

COZIR™ Auto-Calibration

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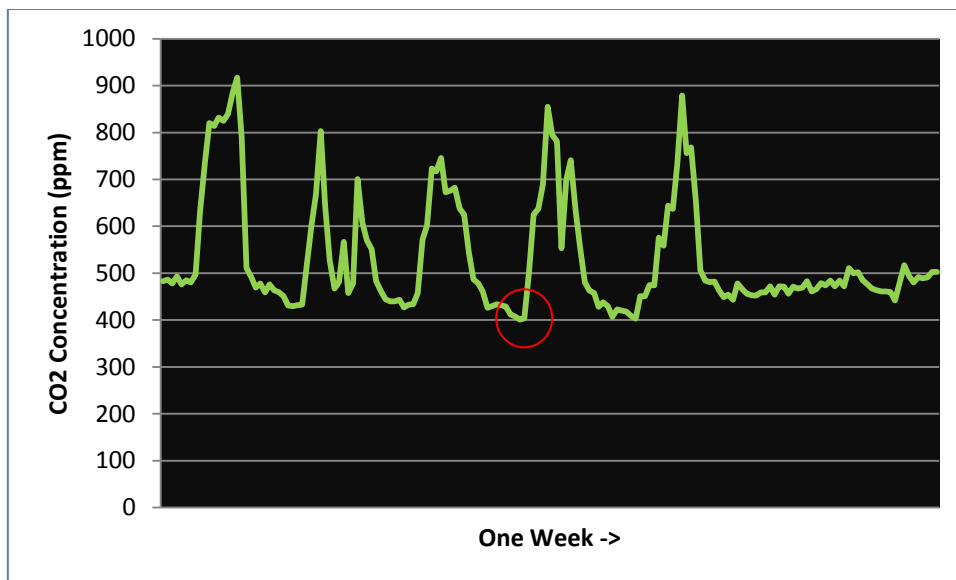
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Principle of Operation

COZIR sensors are fully calibrated prior to shipping from the factory. Over time, the zero point of the sensor needs to be calibrated to maintain the long term stability of the sensor.

In many applications, this can happen automatically using the built in auto-calibration function.

This technique can be used in situations in which sensors will be exposed to typical background levels (400-450ppm) at least once during the auto-calibration period. For example, many buildings will drop quickly to background CO₂ levels when unoccupied overnight or at weekends. The auto-calibration function uses the information gathered at these periods to recalibrate.



This recording from a sensor shows a typical one week recording in an office environment. The auto-calibration function uses the low point (circled) and uses it to recalibrate the zero point.

Environmental Requirements for Auto-calibration

Exposure to Fresh Air

The sensor must 'see' fresh air at least once during the auto-calibration period. You do not need to know when the fresh air will be sensed, just that it will be sensed at some point during the period.

Continuously Powered

The auto-calibration information is deleted when the sensor is switched off. This ensures that each installation is unaffected by a previous history of the sensor. For auto-calibration to function, it must be power on for the whole of the auto-calibration period.

Using the Auto-calibration Utility

The simplest way to set up a sensor for auto-calibration is to use the *Auto-calibration Utility* programme, available from GSS (See *Using the Auto-calibration Utility*).

The next sections show how to set up the auto-calibration without using this utility.

Setting the Auto Calibration Parameters

Three parameters are required to enable the auto-calibration routine:

Auto-calibration period

This determines how often the auto-calibration takes place.

Background Concentration

Typically 400-450ppm. This is the level the sensor will use as background.

Initial Auto-calibration Period

It is possible for the first auto-calibration to take place more quickly than the regular auto-calibration event. This can be useful to stabilize quickly after installation.

Before setting the auto-calibration parameters, please note the following:

- Before altering the auto-calibration parameters, switch the sensor into command mode:
send

`K 0 <CR><LF>`

This stops the measurement process in the sensor.

- All commands must be terminated with `\r\n` (carriage return, line feed). NB HyperTerminal does not add the line feed character as standard. The ASCII Setup must be configured to append line feeds.
- For details on the commands used, please consult the "*COZIR Software Interface Guide*"
- For an example of a typical setting, see *Auto-calibration Example*.

Background Concentration

The background concentration depends somewhat on the area the sensor is installed. Typically, a figure between 400ppm and 450ppm is used. To set this, send

P 8 x |r|n

P 9 y|r|n

where x and y depend on the concentration you want to set.

Concentration	x	y
380	1	124
400	1	144
425	1	169
450	1	194

This is stored as a two byte value, the high byte being in location 8 and the low byte in location 9. The value represents the concentration.

To calculate other values,

$x = \text{int}(\text{concentration}/256)$

$y = \text{the remainder after dividing concentration}/256$

Auto-calibration Interval

To set the auto-calibration interval, send

P 5 x|r|n

P 6 y|r|n

where x and y depend on the auto-calibration interval you want to set.

Interval	x	y
1 week	47	64
2 weeks	94	128
3 weeks	141	192

This is stored as a two byte value, the high byte being in location 5 and the low byte in location 6. The value represents the number of counts between auto-calibration events, where each count lasts 50 seconds.

To calculate other values,

$a = \text{auto-calibration period (in days)} * 1728$

$x = \text{int}(a / 256)$

$y = \text{the remainder after dividing } a/256$

Initial Auto-calibration period

To set the initial auto-calibration period

P 3 x\r\n

P 4 y\r\n

If the first auto-calibration event is to occur at the regular auto-calibration period, set both x and y to 0.

Otherwise, x and y must be calculated using the desired initial auto-calibration time and the regular auto-calibration period.

If the first auto-calibration event is to occur at the regular auto-calibration period, set both x and y to 0.

Otherwise calculate as follows:

a= auto-calibration period (in days)

b= initial auto-calibration period (in hours)

$c = (a*24-b)*72$

$x = \text{int}(c/256)$

y= the remainder after dividing c/256

The Initial auto-cal period works by preloading the auto-cal period count. So the value stored is the auto-calibration period *minus* the initial auto-cal period. Both are measured in auto-cal counts, where a count is 50s.

To disable, set the initial auto-cal period to 0.

This is stored as a two byte value. the high byte being in location 5 and the low byte in location 6. The value represents the number of counts between auto-calibration events, where each count lasts 50 seconds.

Auto-Calibration Examples

This give two example of typical auto-calibration settings.

Example 1

To set auto-calibration to take place every week, with the first auto-calibration event taking place 36 hours after power-up. The background level is assumed to be 450ppm:

K 0
P 7 0
P 3 37
P 4 32
P 5 47
P 6 64
P 8 1
P 9 194
P 7 1

Then switch the sensor off for 30s and on again

Example 2

To set auto-calibration to take place every 3 weeks, with no initial auto-calibration. The background is assumed to be 420ppm:

K 0
P 7 0
P 3 0
P 4 0
P 5 141
P 6 191
P 8 1
P 9 164
P 7 1

Then switch the sensor off for 30s and on again.