SCENTROID
Future of Sensory Technology

IDES CANADA INC.

CTair Smart Monitor
Compact Air Quality Monitor and Analyzer

Operation and Maintenance Manual

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IMPORTANT

At IDES Canada Inc., we make every effort to ensure that our documentation accurately describes the operation and maintenance of our products. However, IDES Canada Inc. cannot guarantee the accuracy of printed material or accept responsibility for errors or omissions.

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1　Introduction

1.1　Welcome

Thank you for purchasing the Scentroid compact air quality monitor CTair!

CTair observes urban air quality with up to 13 sensor varieties, including pressure, temperature, relative humidity and GPS. Our sensor detection ranges from dust (PM1, 2.5, and 10), noise, radiation, and many other chemical compounds.
CTair units work in tandem to predict and collect data for an accurate air quality assessment in a large urban landscape. A grid of CTair units creates a unique mesh network. All units communicate together through hubs and operate through an encrypted LoRa mesh network.

1.2   General Specifications

Table 1: CTair General Specifications

Feature	Specifications
Size	19 x 29 x 14 cm CTair unit, 37 x 34 cm for solar panel mounted on top (optional)
Weight	4.5 kg with solar panel
Cabinet	NEMA 4X
Design Rating	Ip65
Maximum # of Sensors	Up to 13 sensors
Type of Sensors	EC, NDIR, PID, Laser Particulate Counter, Temperature and Relative Humidity, barometric pressure, and GPS
Power Requirement	110-240v 50/60 Hz 2A OR attachable solar panel unit
Battery Only Runtime	36 hours
Communication	Long range RF (LoRa), Cellular 3G / 4G and WiFi (optional)
Sampling Rate	Approximately 1/m
On-Board Data Storage	64 GB SD Card
Temperature Range	-40° C to 40^oC
Operating R.Humidity	$10 - 90\%$
Mounting	Configurable for wall or pole mount

1.3   Device Layout
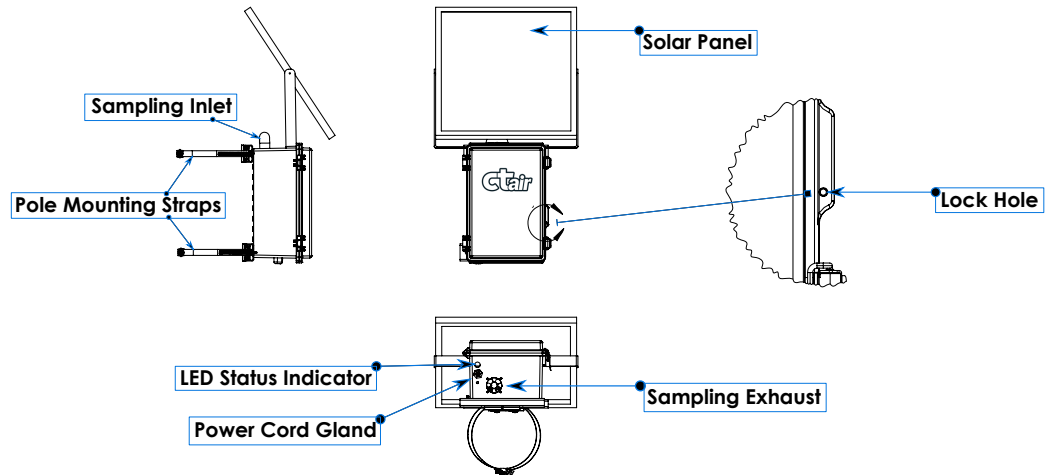
Figure 1: Device Layout

2   Installation and Operation

2.1   Modem Configuration

The CTair sends data through 3G network to a cloud-based software (SIMS2). Therefore, it is necessary to load your CTair with a SIM card with data allowance from a local cellular data provider.

To Insert the SIM card into the CTair modem, hold down SIM pop-up button will pop up the card holder, then load the SIM card.

Connect the 3G antenna by rotating the metal interface clockwise until the movable part can not be rotated, fix the black glue stick of the antenna at the top of the unit's cabinet.

Figure 2: CTair Modem Overview

To configure the modem please follow the instructions below

- Connect the LAN2 port on the modem to a PC via an Ethernet cable.

- Input the device default address 192.168.2.1 in the browser, you will be prompted to the device web page management. Enter the User/Password as adm/123456.
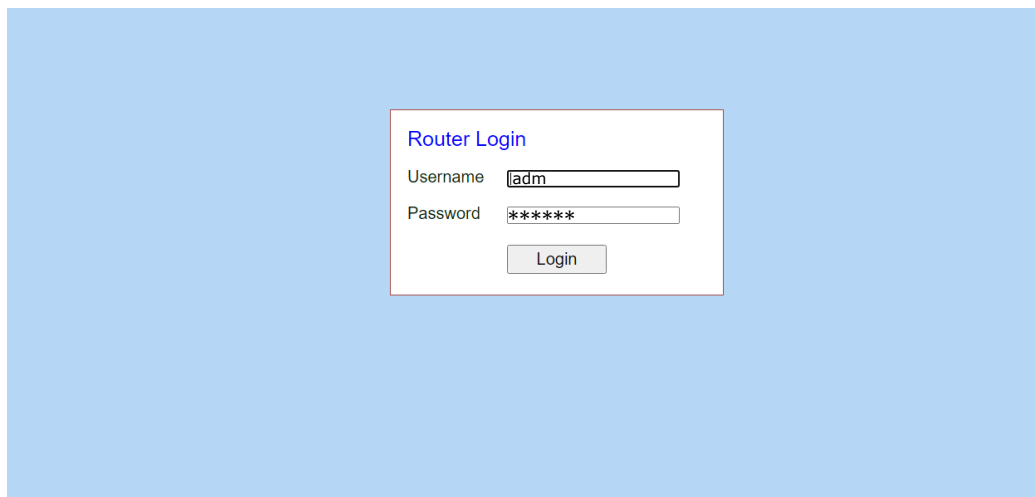
Figure 3: Login WEB Page Management

- Click on the navigation bar "**Network >>Cellular**", under "**Profiles**" tap input your local SIM card provider's APN. Contact your SIM card provider for the APN.
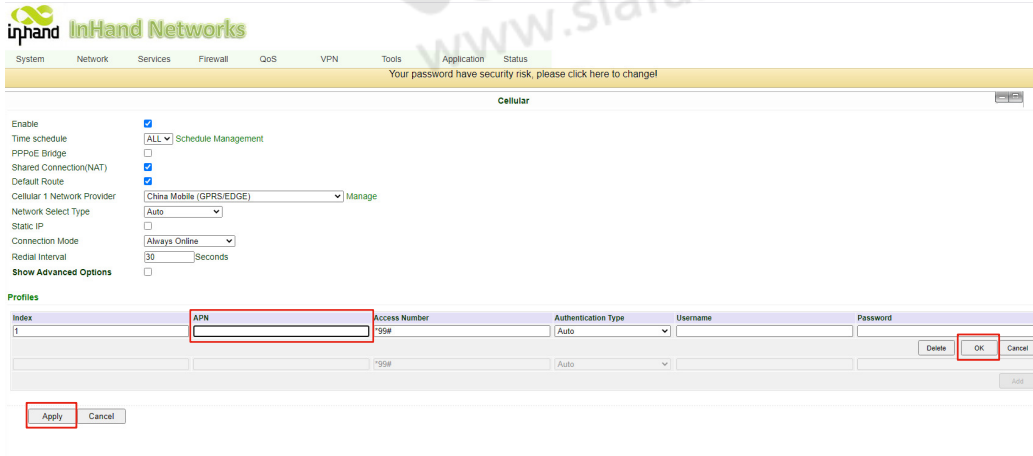
Figure 4: SIM Card Dial-up

- After tapping "**Ok** and **Apply**", click on the navigation bar "**Status >> Network connection**" to view the network status, showing the connected and assigned IP address and other status, indicating that the SIM card has successfully accessed the Internet.
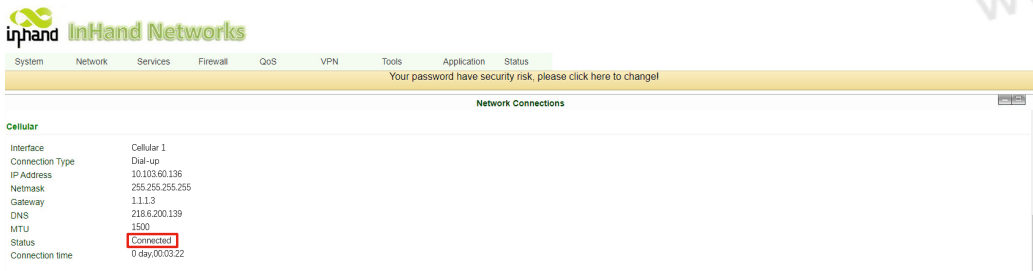
Figure 5: Dial-up Connection Status

2.2 Mounting Instructions

Due to the lightweight design of the CTair unit, it can easily be installed and mounted to a utility pole or wall.
By default, the CTair has four mounting feet which are used to fasten the unit to a wall or post. Use an anchor bolt or masonry screw bolt when mounting to a concrete or brick wall.
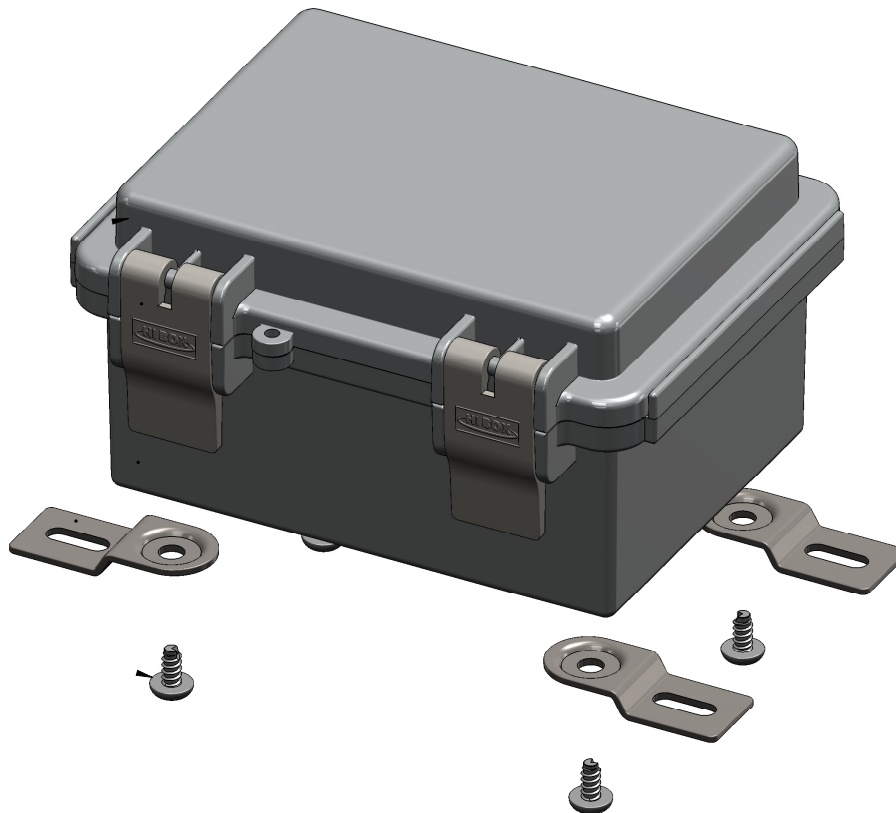
Figure 6: CTair Mounting Feet

The CTair might come with a pole mounting kit as per customer request. The Adjustable stainless steel bands allow for mounting on pole diameters 2" to 12". The CTair will have two strut channels fixed at the back of the unit enclosure. Use the provided assembly hardware to have the mounting kit installed at the back of the unit through the strut channels. The following figure illustrates the assembly steps for the mounting kit
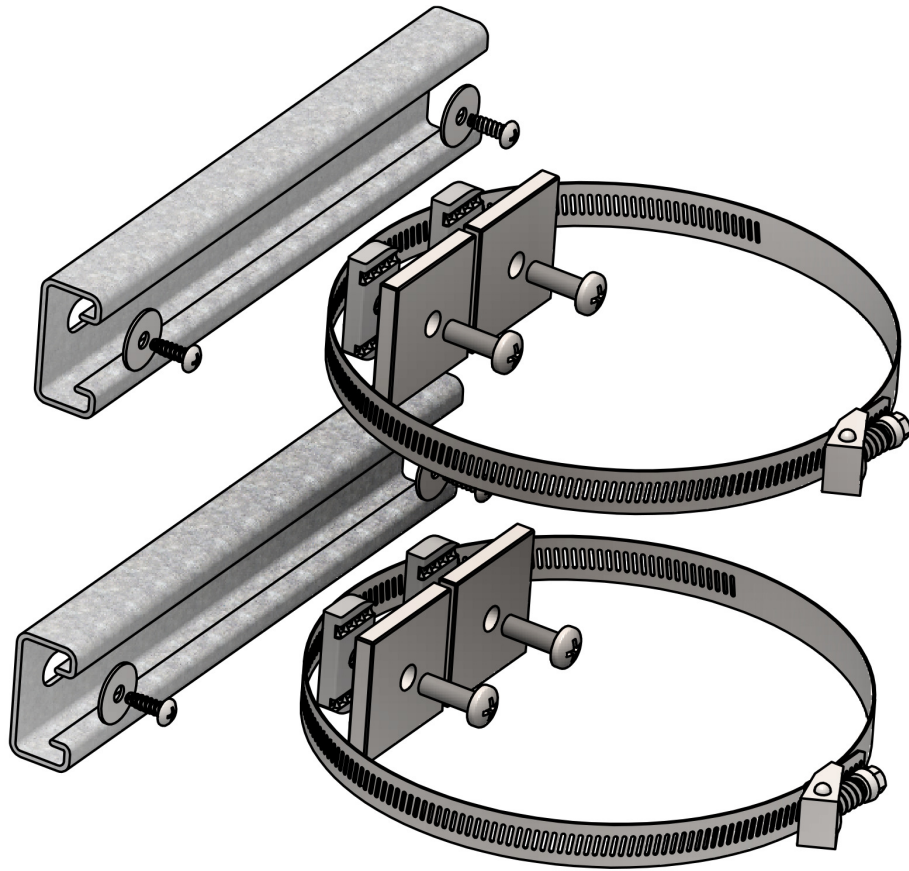
Figure 7: Pole Mount Kit

2.3   Locking Capabilities

The CTair enclosure has a place for a small lock to prevent unauthorized access to the internal components. Small padlock, steel cable lock, etc., can be installed on the hole securing the lid to the chassis.
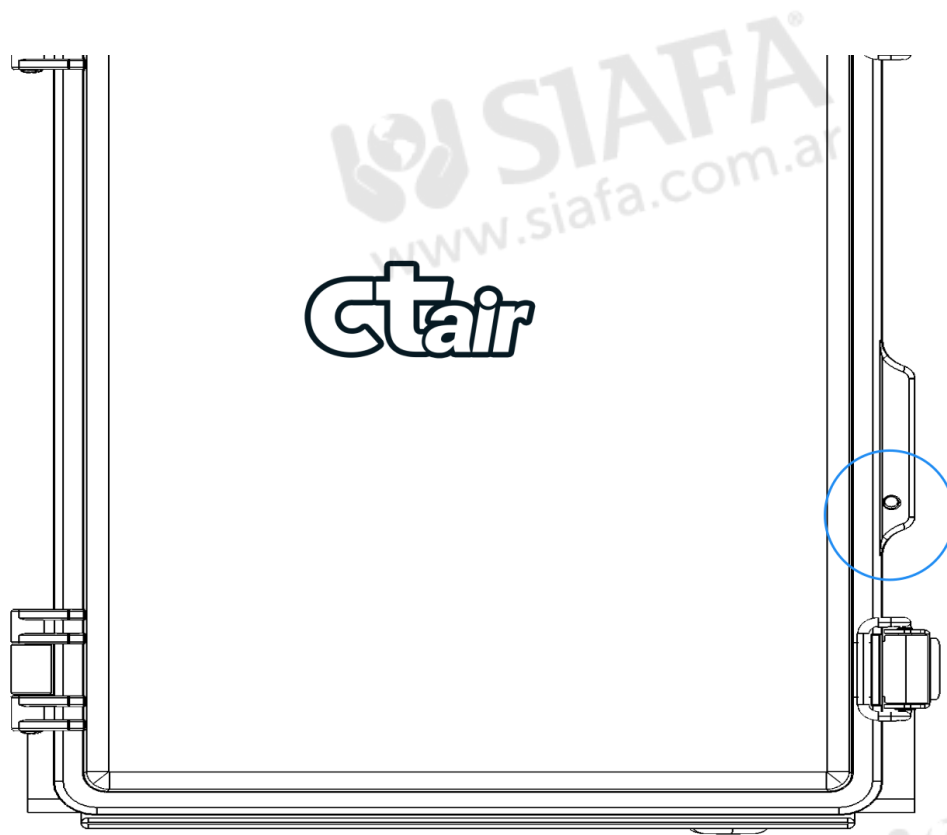
Figure 8: CTair Locking Capabilities

2.4   Power Options

The CTair is rated for 3KV isolation voltage an there are two main ways to power this unit: solar power and wired power. A hybrid model for the CTair is availablr as well to ensure a reliable power supply without interruption.

- **Solar Power and Battery:** Unit is packaged with lithium-ion batteries built inside. Panel must be installed and angled accordingly.
  Ensuring that solar panels face the correct direction and have an appropriate tilt will help to obtain maximum power generation.
  The general rule for solar panel placement in the northern hemisphere is solar panels should face true south (and in the southern, true north).
  — Please consult our support team at support@scentroid.com for installation instructions and orientation determination.

- **AC Power Entry:** Input wire is a cable gland clamping wire with a diameter range from 1.5 to 6 mm (different ranges available). Entry wire is AC line with input voltage of 110-240VAC, 50/60Hz and ground

wire. The cable is rated for outdoor use, and the cable gland is IP68 rated

3 Data Server and Communication

3.1 Cloud-Based Server SIMS2

The CTair features a central monitoring station (SIMS2) hosted on a secure cloud-based server, which allows remote access via any internet-based device. CTair records all measurement readings in the onboard SD card and send all gathered data to cloud server via a 3G internet connection.
The monitoring system provides real-time readings of all sensory data as well as the ability to review data for a specified time period.
SIMS2 also provides easy analysis tools for an operator to view historical data, set air quality alarms, run diagnostics, and configure various settings for the CTair.

3.1.1 Logging into SIMS

The SIMS cloud server is accessed at (http://sims2.scentroid.com/). It is also mobile friendly and can be accessed with a laptop, mobile phone, or tablet. The system will ask you for a user name and password. The log-in user name is your email and your password can be found in the document provided by Scentroid with your purchase of CTair unit.
Once the username and password have been validated by the system you will have full access to the live monitoring management software.

3.1.2 Reviewing the Sensory Data and Real Time monitoring

Once logged in, you can select your CTair unit from the main panel. This will take you to the Monitoring Home Page, where it displays the readings of all monitoring stations installed in the system. This includes their instantaneous readings, 1 hour average, 8 hours average, 12 hours average, and 24 hours average. Additionally, You are able to view charts of real time sensory data. The main panel shows the current meteorological data and location of the CTair on the map.
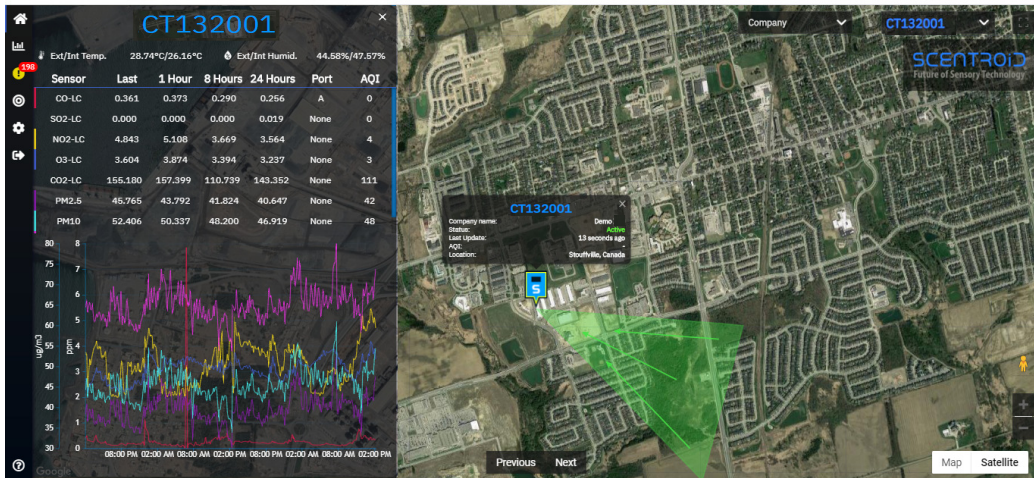
Figure 9: Monitoring Home Page

3.1.3 Viewing and Exporting Historical Data

From the panel on the far left, the analysis page 📊 lets you easily review and analyze historical data collected by the analyzers. You can select a date and time range for an assessment of your device's recordings, and export the results.
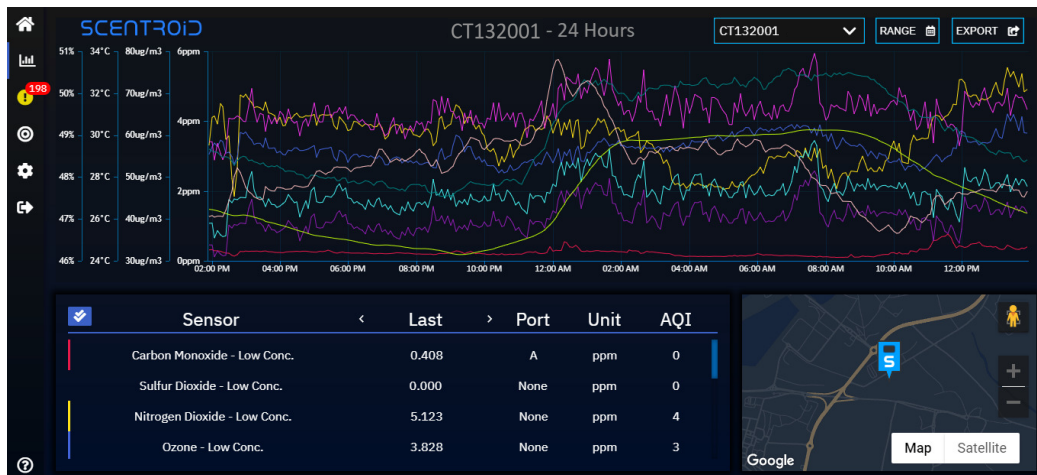
Figure 10: Analysis Page

3.1.4 Alert Settings

To set up an alarm for each sensor, select the settings ⚙ option from the left panel then click the **Alert** tap. This allows the user to set a ppm value in which they will be alerted via email and\or SMS if the measurement sample

were to exceed the designated alarm threshold.

The next figure shows an alarm being set to notify the user when the Ammonia (NH_3) level exceeds 1000 ppm 5 times out of 8 consecutive readings. The alarm notification will be sent to the user every 30 minutes.

The alert contacts can be managed through **Contacts** option at the bottom of the page.
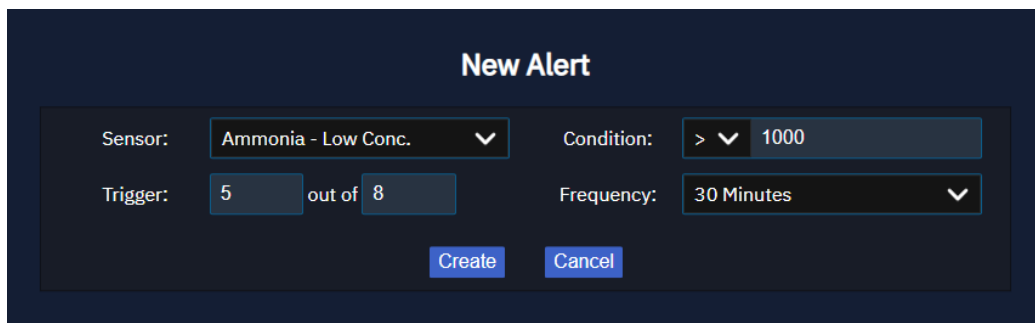
Figure 11: Setting an Alert

3.1.5 SIMS2 Radar Mode

SIMS2 intelligent radar mode conducts and automatically analyzes collected data to display where each pollutant traveled from. By overlaying this information on a map, the user can easily identify the source of all pollutants detected. Additional information such as a wind rose is also presented for further analysis.
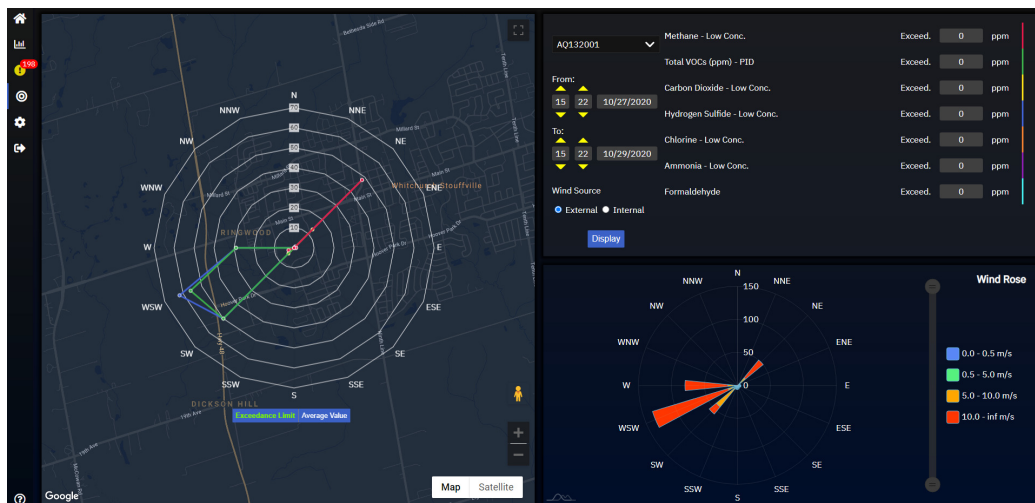
Figure 12: SIMS2 Radar Mode

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3.2 Mesh Networking System

If you happen to purchase multiple Ctair units, they can be deployed as a network mesh. This allows you to monitor an entire perimeter or a facility as a singular, coherent unit. Each individual CTair form a mesh based connection with one another through a LoRa network.

By utilizing a LoRa-Mesh network, you eliminate costs associated with having each unit communicate with our cloud server independently. Each analyzer network will only require 1 or 2 gateways, and the gateway will communicate directly with our cloud service, SIMS2.

As mesh networking encourages multi node hopping, if any node were to be disabled or if a communication path were to be broken, the CTair units will automatically communicate with one another in order to find a different pathway to a gateway.
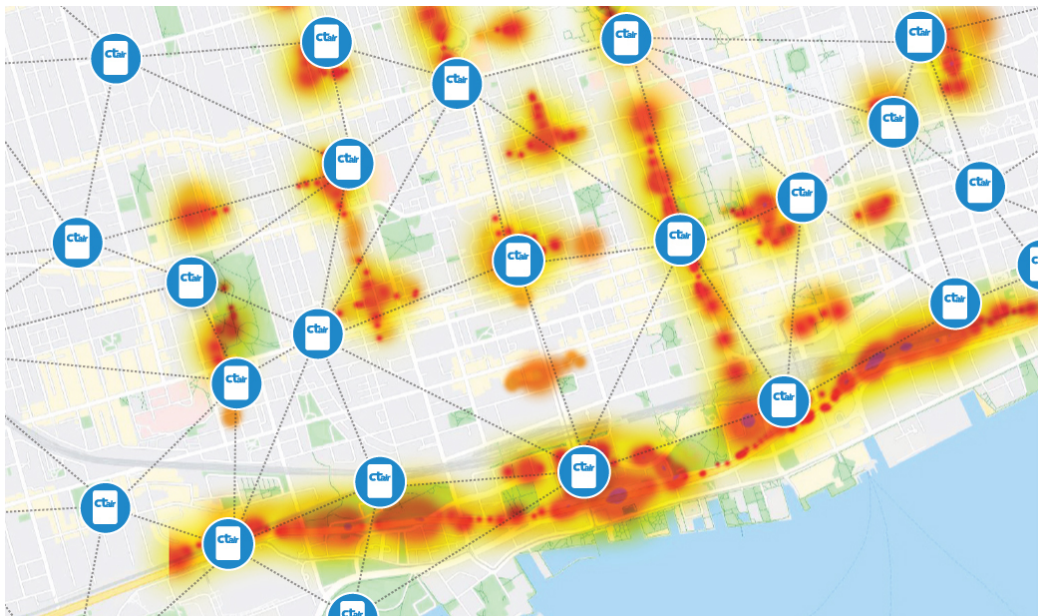
Figure 13: CTair Mesh Networking System

4 Maintenance and Calibration

4.1 Sensors Replacement

The CTair features factory calibrated and interchangeable sensors. Typically, sensor needs to be replaced when it has reached its life span and has lost more than half of its output signal. The lifetime of a sensor depends heavily on the application. Mainly the exposition to certain gases and their concentrations have strong impacts. Also the variations in ambient conditions of temperature and relative humidity have significant impacts on sensor response to the pollutant concentrations.

The performance of a sensor should be verified with regular tests or calibrations. If a sensor has lost more than half of its initial output signal, it is recommended to replace it.

To replace a sensor, lift up the PCB after turning the two holing clips at the corners. The sensors are set underneath the PCB. Remove the old sensor and install the new one in its particular location on the sensor board.

After that, the sensor setting on the microSD card has to be adjusted. Remove the card out of its holder on the PCB and access the unit's configuration file by placing the microSD card (with adapter if necessary) into a computer. Contact our support team at support@scentroid.com for more details on the required adjustment to the configuration file.
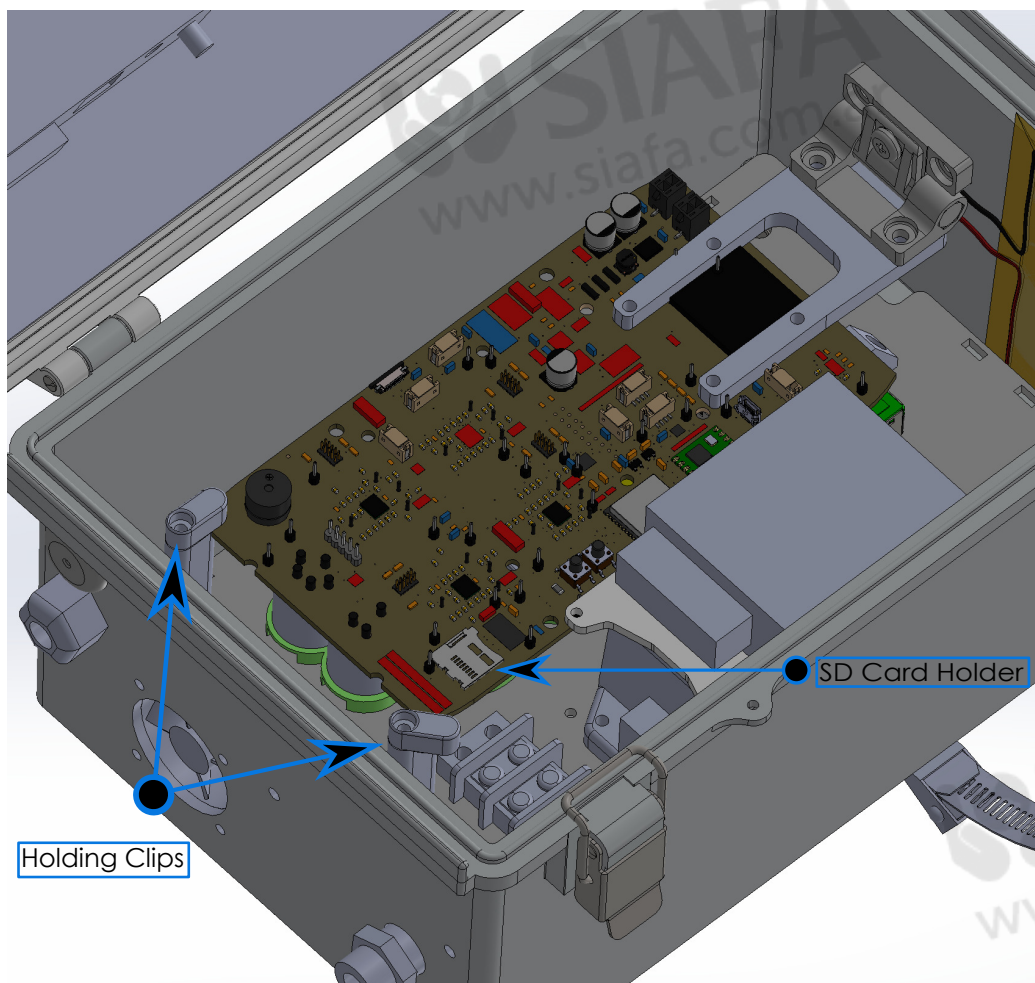
Figure 14: Sensors Replacement

4.2 CTair Calibration Methods

* It is highly recommended to recalibrate sensors every 6-12 months

Method 1: Co-location using a USEPA approved reference station

- Step 1: CTairs are brought to the location of a fixed reference station which measures the same parameters. The station must output data at least once every 5 min

- Step 2: Collect data for 24 hours or more

- Step 3: Upload data from the reference station (in CSV format) to SIMS calibration module. SIMS powerful AI algorithm will conduct

a full calibration of all sensors and provide you with accuracy and confidence of the new calibration parameter.

- Step 4: Reinstall CTair back at location

Figure 15: Co-location using a reference station

Method 2: Co-location using a mobile reference station

- Step 1: Install a Scentroid Scentinal (SL50) high accuracy near-reference analyzer next to the CTair

- Step 2: Wait for 24 hours

- Step 3: In SIMS Calibration module select the CTair being calibrated along with the time of calibration and the SL50 used for calibration. The AI algorithm will automatically extract data from the SL50 as the reference station and calibrate the CTair.

Method 3: Using calibration gas and GD600 (If a reference station is not available)

- Step 1: Install the inlet connector to the CTair being calibrated and connect it to the dilution system (GD600) automated calibration module.

- Step 2: Connect calibration gas to the GD600.

- Step 3: Program the GD600 to output 3 concentrations of the gas along with zero air.

- Step 4: In SIMS calibration module select the calibration time/date range and provide the gas concentrations used. The parameters are automatically created, and the instruments are updated by SIMS.

Appendix A: LED Indicator Routine

Each LED color indicates a different status. It is necessary to recognize them correctly in order to understand the state your CTair is currently in.

Table 2: LED Indicator Routine

#	Status	Color
A	Startup	Transition from Red to Green to Blue
B	In Setup	Yellow
C	Needs WiFi setup (connect to AP)	Dark Red- Maroonish
D	Saving Data (every minute)	Green Flash
E	Low Battery (every 5s)	Red Flash
F	Normal Operation (every 5s)	Blue Flash

Appendix B: Sensor Warm-up and Response Time

#	Type	Formula	Chemical	Maximum Detection Limit	Lowest Detection Threshold	Resolution (ppm)	Expected Life (year)	Warm up Time (Sec)	Response Time (Sec)
1	NDIR	CO_2	Carbon Dioxide-HC	5%	100 ppm	20	1	120	120
2	NDIR	CO_2	Carbon Dioxide-LC	2000 ppm	1 ppm	0.6 ppm	2	12	120
3	EC	CO	Carbon Monoxide-LC	100 ppm	0.03 ppm	0.01 ppm	2	40	40
4	EC	CO	Carbon Monoxide-MC	1000 ppm	1 ppm	1 ppm	5	40	20
5	EC	CO	Carbon Monoxide-HC	10000 ppm	30 ppm	3 ppm	2	45	40
6	EC	Cl_2	Chlorine-HC	2000 ppm	1 ppm	1 ppm	2	45	40
7	EC	Cl_2	Chlorine-LC	10 ppm	0.05 ppm	0.01 ppm	2	120	60
8	EC	H_2	Hydrogen	10000 ppm	100 ppm	10 ppm	2	120	40
9	EC	HCl	Hydrogen Chlorine	20 ppm	0.5 ppm	0.2 ppm	2	120	60
10	EC	HCN	Hydrogen Cyanide	50 ppm	0.1 ppm	0.1 ppm	2	120	30
11	EC	PH_3	Phosphine-LC	5 ppm	50 ppb	30 ppb	2	60	20
12	EC	PH_3	Phosphine-HC	2000 ppm	5 ppm	2 ppm	2	60	25
13	EC	H_2S	Hydrogen Sulfide (LC/ppb)	3 ppm	7 ppb	1 ppb	2	180	35
14	EC	H_2S	Hydrogen Sulfide (HC/ppm)	2000 ppm	15 ppm	2 ppm	2	180	25
15	EC	H_2S	Hydrogen Sulfide (MC/ppm)	200 ppm	2 ppm	0.2 ppm	2	180	60
16	MOS	C_2H_6O, H_2, C_4H_{10}	Organic solvents (Ethanol, Isobutane, H_2)	500 ppm	25 ppm	1 ppm	1	30	10
17	NDIR	CH_4	Methane (LEL)	20,000 ppm	10 ppm	10 ppm	> 3 years	45	12
18	EC	NO	Nitric Oxide-LC	1 ppm	0.01 ppm	0.001 ppm	2	120	60
19	EC	NO	Nitric Oxide-MC	25 ppm	0.2 ppm	0.1 ppm	2	120	60
20	EC	NO	Nitric Oxide-HC	5000 ppm	2 ppm	2 ppm	3	120	10
21	EC	NO_2	Nitrogen Dioxide-LC	1 ppm	0.01 ppm	0.001 ppm	> 5 Years	120	60
22	EC	NO_2	Nitrogen Dioxide-MC	20 ppm	0.1 ppm	0.1 ppm	> 5 Years	120	60
23	EC	NO_2	Nitrogen Dioxide-HC	1000 ppm	2 ppm	1 ppm	2	120	60
24	NDIR	$N2O$	Nitrous Oxide	10,000 ppm	100 ppm	1 ppm	5	30	30
25	EC	O_2	Oxygen-HC	250,000 ppm	5000 ppm	200 ppm	1	60	15
26	PID	$VOCs$	Total VOCS PID 10.0eV	100 ppm	5 ppb	5 ppb%	5	5	3
27	PID	$VOCs$	Total VOCS-LC PID 10.7eV	50 ppm (iso-butylene)	1 ppb	1 ppb	5	5	3
28	PID	$VOCs$	Total VOCS-HC PID 10.7eV	300 ppm (iso-butylene)	1 ppb	50 ppb	5	5	3
29	EC	SO_2	Sulfar Dioxide-HC	2000 ppm	2 ppm	1 ppm	2	120	25

#	Type	Formula	Chemical	Maximum Detection Limit	Lowest Detection Threshold	Resolution (ppm)	Expected Life (year)	Warm up Time (Sec)	Response Time (Sec)
30	EC	SO_2	Sulfar Dioxide-LC	1 ppm	0.01 ppm	0.001 ppm	2	120	20
31	EC	SO_2	Sulfar Dioxide-MC	100 ppm	0.4 ppm	0.2 ppm	2	120	20
32	EC	CH_2O	Formaldehyde	5 ppm	10 ppb	10 ppb	2	180	60
33	Laser Scattered	PM	Particulate PM 2.5, 10 (simultanous)	1000 $\mu g/m^3$	1 $\mu g/m^3$	1 $\mu g/m^3$	> 5 Years	NA	NA
34	Laser Scattered	TSP	TSP-PM Required	20,000 $\mu g/m^3$	1 $\mu g/m^3$	1 $\mu g/m^3$	> 5 Years	NA	NA
35	EC	NMHC	Non-methane Hydrocarbon	25 ppm	0.1 ppm	0.1 ppm	2	180	55
36	MOS	TRS	TRS and Amines	10 ppm	10 ppb	2 ppb	1	30	10
37	MOS	$NH_3-C_2H_6O-C_7H_8$	Air Contaminants (Ammonia, Ethanol, Toulene)	30 ppm	1 ppm	4 ppb	1	30	10
38	EC	NH_3	Ammonia-HC	100 ppm	3 ppm	1 ppm	2	30	40
39	EC	NH_3	Ammonia-LC	10 ppm	0.005 ppm	0.001 ppm	2	30	50
40	EC	O_3	Ozone-LC	0.5 ppm	1 ppb	1 ppb	>5 Years	60	30
41	EC	O_3	Ozone-HC	5 ppm	20 ppb	20 ppb	>5 Years	60	30
42	Geiger Counter	$\alpha-, \beta-, \Upsilon, X$	Radiation Monitor ($\alpha-, \beta-, \Upsilon-$and $X-$ radiation)	0.01 $\mu Sv/h$	0.01 $\mu Sv/h$	0.01 $\mu Sv/h$	>3 Years	0	0
43	EC	ClO_2	Chlorine Dioxide	50 ppm	0.01 ppm	0.05 ppm	2 Years	180	60
44	TDLS	CH4	Mathane-ppb	100 ppm	0.4 ppm	0.01 ppm	+10	20	1