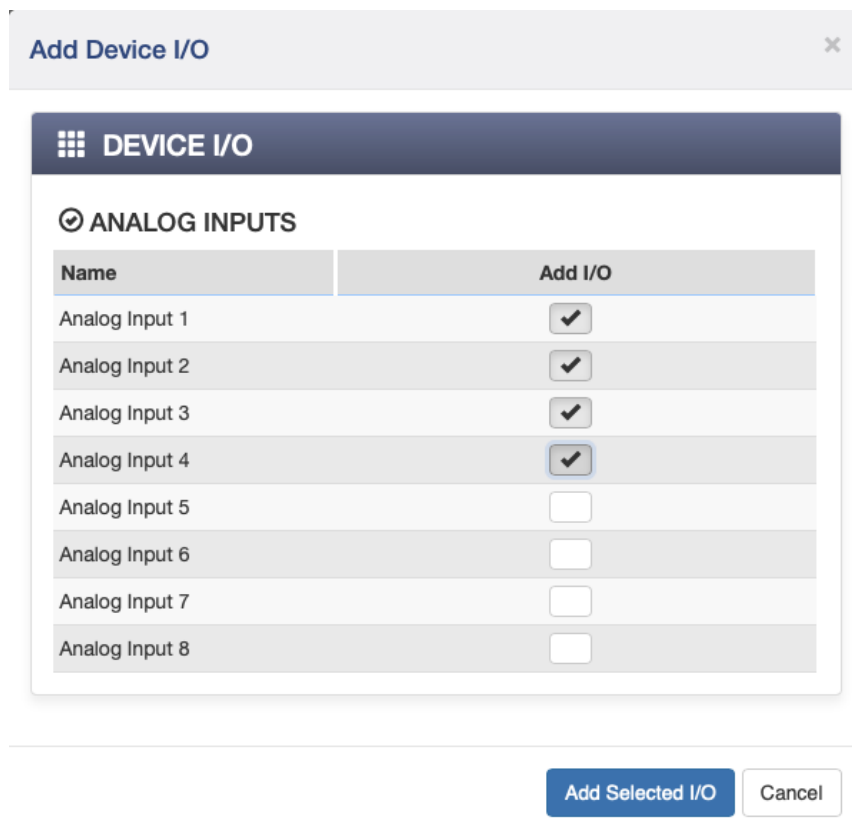
Select the analog inputs that will be used by clicking the checkboxes to the right of the inputs that should be added. A check appears in each input that will be added. Click **Add Selected I/O.**

Now the X-22 module and the selected I/O is installed on the X-400. Next, you can set up the analog inputs as desired.

4. Click on the **I/O Setup** tab, and then the **Analog Inputs** tab. A list of all analog inputs available on the X-400 appears. Note that in the example below, only the first four analog inputs appear from the X-22s because only the first four inputs were selected in the previous step.
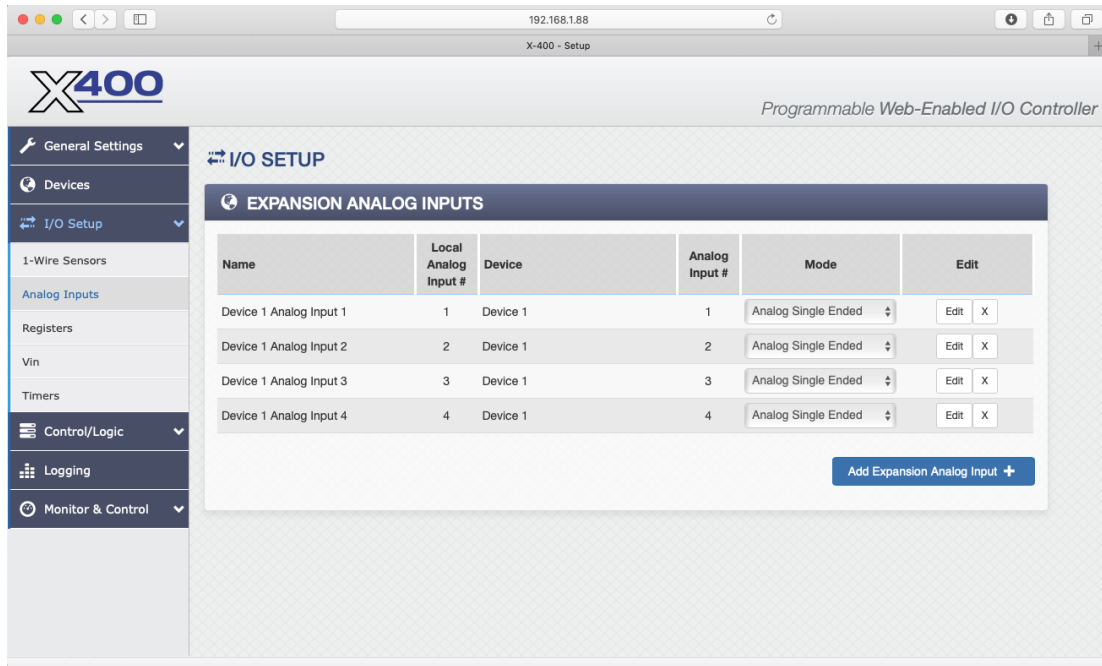
5. Next to each analog input, select the appropriate mode for how that input will be used. Available options are *Analog Single Ended, Analog Differential, Analog 4-20mA,* and *Digital Input*. Note that the Analog Differential option will only appear under odd local analog input numbers (1, 3, 5, and 7). This is because differential mode requires two inputs and when this is selected the adjacent even analog channel will automatically be configured as differential as well.

6. Finish setting up each analog input by clicking the **Edit** button on the right end of each row. When *Analog Single Ended* is selected, the **Edit** button displays the following popup window.

Analog Input Name:
This text field describes the function of the selected analog input. The label text appears to the left of the corresponding analog input on the Control Page and in the email message when email alerts are enabled. When later defining the control logic, logging and other settings, this label appears in the pull-down lists of analog input resources. This field must start with a letter. Up to 35 characters may be entered in this field. The default text is "Device Name Analog Input #". Set the name to a descriptive value such as "Wind Direction".

Range Selection:
The analog to digital converter has a programmable gain amplifier (PGA). This setting specifies the full scale range of the analog input. Settings include; ±1.28V, ±2.56V, ±5.12V, ±10.24V.

Device:
This option displays the device (module) where this analog input physically resides. If there are other devices (X-22s modules) that have analog inputs that have not been set up, this option allows you to change this analog input to a different device.

Device's Analog Input #:
This option displays the analog input number on the device (analog input number on X-22s). If there are other analog inputs on the device that have not been set up, this option allows you to change this analog input to a different input.

Local Analog Input Number:
Analog inputs on each module are numbered 1 through 8. When multiple modules are connected, a unique analog input number is assigned to each input. These index numbers are used in the state.xml and state.json files. The index numbers are also seen by remote X-4xx products that are using the I/O from the local X-400 controller.

Decimal Places :
The number of digits displayed to the right of the decimal point. This does not affect the accuracy of the underlying value.

Units:
Text entered here will be displayed on the right of the value when shown on the Control Page. This text does not affect the underlying value. Set the units to Volts, mA, mph, etc.

Slope:
The analog value can be scaled into engineering units. The X-22s reads the raw value (volts) from the analog-to-digital converter and calculates a new value in engineering units. This scaled value is calculated using the following $y = mX + b$ formula.

$$\text{Scaled Value} = \text{Slope} * \text{RawValue} + \text{Offset}$$

The calculated scaled value is used for logs, email messages, Control Pages, XML pages, and is 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 ($m = 1$ and $y = 0$) the scaled value equals the input voltage.

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.

Appendix A: Specifications

Power Requirements

Input Voltage: 9-28 VDC (power is supplied via the expansion bus cable, 24V recommended)
Current: See table below for typical values at 25°C

| Power Supply	Current (mA) (All channels in voltage modes)	Current (mA) All channels in current mode
9 VDC	42	83
12 VDC	32	62
24 VDC	17	33

Analog Inputs

Number of Inputs: 8 single-ended, 4-differential, or a combination
Input Ranges: ±1.28V, ±2.56V, ±5.12V, ±10.24V, ±20.48V (differential)
Max Input Voltage: -12.5V < Vin < +12.5V
Conversion Method: 16-bit, SAR ADC
Input Impedance (Zin): >500Meg Ohm
Channel Off Leakage: ±0.6nA (typ)
Input Common Mode Rej: >100dB
Total Unadjusted Error: -9LSB (min), +9LSB (max)
Voltage Reference Drift: ±5 ppm/°C
Internal 4-20mA Shunt: 200.0-ohm, ±0.1%, 25ppm (uses ±5.12V range)

Reference Output

Voltage: 5.00V
Accuracy: 0.04%
Temperature Coefficient: 3ppm/°C Max
Current: 25mA max*

Maximum current from the reference may be increased if the environmental temperature is decreased according to the below chart.
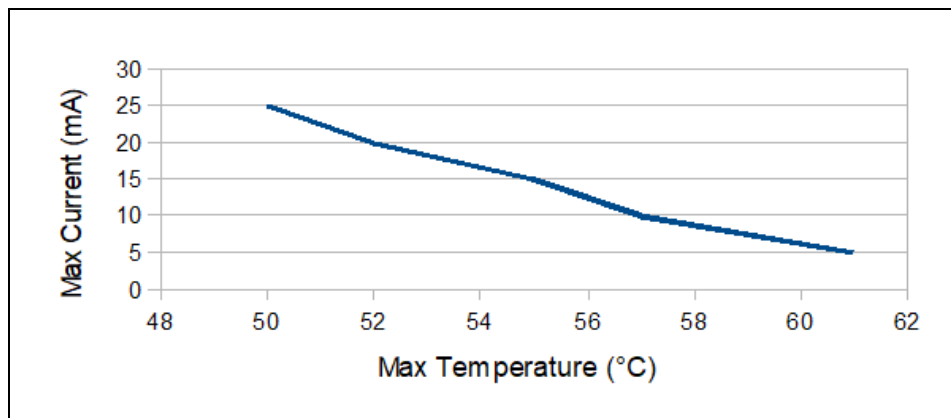
Connector

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

(Replacement part number, Phoenix Contact 1803691)

Expansion Connector:

Connector:	Ribbon cable, 2x5-position, polarized 0.100" pitch
Communications:	RS-485

LED Indicators

Green:	Power On

Environmental

Indoor use or NEMA-4 protected location

Altitude:	up to 2000m
Operating Temperature*:	0ºC to 50ºC (32ºF to 122ºF)*
Storage Temperature:	-40ºC to 85ºC (-40ºF to 185ºF)
Humidity:	5-95%, non-condensing

* Max operating temperature may be increased at the expense of current through the 5V reference. See the chart under Reference Output for details.

Mechanical

Size:	1.41 x 3.88 x 3.1 in. (35.7 x 98.5 x 78 mm), (not including connector)
Weight:	3.8 oz (108 g)

Electromagnetic Compliance

IEC CISPR 22, CISPR 24
FCC 47CFR15 (Class B)
EN55024 ITE Immunity (2010)
EN55022 Emissions (2010)

Product Safety Compliance

UL 61010-1 (Electrical Equipment for Measurement, Control, and Laboratory Use)

$C \in$ FC

Appendix B: Trademark and Copyright Information

This document is Copyright ©2019 by Xytronix Research & Design, Inc. All rights reserved.

X-22s™, X-600M™, X-400™, WebRelay™, ControlByWeb™, and Xytronix Research & Design™ are trademarks of Xytronix Research & Design™, Inc. 2005-2019.

All other trademarks are the property of their respective owners.

All parts of this product and design including but not limited to firmware, hardware design, schematics, PCB layout, concept, graphics, users manual, etc., are property of Xytronix Research & Design, Inc. ©2005-2019. X-22s™ may not be opened, disassembled, copied or reverse-engineered.

No part of this manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying or scanning, for any purpose other than the personal use by the purchaser of this product. Xytronix Research & Design, Inc., assumes no responsibility for any errors that may appear in this document.

Whereas reasonable effort has been made to make the information in this document as useful and accurate as possible, Xytronix Research & Design, Inc. assumes no responsibility for the application, usefulness, or completeness of the information contained herein. Under no circumstance will Xytronix Research & Design, Inc. be responsible or liable for any damages or losses including direct, indirect, special, incidental, or consequential damages or losses arising from either the use of any information contained within this manual or the use of any products or services referenced in this manual.

Xytronix Research & Design, Inc. reserves the right to change any product's features, specifications, documentation, warranties, fee schedules, and conditions at any time and without notice.

Appendix C: Warranty

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

For warranty service or repair, the product must be properly packaged, and returned to Xytronix Research & Design, Inc. The purchaser shall prepay all charges for shipping to Xytronix Research & Design, Inc., and Xytronix Research & Design, Inc. will pay the shipping charges to return the product to the purchaser as long as the product is shipped within the United States. If the product is shipped outside of the United States, the purchaser shall pay all shipping charges, duties, and taxes.

Limitation

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

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

Appendix D: 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.

Appendix E: Mechanical Dimensions

M36 (35mm) DIN RAIL

USE #8 PAN HEAD SCREWS