Smart Ventilation System User Manual

Thank you for your purchase of our demand driven, decentralised ventilation system.

Description of the System

The system is based on an Air Quality Monitor that reads CO2, temperature and relative humidity in indoor air. It does this using NDIR (Non Dispersive Infra Red) technology and as such is a true C02 sensor, and a separate sensor to measure temperature and relative humidity.
Readings are used to set the operation of wireless-interconnected extractor fans via an algorithm, with a goal of keeping CO2 and Relative Humidity within optimal limits.
The wireless technology is very robust, and has a communication range of up to 200 meters, more than sufficient for an average home. The wireless technology is also hard programmed, making it very secure.
The Target Values are:

- CO2 under 1500 parts per million (fan boost begins at values above 800ppm)
- Relative Humidity under 80% (fan boost begins at values above 50% RH)

Preparation before installation

A few considerations need to be made before installation of the system. First off, it is highly recommended that the **dwelling is made as air tight as possible**, through inexpensive DIY level efforts. This is to not just improve the dwelling's energy efficiency, but also to improve the predictability of air movement within the building enclosure, as the system is ductless and relies on predicted airway paths. The goal is to achieve minimal air infiltration, and instead controlled ventilation.

The number of fans/controllers and their locations need to be decided. Bathrooms/shower rooms/toilets are easy, one controller and fan per bathroom. The kitchen will additionally need a fan connected to a "Remote". The total number of fans required per average dwelling (up to 140m2) is 2, although there is no harm in having more as the system is smart and adjusts to the actual ventilation needs of the home.

The location of the monitor: for a two story house, this should ideally be on the ground floor. The monitor MUST be situated in the path of predicted air flow, and as far as reasonable from openings such as windows and doors, and from combustion sources. The "Remote" can be more flexibly located, but should be positioned to assist the desired air flow path. The fans can produce noise, and should ideally NOT be located in bedrooms when avoidable.

All "habitable rooms" must have passive air intakes, either window frame trickle vents, or dedicated wall vents. These air vents serve as the designed air entry points, and exist purely to promote cross ventilation, rather than provide background ventilation (like they otherwise would in homes with natural ventilation). As such the total area of the passive vents is not important, but the location of these vents is. Passive vents should be located as far as possible from internal doors, to encourage ventilation of the whole room. Additionally, all internal doors must have a 1 cm undercut to allow

air to travel through to the rest of the house.. This is a basic ventilation rule of PAS2035 (UK energy efficiency retrofitting standard).

Situate passive air intakes whenever possible as far away from sources of pollution (boiler flues, road traffic, extractor fan locations). So whenever possible, place the passive intakes on the garden side of the house, and extraction on the road traffic side. Extractor fans should be positioned with consideration of their ability to produce noise at high extract rates.

Passive air vents should have a filter/screen system to prevent, at a minimum, insects from entering. The air vents should also be protected from rain ingress, and too much wind. Adjustable vents are preferable to fixed vents, to allow for controlled ventilation rather than infiltration. Passive air vents should be as far away as possible from internal doors, to promote cross ventilation.

The air flow path. The goal is to have fresh air traveling through all parts of the dwelling, mixing, and making its way past the monitor. This is a critical part of the ductless system. Before installation, a visualization of the air flow path is necessary.
Please see the ***Suggested Layouts*** floor plans.

Installation

The extractor fans are 120mm. A 100mm penetration through the wall will need to be provided for every fan. The ideal is to use existing ducting/air bricks in the dwelling, but this will not always be practicable. Proper through-wall ducting and the use of external shrouds is recommended (but not automatic louvre style vents as these are too restrictive at lower fan speeds). As an extra precaution against rain, a slight outward slope on the ducting is suggested. The system runs on 12 volts and plugs directly into domestic sockets. No electrical work should be required.

In bathrooms, the 12 volt adapter has to be plugged into a socket OUTSIDE of the bathroom, to comply with building regulations.

Each system is supplied as a bespoke hard coded set, for both robustness and security reasons. Therefore the monitor will only communicate with its hard coded receiver(s). The system is plug and play and no extra user intervention is required.

Reading stored environmental data

The Monitor will automatically save the first 45 days of CO2 (can save up to a whole year), humidity and temperature data on the (optionally)supplied micro SD card in the form of a CSV file(comma separated value), taking recordings at 1 minute intervals. A CSV file can be read by spreadsheet applications such as Excel or Libreoffice calc, and converted to graphical form for easy viewing. A CSV file can also be quickly added to databases.
You will need a micro SD card reader to retrieve the data (most phones and laptops should have built-in micro SD card readers).
The procedure to retrieve the micro SD card from the monitor is as follows:

unplug the monitor, remove the 2 side arm screws
turn the monitor around and separate the front and back cases,
the micro SD card will be located on the right side
carefully remove the micro SD card, taking a note of orientation
read the micro SD card and copy the CSVs
if another 45 days of readings are desired, delete all files off the micro SD card
return the micro SD card to its slot

plug the monitor back in

Wireless communication will resume automatically with the receivers, and no extra intervention should be required.

Calibrating the Monitor

The CO2 sensor built into the monitor is considered precise scientific equipment and requires regular calibration, ideally at least once per year. Calibration is advised to be carried out during the warmer months, as the procedure requires the opening of windows.
The procedure for calibration is as follows:

METHOD 1:

1. Open all windows and doors as wide as possible.
2. Allow the monitor to run for at least 20 minutes with all windows and doors open.
3. Gently blow from a distance of about six inches, at the vent holes on the right side of the monitor, for a duration of about 10 seconds. This should induce a CO2 reading above 2500ppm , and trigger a calibration message.
4. If not, blow again until the reading goes above 2500ppm.
5. Wait 20 minutes, and avoid exposing the monitor to CO2 during this period.
6. After 20 minutes, the CO2 reading should be 400ppm +- 50.
7. You may now close all windows and doors.

METHOD 2:

1. Follow steps 1 and 2 as in METHOD 1.
2. Insert the calibration tool into the hole on the bottom left side of the rear of the monitor.
3. Press and hold the calibration tool, depressing the calibration button for 10 seconds. Be careful not to breathe towards the monitor.
4. The CO2 reading should be 400ppm +-50 after a few minutes.

Monitor Startup Messages

The Monitor will display a few messages when first plugged in. Ignore the first few CO2 readings, as the Monitor takes a few minutes to stabilize.

ABC OFF : Automatic Background Calibration is switched off. Manual calibration will need to be done at least once annually.

SD Enabled: The SD card has been detected and is ready to be written to. Note that this does not necessarily mean that recordings will be taken. The SD card needs to have no existing readings on it for logging to begin.

SD OFF: No SD card/ unsuitable SD card detected.

The Remote

The Remote requires no configuration and is completely plug and play. It is also the best location to observe readings as being in its presence will not raise CO2 values.

When first switched on, it will display the following default values: CO2 500ppm, 18.1 Celsius, 40.1% RH. Any other values than these will confirm that communication has started with the Monitor.

The Bathroom Fan Controller

The Bathroom Fan Controller is not entirely plug and play. The controller has motion and light sensors to trigger boost. It is necessary that the light sensor is sufficiently illuminated by the bathroom light or it will not be triggered. The motion sensor might also require it's range to be adjusted, and positioned, so that it has people within view but does not falsely trigger.

When first plugging in the Bathroom Fan, it is important to leave the bathroom empty of people or animals for the immediate first two minutes. This is to allow the sensor to "learn the room".

Test the bathroom fan by walking into bathroom and switching the lights on. When successfully triggered, the fan should run at maximum and become audible.

Testing connectivity with The Monitor. Lights off and boost LED on = communication good. Any CO2 value above 800ppm will trigger boost. If the Monitor is reading below 800ppm, you can blow for 1-2 seconds at a distance of 10 inches towards the gold sensor on the right of the Monitor, this will induce a CO2 reading above 800ppm within 20 seconds, and in turn trigger boost in the Bathroom Fan Controller (boost LED will switch on).

Maintenance

The System itself is maintenance free apart from the need to clean filters/screens ideally once a year. The CO2 sensor should ideally also be calibrated at least annually . The fans (Arctic P12 Max) will eventually fail. The manufacturer's Mean Time Till Failure is 500,000 hours or 57 years, so each fan should be conservatively good for upwards of 6 years. The fans can easily (and very cheaply) be swapped out and all other components re-used. This is not only environmentally friendly, but also a considerable cost saving over replacing for instance an entire bathroom extractor fan (continuous running fans from other vendors are £105 on average, requiring replacement every 8-10 years). The System is designed to be modular, with the ability to easily replace or repair any failed components.

Special Safety Feature

All fans are set to shut off automatically if a fire is suspected. This is a unique feature not present on any other commercial ventilation system.

Warranty

Extractor Fans: 6 years (Arctic standard warranty)
Monitor, Remote and Bathroom Fan Controller: 1 year

The System is fairly modular. LowCarbonLiving will replace parts if they fail, charging only for the replacement parts, shipping, and a nominal labour fee, for as long as this remains practicable.

Please Also Read

Suggested Layouts
Installation Instructions
Air Tightness Checklist