



ITWatchDogs

CT30-60-120

SPLIT-FRAME

CURRENT TRANSFORMER



Unit Location: Somewhere
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 Support: 123.4567 or Call 512.257.1462
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installation & user guide

CT30-60-120 *Current Transformer*



There are many instances in which it can be useful to know how much current is being drawn by a particular device or group of devices, or how much is being carried on various feeds from the breaker panels. If your building is wired for three-phase power, it can be very important to determine whether the load across the three phases is properly balanced, especially if you have a mix of single- and three-phase equipment where the single-phase wall outlets are wired across one phase and the neutral wire, or equipment which is powered off of 208VAC across two of the three phases. If your facility is located in an older building, you may find it necessary to keep a closer eye on how much power is being drawn by your servers due to the limits of the older wiring. Or... you might just want to monitor a particular power strip to see if those unexplained Sunday-night crashes are being caused by the cleaning crew plugging a floor buffer into the same circuit as your server rack.

Unfortunately, it's not uncommon for the desirability of monitoring these conditions to be overlooked until after your data-center facility is built and in operation, and oftentimes it isn't desirable to disconnect the equipment in order to insert an in-line current monitor. A split-frame current transformer, such as the one pictured below, can be a potential solution; instead of having to cut the wires to thread them through a solid transformer ring, these types of current transformers can simply be clamped around the current-carrying wire, and then secured into place with screws or bolts into the wall or floor if needed.

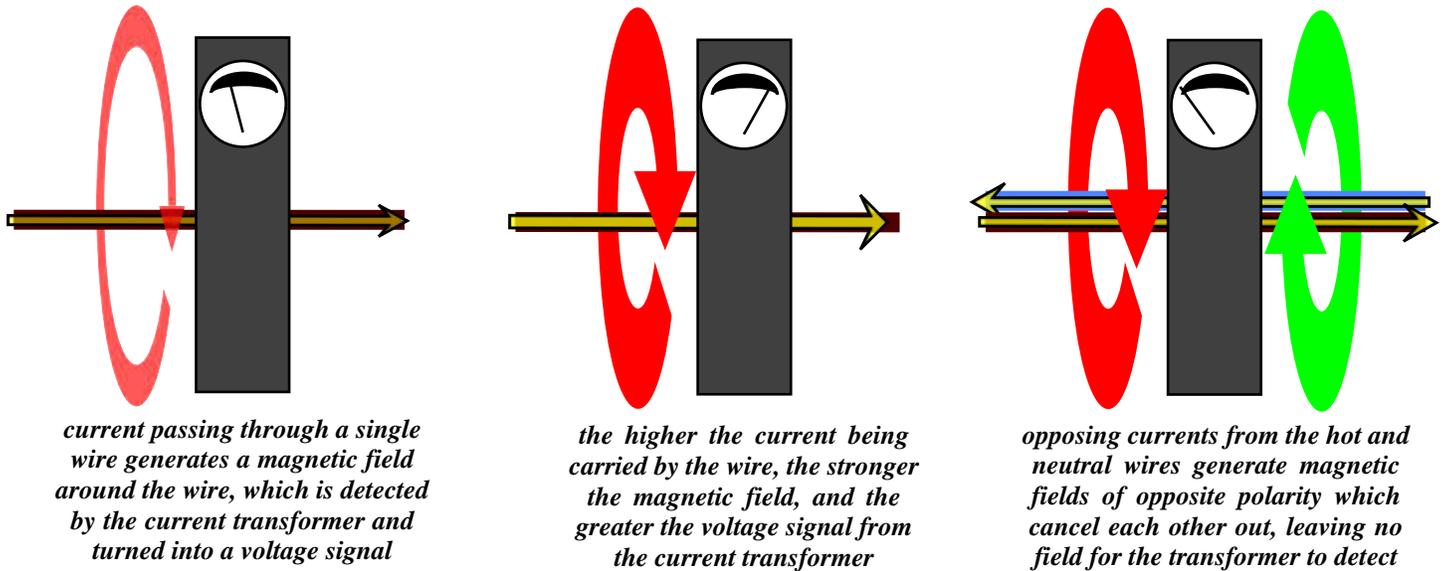
The CT30-60-120 offers a flexible solution to WeatherGoose customers who need this kind of monitoring. It has three selectable current ranges, allowing it to monitor currents of up to 30A, 60A, or 120A, and is designed to match the input range of the WeatherGoose's Analog-Input terminals, outputting a proportional signal of 0-5VDC, with 5VDC representing the maximum current reading for the range the CT30-60-120 is set to. (i.e. If the range switch is set to the 60A range, then 0V = 0A, 2.5V = 30A, and 5V = 60A.)

The CT30-60-120 Telecom Battery 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 CT-30-60-120. **Models which do not provide connections for either analog or digital external sensors, such as the MicroGoose, are not compatible with the CT30-60-120.**



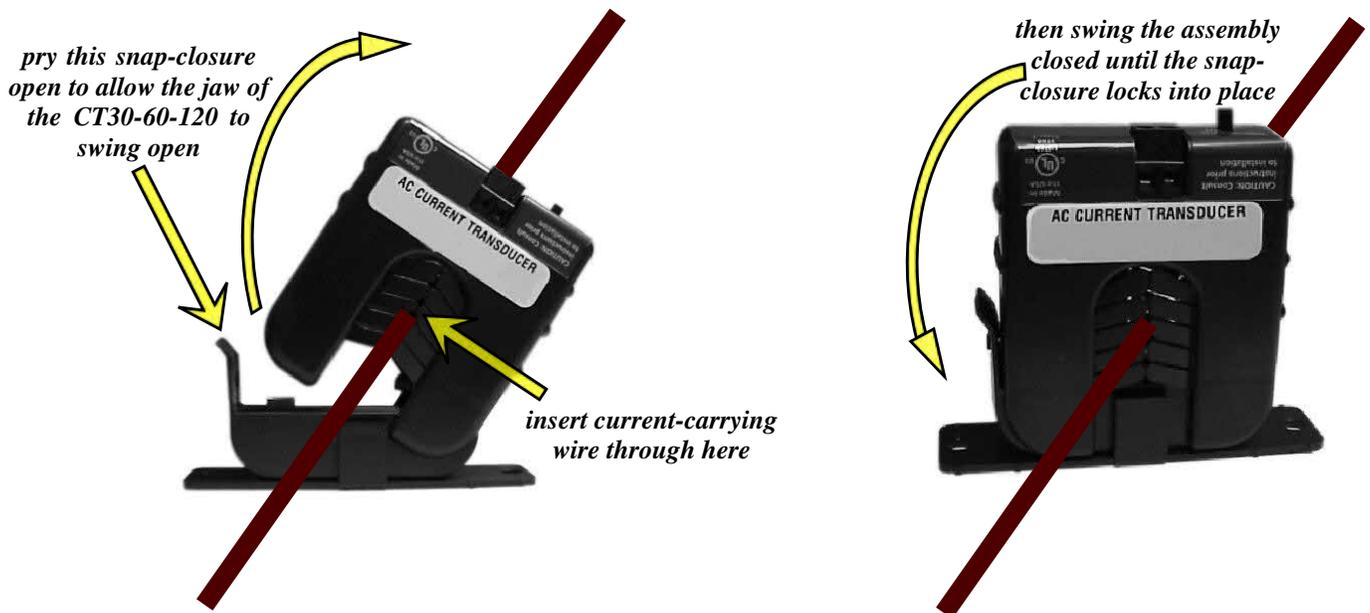
Note that for the current transformer to work properly, it is necessary that only the “hot”, current-carrying wire passes through middle of the transformer; if the CT is simply clamped around a standard 2-wire or 3-wire power cord, you won’t get any reading.

The reason for this is that a current transformer works by detecting the electromagnetic field generated around a current-carrying wire, with the strength and polarity of this field depending on the amount of current being carried. Unfortunately, if you have both the “hot” and “neutral” wires passing through the transformer, then both wires will be generating EM fields – *of opposing polarities*. These opposing fields will cancel each other out, and there’ll be nothing left for the CT to detect. The following diagrams help illustrate this principle:



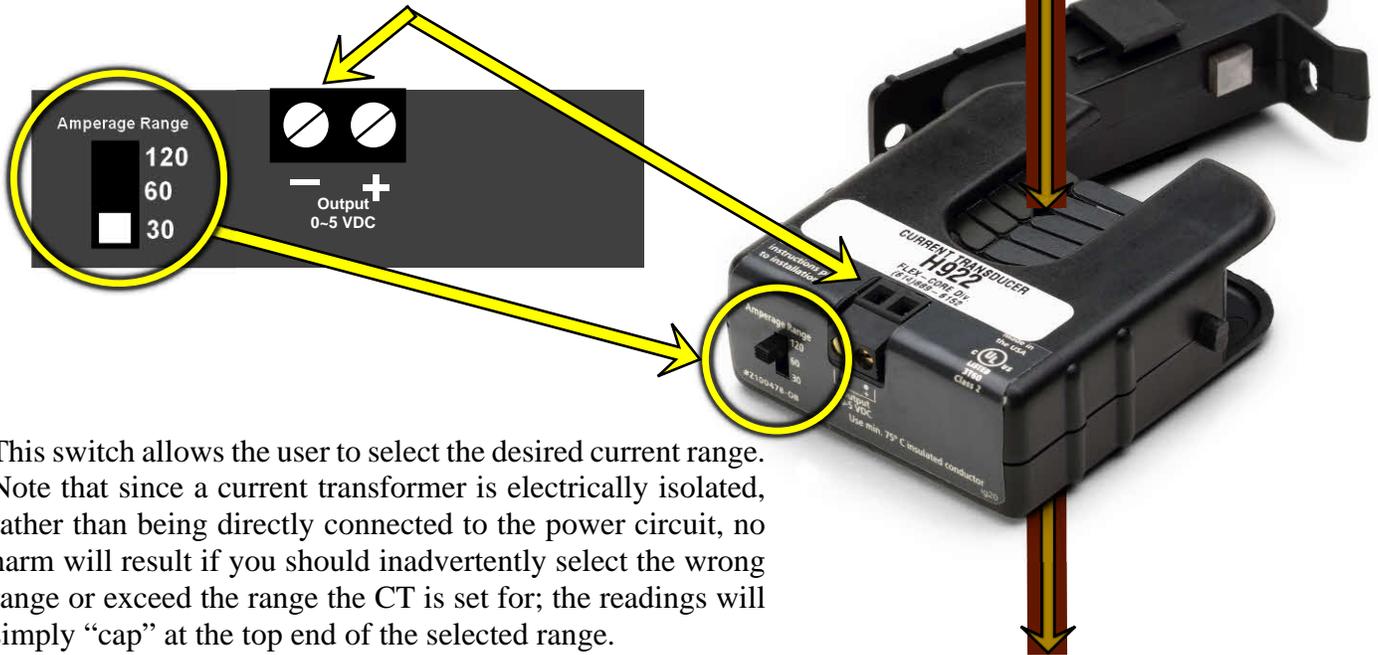
Note: for clarity, the above diagrams show current flow in a single direction. However, it is important to note that in actual operation, a current transformer is an AC-power device; it cannot measure the current in a DC circuit. (The technical reasons for this are beyond the scope of this user guide; suffice it to say, this is an inherent characteristic of transformer-type devices.) If your facility uses DC power to run the equipment whose power consumption you wish to monitor, the CT30-60-120 will not work for your application.

As shown here, the current transformer can be opened up to allow a wire to be threaded through the middle without having to cut or unplug it. The plastic “fingers” lining the center will grip the wire to keep it from moving around; for best results, try to position the wire as close to centered as possible.



The signal voltage is tapped off of this 2-terminal block. Notice that the terminals are marked with a (+) and a (-); **polarity is important!**

Current-carrying wire goes through the middle of the transformer, here.



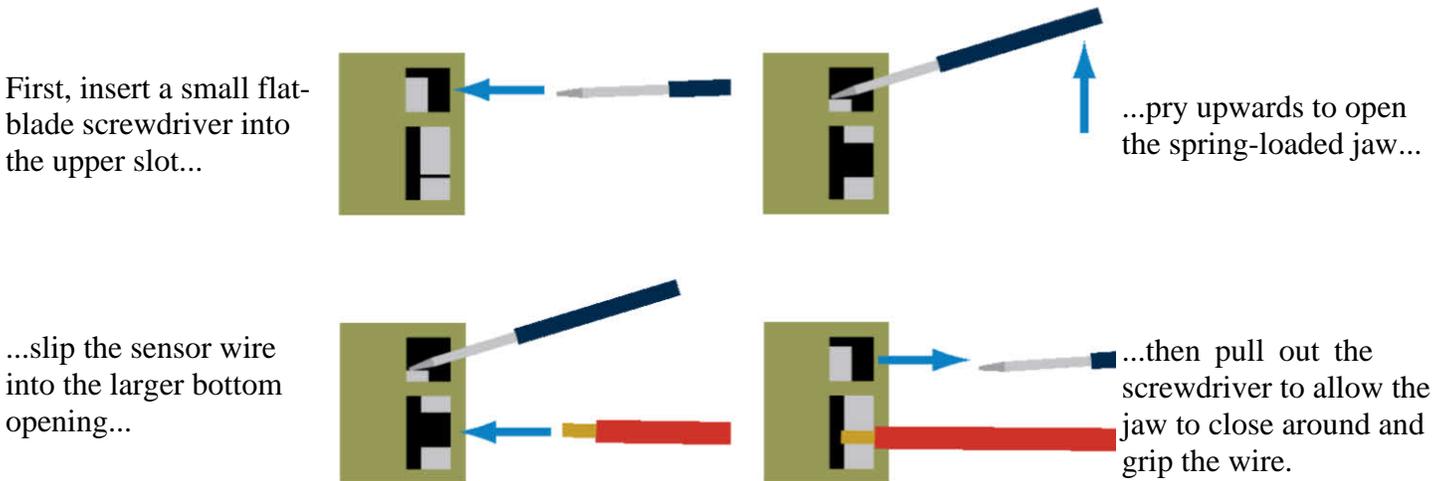
This switch allows the user to select the desired current range. Note that since a current transformer is electrically isolated, rather than being directly connected to the power circuit, no harm will result if you should inadvertently select the wrong range or exceed the range the CT is set for; the readings will simply “cap” at the top end of the selected range.

Using the CT30-60-120 via a direct connection to the WeatherGoose's built-in Analog Inputs:

Connecting the CT30-60-120 to the Analog-Input terminals:

The following diagrams demonstrate how to connect your CT30-60-120 Current Transformer 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.

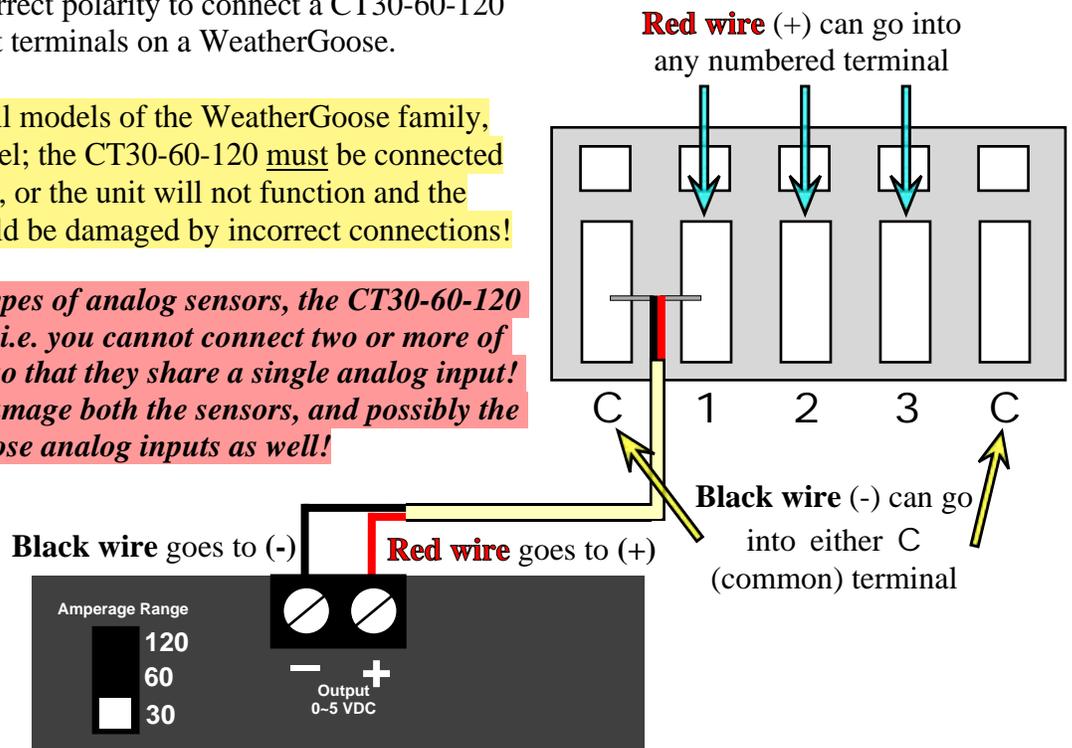
Note that the neither the terminal jaws on the WeatherGoose, nor the terminal block on the current transformer itself, are insulation-piercing types; therefore, the insulation must be stripped at least 1/2" prior to insertion.



This diagram shows the correct polarity to connect a CT30-60-120 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 CT30-60-120 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!

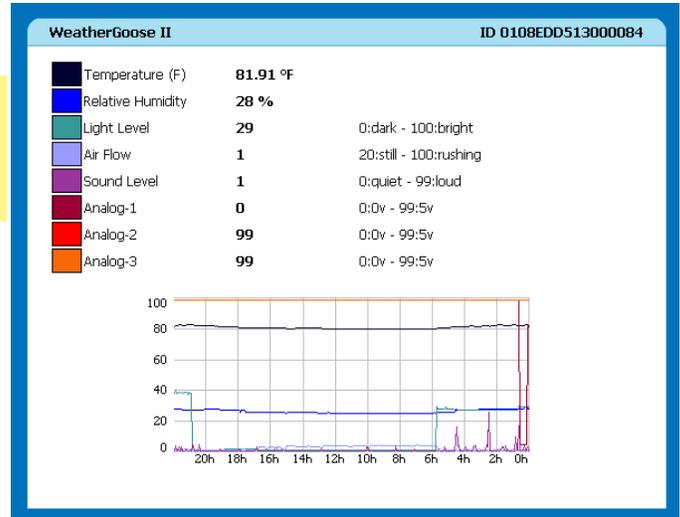
CAUTION: unlike some types of analog sensors, the CT30-60-120 cannot be "doubled up"; i.e. you cannot connect two or more of them in series or parallel so that they share a single analog input! Attempting to do so can damage both the sensors, and possibly the WeatherGoose analog inputs as well!



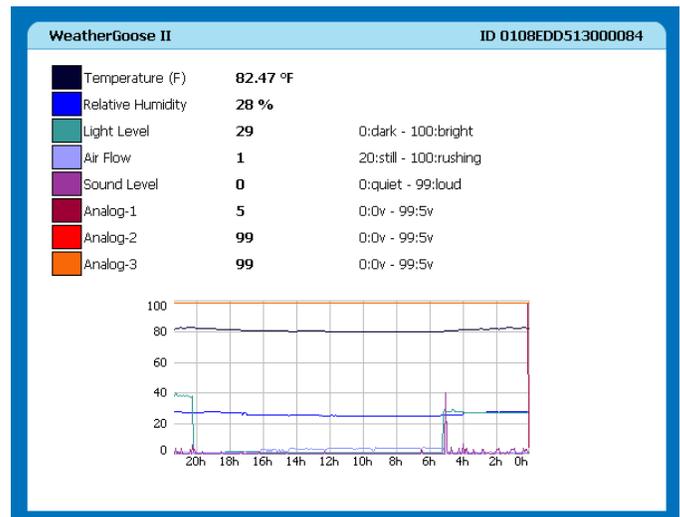
Y Sensor operation and behavior:

Once you've successfully connected the CT30-60-120 current transformer to your WeatherGoose, the internal-sensors display block of the *Sensors* page will look something like this: (NOTE: for purposes of this example, the CT30-60-120 has been connected to Analog Input #1 of a WeatherGoose-II with v3.3 firmware; the use and operation of the CT30-60-120 will be similar for other models, but the on-screen displays may differ somewhat.)

In this first screenshot, no current is flowing through the wire passing through the center of the CT30-60-120 transformer frame, so the input is showing "0". (Note that since the transformer is only accurate to within 2% it is not uncommon for this, plus random electrical noise, to cause this value to fluctuate between "0" and "1", especially if the wiring run between the current transformer and the Goose are particularly long or if they are routed near other sources of EM interference, or alongside high-current AC wiring that feeds an electrically-noisy load such as a heavy-duty motor or air-conditioner.)



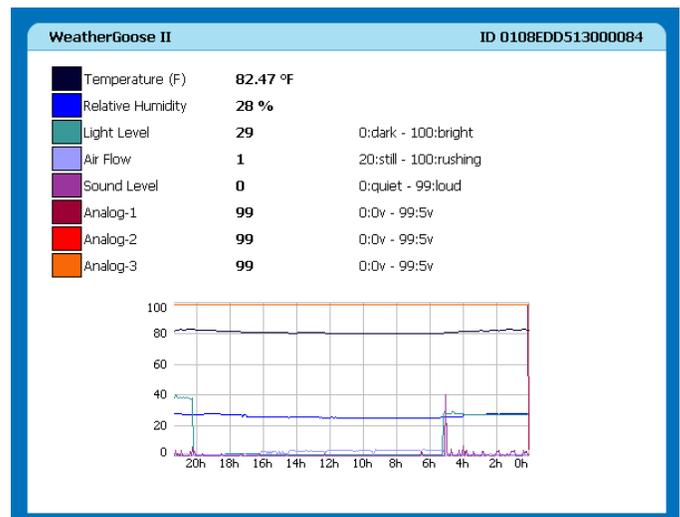
Here in the second screenshot, we see the reading when a small amount of current is flowing through the wire. The current reading is "5" – however, please note that this does not mean 5 amps! Because the Analog Inputs built-in to the WeatherGoose have no way of knowing what type of sensor is connected to them *or what the CT30-60-120's range switch is set to*, the unit is just taking the 0~5V input range and scaling it to a generic reading of 0~99. In order to properly interpret the reading, you will need to convert this value manually.

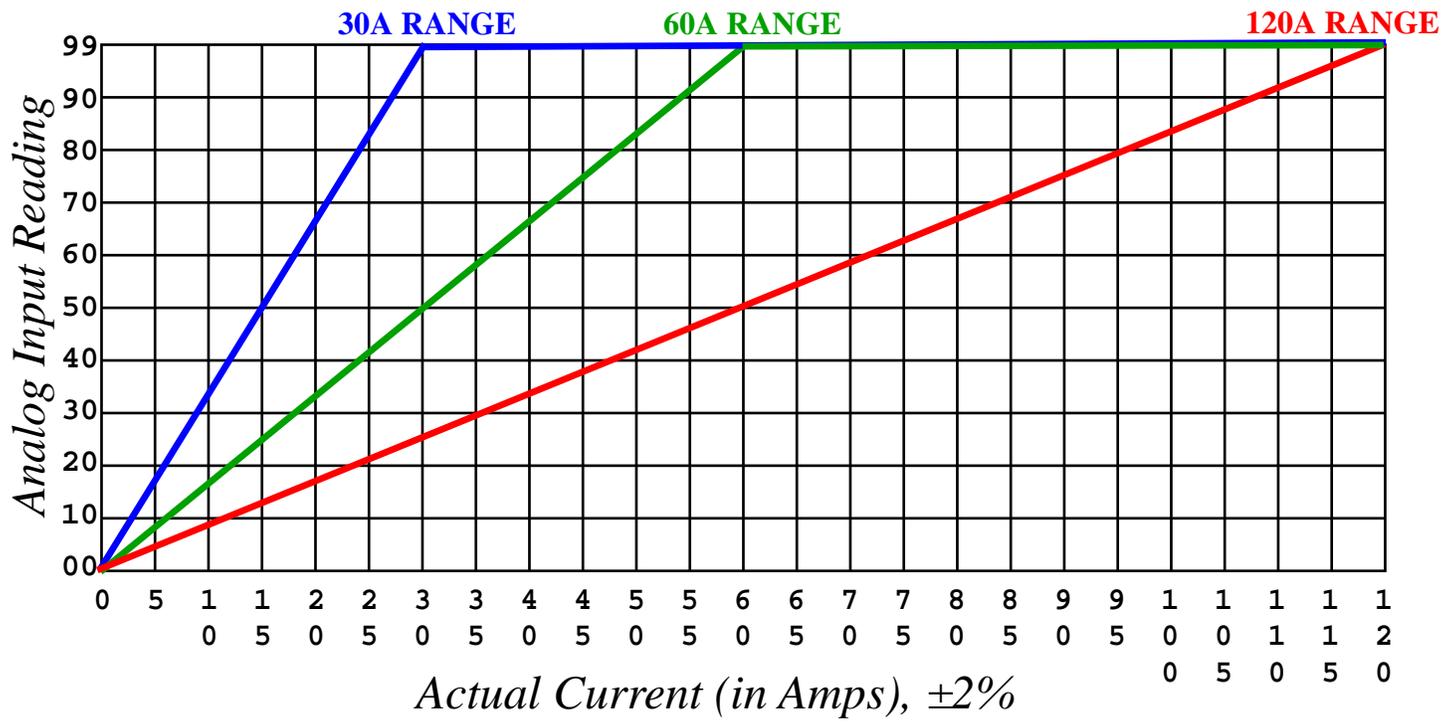


Fortunately, this conversion is relatively simple. Since a 0V signal represents 0A, and a 5V would represent the maximum current as determined by the range switch, and 0~5V = 0~99 on the display, you can consider the reading on the Goose as being equivalent to a percentage of the CT30-60-120's range setting, i.e. if the range switch is set to 30A, then a reading of "5" is approximately 5% of 30 amps, or 1.5A. If the range switch were set to 120A, then "5" would represent 5% of 120 amps, or 6A.

(Granted, since the readings are 0~99 rather than 0~100, this simple method introduces a slight error into the calculation, but since the current transformer is only accurate to within 2% or so to begin with, this method should suffice for most purposes. The more accurate calculation would, of course, be $(\text{reading} \div 99) \times (\text{range})$.)

Finally, in this third screenshot, we see the transformer at its maximum reading of either 30A, 60A, or 120A, depending on the setting of the transformer's range switch. Note that if the current through the wire being measured exceeds the range setting, the reading will simply "peg" at the maximum. The following graph illustrates this effect, along with the scaling of the displayed Analog Input value vs. measured current:

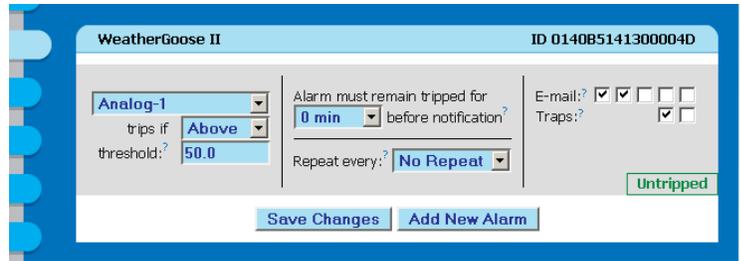




Y Alarm-threshold settings when connected directly to an Analog Input:

If you are using a Series-II unit:

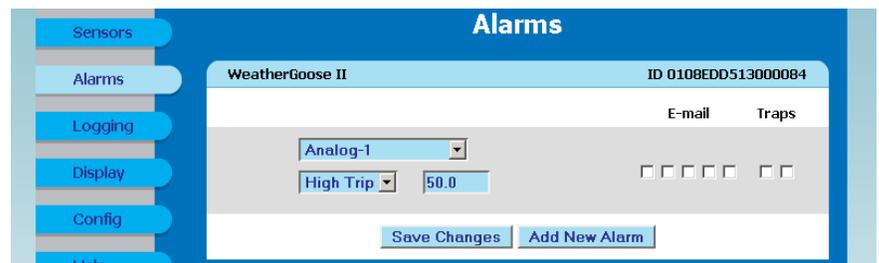
To set an alarm threshold to notify you when the CT30-60-120 detects a current draw higher or lower than your desired limits, simply go to the *Alarms* page, click the *Add New Alarm* button under the Goose’s internal-sensors block, choose the Analog Input to which the CT30-60-120 is connected (Analog-1 in this example), set *trips if:* to **BeLow** and the threshold to the desired current 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*.



In the example shown here, the CT30-60-120’s range switch is set to the 30A range, so we are setting an alarm threshold of 15A by setting the trip point to “50” (i.e. 50% of 30A), so the associated alarm notifications will trip if the current draw exceeds 15A. (You could, of course, just as easily set an alarm to occur if current drops below a specified threshold, simply by setting the alarm type to **Low Trip** instead of **High Trip**.)

If the range switch was set to the 60A range instead, a trip point of “50” would represent 50% of 60A, or a 30A trip point. Again, it is important to note that the WeatherGoose is not able to know what the range switch is set to, so you as the user must make sure to know the setting of the range switch and calculate your desired thresholds accordingly.

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.



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, the alarm settings are calculated in the same fashion as above, but setting the actual thresholds is done a bit differently. Find the sensor block on the *Alarms* page for the Goose unit’s internal sensors, then set the *Low Trip* and *High Trip* thresholds to the desired current limits, as shown here, for the input which the CT30-60-120 is connected to, then set the *Alarm State* to the action 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.) If you do not want a Low Trip alarm, set the *Low Trip* threshold to -10 to disable it (since current can’t be less than 0); if, conversely, you do not want a High Trip alarm, set the *High Trip* threshold to 110 to disable it (since the generic analog inputs can’t go higher than 99).

SuperGoose		ID 01C00F65080001D		
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	82	-10	50	Disabled
IO-2	99	0	100	Disabled
IO-3	99	0	100	Disabled

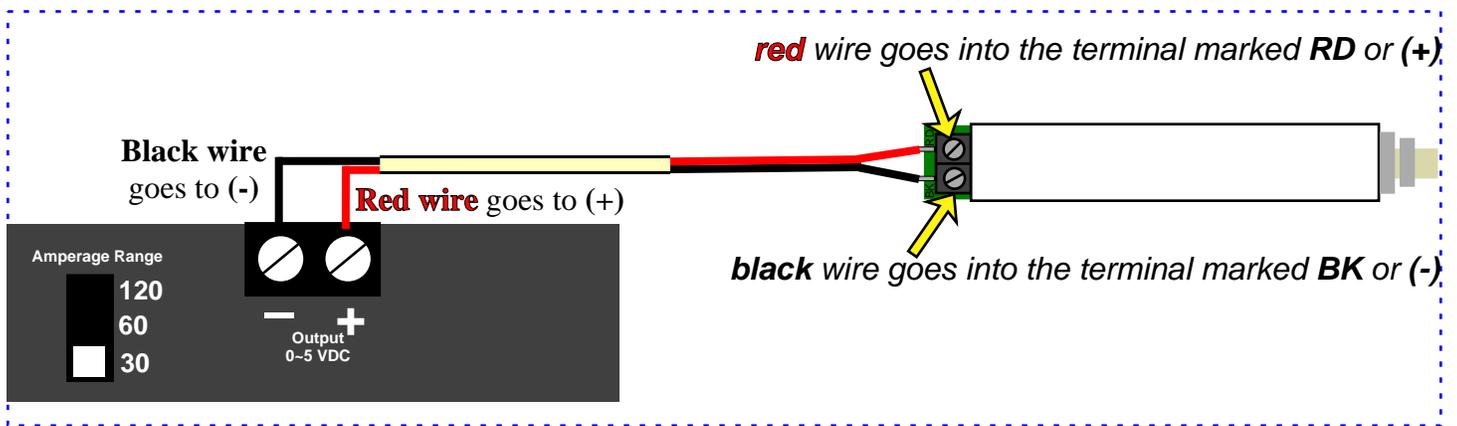
Using the CT30-60-120 via a CCAT-CUR analog-to-digital bus interface module:

Connecting the CT30-60-120 to the CCAT-CUR:

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 CT30-60-120 via an appropriately-programmed CCAT analog-to-digital bus interface module, available from IT Watchdogs. The following diagrams show how to hook up and use a CT30-60-120 in combination with a CCAT-CUR 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.)

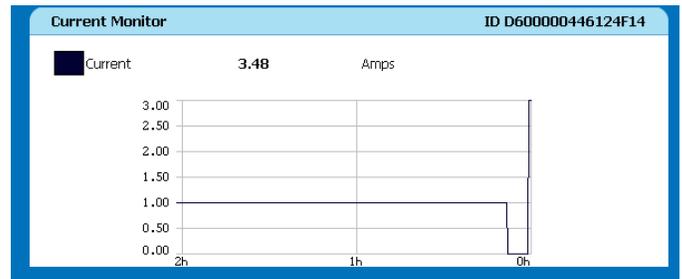
Note that the same cautions apply to using the CCAT as to the internal Analog Inputs; i.e. correct polarity must be observed when connecting the CT30-60-120, and multiple units may not be connected in series or parallel to share a single CCAT connection! Again, the wires will need to be stripped, as 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 1/4-inch of exposed wire will generally be sufficient for the style of terminals used on the CCAT.



Sensor operation & behavior when connected via a CCAT-CUR:

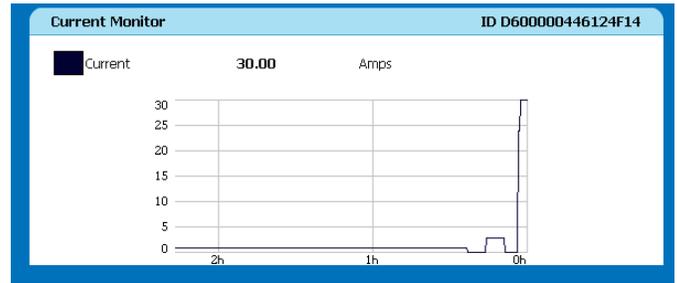
Once you've connected the CCAT-CUR to the monitoring unit, a new sensor block will appear, initially titled "Current Monitor." (This name can, of course, be changed from the *Display* page to something more specific to your installation.) If your CCAT does not initially display as "Current Monitor", 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.)

This screenshot shows the CT30-60-120 plus CCAT-CUR combination in operation, with a moderate current flow of 3.48A. Note that if you have connected the CCAT-CUR, but have not yet wired up the CT30-60-120 to it, the reading shown may drift randomly; this is normal for a floating input on a voltage-measurement circuit such as the CCAT's A/D converter chip, and nothing to worry about.

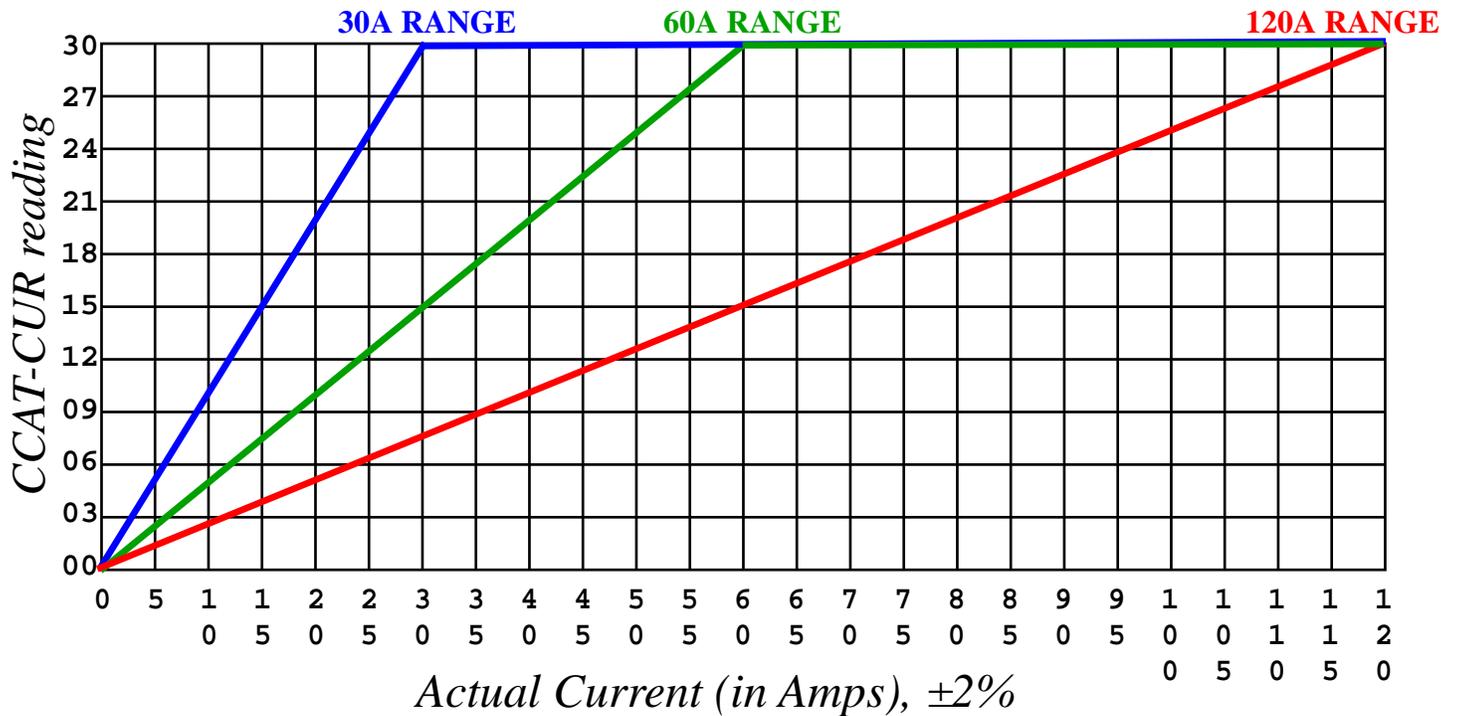


However, it should be noted that at very low currents ($< 1A$), the readings may be less accurate, and the measurements probably will not fall all the way to 0. This, too, is characteristic of the A/D converter used in the CCAT, as the comparatively small voltage output from the current transformer under these conditions (80mV or less) can be below the measurement chip's threshold of accuracy. This is generally not a problem in most common applications, but it is something to keep in mind.

Here, the current transformer has reached its maximum – which, on the CCAT-CUR, is displayed as 30A. However, *it is important to note that the CCAT-CUR has no way of knowing what the range switch is set to on the current transformer, and so will always display the 0-5V output as 0-30A!* We emphasize this because it is very important to keep it in mind when interpreting the readings – and, most importantly, when setting alarm thresholds. (More on this in the next section.)



We actually saw this switch setting-dependent change in the reading scales in the previous section as well, where the CT30-60-120 was directly connected to the Analog Input terminals; however, it bears repeating and emphasizing here because, since the CCAT-CUR displays a scaled reading in Amps, rather than a generic 0~99 value, the readings can be deceptive if the CT30-60-120 happens to be set to the 60A or 120A range settings and the operator of the monitoring unit is unaware of this behavior.



Here, too, you may need to apply a conversion factor to the displayed reading to get the “true” value. However, in this case, the conversion factor is much simpler:

• for the 30A range setting: “true” current = displayed value

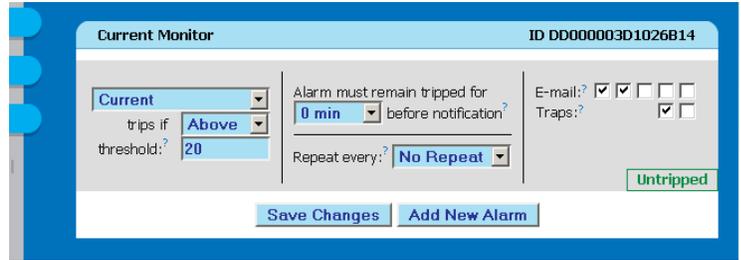
• for the 60A range setting: “true” current = displayed value X 2

• for the 120A range setting: “true” current = displayed value X 4

Y Alarm-threshold settings when connected via a CCAT-CUR:

If you are using a Series-II unit:

When you go to the *Alarms* page, you'll find that a new parameter block has been added there as well, also titled "Current Monitor." To set an alarm threshold to notify you when the CT30-60-120 detects a current draw higher or lower than your desired limits, simply scroll down to this new parameter block, click the *Add New Alarm* button, set *trips if:* to **Below** and the threshold to the desired current limit; then, select the alarm actions you wish this threshold to trigger, along with a trigger delay or alarm-repeat interval if desired, and click *Save Changes*.

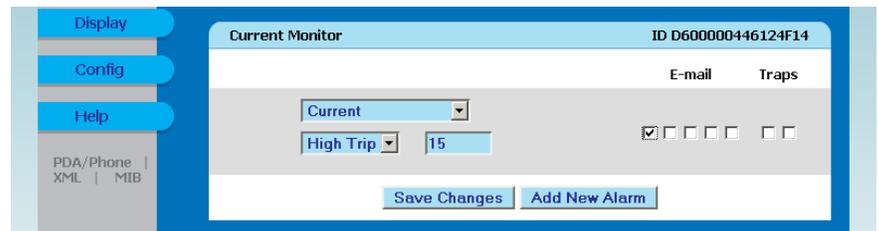


In the example shown here, the CT30-60-120's range switch is set to the 30A range, so we are setting an alarm threshold of "20", so the associated alarm notifications will trip if the current draw exceeds 20A. (You could, of course, just as easily set an alarm to occur if current drops below a specified threshold, simply by setting the alarm type to **Low Trip** instead of **High Trip**.)

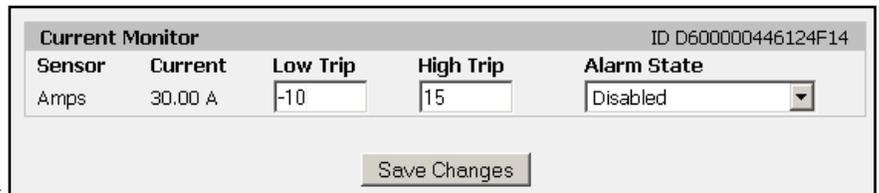
If, instead, we were using the CT30-60-120 with its range switch set to the 60A or 120A range, we would need to adjust our thresholds accordingly. Since the "true" current reading on the higher ranges is equal to the displayed value multiplied by x2 or x4 (for the 60A and 120A range, respectively), it follows that the alarm threshold would need to be the desired trip current divided by ÷2 or ÷4, respectively. For example, if the transformer was clamped around a 120A main-power feed with the range switch set to the 120A range, and we wished to be notified if the current exceeded 60A on that feed, then the threshold setting would be 60A÷4, or 15. It is important to note that the WeatherGoose is not able to know what the range switch is set to, so you as the user must make sure to know the setting of the range switch and calculate your desired thresholds accordingly.

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, the alarm settings are calculated in the same fashion as above, but setting the actual thresholds is done a bit differently. Find the sensor block on the *Alarms* page for the newly-connected CCAT-CUR, set the *Low Trip*



Trip and *High Trip* thresholds to the desired current limits, as shown here, then set the *Alarm State* to the action you wish to take place when the trip threshold(s) are exceeded and click *Save Changes*. If you do not want a Low Trip alarm, set the *Low Trip* threshold to -10 to disable it (since current can't be less than 0); if, conversely, you do not want a High Trip alarm, set the *High Trip* threshold to 110 to disable it (since the CCAT-CUR reading cannot go above 30).