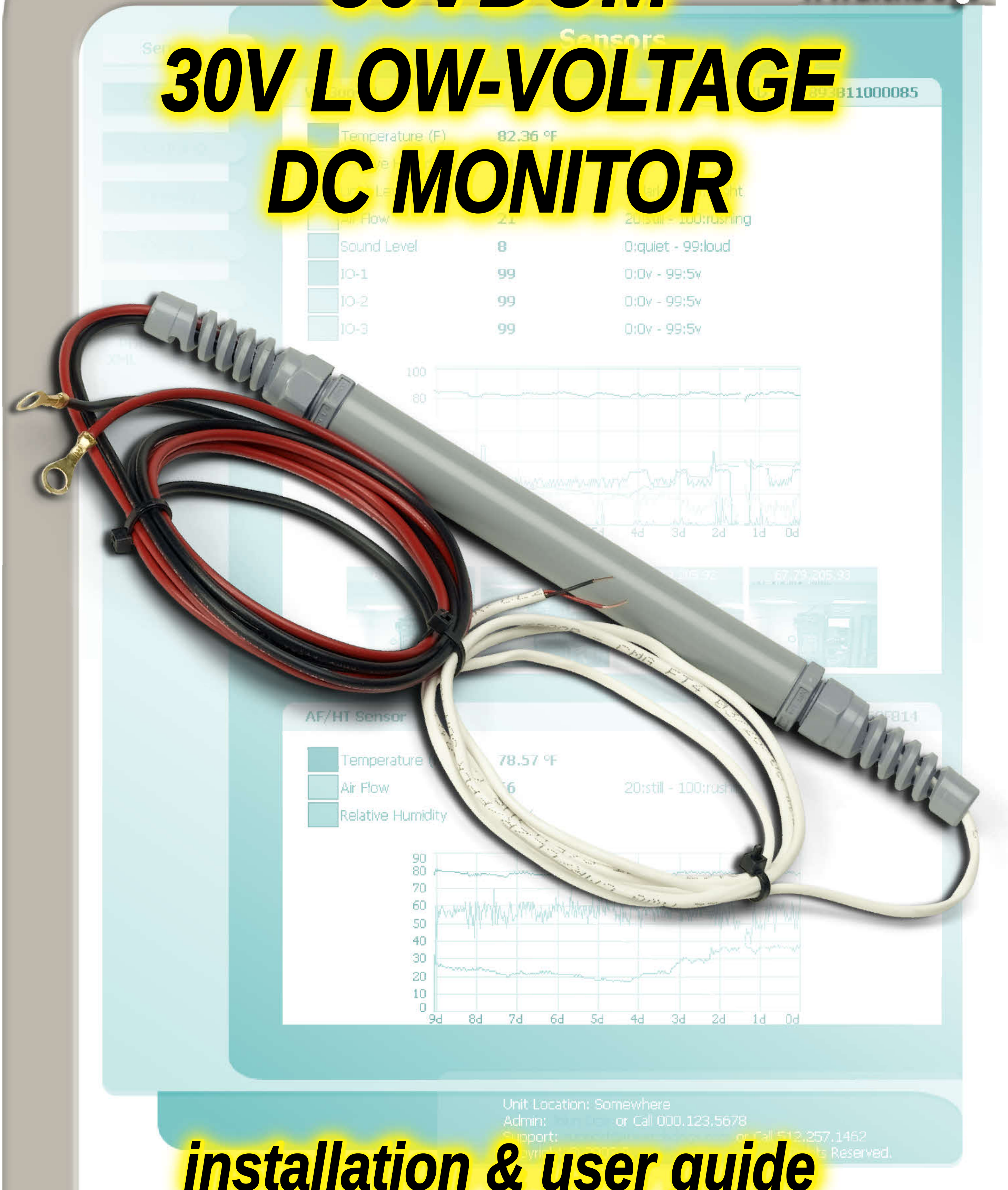
ITWatchDogs

30VDCM

30V LOW-VOLTAGE DC MONITOR



installation & user guide

30VDCM *Low-Voltage DC Monitor*

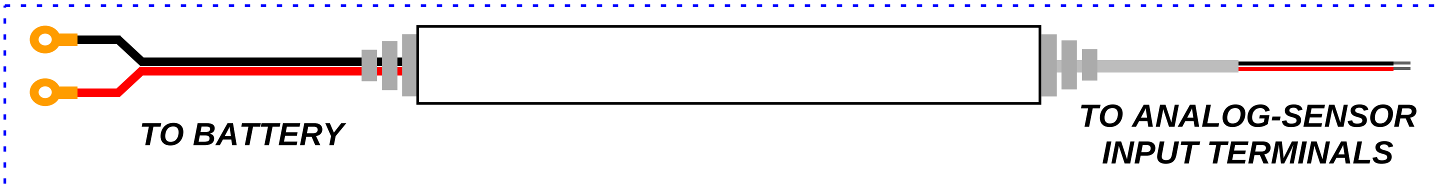
These days, IT and telecommunication infrastructures are spreading out all over. Equipment that used to be confined to a central facility is increasingly finding its way into remote locations, often powered at least in part by 12V or 24V battery banks (which may, in turn, be charged by a variety of sources; solar power, windmills, portable generators, water wheels...) that need to be monitored to alert someone when the charge is getting low.

The 30VDCM Low-Voltage DC Monitor is an inexpensive solution to this problem. This simple device provides the necessary signal conditioning to convert an input-voltage range of +0 ~ +30VDC to a proportional +0 ~ +5VDC signal suitable for use with the WeatherGoose monitoring system's analog-sensor inputs, and also incorporates protection circuitry to help prevent incorrect hookups from destroying either the sensor device or the Goose itself. By setting appropriate trip points on the Goose's alarm page, you can receive automatic notifications of potentially dead, discharged, or overcharged battery banks based on the measured voltage across the batteries, giving you advance notice of potential problems without needing to constantly send someone out to measure the battery voltages manually.

The 30VDCM Low-Voltage DC Monitor is directly compatible with any WeatherGoose (series I or series II) monitoring unit which has analog-sensor inputs; such models include the WeatherGoose, SuperGoose, and the MiniGoose/XP. Models which do not have built-in analog inputs, such as the MiniGoose, will require the use of an appropriately-programmed CCAT analog-to-digital converter to use an 30VDCM. Monitoring units which do not provide connectors for either analog or digital sensors, such as the MicroGoose, are not compatible with the 30VDCM.

30VDCM Low-Voltage DC Monitor

The first step is to connect your 30VDCM to the WeatherGoose unit. When you look at the 30VDCM device, you'll see a set of wires coming out of each end:



One pair consists of two heavier-gauge wires, one red and one black, ending in ring terminals; this pair connects to the battery or batteries that you wish to monitor. The red wire connects to the (+) battery terminal, while the black wire connects to the (–) terminal.

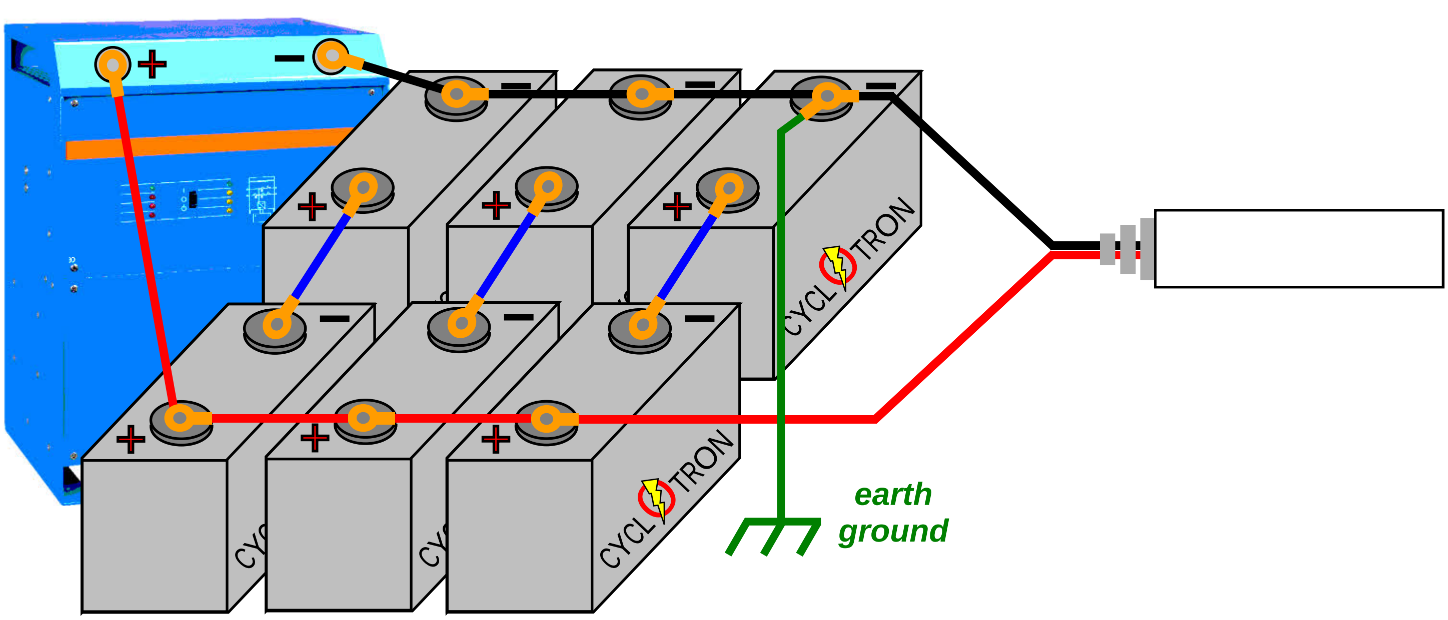
The other wire pair consists of two thinner wires, also one red and one black, encased in white outer insulation. This is the signal pair, which connects to the WeatherGoose's analog-input terminals or to an appropriately-programmed CCAT interface, depending on your installation and Goose model; this connection will be shown in more detail in the following sections.

PLEASE NOTE THAT POLARITY IS IMPORTANT! While the device is protected against backwards connections, you will not get the correct readings from the device if either the battery pair or the signal pair are connected improperly.

One of the protections included inside the device is a self-resetting fuse; in the unlikely event that an incorrect hookup results in a short circuit through the device, the fuse will open up to a high resistance to effectively cut off the current flow. If this happens, the fuse may take several seconds to reset once the voltage is disconnected, so if you hook up the 30VDCM and get no readings (or nonsense readings) from it, disconnect the device and let it "rest" for about 10~15 seconds before trying to reconnect it, to give the fuse time to reset itself.

The input range of the device is +0 ~ +30VDC, to provide sufficient overhead for increased voltage across a 24V battery bank during the charging cycle.

The illustration below shows a (much simplified) example of how to connect the 30VDCM to a battery bank and charger. Here, each battery is a 12-volt deep-cycle lead-acid battery, with the six batteries wired in a series-parallel combination; each pair of 12V batteries wired in series (via the blue wires) provides 24V (with the negative side going to ground), and the three pairs wired in parallel (via the red and black wires) provide increased current capacity. The 30VDCM, connected across the paralleled sets, monitors the voltage of the battery bank as a whole.



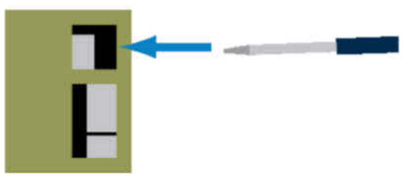
Using the 30VDCM via a direct connection to the WeatherGoose's built-in Analog Inputs:

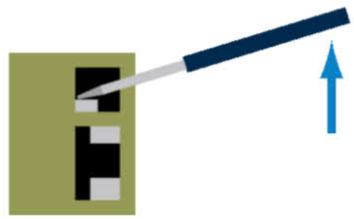
Ÿ Connecting the 30VDCM to the Analog-Input terminals:

The following diagrams demonstrate how to connect your 30VDCM Low-Voltage DC Monitor directly to the spring-loaded analog-input terminals used on most of the standard series-I and series-II WeatherGoose product lines. (Note that specialized models, such as the PowerGoose and RelayGoose, use different styles of terminal blocks; while the connections will be the same electrically, the mechanical nature of the connector will be different than the one shown here. If necessary, refer to the manuals for those specific models for further details on how to connect analog sensor devices.) Each terminal consists of two openings; a larger, square opening at the bottom, where the wire will be inserted, and a smaller, narrower opening above which is used to open the spring-loaded jaws inside the terminal block so the wire can be inserted.

Note that the neither the terminal jaws on the WeatherGoose, nor the terminal block on the current transformer itself, are insulation-piercing types; therefore, the insulation must be stripped at least ½" prior to insertion.

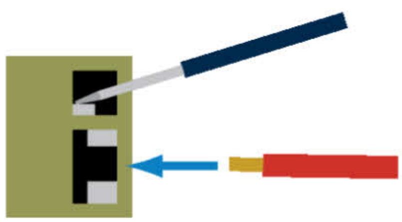
First, insert a small flat-blade screwdriver into the upper slot...

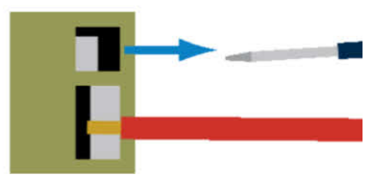




...pry upwards to open the spring-loaded jaw...

...slip the sensor wire into the larger bottom opening...





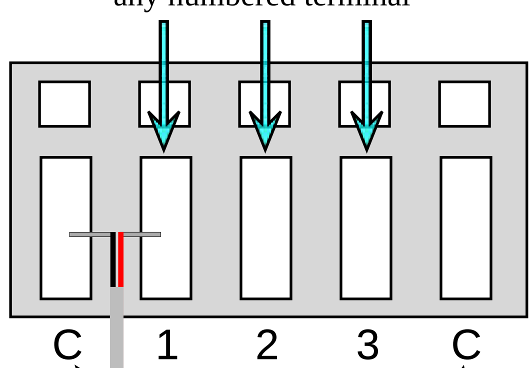
...then pull out the screwdriver to allow the jaw to close around and grip the wire.

This diagram shows the correct polarity to connect a 30VDCM to the analog-input terminals on a WeatherGoose.

Note that this applies to all models of the WeatherGoose family, regardless of series or model; the 30VDCM must be connected with the correct polarity, or the unit will not function and the Goose's input circuitry could be damaged by incorrect connections!

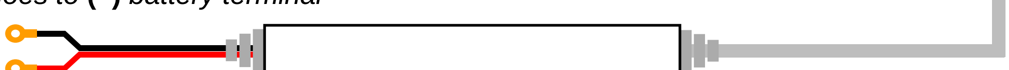
CAUTION: unlike some types of analog sensors, the 30VDCM cannot be "doubled up"; i.e. you cannot connect two or more of them in series or parallel so that they share a single analog input! Attempting to do so can damage both the sensors, and possibly the WeatherGoose analog inputs as well!

Red wire (+) can go into any numbered terminal



Black wire (-) can go into either C (common) terminal

***BLACK** wire with ring terminal goes to **(–)** battery terminal*

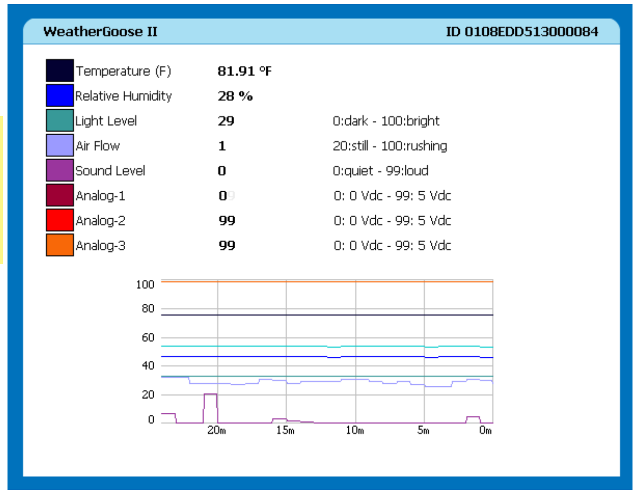


***RED** wire with ring terminal goes to **(+)** battery terminal*

TO ANALOG-SENSOR INPUT TERMINALS

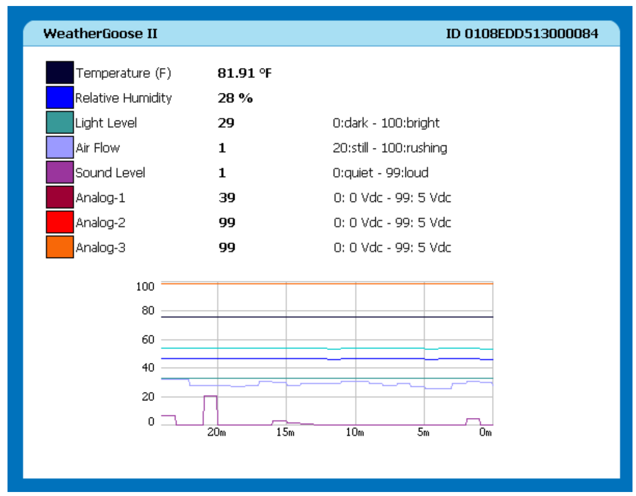
Ÿ Sensor operation and behavior:

Once you've successfully connected the 30VDCM Low-Voltage DC Monitor to your WeatherGoose, the internal-sensors display block of the ***Sensors*** page will look something like this: (***NOTE: for purposes of this example, the 30VDCM has been connected to Analog Input #1 of a WeatherGoose-II with v3.3 firmware; the use and operation of the 30VDCM will be similar for other models and firmware revisions, but the on-screen displays may differ somewhat.***)



In this first screenshot, the 30VDCM is connected, but there is no voltage present at its input terminals. Notice, however, that the displayed reading at the Analog-1 input may not necessarily be "**0**"; if the sensor is not connected to a battery or other voltage source, both the sensor and the WeatherGoose's analog input terminal are "floating", electrically speaking, which could cause the displayed value may drift slightly away from zero due to the influence of the internal "pull-up" resistors which would normally supply a small loop current to drive a dry-contact sensor device such as a door switch. This is generally not a cause for concern; once the 30VDCM Low-Voltage DC Monitor is connected to a voltage source, its signal will override this pull-up drift.

Here, we have applied 12VDC to the sensor's input terminals, and the WeatherGoose is now showing a reading of "**39**". Why 39, and not 12? This, too, is a characteristic of the way the generic Analog Inputs on a WeatherGoose work. The WeatherGoose has no way of knowing what kind of sensor is actually attached to the Analog Input, so it simply scales the 0~5V input to a generic reading of 0~99; it is up to the user to interpret the reading in terms of what type of sensor is actually connected to the input terminals.

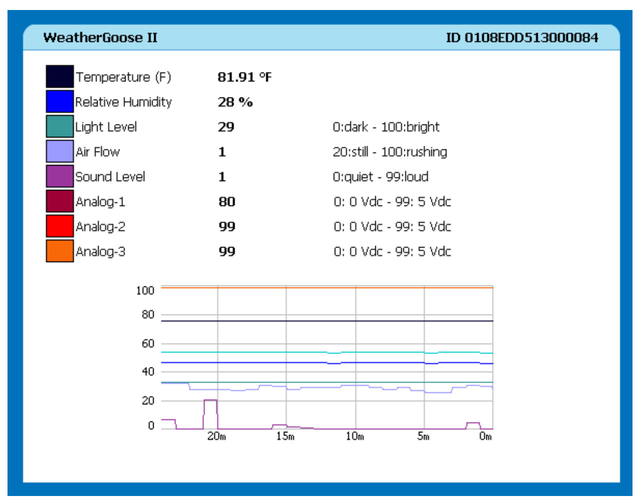


To convert the displayed reading into the "true" voltage, use the following formula:

***voltage* = (0.303 X *displayed reading*)**

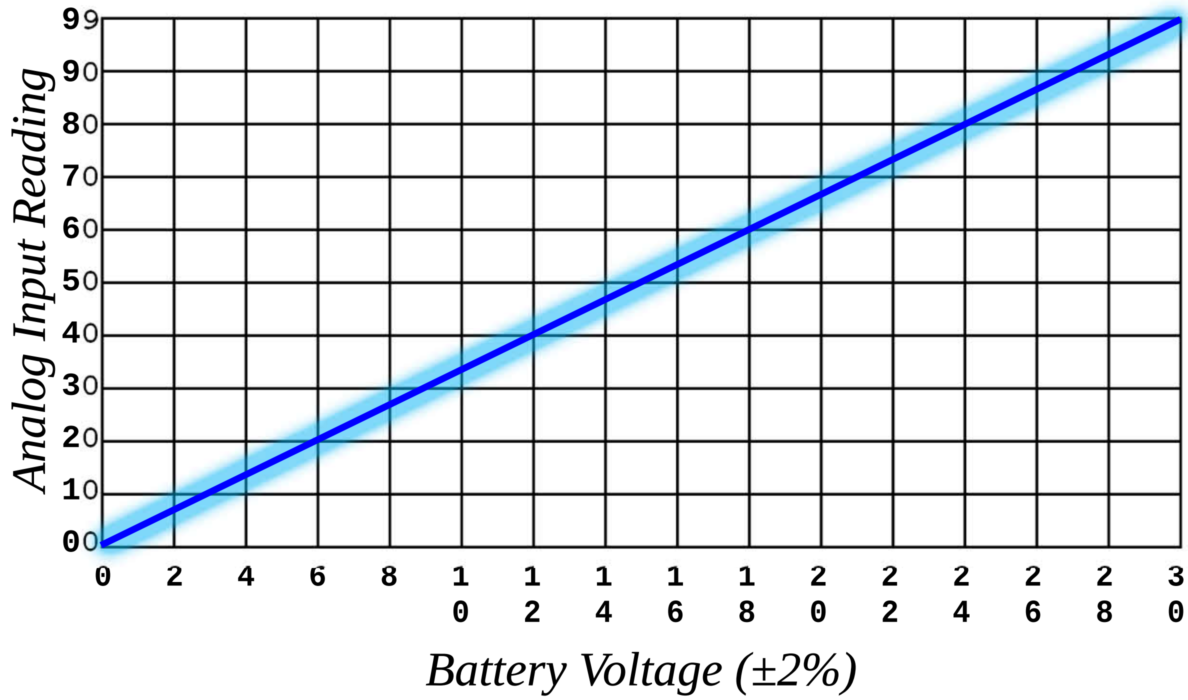
In this case, 0.303 X 39 = 11.817V – which is a bit low, but still well within the rated accuracy of the 30VDCM sensor and the WeatherGoose's internal Analog Inputs.

Here, the applied input is 24V, and the displayed reading has risen to **80** – which, according to the above formula, works out to 0.303 X 80 = 24.24V, a bit high, but still within the device's accuracy range.



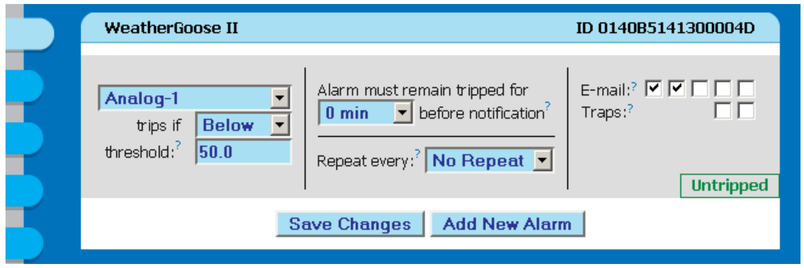
Admittedly, these measurements aren't quite as accurate as a properly-calibrated voltmeter might be; however, the error is small, typically less than 2%, which is easily good enough to monitor charge/discharge trends in typical lead-acid backup-battery banks and their associated charging systems. (These slight inaccuracies are primarily due to the technical trade-offs necessary to make a sensor that can power itself from the same voltage source that it's trying to measure, eliminating the need for a secondary battery or power supply for the sensor, and also partly due to the internal protection circuitry which helps keep the sensor or monitoring unit from being damaged if the sensor is accidentally hooked up the wrong way around.)

The graph shown below demonstrates the range of displayed readings vs. battery voltage typical of the 30VCDM Low-Voltage DC Monitor when it is connected directly to the Analog Input terminals of a WeatherGoose monitoring system.



Ÿ Alarm-threshold settings when connected directly to an Analog Input:

If you are using a Series-II unit:



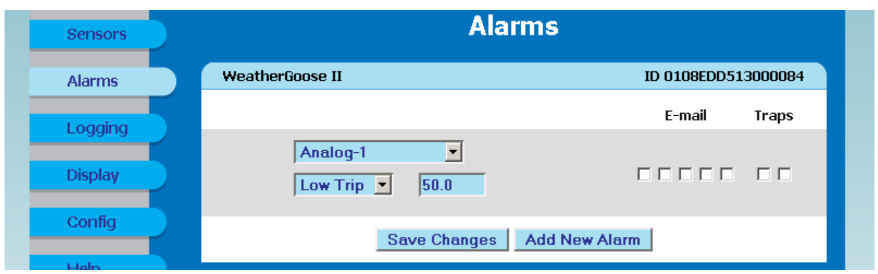
To set an alarm threshold to notify you when the 30VDCM detects that the battery voltage has dropped below your desired limit, simply go to the ***Alarms*** page, click the *Add New Alarm* button under the Goose's internal-sensors block, choose the Analog Input to which the 30VDCM is connected (Analog-1 in this example), set *trips if:* to **`Below`** and the threshold to the desired voltage level as calculated above; then, select the alarm actions you wish this alarm threshold to trigger, along with a trigger delay or alarm-repeat interval if desired, and click *Save Changes*.

To calculate the proper threshold for the desired voltage, simply divide the desired voltage by 0.303, as follows:

$$\textit{alarm threshold} = (\textit{voltage} \div 0.303)$$

In the example shown here, we are setting an alarm threshold of 15V by setting the trip point to "**`50`**" (i.e. 15 divided by 0.303), so the associated alarm notifications will trip if the battery voltage falls below 15V. If you also want to set an overvoltage threshold, simply set *trips if:* to **`Above`** instead of **`Below`**. (Be sure to take the battery-charging system's output voltage into account, or else your "overcharge" alarm will keep tripping every time the battery charger kicks in!)

If you wish to monitor for both over- and under-voltage conditions, then simply repeat this "Add New Alarm" process to attach a second alarm threshold to the appropriate analog input, and set the thresholds and actions accordingly. (You can also set "escalating" thresholds this way, by adding multiple alarms to a given sensor; refer to the user guide for your particular model of climate monitor for more information on how to do this.)



If you are using a Series-II unit with a firmware revision prior to v3.4.x, your alarm-settings block will look like this. Alarm-threshold settings are calculated and programmed the same way as above; the only difference (aside from the lack of trigger-delay and alarm-repeat intervals, which were introduced in v3.4) is that the alarm types are named **`High Trip`** and **`Low Trip`** instead of **`Above`** and **`Below`**, respectively. **`High Trip`** alarms are tripped when the reading goes higher than the set threshold, while **`Low Trip`** alarms are tripped when the reading goes below the threshold.

If you are using a Series-I unit:

SuperGoose				ID 01C00F650B00001D
Sensor	**Current**	**Low Trip**	**High Trip**	**Alarm State**
Temperature	89.17°F	20	90	Disabled
Relative Humidity	24%	0	99	Disabled
Air Flow	1	0	99	Disabled
Light Level	42	0	25	Disabled
Sound Level	1	0	75	Disabled
IO-1	72	50	110	Disabled
IO-2	99	0	100	Disabled
IO-3	99	0	100	Disabled

Find the sensor block on the ***Alarms*** page for the Goose unit's internal sensors, then set the *Low Trip* threshold to the desired voltage threshold and the *High Trip* threshold to **`110`**, as shown here, for the input which the 30VDCM is connected to, then set the *Alarm State* to the action(s) you wish to take place when the trip threshold(s) are exceeded and click *Save Changes*. (The input being used here, #1, is highlighted for clarity.) Since the Analog input cannot go above 99, this will effectively disable the High Trip event, which is generally not needed if you are only monitoring for a low-battery condition. Thresholds are calculated using the same formula as given above, regardless of series or firmware revision.

If you wish to monitor for overvoltage as well, then set both the *High Trip* and *Low Trip* thresholds to the desired voltages.

If, for some reason, you wish to <u>only</u> monitor for the over-voltage condition, and not for under-voltage, then set the *High Trip* threshold to the desired voltage limit, and set the *Low Trip* threshold to **`-10`** to disable it.

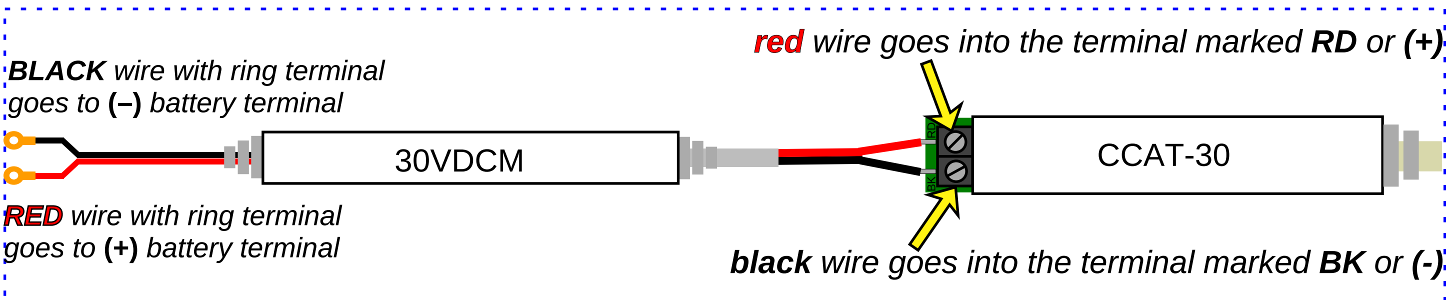
Using the 30VDCM via a a CCAT-48 analog-to-digital bus interface module:

Ÿ Connecting the 30VDCM to the CCAT-30:

If you are using an ITWatchdogs monitoring device which does not have built-in analog inputs, such as the MiniGoose-II, or if you have already used up all of your analog inputs on other sensors, then you will need to attach the 30VDCM Low-Voltage DC Monitor via an appropriately-programmed CCAT analog-to-digital bus interface module, available from IT Watchdogs. The following diagram shows how to hook up and use a 30VDCM in combination with a CCAT-30 interface module.

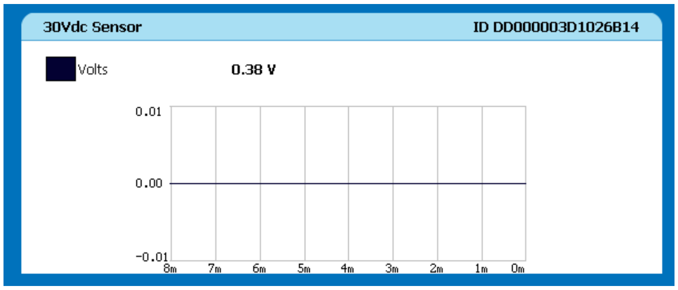
(Note: the CCAT has been manufactured in a couple of different physical variations over the lifetime of the product. If your CCAT does not seem to match the appearance of the one shown below, you may have an earlier model, and may wish to consult the CCAT User Guide to insure the correct hookups.)

Note that the same cautions apply to using the CCAT as to the internal Analog Inputs; i.e. correct polarity must be observed when connecting the 30VDCM, and multiple units may not be connected in series or parallel to share a single CCAT connection! Again, the wires will need to be stripped, as the terminals are not of an insulation-piercing type. However, they do not need to be stripped back as far as they do for the Analog Input block; a ¼-inch of exposed wire will generally be sufficient for the style of terminals used on the CCAT.



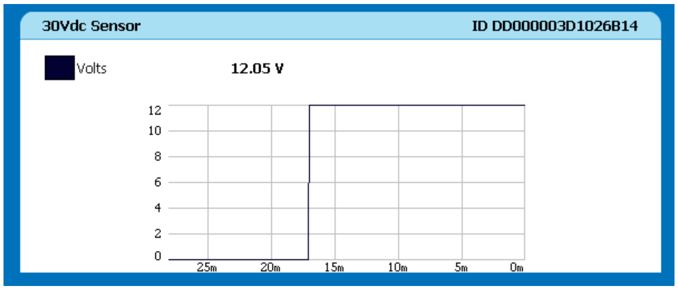
Ÿ Sensor operation and behavior when connected via a CCAT-30:

Once you've connected the CCAT-30 to the monitoring unit, a new sensor block will appear, initially titled "30Vdc Sensor." (This name can, of course, be changed from the ***Display*** page to something more specific to your installation.) If your CCAT does not initially display as "30Vdc Sensor", do not proceed further, as your CCAT is not correctly programmed for this sensor and will not display its status properly! (In this event, contact IT Watchdogs technical support for assistance.)

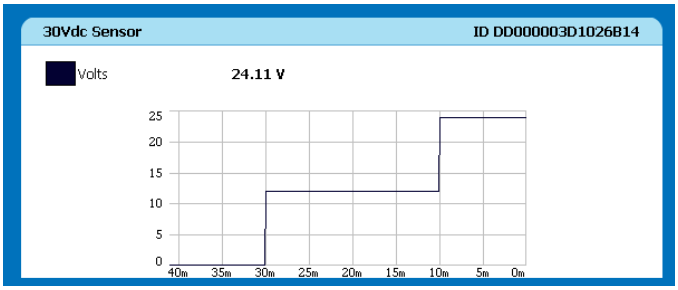


In this first screenshot, the 30VDCM is connected to the CCAT-30, but there is no voltage present at the 30VDCM's input terminals. Notice that the displayed reading is not actually "**0.00V**"; rather, it is drifting around 0.35~0.4V. This is not unusual; with no input voltage to the 30VDCM, its measurement and signal-generation circuitry has no power to operate, so the CCAT-30's analog-to-digital measurement input is able to "float", and may drift slightly away from a "true" 0V level.

This kind of "floating" behavior is to be expected when the measurement circuitry has no power to operate itself, and is no cause for concern; once the 30VDCM is connected to a voltage source, the CCAT-30's input will no longer float and the voltage measurements will behave as expected.



Here, we have applied 12VDC to the sensor's input terminals. The actual displayed voltage is 12.05V, within the bounds of the CCAT-30 and 30VDCM's rated accuracies of about ±2%.

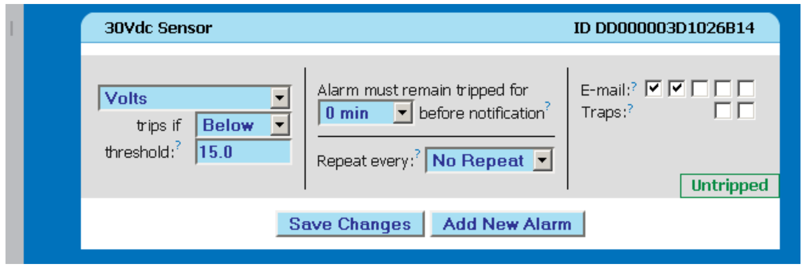


Finally, we see the unit with 24VDC applied to the sensor. The displayed voltage is 24.11V, still within the combined accuracies of the 30VDCM and the CCAT-30.

Admittedly, these measurements aren't quite as accurate as a properly-calibrated voltmeter might be; however, the error is small, typically less than 2%, which is easily good enough to monitor charge/discharge trends in typical lead-acid backup-battery banks and their associated charging systems. (These slight inaccuracies are primarily due to the technical trade-offs necessary to make a sensor that can power itself from the same voltage source that it's trying to measure, eliminating the need for a secondary battery or power supply for the sensor, and also partly due to the internal protection circuitry which helps keep the sensor or monitoring unit from being damaged if the sensor is accidentally hooked up the wrong way around.)

Ÿ Alarm-threshold settings when connected via a CCAT-30:

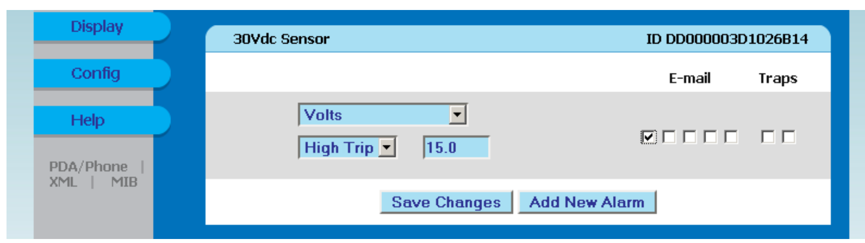
If you are using a Series-II unit:



When you go to the ***Alarms*** page, you'll find that a new settings block has been added there as well, also titled "30Vdc Sensor." To set an alarm threshold to notify you when the 30VDCM detects that the battery voltage has dropped below your desired limit, simply simply scroll down to this new settings block, simply go to the ***Alarms*** page, click the *Add New Alarm* button under the Goose's internal-sensors block, set *trips if:* to **`Below`** and the threshold to the desired voltage level; then, select the alarm actions you wish this alarm threshold to trigger, along with a trigger delay or alarm-repeat interval if desired, and click *Save Changes*. Note that since the CCAT-30 displays the sensor reading as a properly-scaled 0~30V value, there is no need to convert the desired voltage threshold into a 0~99 value using a formula; simply enter the desired voltage threshold directly.

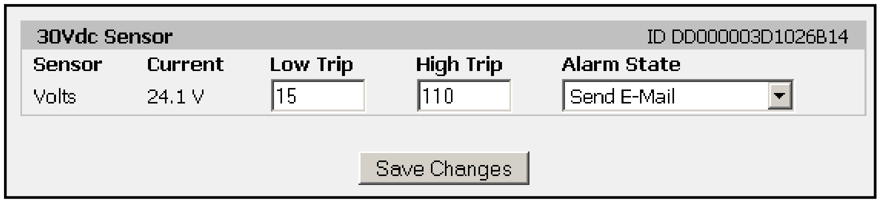
To set an over-voltage threshold, simply set set *trips if:* to **`Above`** instead of **`Below`**, then set your threshold accordingly. (Be sure to take the battery-charging system's output voltage into account, or else your "overcharge" alarm will keep tripping every time the battery charger kicks in!)

If you wish to monitor for both over- and under-voltage conditions, then simply repeat this "Add New Alarm" process to attach a second alarm threshold to the 30Vdc Sensor block, and set the thresholds and actions accordingly. (You can also set "escalating" thresholds this way, by adding multiple alarms to a given sensor; refer to the user guide for your particular model of climate monitor for more information on how to do this.)



If you are using a Series-II unit with a firmware revision prior to v3.4.x, your alarm-settings block will look like this. Alarm settings are programmed the same way as above; the only difference (aside from the lack of trigger-delay and alarm-repeat intervals, which were introduced in v3.4) is that the alarm types are named **`High Trip`** and **`Low Trip`** instead of **`Above`** and **`Below`**, respectively. **`High Trip`** alarms are tripped when the reading goes higher than the set threshold, while **`Low Trip`** alarms are tripped when the reading goes below the threshold.

If you are using a Series-I unit:



Find the sensor block on the ***Alarms*** page for newly-connected CCAT-30, then set the *Low Trip* threshold to the desired voltage threshold and the *High Trip* threshold to **110**, as shown here, then set the *Alarm State* to the action(s) you wish to take place when the trip threshold(s) are exceeded and click *Save Changes*. This will place the High Trip event well above the 30VDCM's operating range of 0 ~ 30VDC, effectively disabling it since it isn't needed for this application.

If you wish to monitor for overvoltage as well, then set both the *High Trip* and *Low Trip* thresholds to the desired voltages. (Unlike the Series-II behavior described above, both High and Low trips are set in a single operation; however, Series-I does not allow for multiple escalating alarm thresholds like Series-II does; you can only have a single High and a single Low.)

If, for some reason, you wish to only monitor for the over-voltage condition, and not for under-voltage, then set the *High Trip* threshold to the desired voltage limit, and set the *Low Trip* threshold to **-10**. Since the reading on a CCAT-30 can never go below 0, this will effectively disable the Low Trip event, which is not needed if you are only interested in overvoltage.