



**ITWatchDogs**



# IOE

## I/O Expander User Guide

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# Preface

## About this Manual:

This manual is designed to help you set up and use your ITWatchDogs IOE I/O Expander. The first chapter will provide you with a basic introduction to the I/O Expander itself, along with instructions on how to properly install and connect it; subsequent chapters will explain each of the I/O Expander's functions in detail. Note that this manual assumes that the user has at least some basic familiarity with configuring and using monitoring units from the ITWatchDogs *WeatherGoose Series-II* family, including how to connect external sensor devices via the Digital Sensor Bus and access the monitoring unit's configuration and control pages via a web browser.

## Obtaining Related Documentation:

This manual is primarily concerned with the ITWatchDogs IOE I/O Expander, which is an optional accessory for the ITWatchDogs family of environment monitors. For more information or additional examples concerning the environment-monitor unit itself, refer to the appropriate manual for the specific model of ITWatchDogs environment monitor in question. These manuals can be downloaded from our web site, in the Support→Documentation section here: <http://www.itwatchdogs.com/documentation.aspx>

## Document Conventions:

This document uses some or all of the following conventions:

<b>system messages</b>	Messages which the unit displays to the user are shown in <b><i>monospaced italic "Courier"</i></b>
<b>user-typed commands</b>	Information you must enter is shown in <b><i>monospaced "Courier"</i></b>
<b>[KEY]</b>	Square brackets are used to indicate that the user should press a specific key or keys on the user's PC keyboard; i.e. <b>[ENTER]</b> means the user should hit the "Enter" key, as opposed to typing the word "enter". <b>[CTRL][C]</b> means to hit the "control" and "c" keys together.
<b>web page controls</b>	The names of buttons or control boxes on the unit's web page are shown in <b><i>Arial italic</i></b> .
<b>&lt;user setting&gt;</b>	Elements which the user must fill in with their own specific information are shown in <i>italics</i> between angle brackets; i.e. <b>&lt;ip address&gt;, &lt;account name&gt;</b>
<b>Note:</b>	Text highlighted in yellow means <b>reader take note</b> . Notes contain suggestions or cautions which the reader should keep in mind when trying to use a particular feature of the product.
<b>Warning:</b>	Text highlighted in red means <b>reader be careful!</b> Warnings indicate situations where equipment damage, malfunction, or data loss could result if the highlighted information or instructions are not followed by the user.
<b>► Model-specific information</b>	Information which only applies to one or more specific models will be highlighted in grey, with an ► arrow preceding the text.



## Introducing your IOE I/O Expander

While most models of the *WeatherGoose Series-II* family of environmental monitoring systems include at least three general-purpose analog-input channels for connecting analog-sensor devices (such as water sensors, magnetic door switches, battery-voltage monitors, etc.), plus at least four digital Digital Sensor Bus jacks for attaching digital-sensor devices such as temperature or airflow/humidity sensors, some users may find that they need a much larger number of sensor inputs to adequately monitor a large, complex IT facility. Backup-generator panels, for example, often have at least a dozen dry-contact relay outputs which are used to signal a variety of conditions such as low fuel levels, oil-pressure warnings, over/under-speed indications, pre-heat/overheating, etc. which may need to be monitored. Or, you may need to install multiple water and smoke sensors to cover several rooms over a large area, or put individual door switches on each cabinet in an entire row, or have some other combination of conditions to be monitored where three analog inputs just isn't enough. Some applications may even require the ability to control external devices, such as a telephone dialer or a flashing signal light, when an alarm condition occurs.

With an additional 8 Digital Sensor Bus jacks, three dry-contact control-relay outputs, and 32 additional analog-input channels contained within a single 1U-sized, rack-mountable accessory device, the I/O Expander greatly expands the sensor-and-control capabilities of any compatible monitoring unit in the *WeatherGoose Series II*-family. Depending on which model the IOE is paired with, the system's capacity can be expanded to as many as fifteen additional digital Remote Sensors, six control relays, and thirty-eight analog inputs.

The I/O Expander is compatible with any monitoring unit in the *WeatherGoose Series II*-family which has at least one available Digital Sensor Bus jack. (The MicroGoose is the only member of the *Series-II* family which is not compatible, as it does not have any connections for digital or analog sensors.) In general, the I/O Expander will operate the same way regardless of which model it is connected to; therefore, in the majority of the instructions and diagrams on the following pages, we will simply illustrate the use of the I/O Expander with a standard SuperGoose-II model, and will use the term "WeatherGoose" or "monitoring unit" to refer generically to the ITWatchDogs *WeatherGoose Series-II* family of monitoring units as a whole. If it is necessary to point out a particular behavior which only applies to a specific model, this behavior will be highlighted (as shown here), along with the specific model(s) to which the highlighted section applies.

# Important Compatibility Information!

The I/O Expander (IOE) is a relatively new addition (as of the 2nd quarter of 2011) to our product line. If you purchased your *WeatherGoose Series-II* monitoring unit and additional sensors (if any) at the same time as your IOE, your monitoring unit and sensors will have already shipped with the correct firmware revision and compatible hardware to support it. However, if you are attempting to use an I/O Expander in combination with a monitoring unit and/or other external sensor devices which you may already have purchased and set up prior to the introduction of the IOE, please read and be aware of the following compatibility requirements:

- The I/O Expander is only supported by the “*WeatherGoose Series II*”-family of monitoring devices. *Series-I* models are not supported, as the *Series-I* hardware does not have enough memory capacity to handle the IOE’s enhanced features or the amount of sensor data generated. If you are currently using a *Series-I* model, you will need to replace it with the equivalent *Series-II* model if you wish to add an I/O Expander to your facility. If you are in doubt about which model you have, a visual guide to identifying your particular model can be found on our website here: <http://www.itwatchdogs.com/series.gif>
- A firmware revision of v3.6.0 or higher is required. If your monitoring unit is currently running a firmware revision prior to v3.6.0, you will need to visit the Support→Firmware area of our web site (<http://www.itwatchdogs.com/software-firmware-download.aspx>), to download and install the firmware upgrade for your monitoring unit prior to connecting the I/O Expander.
- The I/O Expander is not compatible with the older RTAF2 and RTAFH2 airflow sensors. If you have an existing installation with one or more of these sensor devices attached, you will need to disconnect and remove them before you connect the I/O Expander, as these older sensor devices will cause data-communication errors if they are paired with an I/O Expander. (If the monitoring unit detects this conflict occurring on the sensor bus, it will display a warning message on its web page advising you which legacy sensor(s) are causing the conflict, and ask you to remove them.) This incompatibility between RTAF2 / RTAFH2 and the IOE applies to all WeatherGoose models and firmware revisions.
- Incompatibilities may also occur with certain versions of the RTHD2 (temperature / humidity / dewpoint) sensors, especially ones manufactured before the 4th quarter of 2010. Again, the unit will display a warning message if you have an incompatible RTHD2 connected alongside the I/O Expander.

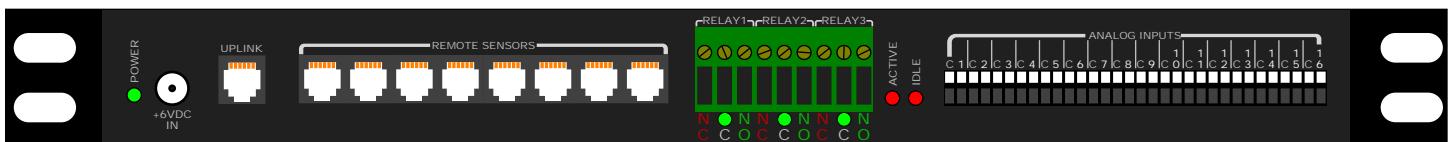
Other Digital Sensor Bus devices such as the RT-series temperature sensors, CCAT analog-to-digital converters, and the newer RTAFHD3 temperature/airflow/humidity “combo” sensors are not affected by this incompatibility. If you are not certain whether you currently have any of the older RTAF2 or RTAFH2 sensors in service, **Appendix A** of the “**RTAFHD3 Temperature / Airflow / Humidity / Dewpoint Sensor Installation & User Guide**” contains some diagrams to assist you in determining which type(s) of sensors you have installed.

ITWatchDogs apologizes for the inconvenience. Any customers who wish to add an I/O Expander to an existing *WeatherGoose Series-II*-based monitoring system with RTAF2, RTAFH2, or RTHD2 sensors already attached are invited to contact our sales department, to discuss possible upgrade or replacement options for these devices.

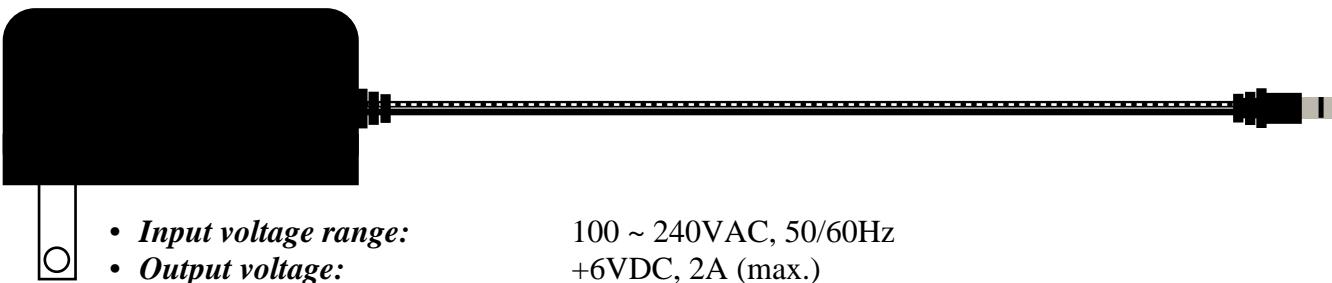
# Unpacking your I/O Expander:

When you first open up the box your I/O Expander came in, you should find the following items. (Note that the actual appearance of the devices you received may vary slightly from the sample illustrations shown here.)

## IOE I/O Expander



## +6VDC power supply



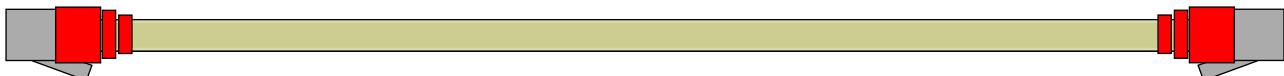
- ***Input voltage range:*** 100 ~ 240VAC, 50/60Hz
- ***Output voltage:*** +6VDC, 2A (max.)
- ***Operating temperature range:*** 0 – 40°C / 32 – 104°F (typ.)

This power supply is the same type as the ones supplied with the WeatherGoose monitoring units themselves; they are capable of worldwide-voltage (120~240VAC, 50/60Hz) operation, and connect to the IOE via a standard 2.1mm center-positive DC barrel plug.

**WARNING: Using any DC power supply other than the model(s) supplied or approved by ITWatchDogs may damage your I/O Expander and void your warranty!** If the standard +6VDC wall transformer-style power supply is not suitable for your application, please contact ITWatchDogs' sales & service department to discuss possible alternatives.

The standard +6VDC power supply normally supplied with the I/O Expander comes with a U.S.-style (NEMA 5-15, ungrounded) plug. Power supplies with a U.K.-style (BS 1363) plug, or with a “universal” kit of interchangeable U.S. / U.K. / European (CEE 7/4) / Australian (AS 3112) plugs, are available as an option.

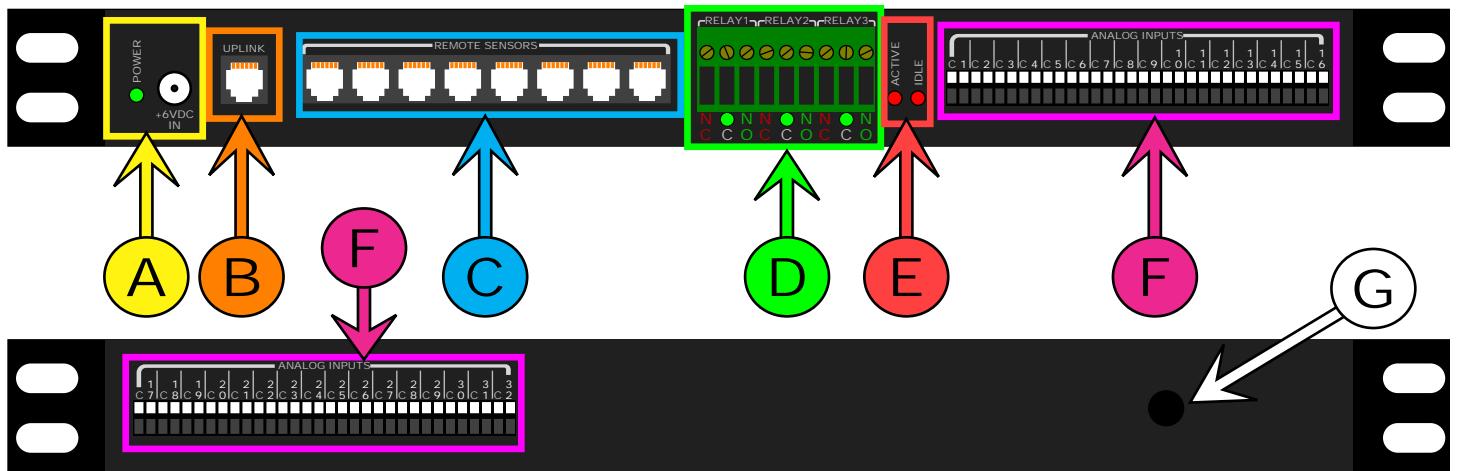
## Uplink Cable



The standard Uplink Cable supplied with the I/O Expander is 10 ft. (3 m.) in length, with 6P6C modular connectors at each end. If your application requires a longer (or shorter) cable length, any suitable CAT3 or telephone-style patch cable can be used, as long as all six wires are connected “straight-through” from one end to the other; i.e. pin 1 to pin 1, pin 2 to pin 2, etc.

Below is a quick overview of the physical connections and indicators on the front and back of the I/O Expander unit itself. (Note: the sample diagrams shown below have been simplified for clarity; the actual physical appearance of the unit may vary slightly.)

## FRONT PANEL



## REAR PANEL

### **A DC power jack and LED:**

The +6VDC power supply's 2.1mm, center-positive barrel plug fits into this socket to provide power to the I/O Expander. The IOE requires this power supply in order to operate, since it consumes more power than can be supplied directly from the Digital Sensor Bus. The green LED next to the power-supply jack will illuminate when the I/O Expander is receiving DC power from its supply.

### **B "Uplink" jack:**

This connection is the same type of 6P6C modular jack used for the Digital Sensor Bus sensor devices. However, this jack is specifically set aside for linking the I/O Expander to the host monitoring unit, so make sure that you connect the Uplink Cable only to this jack. If you connect the Uplink Cable to one of the other "Digital Sensor" jacks instead, the IOE may not be identified by the WeatherGoose, and any other attached Digital Sensors may not operate correctly.

### **C Digital Sensor jacks:**

(*Note: depending on date of manufacture, on some units these jacks may be labeled "Remote Sensors" rather than "Digital Sensors".*) This group of eight 6P6C modular jacks expands the number of available Digital Sensor Bus connections, allowing you to attach additional digital-type sensors such as RT-series temperature sensors, RTAFHD3 temperature/airflow/humidity "combo" probes, etc. Note that this expansion is subject to the following restrictions:

- The maximum number of Digital Sensor Bus devices which can be attached to any one WeatherGoose unit is 16 devices. The I/O Expander does not increase this limit; it simply provides additional physical connection points beyond the one(s) built-in to the WeatherGoose unit itself. (As an example: if the IOE is connected to a MiniGoose/XP-II, which already has 16 Digital Sensor Bus jacks built in, the IOE will not increase the system's capacity beyond the 16 connections already provided on the MiniGoose/XP-II – although you can still use the I/O Expander's jacks to connect some of these sensors, if desired.)
- The I/O Expander, with its 32 analog inputs and 3 dry-contact control relays, is an active Digital Sensor Bus device in its own right. Therefore, unlike a passive splitter, when an IOE is connected it will occupy one of the 16 digital sensor-device slots for its own use, leaving 15 (16 minus 1) as the the maximum number of additional digital sensors that can be connected to the system.

- The I/O Expander also does not increase the cable-length limit of the Digital Sensor Bus. The WeatherGoose system has a maximum limit of 600 ft. of total cable length on the Digital Sensor Bus; i.e. you can have twelve 50 ft. sensors, or ten 50 ft. sensors plus five 20 ft. sensors, or any other combination of cable lengths as long as (A) the number of sensors does not exceed sixteen, and (B) the cable lengths do not add up to more than 600 ft. total. Note also that the length of the link cable between the WeatherGoose monitoring unit and the IOE must be included as part of this total, so don't neglect to take it into account if the IOE is mounted at any significant distance from the WeatherGoose unit itself.

### **D Control Relay outputs:**

To the right of the eight Remote Sensor jacks is a dark-green 9-position terminal block, which provides access to the control relays' dry-contact pairs. The I/O Expander provides three control relays which the user can either configure to energize in response to an alarm condition, or which can be energized and de-energized manually via the **Control** page. Both the Normally-Open (NO) and Normally-Closed (NC) contacts are provided, so that you can choose whichever action is appropriate for your particular application. (Relay actions will be described and illustrated in more detail in the chapter concerning the use of the control relays.)

Underneath the Common (C) terminal of each relay is an LED which indicates the relay's current status. A **red** LED indicates that the relay is currently de-energized, and that the NC pair is closed; a **green** LED indicates that the relay is currently energized and that the NO pair is closed.

### **E Active / Idle LEDs:**

Located in between the control relays and the analog inputs, these serve as indicators that the I/O Expander is operating properly and communicating with its host WeatherGoose-II monitoring unit. The "Idle" LED will normally blink approximately once a second while the IOE is operating, while the "Active" LED will light up when the unit is actively exchanging data with the host over the Uplink connection.

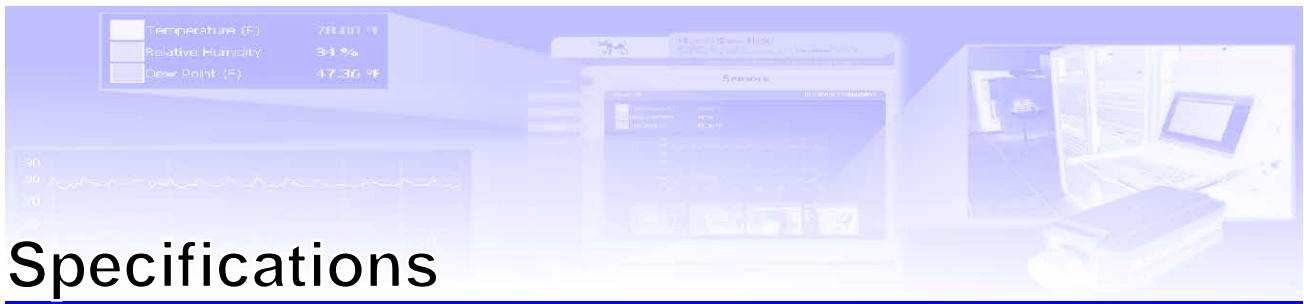
### **F Analog Inputs:**

The I/O Expander's 32 analog-input channels are split into two sets of terminals; channels #1 ~ #16 are located on the I/O Expander's front panel, along with the rest of the system connections; while channels #17 ~ #32 are located on the rear of the IOE. Each analog input consists of two terminals; a "C", or Common (DC ground) terminal, and a numbered terminal which corresponds to the ID of that particular analog-input channel. By default, these inputs are identified as "Analog-1" through "Analog-32" on the WeatherGoose unit's web page, but these names can be changed to something more meaningful via the unit's **Display** page. (More information about this, and about the general behavior of the analog inputs with various types of sensors, will be described and illustrated in more detail in the chapter concerning the use of the analog-inputs channels. Specific information concerning the behavior of a given sensor can be found in the user guide for that sensor model.)

Unlike the Digital Sensor Bus, there is no fixed limit on the length of the wiring used to connect analog sensors; however, users are cautioned that excessively long cable runs can pick up ambient electrical and radio-frequency noise from other equipment in the room, similar to a radio antenna, which may interfere with the sensor readings and make them appear noisier or less accurate than usual. Therefore, ITWatchDogs recommends keeping the cable runs between the I/O Expander and attached sensors as short as possible, to minimize this effect.

### **G Earth-grounding point:**

This #10-32 tapped hole in the metal chassis is provided as a convenient place to earth-ground the I/O Expander's chassis, if necessary. Such earth-grounding is not absolutely required, but it often helps suppress electrical interference in the sensor readings if the unit is mounted in a particularly electrically-noisy environment. (Note: if you intend to use this feature, ITWatchDogs recommends consulting a qualified electrician to assist you in locating a suitable earth-grounding point in your facility.)



# Specifications

- **Power requirements, I/O Expander unit:**  
*(all relays de-energized, no sensors)*  
*(all relays energized + 8 RTAFHD3 sensors)*  
+6VDC  
140mA (0.84W) typ.  
350mA (2.1W) typ.
- **Power requirements, AC Power Adapter:**  
*(included w/unit)*  
100 ~ 240VAC, 50/60Hz
- **Inputs:**  
32 analog-input channels (2x32-position terminal blocks)  
8 Digital Sensor Bus connections (8x 6P6C modular jacks)
- **Outputs:**  
3 dry-contact relays, SPDT (1x9-position terminal block)  
1 Uplink port (1x 6P6C modular jack)
- **Analog Input voltage range:**  
0 ~ +5VDC
- **Analog Input sampling rate (internal):**  
5 seconds (approx.)
- **Relay contact ratings:**  
0.5A @ 60VDC  
1A @ 30VAC(rms)
- **Maximum Digital Sensor Bus cable length:**  
*(total including Uplink Cable)*  
600ft (182m)
- **Operating Temperature Range:**  
0 ~ +70°C (-32 ~ +158°F)
- **Supplied Accessories:**  
Uplink Cable, 10 ft. (3m) (1)  
AC Power Adapter, 100~240VAC in, +6VDC out (1)



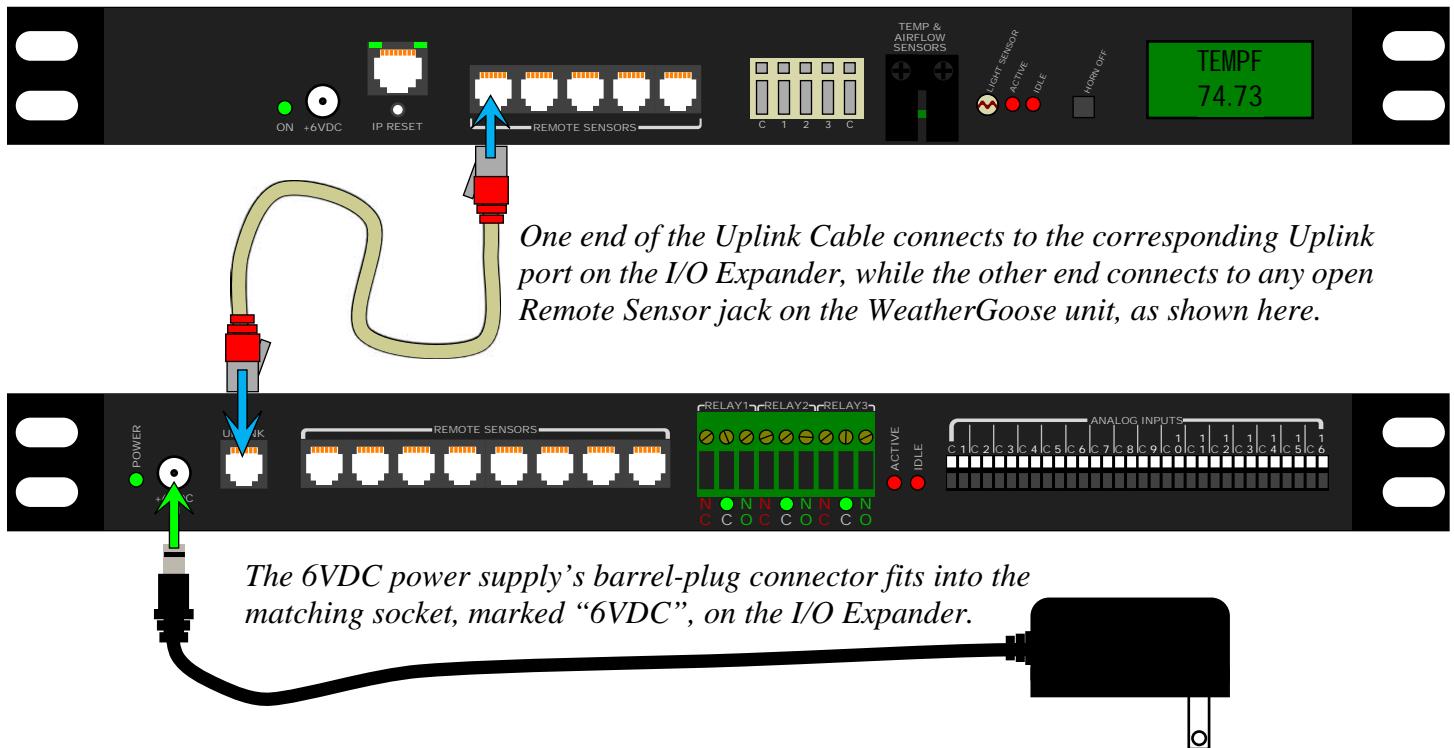
## Hooking up the IOE I/O Expander

Once you have mounted the I/O Expander in the desired location in your equipment rack, the next step is to connect it to your monitoring unit, hook up the power supply, and start connecting sensor devices to it. The following sections will provide illustrated examples of how to:

- Connect the external power supply and Uplink Cable
- Connect external Digital Sensor Bus sensors to the sensor jacks
- Connect external analog sensor devices to the analog inputs
- Connect accessory devices to the control-relay contact pairs

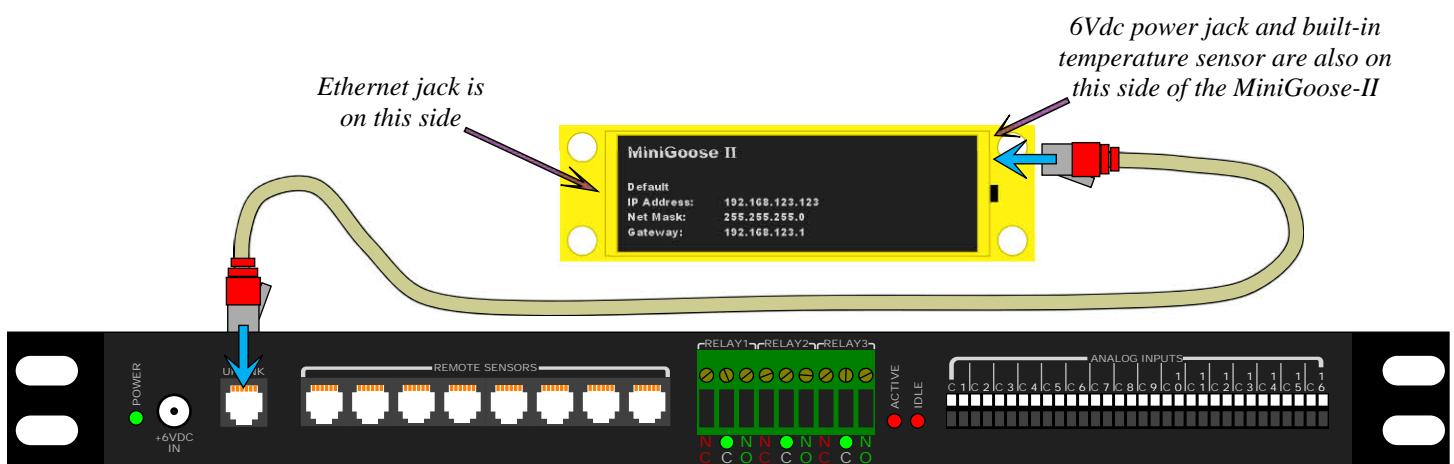
## Connecting the external power supply and Uplink Cable:

The diagram below illustrates the connection to a standard SuperGoose-II monitoring unit as an example; other rack-mounted units, such as the RelayGoose-II, WeatherGoose-II, or MiniGoose/XP-II, will connect in a similar fashion.



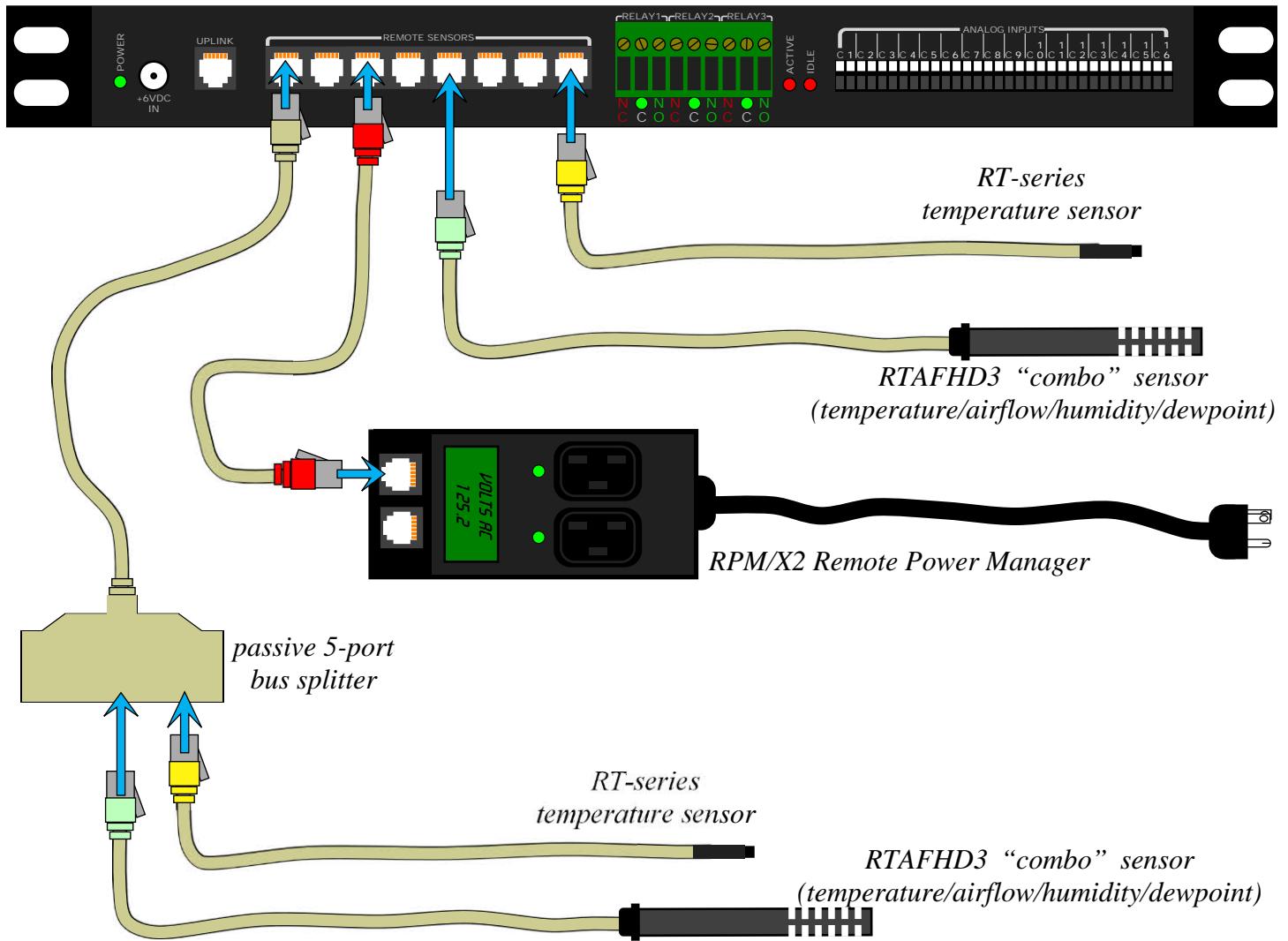
Note that the Uplink Cable, as mentioned in the preceding section, must be connected to the jack marked “Uplink” on the I/O Expander; the device will not function correctly if the Uplink Cable is connected to one of the eight Digital Sensor jacks instead!

The I/O Expander can also be connected to the single Digital Sensor jack of a MiniGoose-II, as shown here. The MiniGoose-II can then be mounted anywhere that's convenient – including directly onto the I/O Expander's cable-management tray, if desired.



## Connecting additional Digital Bus Sensors:

Connecting Digital Sensor Bus devices is as simple as plugging the sensor's 6P6C plug into any of the eight Digital Sensor jacks, as shown here. The I/O Expander's sensor jacks are compatible with all of ITWatchDogs' current digital-sensor products, and also supports most of our legacy products (such as previous versions of the CCAT) as well. (The only legacy sensors specifically not supported are the now-discontinued RTAF2 and RTAFH2 airflow sensors, as mentioned at the front of this manual.)



You can also, as demonstrated in the above diagram, attach another passive splitter to one of the Digital Sensor jacks to further increase the number of available connections for sensors, if needed. However, as mentioned previously, the absolute maximum number of sensors which can be supported by any single WeatherGoose unit is 16, and the cable length of all sensors combined must not exceed 600 ft (200m). The I/O Expander does not increase either of these limits, and neither will additional passive splitters, regardless of whether they are connected to either the IOE's or the WeatherGoose's Digital Sensor jacks. (A passive splitter can, however, help reduce the aggregate cable-length totals in a complex installation, since its cable length only counts once in the total. If, for example, you needed to mount four sensors in an adjoining room 50 feet away from the rack the IOE is in, running all four sensors back to the IOE itself would result in an aggregate cable length of 2x50, or 200ft. On the other hand, running a single passive splitter to the adjoining room, then connecting four sensors with shorter 12ft cables, would result in an aggregate length of only 50 + (4x12), or 98ft.)

Also note that since the I/O Expander counts as one Digital Sensor device itself, the actual number of additional sensors that can be connected to the WeatherGoose unit will be 15, rather than 16.

# Connecting analog sensors to the analog-input channels:

The I/O Expander provides up to 32 separate analog-input channels, suitable for connecting any sensor of the following types:

- **Dry-contact pairs:**

Essentially, a “dry contact” is simply a switch or relay which is either open or closed, but which doesn’t provide any actual voltage or current of its own; i.e. it’s up to the monitoring device to provide a suitable loop current to sense the state of the contacts. Examples of this type of sensor would include the *MS-1 Magnetic Door Switch*, or the relay outputs of the *WaterSnake Water Detection System*. Many backup-generator and HVAC control systems also provide status outputs of this type.

- **Conductivity sensors:**

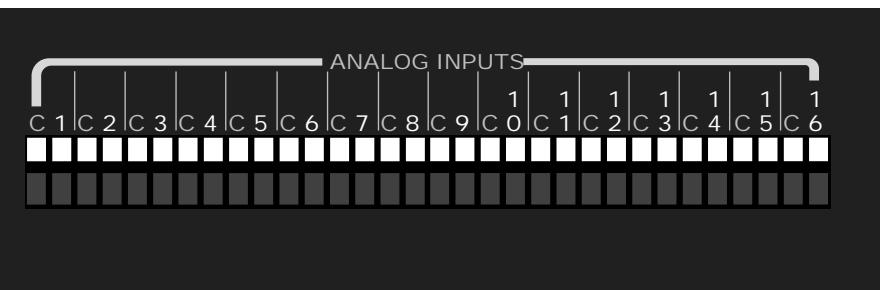
This type of sensor changes its electrical resistance based on the condition it’s sensing. The most common example of this type of sensor is water or liquid detectors, such as the *WD-1 Water Sensor*. This type of sensor starts off with a near-infinite resistance when dry; then, its resistance drops rapidly when water or other conductive liquids bridge the gap between the metal contact points, allowing current to flow between the contacts.

- **Proportional voltage-output sensors:**

These types of sensors output an analog signal voltage proportional to the condition being sensed or monitored. Examples of this type of sensor would be the *CT30-60-120 Current Transformer*, which puts out a 0 ~ 5Vdc signal which is proportional to the current being drawn through the wire which is passing through the center of the transformer (*i.e.* if 15 amps is passing through the wire, and the CT30-60-120 is set to the 0~30 amp range, then the signal voltage will be  $\approx$ 2.5Vdc); or the *RCP2-100 City Power Monitor*, which puts out a steady  $\approx$ 4.3V “power good” signal as long as the AC power socket it’s plugged into is “live” (incoming AC line voltage is present at the outlet), and drops its signal voltage to <0.5V if a blackout or brownout causes the AC line voltage to drop below  $\approx$ 85VAC.

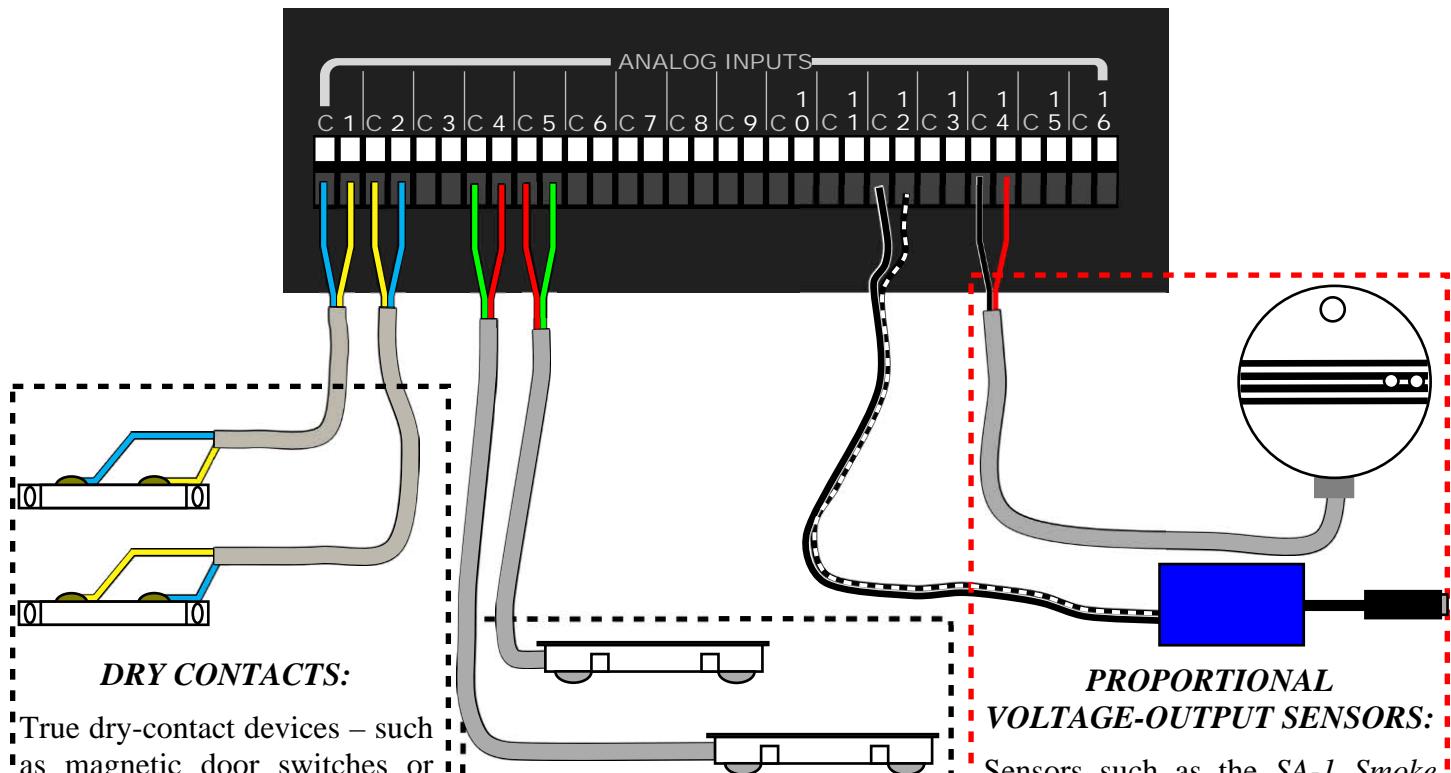
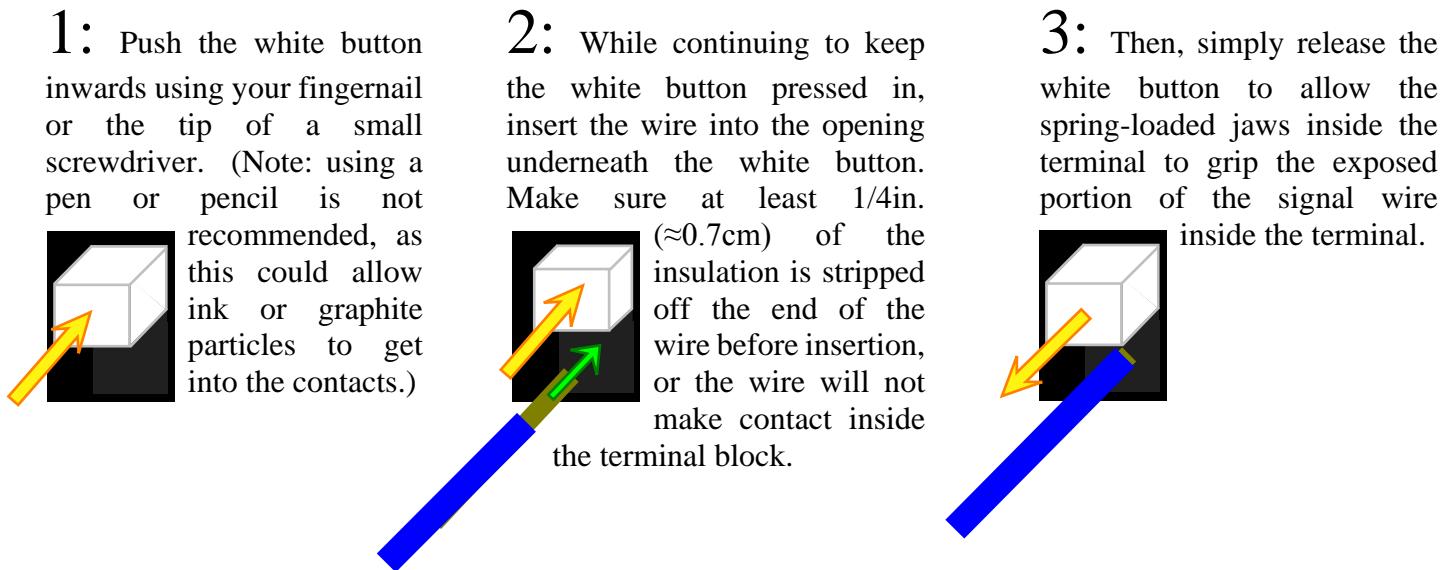
The analog inputs on the I/O Expander can accept a signal voltage range of 0~5Vdc. If your sensor puts out a different signal voltage range, or uses a 0~20mA current-loop arrangement instead, you will need to check with the sensor’s manufacturer to see if they offer some additional signal-conditioning options to convert the sensor’s output to a 0~5Vdc signal, or a similar sensor device that provides a 0~5Vdc signal.

As shown here, each analog input channel consists of two positions on the terminal block. The terminal marked “C” is the Common, or DC ground, terminal, while the numbered terminal is that particular input channel’s ID number. For sensors which have no polarity, such as dry-contact devices, the order of the wires is irrelevant; however, for sensors which do have a specific DC voltage polarity, such as proportional-output sensors or sensors which use a solid-state transistor output rather than a physical switch, always be sure to connect the wires in the correct order.



**WARNING:** Reversing the polarity of the wires on such sensors will result in incorrect sensor behavior, and may damage the sensor and/or the I/O Expander itself!

Examples of these connections, along with an illustration of how to insert wires into the spring-loaded terminals, are shown on the following page:



## Connecting external equipment to the control-relay outputs:

The I/O Expander provides three control relays which can either be set to energize when a sensor exceeds the thresholds you've set, or which can be energized and de-energized manually via the monitoring unit's **Control** page. The relays are of an SPDT (Single-Pole Double-Throw) type; both the Normally-Open (NO) and Normally-Closed (NC) contacts are provided, so that you can choose whichever action is appropriate for your particular application.

The relay connections are suitable for switching low-voltage loads such as signal lights and sirens, and even small low-voltage motors such as a 12VDC fan or an air pump, so long as the load does not draw more than 30W. However, they are not suitable for directly controlling equipment that runs off line voltage (120/208/240VAC) or draws high currents, such as water pumps, or air conditioners, or lead-acid battery chargers. **Warning:** attempting to switch high-voltage or high-current loads directly via the RelayGoose-II relay contacts may permanently damage the unit!

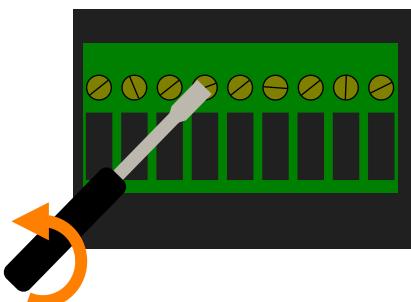
The maximum ratings of the relay contacts are as follows:

- 0.5 Amps @ 60 Volts DC
- 1 Amps @ 30 Volts AC(rms)
- 30 Watts maximum

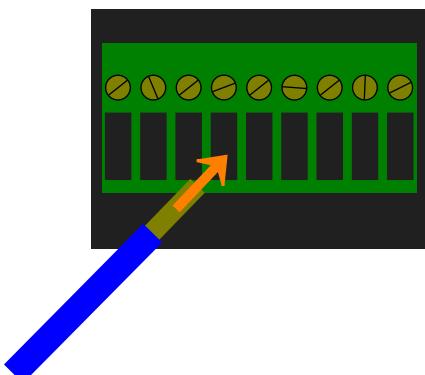
*Watts = Volts X Current;* so, a device running on 30VAC may draw up to 1A, while a 60VDC load may only draw 0.5A.

The control-relay terminals are of a standard screw-terminal design; to connect your external device's wires to the terminals, use a small flat-blade screwdriver to open and close the terminal jaws, as illustrated below:

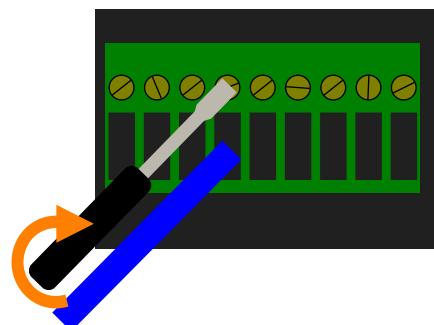
**1:** Using a small flat-blade screwdriver, turn the screw above the desired terminal opening several turns counter-clockwise to open the terminal.



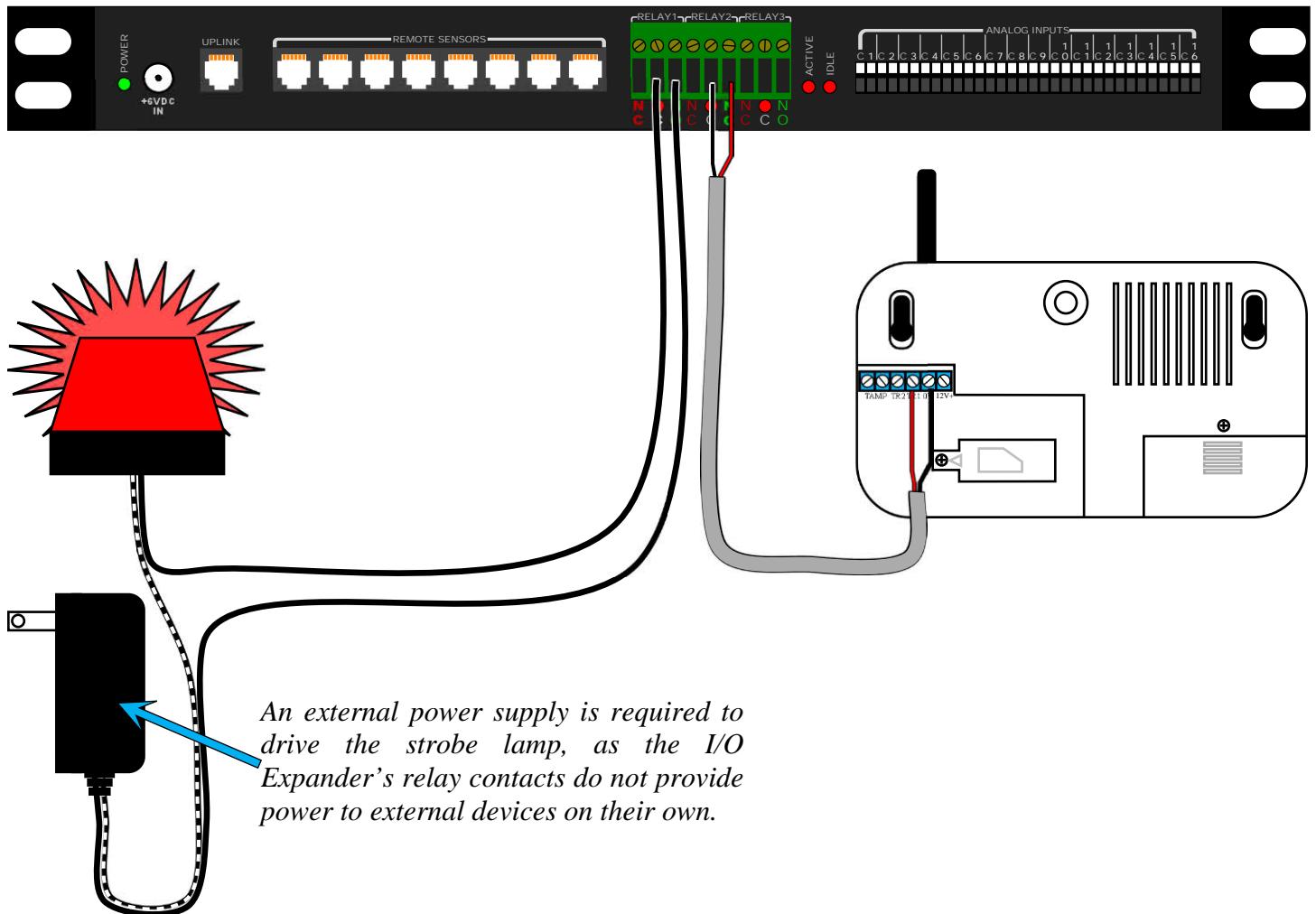
**2:** Insert the wire into the open terminal. Make sure at least 1/2in. ( $\approx 1.3\text{cm}$ ) of the insulation is stripped off the end of the wire before insertion, or the wire will not make proper contact inside the terminal block.



**3:** Turn the screw above the desired terminal opening several turns clockwise, until the wire is securely gripped by the terminal.



The diagram below illustrates a typical example of using the control-relay outputs in conjunction with a telephone auto-dialer, to allow the monitoring unit to alert the appropriate personnel via a phone call even if the facility's internal network is down, and a warning strobe-lamp to draw the system administrator's attention:



If Relay-1 energizes, the strobe light will flash; if Relay-2 energizes, the auto-dialer will activate and attempt to call the phone numbers stored in its dialing list. More details on relay actions, including how to tie a relay's action to one or more sensors' alarm thresholds, can be found in the section concerning the use of the control relays.



# Configuring and Using the I/O Expander

Once you have connected the I/O Expander to your WeatherGoose Series II-family monitoring unit, and have hooked up any external sensor devices or accessories according to the preceding pages, the next step is to configure the unit by setting the desired alarm thresholds and actions via the monitoring unit's **Alarm**, **Control**, **Display** and **Logging** pages. You can also assign names to the sensors, and selectively determine how and whether a particular sensor's data is to be graphed and logged. The following sections will describe how to:

- Assign meaningful names to the sensors connected to the I/O Expander via the **Display** page
- Program how the analog-input channels' measurements are to be scaled, and in what units of measure they should be shown, via the **Display** page (*firmware revisions v3.6.1 and higher only*)
- Determine which sensors' data are graphed and logged via the **Logging** page
- Assign meaningful names to the control relays, and set up their actions via the **Control** page
- Program alarm thresholds via the **Alarm** page

## Assigning “friendly” names to the I/O Expander and the analog-input channels:

Once you have connected the I/O Expander to the host monitoring unit, as detailed in the previous chapter, open your PC’s web browser and type `http://<ip address>` in the browser’s address bar to bring up the unit’s web page. (If you have not yet changed the monitoring unit’s configuration from the factory default, `<ip address>` would be 192.168.123.123; otherwise, type in the IP address you’ve assigned it to on your network.) Then, click on the **Display** tab to bring up the “Display” page, where you can configure the “friendly names” assigned both to the I/O Expander and its 32 analog inputs.

Upon opening the “Display” page, you will notice that the **Display** tab has acquired two new secondary tabs underneath it, titled **Main** and **I/O Expander**. The **Main** tab contains all of the controls that were previously shown on the “Display” page prior to the installation of the I/O Expander – the date format, whether temperatures should be shown in Celsius or Fahrenheit, “friendly names” for connected digital-sensor devices and the unit’s internal analog inputs (if any), and so on – and is the tab that will be shown by default whenever **Display** is selected.

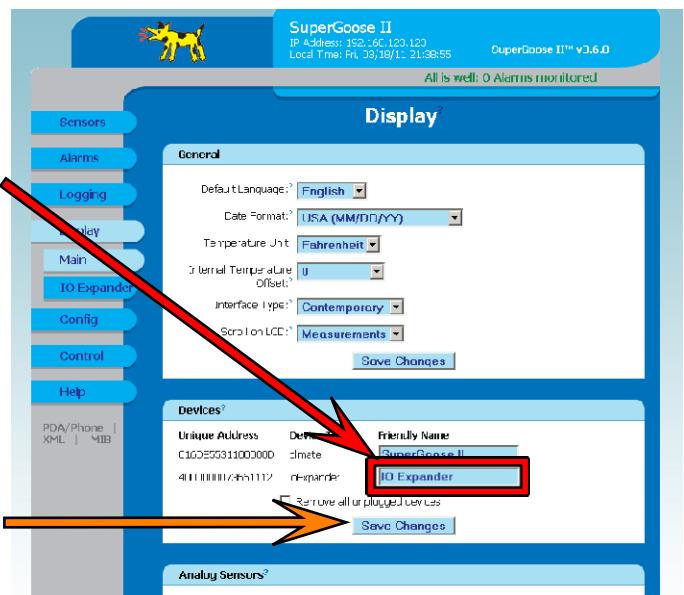
Scroll down to the “Devices” section, and you will see the I/O Expander as a new entry with a Device Type of “ioExpander” and a unique 16-digit address which corresponds to the unit’s ID code on the Digital Sensor Bus. The “Friendly Names” of the attached sensor devices are to the right of the device types, as shown here.

By default, the I/O Expander names itself “I/O Expander”; however, you can change this to any name you prefer. If the unit is primarily to be used to monitor a backup-generator status panel, for example, you might give it a name such as “Power Status Panel” or “Bldg 4 Generator”. The only limit is that the name can only be 31 characters long. After typing in the name you wish to give the I/O Expander, click the “Devices” section’s **Save Changes** button to make the change.

If you have attached any Digital Sensor Bus devices to the ports on the front of the I/O Expander, they will also appear here in the “Devices” section, just as if they had been connected directly to the monitoring unit itself. This is because the I/O Expander does not actively manage those ports itself, or the devices connected to them; it simply provides the physical connections to the Digital Sensor Bus, and passes all communications between the sensors and the monitoring unit unchanged, so the host unit “sees” these additional sensors as part of the Bus and doesn’t know (or care) which jacks they’re physically connected to.

After you have assigned a new name to the I/O Expander, you’ll also notice that the name of the **I/O Expander** tab will change as well.

(Note: depending on your browser and OS’s default font settings, and the **Interface Type** setting you’ve chosen, excessively long names may sometimes overflow past the tab’s background graphic. This is merely a cosmetic issue, and does not affect the operation of the unit.)



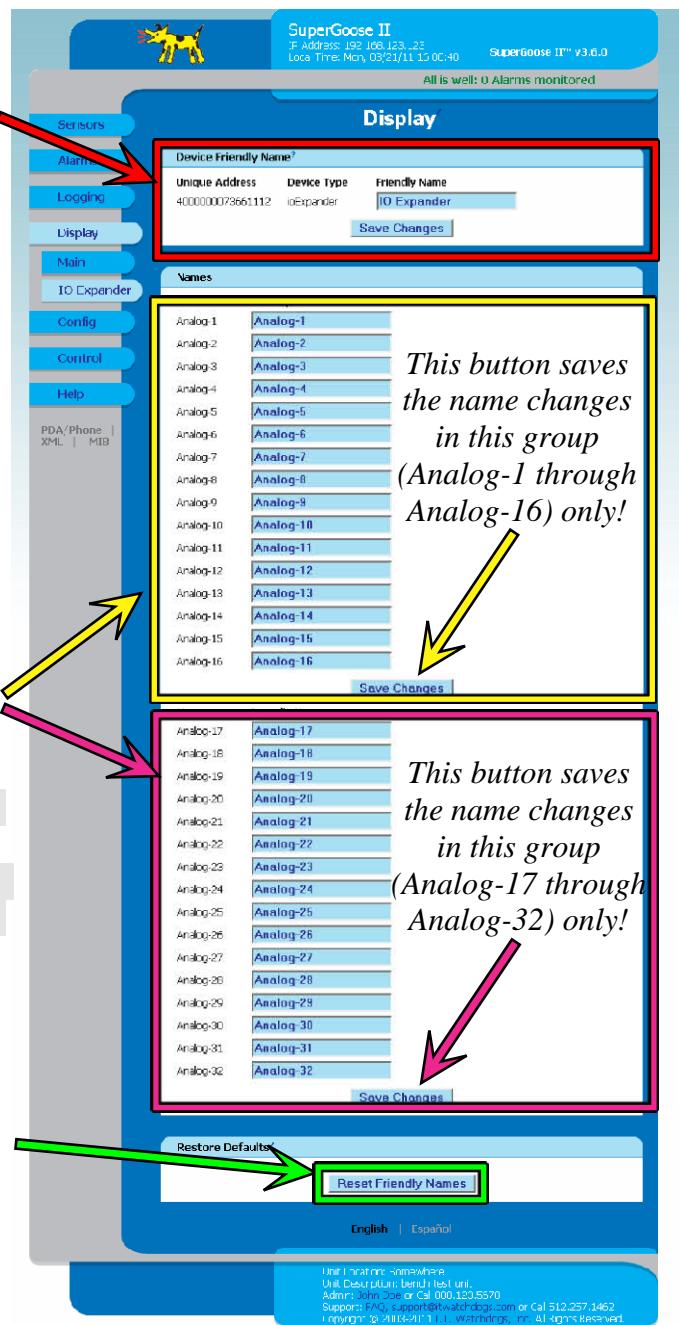
Clicking on the I/O Expander's tab brings up its own display-configuration page, where you can individually set the names of all 32 analog-input channels. The topmost section of the I/O Expander's page is simply a repeat of the friendly-name setting in the "Devices" section on the main page; you can set the I/O Expander's friendly-name from here as well.

The next section allows you to assign a name to each Analog Input channel, individually. Notice that the 32 channels are divided up into two groups, each with its own **Save Changes** button. Each button will only save the changes for the 16 inputs in its assigned group, not for the entire page as a whole – i.e. the first **Save Changes** button only saves the names of Analog-1 through Analog-16, while the second one only saves Analog-17 through Analog-32. Therefore, if you intend to change the names of all 32 channels, you'll need to do it in two steps; change the names of 1~16 first, click the upper group's **Save Changes** button, then do 17~32 and click the lower **Save Changes**.

- If your firmware revision is v3.6.1 or higher, you will also see additional columns of settings for the user-programmable measurement scaling and units of measure. These settings will be explained in more detail in the following section.

At the bottom of the page is a **Reset Friendly Names** control which you can use to reset all of the I/O Expander's friendly names to their factory defaults of "IO Expander" for the device itself, and "Analog-1" through "Analog-32" for the Analog Input channels.

Note that this control does not reset the names of the I/O Expander's control relays. Relay names are set from the **Control** tab, instead. This will be demonstrated later in this manual in the section concerning the control relay settings.



# Setting the Analog Inputs' user-programmable scaling and units of measurement:

NOTE: This feature requires firmware revision v3.6.1 or higher; these settings are not available in v3.6.0

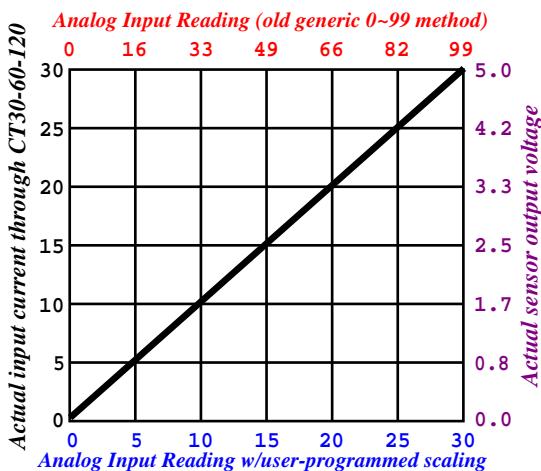
As of v3.6.1, the *WeatherGoose Series-II* family of monitoring units offers the ability to change the scaling of the analog-input channels from the generic 0 ~ 99 to a scale that's more appropriate for the type of sensor being connected.

The I/O Expander's analog inputs are programmed in the same manner as the ones which are built-in to most models of the *Series-II* family, so you may already be familiar with these settings – but if you are accustomed to using those models which do not have these types of inputs, these settings may be new to you, so some explanation may be in order.

By default, the analog input channels scale their 0 ~ +5VDC input range into a generic 0 ~ 99 reading, with 0 corresponding to 0V at the input terminal and 99 corresponding to +5V. (This default mirrors the behavior of the inputs in versions prior to v3.6.1, and also the previous Series-I family of monitoring units.) Normally, this would require the user to do some manual calculations to convert the displayed value into a “real” measurement, or to convert a desired “real” threshold value back into the appropriate 0~99 value for the alarm setting. However, by adjusting the **Min** and **Max** values associated with each analog input channel, the monitoring unit can be made to display values which correspond to the conditions actually being measured by the sensor, along with an appropriate **Unit** of measure afterwards, making the display much easier to read, and alarms easier to set.

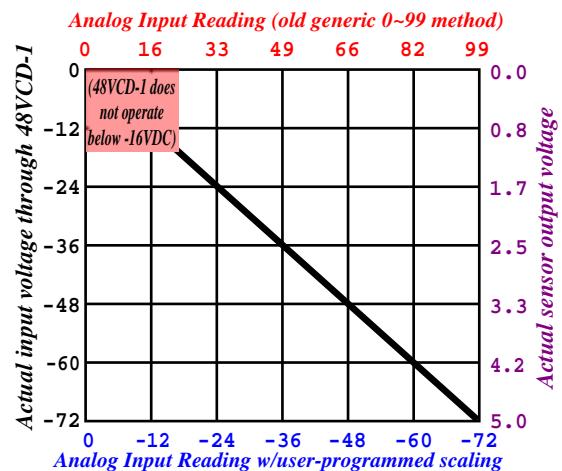
The example shown here illustrates the use of a CT30-60-120 current transformer, set to the 0~30A range, connected to Analog-1, and a 48VCD-1 telecom battery monitor connected to Analog-2.

In the current transformer’s case, 0V = 0A, while 5V = 30A, so **Min** is set to 0 and **Max** to 30, with the **Unit** set as **A**. The battery monitor, on the other hand, is set so that 0V at the analog input means a battery voltage of 0Vdc from the sensor, while +5V = -72Vdc. Note that the **Max** value is negative, because the 48VCD-1 is measuring a positive-ground telecom-system battery; this is an important example, because it illustrates how the scaling calculations do not care whether **Max** is mathematically larger than **Min**, or vice-versa; these numbers simply define the endpoints on a scale, and the monitoring unit simply calculates where each measurement sample lies on that arbitrary line without any regard for what the numbers actually signify. The graphs below illustrate how the scaling works for both the CT30-60-120 and 48VCD-1 examples described above:



Save Changes					
Names					
Sensor	Friendly Name	Min	Max	Unit	
Araog-1	Analog-1	0.000	99.000		
Araog-2	Analog-2	0.000	99.000		
Araog-3	Analog-3	0.000	99.000		
Araog-4	Analog-4	0.000	99.000		
Araog-5	Analog-5	0.000	99.000		
Araog-6	Analog-6	0.000	99.000		
Araog-7	Analog-7	0.000	99.000		
Araog-8	Analog-8	0.000	99.000		
Araog-9	Analog-9	0.000	99.000		
Araog-10	Analog-10	0.000	99.000		
Araog-11	Analog-11	0.000	99.000		
Araog-12	Analog-12	0.000	99.000		
Araog-13	Analog-13	0.000	99.000		

Names					
Sensor	Friendly Name	Min	Max	Unit	
Analog-1	Mains Current	0.000	30.000	A	
Analog-2	Battery Bank	0.000	-72.000	Vdc	



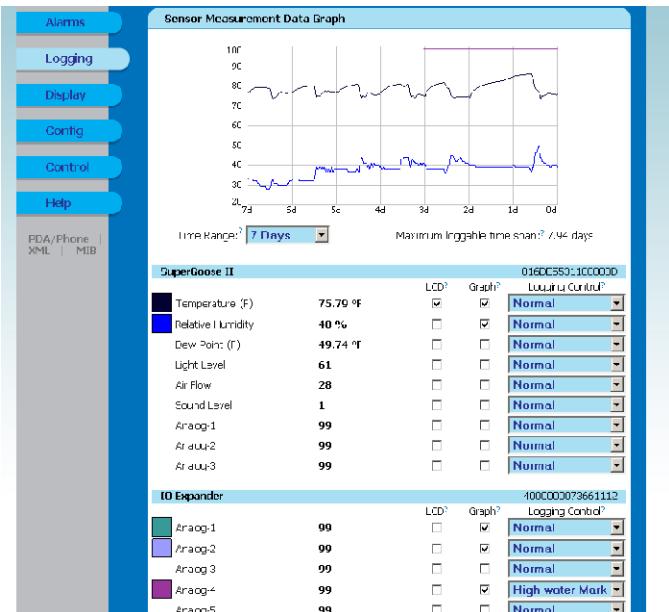
# Choosing which measurement(s) to log and graph:

From the Logging page, you can selectively determine which of the I/O Expander's analog-input channels should be shown in the unified graph at the top of the page, in the same fashion as any other sensor measurement.

The I/O Expander will appear as its own block of settings, beneath the host monitoring unit's own internal sensors. These settings are explained in more detail in the user guides for the monitoring units themselves, but in brief, you can set the following parameters for each analog-input channel:

**LCD:** this checkbox determines whether this measurement appears in rotation on the front-panel LCD, if your monitoring unit is equipped with one.

►(If your particular model of monitoring unit doesn't have a built-in LCD display, this column of checkboxes will not be shown.)



**Graph:** this checkbox determines whether this measurement is shown in the merged graph at the top of the Logging page. Note that this does not affect the individual graphs on the Sensors page; these will always be shown, unless logging is turned off for all of the measurements in a particular sensor device.

**Logging Control:** this drop-down box allows you to control how the data is logged for that particular measurement. There are four possible options:

- **Normal:**

All measurements will be logged.

- **High-Water Mark:**

Each new measurement sample is compared to the previous one. If the new measurement is higher than the previous one, it will be logged and become the new “high-water mark”; if it is lower, it is discarded and the previous measurement will persist until a higher measurement is seen by the sensor.

- **Low-Water Mark:**

Each new measurement sample is compared to the previous one. If the new measurement is lower than the previous one, it will be logged and become the new “low-water mark”; if it is higher, it is discarded and the previous measurement will persist until a lower measurement is seen by the sensor.

- **Logging Off:**

No measurements will be logged. Note that if this option is selected, the **Graph** checkbox for that sensor will be greyed out, since it is not possible to graph that sensor if its data is not logged.

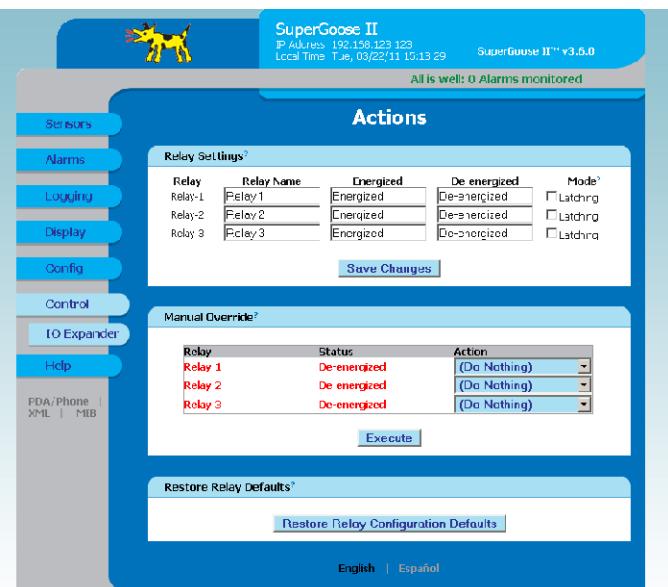
Note that these logging options do not affect the alarm system; the monitoring unit will continue to check each sensor's incoming measurement sample against any alarm thresholds you may have set for that sensor, and will trip the alarm if the measurement exceeds the thresholds. These options only affect whether or not the sample is then recorded into the logging system, which operates independently of the alarm system. After you have set your preferred logging options, click the **Save Changes** button to make them take effect.

# Configuring the control relays:

► If you have connected the I/O Expander to a monitoring unit that does not have built-in control relays of its own, such as a SuperGoose-II (shown here), you will notice that the web interface has acquired a new tab, named Control, with a single secondary tab named IO Expander. This tab is where you configure the IOE's control relays. The unit will default to the IO Expander tab when Control is selected.

► If you have connected the I/O Expander to a monitoring unit that does have built-in control relays of its own, such as a RelayGoose-II, you will notice that the Control tab has now split itself into two secondary tabs, named Main and IO Expander. The unit will default to the Main tab when Control is selected.

Note that if you have changed the name of the I/O Expander from the **Display** page, the name of the IOE's tab will also change on the **Control** page.



The I/O Expander's control relays offer the same configuration options as those which are built into models such as the RelayGoose-II; they can be re-named, set to latching or non-latching operation, manually activated, and triggered via one or more alarm thresholds. These functions are described in more detail in the user guides for the monitoring units themselves, but in brief, you can set the following parameters for the relays from this page:

## **Relay Settings:**

Here, you can change the **Relay Name**, and also assign descriptive names to the **Energized** and **De-energized** states. The relay names you assign will be used anywhere the relays are referred to, such as on the alarm-setting page, to make it easier for you to distinguish which relay(s) you're associating with a particular alarm threshold, while the names assigned to the energized/de-energized states will be shown anywhere the relay's current status is being displayed.

You can also configure the relay to act as a **Latching** relay by clicking the appropriate checkbox in the **Mode** column on the far right. A latching relay, once it has been energized by an alarm condition, stays energized until the user manually de-energizes it from the **Control** page, even if the alarm state which triggered the relay is subsequently cleared. (More on this below.) If this checkbox is left un-checked, the relay will be in "normal", i.e. non-latching mode; the relay will only remain energized as long as one or more of the alarm thresholds associated with it are tripped; if all of its associated alarms are clear, the relay will de-energize.

## **Manual Override:**

The relays' current state is displayed here; energized relays are shown in green, while de-energized relays are shown in red. To the far right, the drop-down boxes in the **Action** column allow the user to forcibly energize or de-energize a relay, independent of the alarm thresholds which may be associated with that relay. The available options are:

- **Force De-energize:** force the relay to de-energize (if it isn't already) and stay that way until you release it.
- **Force Energize:** force the relay to energize (if it isn't already) and stay that way until you release it.
- **Release Override:** release the relay from either of the above forced states, allowing it to be controlled by the alarm system again.

The default action is “(Do Nothing)”, which doesn’t change the relay’s state either way. Once you’ve chosen your desired override actions, click the **Execute** button, and the relays will change to the states you’ve set within a few seconds.

### Acknowledgements:

This set of controls will only be shown if there are one or more relays currently in a latched state, after having been tripped by an alarm threshold while being set to Latching mode as described above. Setting the **Acknowledge & De-energize** checkbox, then clicking the **Execute** button, will release the latch and allow the relay to de-energize.



Once all relays are released, this set of controls will disappear again, until the next time a latched-mode relay is energized. If you are not using latched mode on any of the relays, this set of controls will not be shown regardless of whether any of the relays are energized.

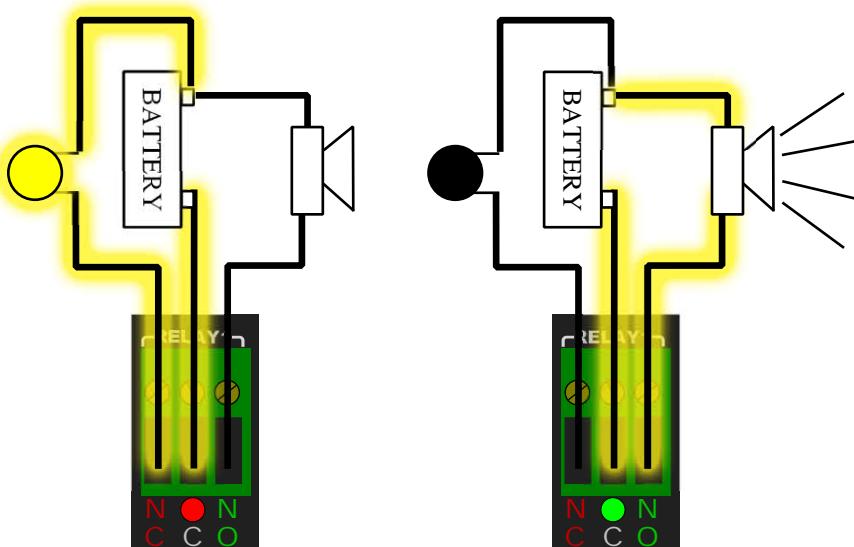
### Restore Relay Defaults:

Clicking this button will erase any changes you may have made to the *Relay Settings* and return them to factory defaults of “Relay 1” through “Relay 3” for the relay names, “Energized” and “De-energized” for the relay-action states, and the latching-mode checkboxes un-checked (i.e., “normal” mode).

### Understanding the Relay Actions:

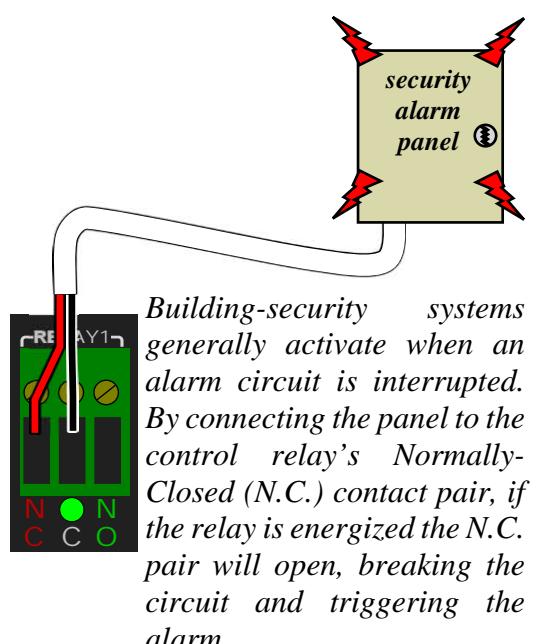
The default state of the control relays is the **de-energized** state. In this state, the Normally Open (N.O.) contact pair is open, while the Normally Closed (N.C.) contact pair is closed. (“Normally”, in the context of relays, always refers to what is “normal” when the relay is in its de-energized state.)

Once you’ve assigned a relay to one or more alarm thresholds (see below), if any of those alarms is tripped, the relay will be **energized**. In this state, the Normally Open (N.O.) contact pair will close, while the Normally Closed (N.C.) contact pair will open. Both pairs are provided because some devices, such as signal lamps or sirens, are triggered by a closed circuit, while other devices such as building-security alarm systems are activated by a formerly closed circuit suddenly becoming open. Examples of these actions are illustrated below:



*relay is de-energized;  
N.C. pair is closed,  
N.O. pair is open*

*relay is energized;  
N.C. pair is open,  
N.O. pair is closed*



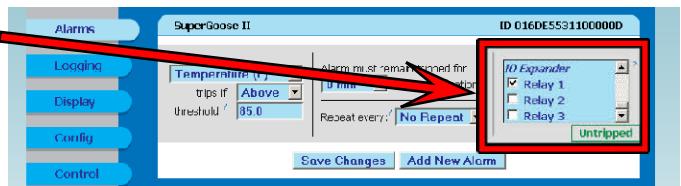
*Building-security systems generally activate when an alarm circuit is interrupted. By connecting the panel to the control relay’s Normally-Closed (N.C.) contact pair, if the relay is energized the N.C. pair will open, breaking the circuit and triggering the alarm.*

## Setting alarm thresholds to trigger the relays:

Once you have connected the I/O Expander, its relays become part of the alarm-action options which can be chosen from the list on the right-hand side. When setting an alarm threshold, simply scroll down the list until you see the section named “IO Expander”, then set (or clear) the checkboxes associated with whichever relay(s) you wish to energize when this particular alarm is tripped. Note that if you have changed the names of the I/O Expander from the **Display** page, or of the relays from the **Control** page, those names will appear in this list as well.

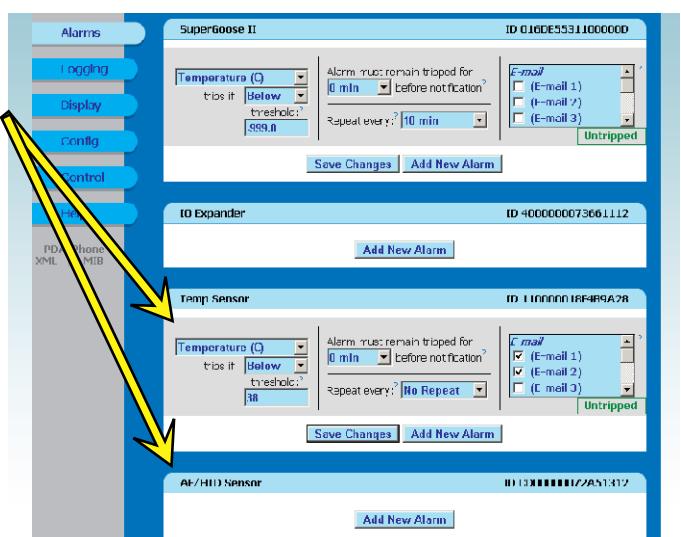
Other than this, alarm thresholds are set just as they were before the I/O Expander was installed. (See *setting alarm thresholds on the I/O Expander’s analog input channels*, below, for a brief overview of how to add and configure alarms. For a more detailed explanation, please refer to the operations manual for the particular model of monitoring unit you’re connecting the I/O Expander to.)

You may assign a relay to more than one alarm threshold, if desired. In this case, if any one of the alarms with that relay assigned to it is tripped, the relay will energize; if more than one of those alarms is tripped, then the relay will remain energized until all of those alarms have cleared. (Unless, of course, that relay is set to Latched mode, in which case it will stay energized until you manually clear it as described above, since Latching mode takes priority over any alarm-clear actions.)



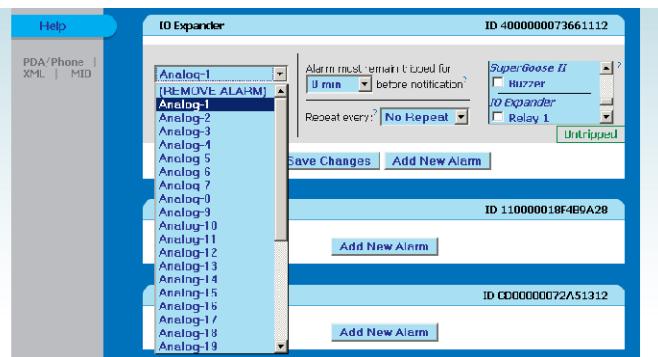
## Setting alarm thresholds on sensors connected to the I/O Expander’s Digital Sensor Bus ports:

Digital Sensors connected through the I/O Expander will appear as separate devices with their own block of alarm settings, just as if they were connected directly to the host monitoring unit. No special instructions are required to set alarms for these sensors; they can be treated just as if they were directly connected to the host monitoring unit itself.



# Setting alarm thresholds on the I/O Expander's analog input channels:

As with any other Digital Sensor Bus device, the I/O Expander will acquire its own block of alarm-threshold settings on the **Alarms** page. Any of the 32 analog-input channels can be selected from the drop-down box on the upper-left, and its alarm thresholds and actions are set in the same manner. Clicking the **Add New Alarm** button creates a new alarm entry in the I/O Expander section; you choose the analog-input channel you wish to monitor from the drop-down box, then choose the following options:



## **Trips if:**

Determines whether the reading must go **Above** or **Below** the threshold setting to trip the alarm.

## **Threshold:**

The threshold setting for this alarm. The alarm will trip if the sensor's reading exceeds this threshold by going above or below it, as configured above. (For more information about the appropriate thresholds for specific ITWatchDogs sensor types, please consult the user guide for the model(s) of sensor in question.)

## **Alarm must remained tripped...:**

Allows you to set a delay of 1, 5, or 10 minutes, during which the sensor measurement must remain outside the threshold you've set, before any of the alarm actions will actually occur. If the sensor measurement returns to normal before this delay time expires, no actions will be taken. This setting can be useful in avoiding "false alarms" caused by brief, temporary shifts in the readings that might occur as part of normal operations – such as what might be seen by a temperature sensor inside a storage cooler, for example, when the door is briefly opened by personnel taking things in or out of the cooler. In this case, a delayed alarm would help insure that action is only taken if there is a sustained rise in temperature for several minutes.

## **Repeat Every:**

Alarms can be set to repeat every 10, 30 or 60 minutes, for as long as the alarm remains tripped.

After setting these options, and choosing your desired alarm actions from the list on the right, click **Save Changes** to commit these settings and enable the alarm. As with any other sensor device, multiple alarm thresholds can be associated with any of the analog-input channels, and each threshold can have its own combination of actions to be taken if that particular threshold is exceeded, allowing you to set escalating alarms of increasing severity as the sensor reading moves further away from "normal" conditions.