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Critical Environment Solutions

User Manual *Document No. 1801-09*

CleanWatch+® and ParticleWatch® Airborne Particle Monitor

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User Manual

CleanWatch+® and ParticleWatch® Airborne Particle Monitor

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CAUTION — **Cautions are used when failure to observe instructions could result in significant damage to equipment.**

WARNING — **Warnings are used when failure to observe instructions or precautions could result in injury or death.**

The information presented here is subject to change without notice.

CAUTION — **Read the Installation chapter before applying power.**

1. Introduction

Your monitor continuously counts airborne particles and shows the results on a 5-inch color touchscreen. It measures two independent air samples at once, keeps roughly eight hours of history on screen, sounds an alarm when a count you choose is exceeded, and uploads readings to the CleanWatch+® web application over your Wi-Fi network (See section 7). Both CleanWatch+® and ParticleWatch® monitors report to the CleanWatch+® portal. Uploading requires a CleanWatch+® account – request one at https://cleanwatch.terrauniversal.com before first use.

No computer is needed to use the monitor. Everything in this manual is done on the touchscreen itself.

1.1 Two form factors

The same monitor is supplied in two enclosures. The screen, the controls, and all the operating instructions are identical; only mounting, airflow, and antenna position differ. The calibration procedure in chapter 8 applies to the CleanWatch+® only.

	CleanWatch+®	ParticleWatch®
Installation	Wall mounted	Set-top (free standing)
Mounting Provision	Two teardrop holes on the back	None required
Air Intake	Left and right sides	Back
Air Outlet	Bottom	Left and right sides
Wi-Fi Antenna	Top	Back

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1.2 What the monitor measures

Each of the two internal sensors counts particles in six size channels at the same time. Every channel is a cumulative count of particles at or above that size, reported in particles per liter of air (pcs/L).

Size Channel	Meaning	Color on Screen
0.3 µm	Particles 0.3 µm and larger	Blue
0.5 µm	Particles 0.5 µm and larger	Green
1.0 µm	Particles 1.0 µm and larger	Amber
2.5 µm	Particles 2.5 µm and larger	Red
5.0 µm	Particles 5.0 µm and larger	Purple
10.0 µm	Particles 10.0 µm and larger	Pink

New readings arrive every 2 seconds. This is the on-screen display rate – data sent to the CleanWatch+® web application is logged once a minute (section 7.2). The two sensors are named Sensor 1 and Sensor 2 when the monitor leaves the factory, and you can rename them to match your installation (section 3.2).

1.3 The screen at a glance

The bar across the top of the screen is always present. It shows status on the left, the date and time in the middle, and four controls on the right.

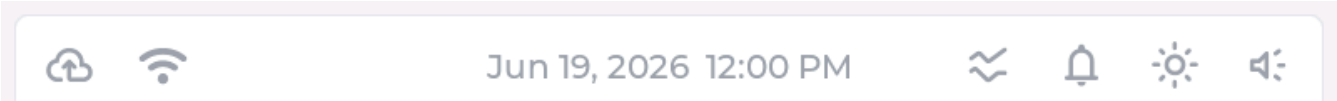


Figure 1. The status and control bar at the top of every screen.

The icons do three different jobs, so it is worth knowing which is which before you start touching them:

- The **cloud** icon on the far left reports whether readings are being uploaded. It is the one icon that does nothing when touched.
- The **Wi-Fi** icon next to it does both jobs: its color reports the network connection, and touching it opens the Wi-Fi screen.
- On the right, **graph settings** and **alarms** open a screen. Each of those screens has a back arrow in its top-left corner that returns you to the main display.
- Also on the right, **brightness** and **sound** change a setting on the spot – no screen opens, and the change takes effect immediately.

Appendix A lists every icon and what it does.

NOTE

About the beep: The monitor gives a short beep each time you touch a control. That beep confirms the touch registered. You can turn it off along with the alarm sound – see section 6.2

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2. Installation

NOTE

Before you start: Choose the location before mounting. The monitor needs unobstructed air at its intake and outlet, and Wi-Fi coverage at the mounting point. Both are easier to check with the unit loose than after it is on the wall.

2.1 Choosing a location

- Mount the unit where the air it samples represents the space you want to monitor.
- Keep the intake and outlet clear. Do not mount the unit so that its own exhaust is drawn straight back into its intake, and do not push it flush against a surface that covers either opening.
- Confirm Wi-Fi coverage at the chosen spot. The monitor needs the network to upload readings, though it will keep measuring and displaying without it.
- Keep the screen at a height where it can be read and touched comfortably.
- Use the monitor in normal indoor environments, cleanrooms, and HVAC applications. **Particle types to avoid**:
    - Oily or sticky aerosols (oil mist, cooking fumes, cigarette smoke)
    - Fire smoke or welding fumes
    - Conductive or corrosive particles (metal dust, salt mist, acid mist)
    - Large fibrous or abrasive particles (fibers, lint)
    - Condensing conditions (water droplets, steam)
    - Flammable or explosive environments (the monitor is not explosion-proof)

NOTE

The sensors measure up to 10,000,000 particles per liter. Above that, the reading shows the maximum and the monitor keeps working. Exposure at this level for several days or longer is not recommended because it can affect the performance and lifespan of the sensors.

2.2 Airflow clearances

Air is drawn in through the intake, passes the two particle sensors, and leaves through the outlet. Blocking either one changes the readings.

	Intake	Outlet	Minimum Clearance
CleanWatch+®	Left and right sides	Bottom of the enclosure	20 cm (7.875 in) clearance recommended for air inlet and air outlet.
ParticleWatch®	Back of the enclosure	Left and right sides	20 cm (7.875 in) clearance recommended for air inlet and air outlet.

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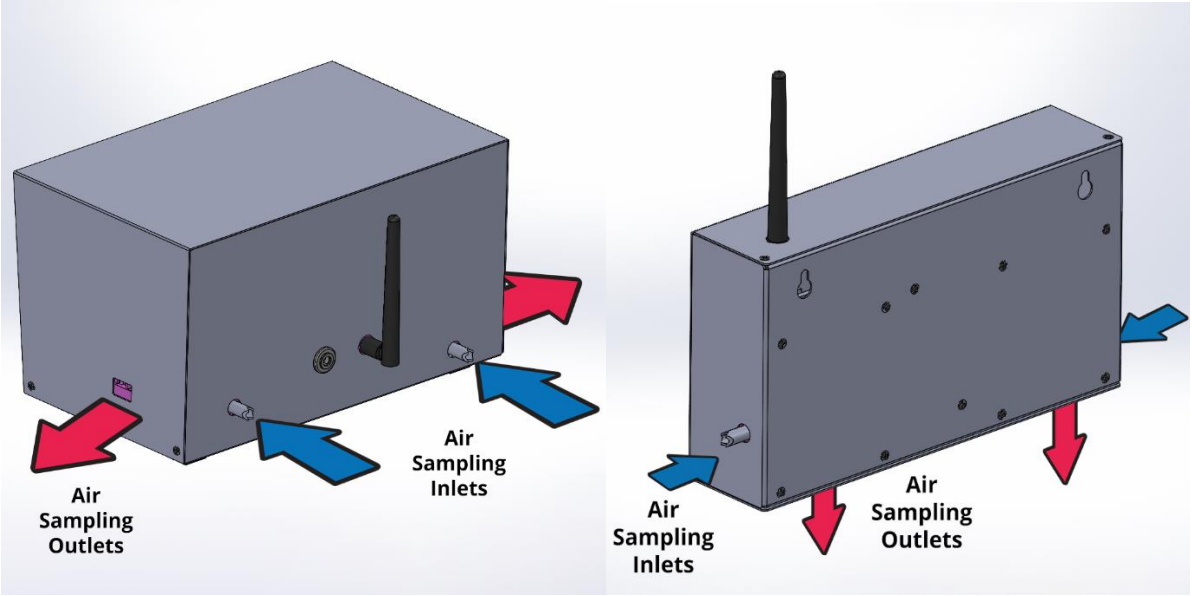


Figure 2. Airflow and clearances.

2.3 Mounting the CleanWatch+®

The CleanWatch+® enclosure hangs on the two teardrop holes on its back.

1. Hold the unit against the wall at the height you want and mark the two hole positions. Keep the unit level – the outlet is on the bottom face and needs to stay facing down.
2. Install two fasteners suited to the wall material.
3. Leave each fastener head standing proud of the wall so it can enter the wide part of the teardrop.
4. Hang the unit on both fasteners and let it settle down into the narrow part of each hole.
5. Check that the unit sits flat and that the side intakes are not blocked by anything alongside it.

The antenna is on the top of the CleanWatch+®. Leave clearance above the unit for it.

2.4 Placing the ParticleWatch®

The ParticleWatch® is a set-top unit and needs no mounting hardware. Stand it on a flat, stable surface.

- Leave the left and right sides clear – both are outlets.
- Leave the back clear – it carries both the air inlet and the Wi-Fi antenna.
- Do not stand the unit against a wall or in a recess that closes off the back.

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2.5 Sensor Tubing

Two 7.75 in polyurethane tubes are provided with both the CleanWatch+® and the ParticleWatch®. They may be used with the particle sensors to sample air from an adjacent room or area as a comparator reading, within the 7.75 in reach of the tube.

NOTE

Do not exceed the 7.75 in tube length. Longer tubing will affect readings and accuracy.

Route the tubing so it is not pinched or otherwise damaged. The same clearance required around each unit's intake (see section 2.2) also applies to the tubing once installed.

2.6 Power

The monitor is powered through a low-voltage barrel jack. Use only the supplied power supply:

- Route the cable so it cannot be walked on or pinched, and so it does not hang across the air intake.
- There is no on/off switch. The monitor runs whenever power is present, and starts measuring by itself at power-on.
- Your settings – sensor names, alarms, brightness, sound, which particle sizes are graphed, and the Wi-Fi network – are stored in the unit and survive a power loss.

2.7 First power-on

NOTE

Start up: Allow the monitor about 5 seconds to start up. The display turns on once the system has booted.

When the screen appears, the main display is already there but has no data yet. The readings show dashes, the graphs are empty, and a red "Connecting to sensors…" message sits in the top bar while the sensors warm up.

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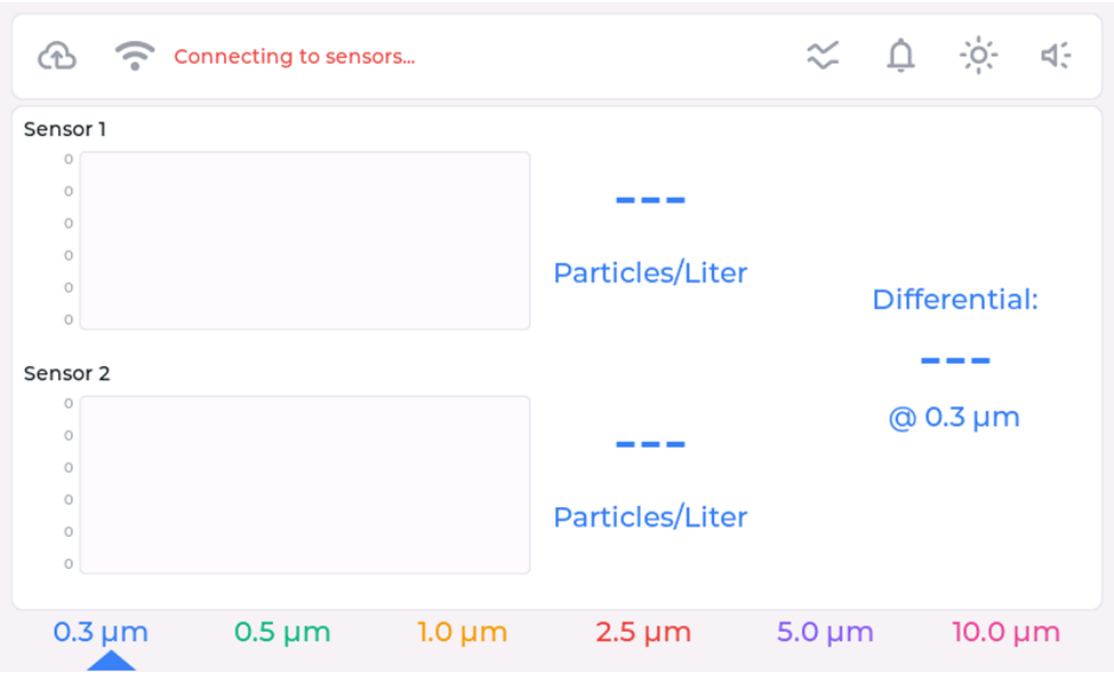


Figure 3. First power-on: no readings yet, and the "Connecting to sensors..." message in the top bar

The particle sensors need about 8 seconds of warm-up, after which readings appear and the message clears. The date and time stay blank until the monitor has joined a Wi-Fi network and set its clock from the internet, so on a brand-new unit the clock is empty until you finish the Wi-Fi setup in section 3.1.

Go on to chapter 3 to finish setting up.

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3. First-time Setup

Three tasks, in this order: join the Wi-Fi network, name the two sensors, and set the alarms. Each is done entirely on the touchscreen.

3.1 Connecting to the Wi-Fi

Wi-Fi lets the monitor upload readings to the CleanWatch+® web application and set its own clock. The monitor measures and alarms normally without it, but the clock stays blank and nothing is uploaded.

You need the network name and its password.

6. Touch the **Wi-Fi** icon in the top bar (second from the left). The Wi-Fi screen opens and immediately starts scanning.

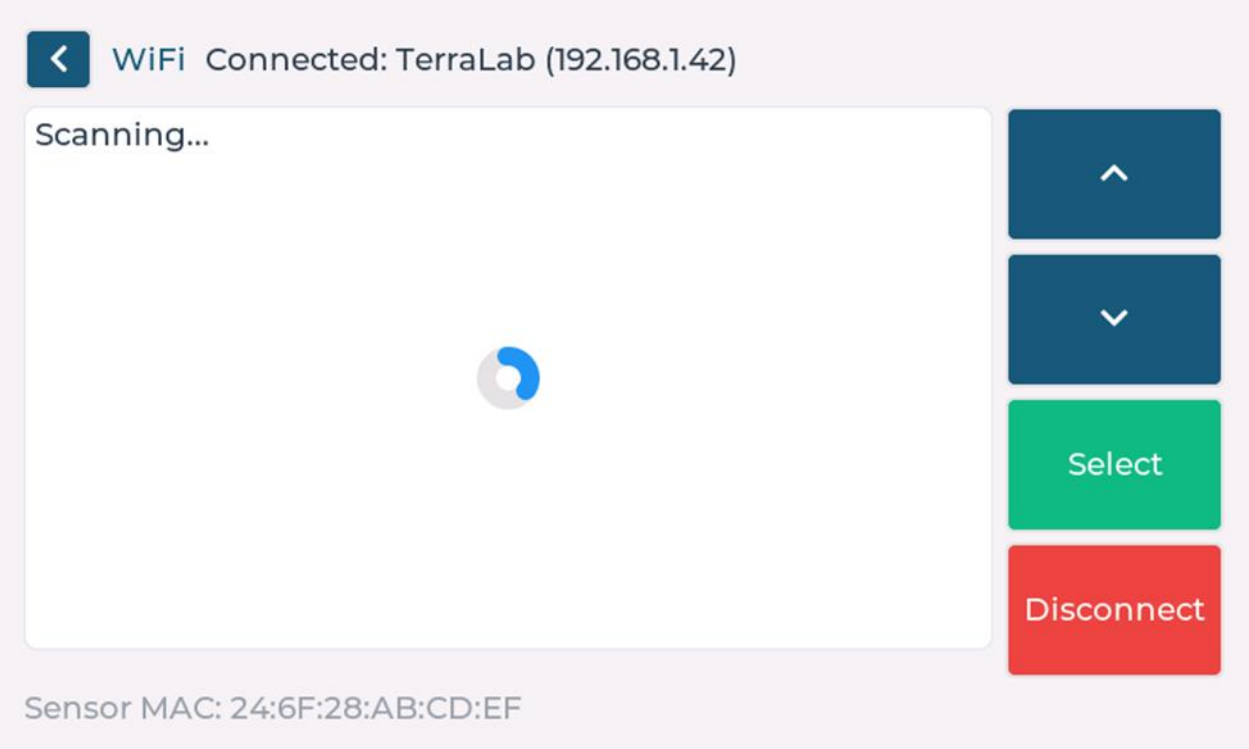


Figure 4. Scanning for networks. The spinner runs until a result arrives.

7. Wait for the list of networks. Each entry shows the network name and its signal strength – Strong, Good, Fair, or Weak. Prefer a Strong or Good network.
8. Use the **up** and **down** arrow buttons on the right to move the highlight onto your network.
9. Touch **Select**.
10. Type the password on the keyboard that appears, then touch **Connect**. Use the **1#** key for numbers and symbols and **ABC** to return to letters.

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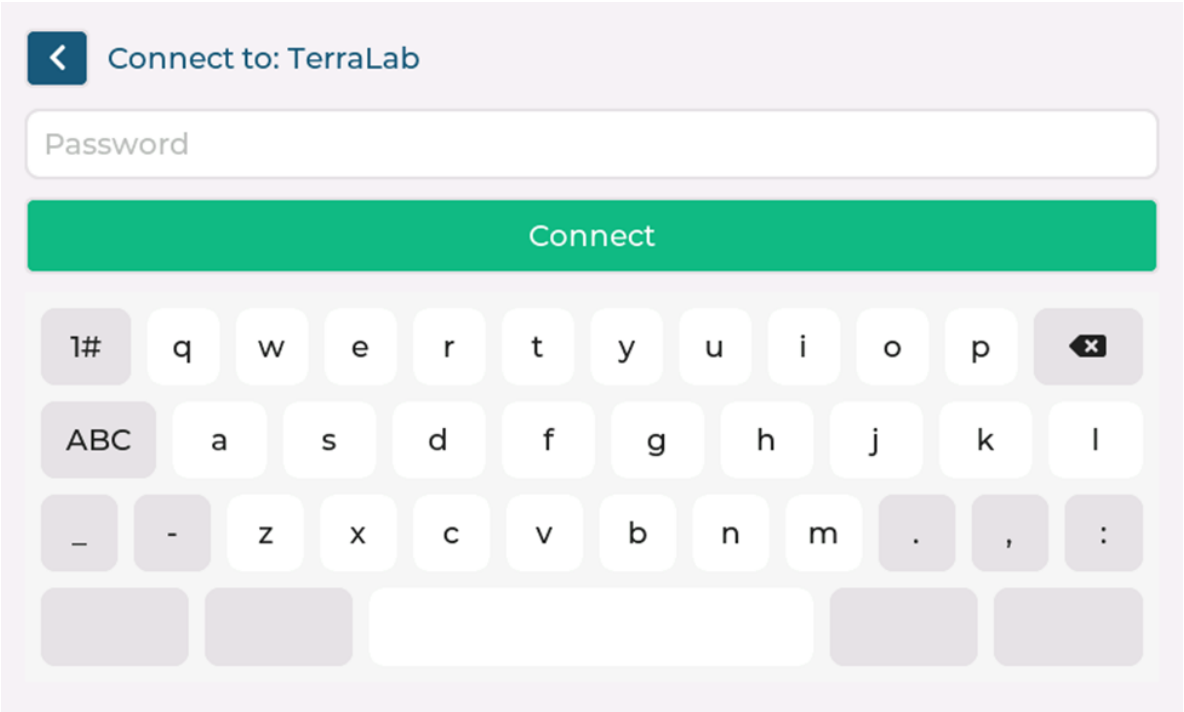


Figure 5. Password entry. The network you selected is named in the title.

11. Watch the title at the top of the Wi-Fi screen. On success it reads “Connected:” followed by the network name and the address the network gave the monitor.

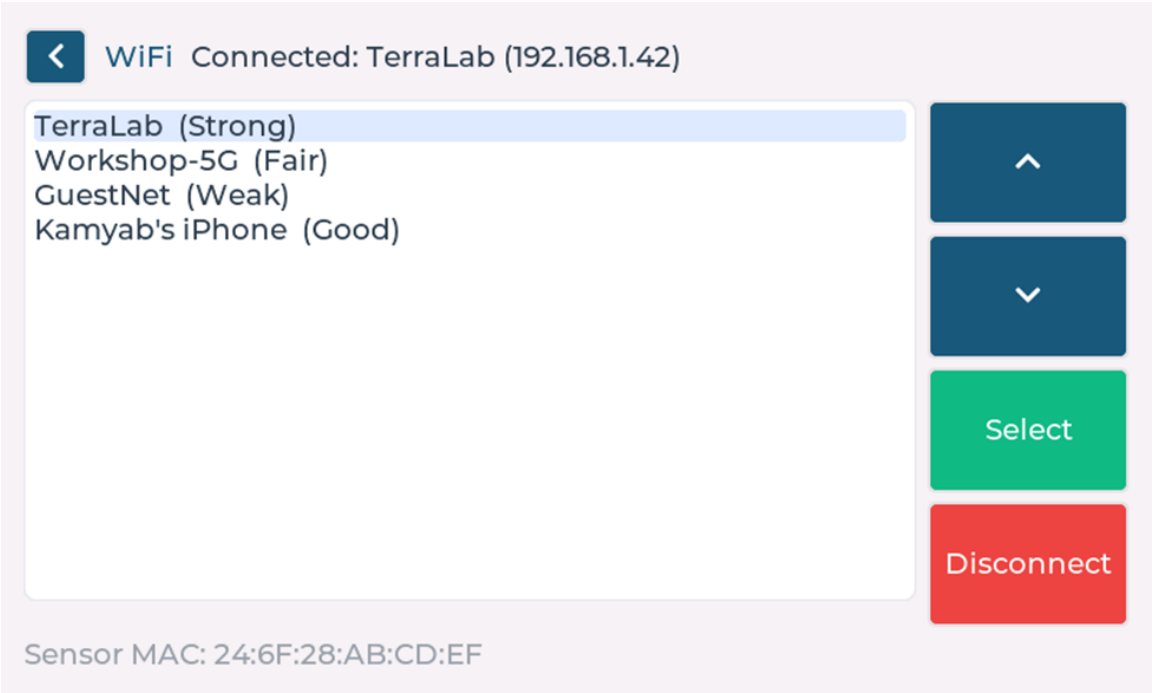


Figure 6. Connected. The Disconnect button turns red once there is a connection to drop.

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12. Touch the back arrow to return to the main display. The Wi-Fi icon in the top bar is now green, and the date and time appear within a minute or so.

> NOTE
>
> **If it does not connect:** The title shows **Couldn't connect** if the password was wrong or the network refused the connection. Touch **Select** and try again – the password is not saved unless the connection succeeds. See chapter 9 for the other cases.

Changing or removing the network
Return to the Wi-Fi screen at any time to join a different network. The red Disconnect button drops the current network and forgets it; it is gray and inactive when the monitor is not connected to anything.

The bottom of the Wi-Fi screen shows the hardware address of the sensor unit inside the monitor. Have it ready if you contact support – it identifies your unit to the CleanWatch+® service. It reads "—" until the sensor unit has reported in, which takes a few seconds after power-on.

3.2 Naming the two sensors

The two sensors are called Sensor 1 and Sensor 2 from the factory. Giving them names that describe what they sample makes the display and the alarms much easier to read.

13. Touch the **graph settings** icon in the top bar (third from the right). The Graph Settings screen opens.

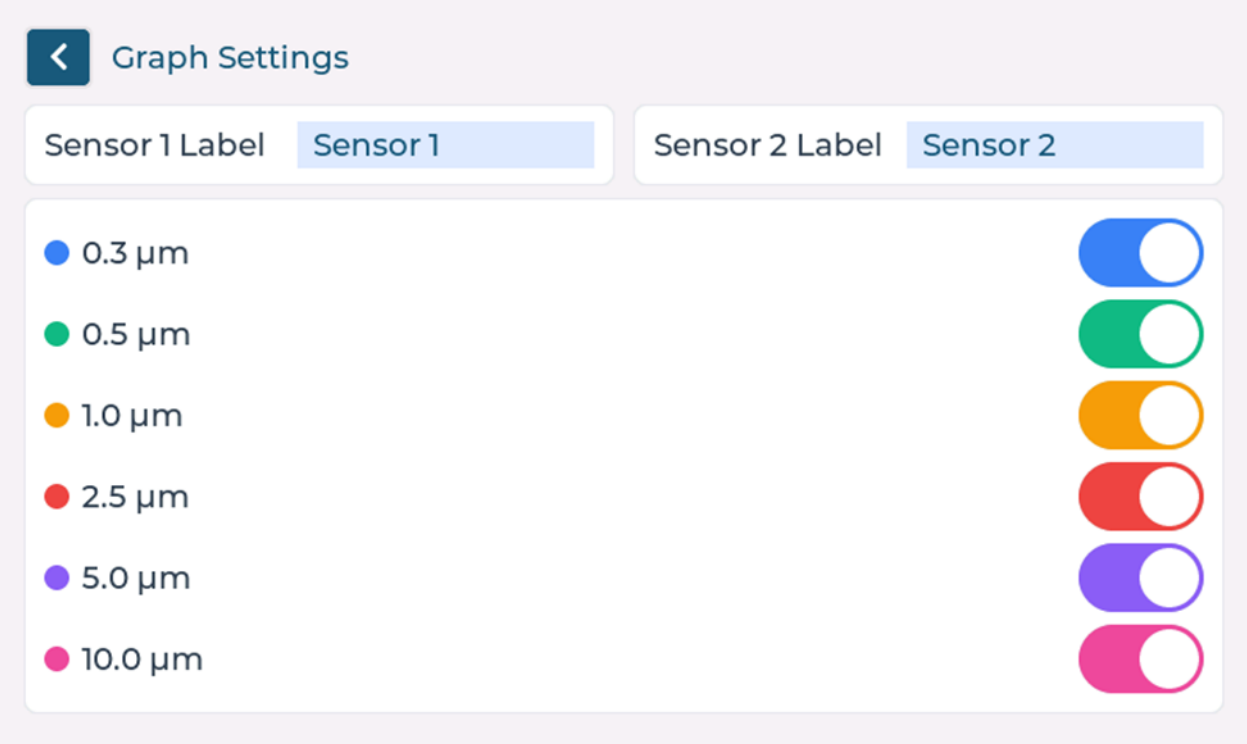


Figure 7. Graph Settings. The two name fields are along the top; the six switches control which sizes are graphed.

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14. Touch the name field for the sensor you want to rename.
15. Type the new name. Names can be up to 19 characters; the keyboard stops accepting input at that length.

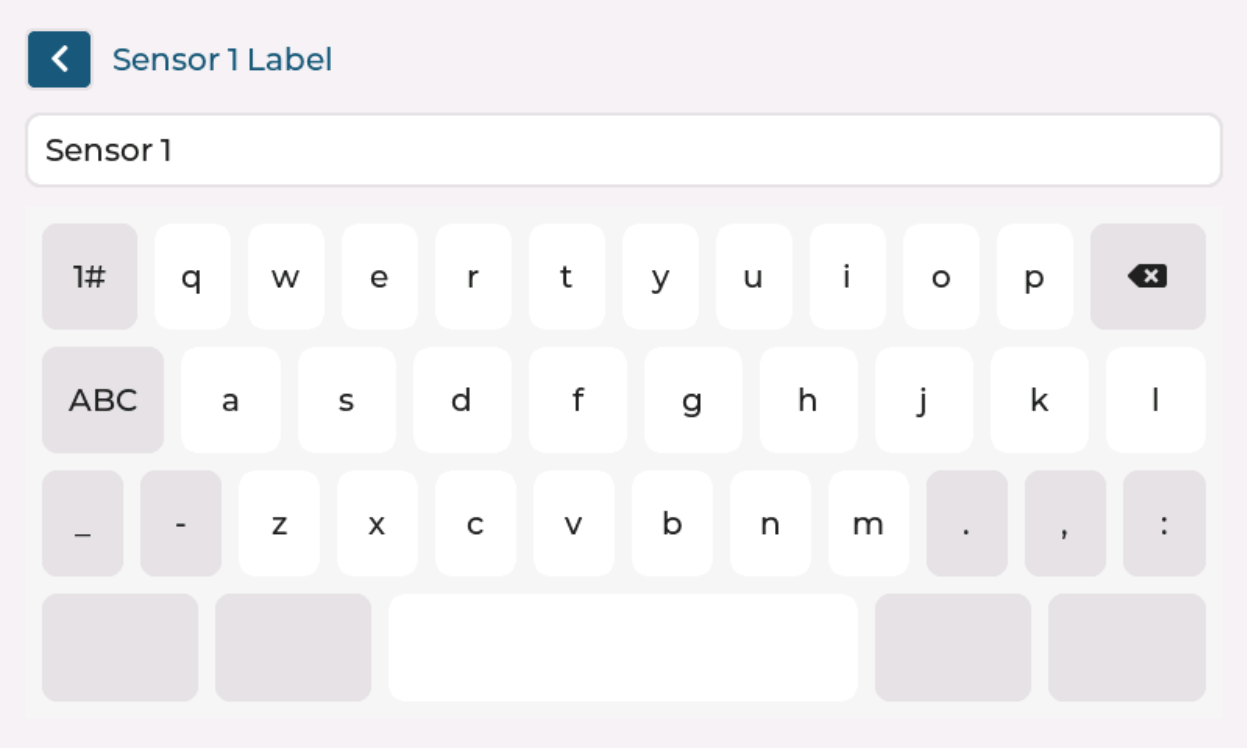


Figure 8. Renaming a sensor.

16. Touch the back arrow. **The name is saved when you go back** – there is no separate save button. You return to Graph Settings, where the field now shows the new name.
17. Touch the back arrow again to return to the main display.

The new names appear as the titles of the two cards, and on the Alarm Settings screen.

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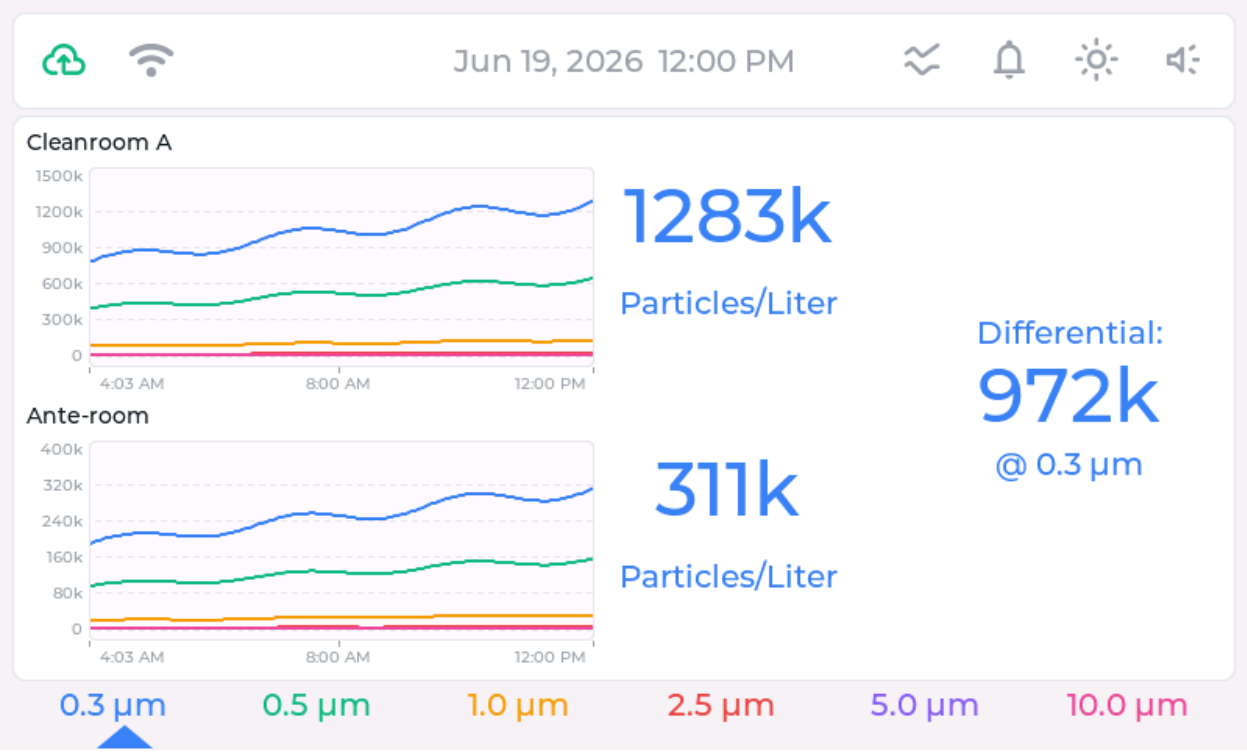


Figure 9. The main display after renaming the two sensors.

NOTE

If a name reverts: Clearing the field completely and going back restores the factory name for that sensor. To keep a name, leave at least one character in the field.

3.3 Setting the alarms

Each sensor has its own alarm, and the two are completely independent – different particle sizes and different limits. Chapter 5 covers alarms in full; the short version is:

18. Touch the **bell** icon in the top bar.
19. Turn on the switch for the sensor you want to watch.
20. Touch the colored size button to step to the particle size that alarm should watch.
21. Touch that sensor's threshold box, then type the limit in particles per liter on the keypad.
22. Repeat for the second sensor if you want it too.
23. Touch the back arrow. **Alarm settings are saved when you go back.**

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4. Reading the main display

The main display is the monitor's home screen. It shows both sensors, their recent history, and the difference between them.

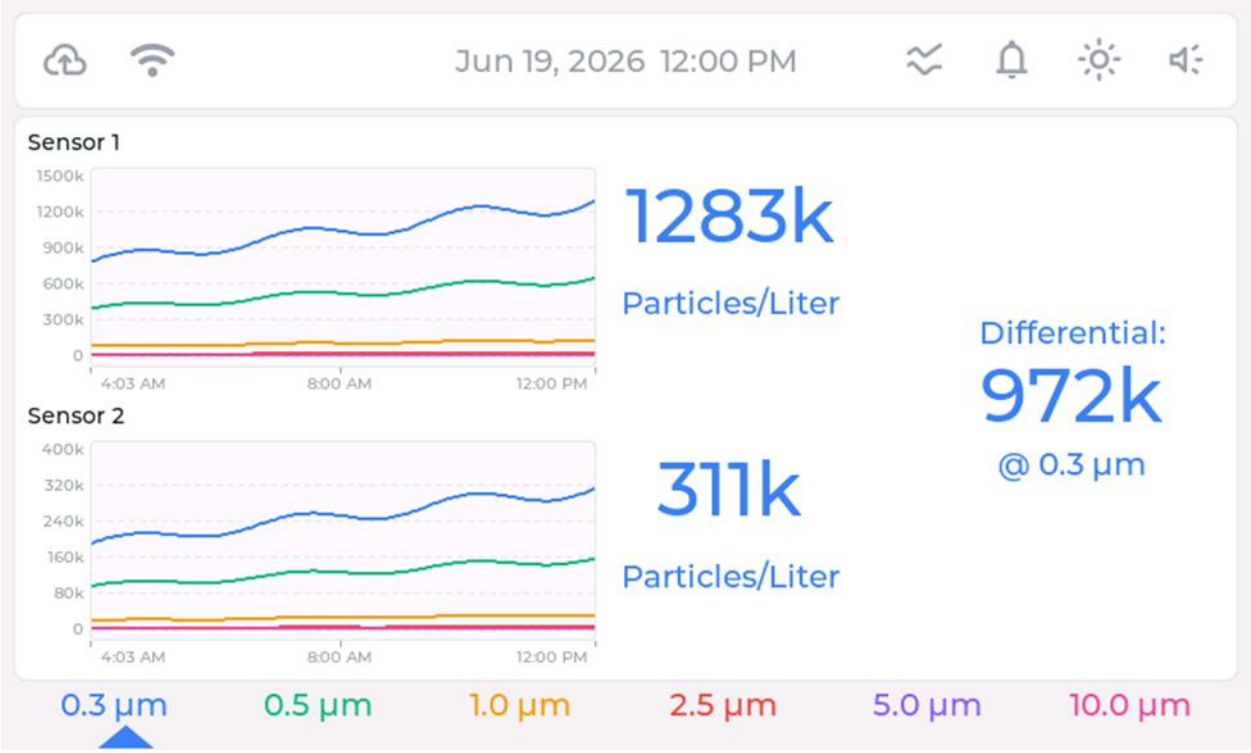


Figure 10. The main display.

4.1 The top bar

The two icons on the left report status by their color. Gray means no, green means yes.

Icon	Gray means	Green means
Cloud with an arrow (upload)	Readings are not reaching the CleanWatch+® service	Readings are being uploaded
Wi-Fi	Not connected to a network	Connected to a network

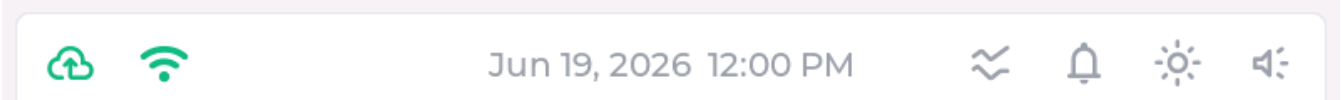


Figure 11. The top bar with both status icons green: connected to Wi-Fi and uploading.

The Wi-Fi icon can be green while the upload icon is still gray. That means the monitor is on your network but has not established its connection to the CleanWatch+® service – see chapter 9.

The cloud icon is a pure indicator and does nothing when touched. The Wi-Fi icon also opens the Wi-Fi screen, so it is both an indicator and a button.

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The date and time in the middle comes from the internet, by way of the Wi-Fi connection. They are blank on a monitor that has never been connected.

The four icons on the right split into two pairs:

Icon	What touching it does
Graph Settings	Opens the Graph Settings screen (sections 3.2 and 6.3).
Alarms	Opens the Alarm Settings screen (chapter 5).
Brightness	Steps the backlight up one level. No screen opens (section 6.1).
Sound	Turns all sound on or off. No screen opens (section 6.2).

The two that open a screen return you here with the back arrow in the screen's top-left corner. See Appendix A for the full icon list.

4.2 The sensor cards

Each sensor has a card on the main display: its name at the top left, its recent history as a graph, and its current reading as the large number on the right. The reading and the graph both show the particle size currently selected in the colored strip along the bottom of the screen.

The large reading updates every 2 seconds on screen. Logged data for the CleanWatch+® web application is captured once a minute (section 7.2). Large counts are abbreviated so they fit:

On screen	Means	Used when
847	847 particles per liter	Under 1,000
12,778	12,778 particles per liter	1,000 to 99,999
1283k	about 1,283,000 particles per liter	100,000 and above

A reading shown as dashes means no data has arrived from that sensor yet.

4.3 The history graph

Each graph holds about eight hours. A point is added roughly every three minutes, so the graph fills gradually after power-on and then scrolls, always ending at the present moment on the right.

- Every particle size that is switched on in Graph Settings is drawn as its own colored line, so you can see all of them at once regardless of which size the large reading shows.
- The vertical scale is chosen automatically to fit the data on screen, so it changes as counts rise and fall. Always read the numbers on the left edge before comparing two graphs – the two cards frequently use different scales.
- The three times under the graph mark the oldest point, the middle, and the newest. While the graph is still filling, the leftmost time is when the monitor started logging.
- A red dashed line across the graph is that sensor's alarm threshold (chapter 5).

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4.4 Choosing a particle size

The colored strip along the bottom of the screen lists the six sizes. Touch one to select it. A filled triangle marks the selection, and both large readings and the Differential switch to that size. The lines on the graphs do not change – all switched-on sizes stay drawn.

4.5 The Differential

The Differential on the right of the screen is Sensor 1's reading minus Sensor 2's, at the selected particle size, which is repeated underneath it. In Figure 10 that is 1283k minus 311k, giving 972k.

The value is negative when Sensor 2 reads higher than Sensor 1. The Differential is a display only – it has no alarm of its own.

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5. Alarms

5.1 How the alarms work

There are two alarms, one per sensor, and they are fully independent. Each has its own on/off switch, its own particle size, and its own threshold. Sensor 1 can watch 0.3 µm above 50,000 while Sensor 2 watches 5.0 µm above 500.

An alarm is active only when both of these are true:

- **Its switch is on**, and
- **Its threshold is greater than zero**. A threshold of 0 leaves the alarm off even with the switch on.

An active alarm trips as soon as that sensor's reading at the chosen size reaches or exceeds the threshold. Because it is checked against the live reading, an alarm responds within a couple of seconds – it does not wait for the graph to update.

An alarm clears by itself as soon as the reading falls back below the threshold. There is nothing to acknowledge or reset.

5.2 Setting an alarm

Touch the **bell** icon in the top bar to open Alarm Settings. There is one row per sensor.

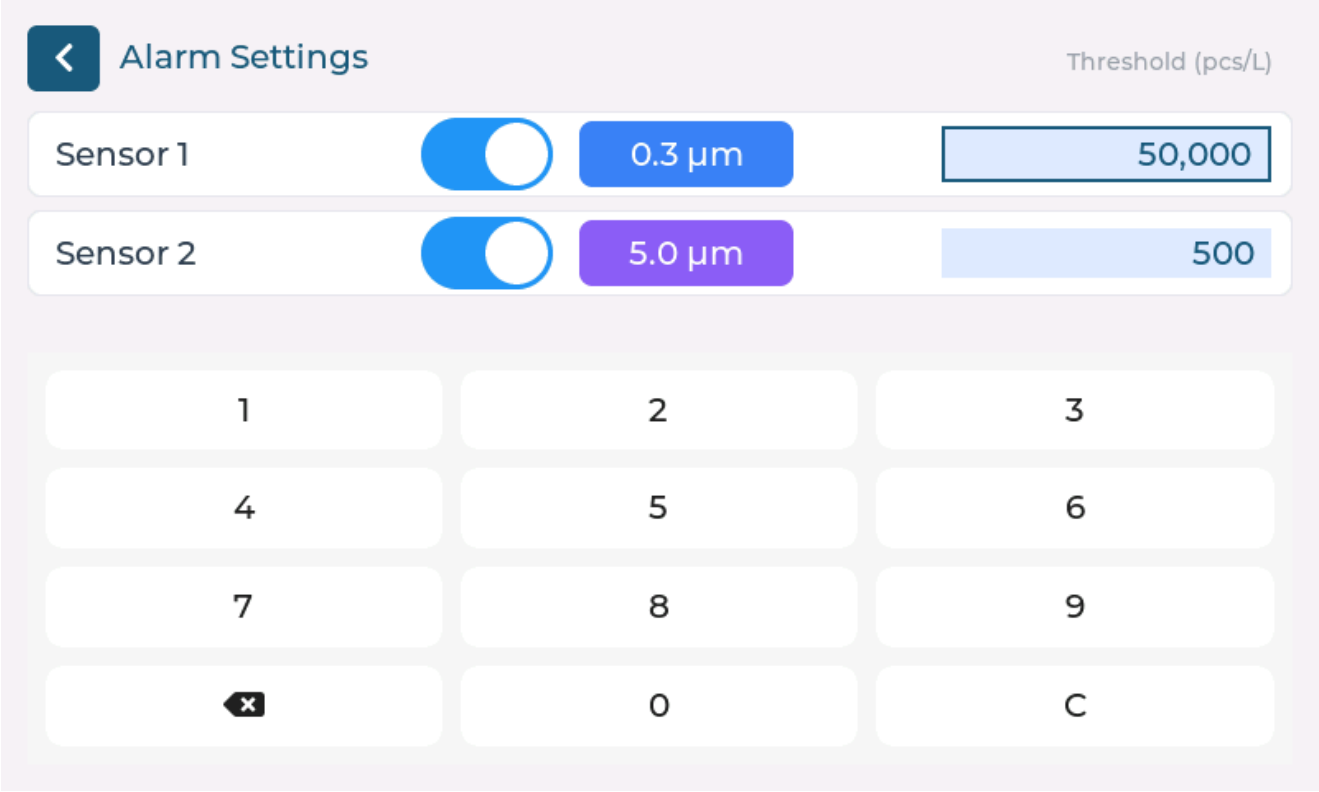


Figure 12. Alarm Settings. Sensor 1 watches 0.3 µm above 50,000; Sensor 2 watches 5.0 µm above 500. Sensor 1's threshold box is selected, shown by its dark outline

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Control	What it does
Sensor name	Identifies the row. Rename in Graph Settings (section 3.2).
Switch	Turns this sensor's alarm on or off.
Colored size button	Touch to step to the next particle size. The color matches that size's color on the main display.
Threshold box	Touch to select it, then type with the keypad. The selected box has a dark outline. Only the selected box is edited.
Keypad	Digits enter the threshold. The arrow key deletes the last digit. C clears the selected box.

NOTE

Settings are saved when you touch the back arrow. Nothing you change on this screen takes effect until you go back. This is deliberate: it stops a half-typed number from tripping the alarm while you are still entering it. If you leave this screen by any other route, your edits are not applied.

5.3 What a tripped alarm looks like

On the main display, a tripped sensor's card turns red, strongest at the top and fading downward, and pulses gently. Its large reading turns dark red. The red dashed threshold line shows where the limit sits on the graph.

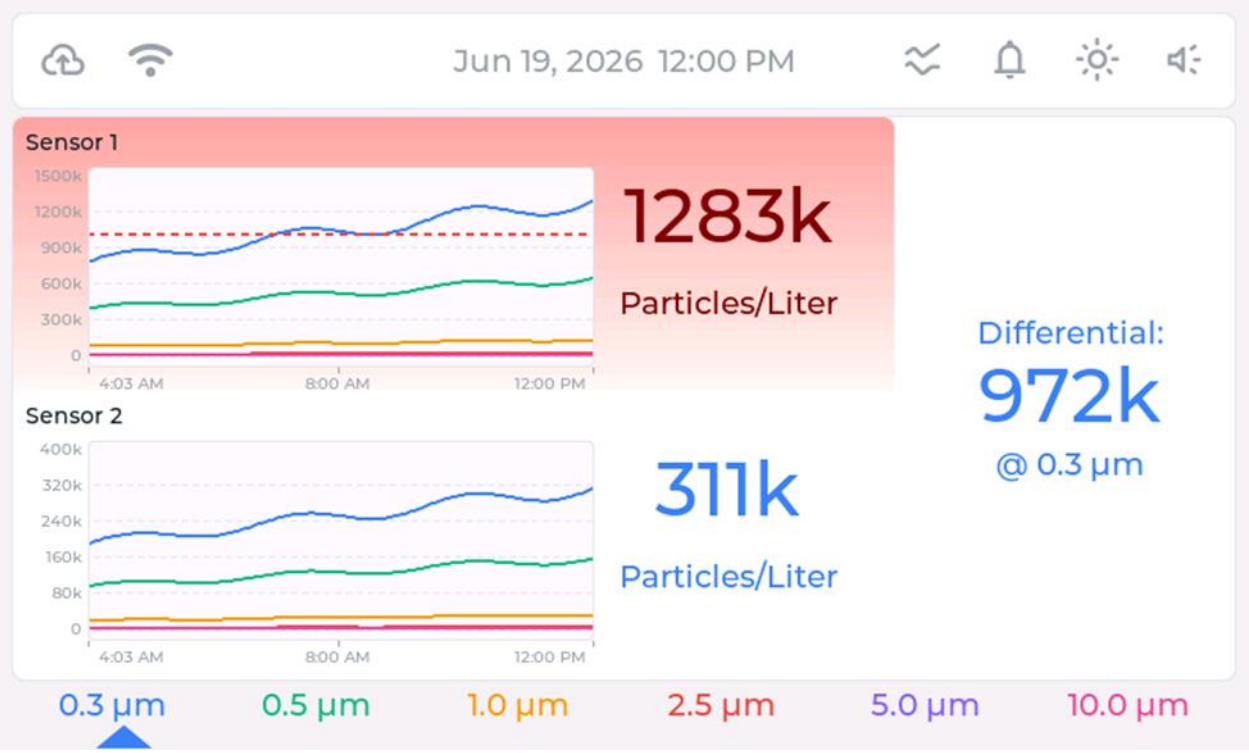


Figure 13. Sensor 1 in alarm. Sensor 2 is normal and stays white.

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Because the alarms are independent, both cards can be in alarm at once, on different particle sizes.

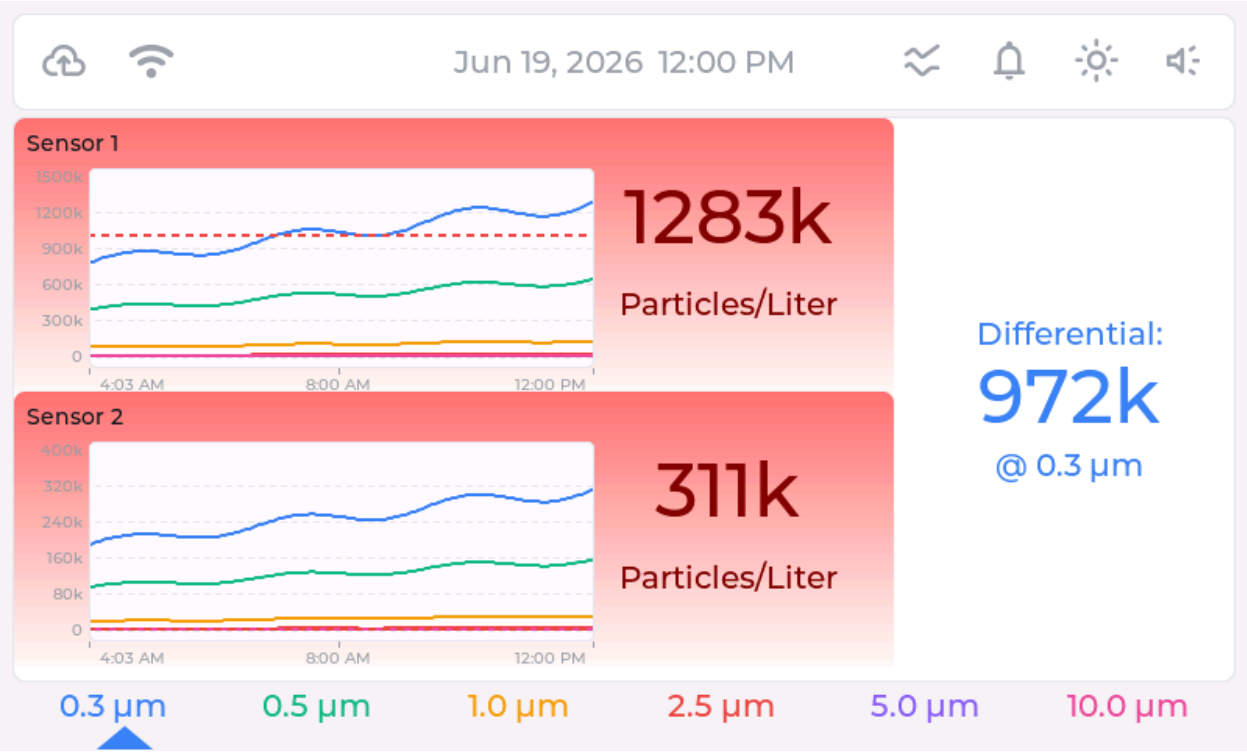


Figure 14. Both sensors in alarm at the same time.

The monitor also beeps in a repeating pattern – a short beep about once a second – for as long as either alarm is tripped. One shared sound covers both alarms; two tripped alarms do not beep twice as fast.

5.4 Silencing the alarm

Touch the sound icon in the top bar to mute the monitor. This silences the alarm and the touch beep together, and it stays muted until you turn it back on. The red card and the dark red reading continue to show – muting only affects sound.

NOTE

Watch Out! Mute is a lasting setting, not a temporary silence for the current alarm. A muted monitor stays silent for every future alarm too, including after a power cycle. The icon shows a crossed-out speaker while muted.

5.5 Two things worth knowing

- **There is no visual alarm cue except on the main display.** While you are on the Wi-Fi, Alarm, or Graph Settings screen, a tripped alarm beeps but nothing on screen turns red. The bell icon does not change color. Go back to the main display to see which sensor is in alarm.
- **The threshold line is not always visible.** If the threshold is far above the counts being measured, it sits off the top of the graph's automatic scale and is not drawn. The alarm still works. Check the threshold on the Alarm Settings screen rather than looking for the line.

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6. Display Settings

6.1 Brightness

Touch the brightness icon in the top bar to step through four levels: 25%, 50%, 75%, 100%, then back to 25%. There is no slider and no separate screen – each touch advances one step.

A new monitor starts at 25%, the dimmest setting. If the screen looks faint out of the box, touch the brightness icon a few times.

> **NOTE**
>
> A brightness touch in the first few seconds after power-on may be overridden while the screen is still fading up. Touch the icon again once the screen is fully on.

6.2 Sound

The sound icon in the top bar turns all sound on or off – both the alarm and the beep that confirms each touch. The icon shows a crossed-out speaker when the monitor is muted. Sound is on when the monitor leaves the factory.

Turning sound on beeps once, to confirm it is working. Turning it off is silent.

6.3 Choosing which sizes are graphed

Touch the graph settings icon in the top bar. Below the two sensor name fields is one switch per particle size. Switching a size removes its line from both graphs, which is useful when one channel is much larger than the others and flattens everything else.

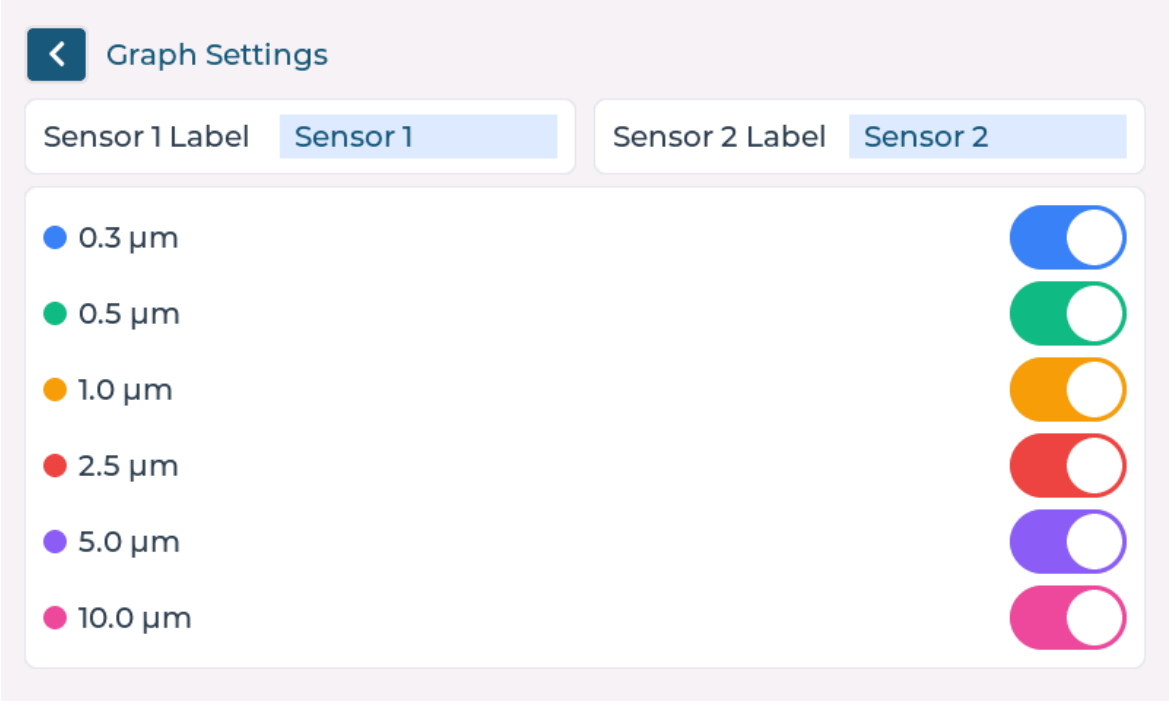


Figure 15. Graph Settings.

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- The switches affect both graphs together.
- They change only the graph lines. The large readings and the Differential follow the size selected in the colored strip on the main display, not these switches.
- Switching a size off does not stop it being measured, alarmed on, or uploaded.

NOTE

A missing graph line is usually this setting. If a color you expect is absent from the graphs, check its switch here before suspecting a fault.

6.4 Settings that are kept

All of these survive a power loss:

Setting	Factory value
Sensor names	Sensor 1, Sensor 2
Alarm switches	Off
Alarm sizes and thresholds	0.3 µm, threshold 0
Brightness	25% (dimmest)
Sound	On
Sizes shown on the graphs	All six on
Wi-Fi network and password	None stored

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7. Cloud data and the CleanWatch+® web application

7.1 Is it uploading?

The cloud icon at the far left of the top bar is the answer. Green means readings are reaching the CleanWatch+® service. Gray means they are not.

Uploading needs a working Wi-Fi connection first, so check the Wi-Fi icon next to it. If Wi-Fi is green and the cloud icon is gray, see chapter 9.

7.2 What the monitor sends

Once a minute the monitor sends one record containing:

- The date and time of reading, and
- The current count for all six particle sizes, for both sensors – twelve numbers in total.

Readings are sent over an encrypted, mutually authenticated connection, using a certificate unique to your unit. The upload is one-way: the monitor publishes readings outward, and the cloud connection cannot be used to control it.

> **NOTE**
>
> The display updates every 2 seconds but uploads happen once a minute, so both the web application and any data you export from it show a coarser record than the screen. Readings are not stored up and sent later – if the network is down, records for that period are simply not uploaded, though the on-screen graph still holds its eight hours of history.

7.3 Viewing your data

Sign in to **cleanwatch.terrauniversal.com** to view readings from your monitors.

To get an account, submit a request via the login page on: https://cleanwatch.terrauniversal.com

The hardware address shown at the bottom of the monitor's Wi-Fi screen identifies your unit to the service. Have it ready when asking for access or support.

7.4 Data ownership and retention

Measurement data uploaded from the monitor is owned by Terra Universal. Data retention periods are subject to change without notice. Contact Terra Universal for the retention period in effect and for any question about access to or export of your data.

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8. CleanWatch+® Particle Sensor Calibration Procedure

Check your CleanWatch+® particle readings once a year by comparing them with a reference instrument sampling the same air. A sensor passes when each particle size reads within 30% of the reference reading.

8.1 Before you start

Check how many particle sensors your CleanWatch+® has. Each sensor is checked on its own.

Part number	Particle sensors
6607-14A	2 (Sensor 1 and Sensor 2)
6607-16	2 (Sensor 1 and Sensor 2)
6607-17	1 (Sensor 1)

You need:

- Your CleanWatch+® with its supplied power supply and sensor tubing fitted.
- A reference instrument (see section 8.2).
- A clock or timer.
- The record sheet in section 8.7, or the CleanWatch+® cloud app to export readings.
- A room with normal air at 0 to 40°C (32 to 104°F) and 40 to 60% humidity. **Do not test** inside the cleanroom: the air is too clean to compare readings.

8.2 Choose a method

Use Method A whenever you can. The TSI-9306 is the more accurate reference, so Method A is a full calibration. Method B is a quicker comparison check you can use between Method A calibrations.

	Method A: TSI-9306 (Recommended)	Method B: Reference sensor comparison
Accuracy	Most accurate.	Less accurate: the reference sensor has its own small error.
Reference	TSI AeroTrak 9306 particle counter, with a calibration certificate from the last 12 months.	Another CleanWatch+® checked by Method A, or calibrated by Terra, in the last 12 months. Label it “Reference unit” and use it only for checks.
Use for	Yearly calibration.	Checks between yearly calibrations, or when no TSI-9306 is available.
If the sensor fails	Contact Terra.	Confirm with Method A, or contact Terra.

The steps in sections 8.3 to 8.5 are the same for both methods. “Reference” means the TSI-9306 or the reference unit, whichever you use.

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8.3 Set-up

1. Place the CleanWatch+® and the reference in the same room, at least 20 cm (8 in) above the floor. Keep them away from air vents, fans, doors, and people walking past.
2. Put the reference's air inlet 15 to 20 cm (6 to 8 in) from the open end of the CleanWatch+® sensor tubing, at the same height.
3. **Two-sensor models:** put both tubing ends near the reference so both sensors sample the same air. If the unit is mounted through a cleanroom wall, move the outside tubing end into the same room for the test, or take the unit down and test it on a bench.
4. Leave the tubing as installed: no longer than 7.75 in, no bend tighter than 2.25 in, not pinched. Keep the CleanWatch+® exhaust vents clear.
5. **Method A only:** set the TSI-9306 to cumulative counts, particles per liter, 1-minute samples, and sizes 0.3, 0.5, 1.0, 2.5, 5.0, and 10 µm. If it shows particles per cubic foot, divide by 28.3 to get particles per liter.

8.4 Take the readings

1. Turn on the CleanWatch+® and the reference. Wait **10 minutes** before recording.
2. On the CleanWatch+®, open the **Particle Sensor** tab. Use the Up and Down buttons to choose Sensor 1 or Sensor 2, and the Left and Right buttons to step through the six particle sizes. Readings are in particles per liter and update every minute.
3. Start the reference's 1-minute sampling at the moment the CleanWatch+® reading updates.
4. Record **5 minutes** of readings for every particle size: five from the reference and five from the CleanWatch+®. The easiest way is to export the 5 minutes from the CleanWatch+® cloud app. Otherwise write them on the record sheet.
5. Two-sensor models: record Sensor 2 the same way, at the same time or straight after.
6. For each size, add the five readings and divide by 5. Do this for the reference and for the CleanWatch+®.

8.5 Check the results

First check the reference's 0.5 µm average is at least 10,000 particles per liter. If it is lower, there are too few particles to compare: repeat the test in a busier room.

Then, for each particle size, work out the difference:

Difference (%) = (CleanWatch+® average – Reference average) ÷ Reference average x 100

Reference average	The size passes when
100 particles/L or more	Difference is between -30% and +30%.
Below 100 particles/L (often 5 and 10 µm)	CleanWatch+® average is within 30 particles/L of the reference.

A sensor passes when **all six sizes** pass.

Example: at 0.5 µm the reference averages 51,000/L and the CleanWatch+ averages 47,500/L.
Difference = (47,500 – 51,000) ÷ 51,000 x 100 = -6.9%. This size passes.

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8.6 What to do next

Result	What to do
All sizes pass	Record the result. Put a label on the unit with the date, method (A or B) and your initials.
All sizes pass, but any size is more than 20% off.	Record the result. Check again in 6 months.
Any size fails (Method A)	Contact Terra.
Any size fails (Method B)	Check again with Method A, or contact Terra.
Readings are zero, frozen, or jump around	Contact Terra.

How Often: Calibrate with Method A every 12 months. Use Method B for checks in between if you want. Also check after the unit is moved, repaired, or has a sensor replaced.

Terra support: (714) 578-6000, TerraUniversal.com. Have your part number, serial number, and record sheet ready.

8.7 Record Sheet

Fill in one sheet per sensor: two for 6607-14A and 6607-16, one for 6607-17.

Field	Entry
CleanWatch+® part number / serial number	
Sensor (Sensor 1/ Sensor 2)	
Method (A: TSI-9306 / B: reference unit)	
Reference serial number / calibration due date	
Date / name	
Room temperature / humidity	

Size	Reference average (/L)	CleanWatch+® average (/L)	Difference	Pass / Fail
0.3 µm				
0.5 µm				
1.0 µm				
2.5 µm				
5.0 µm				
10 µm				

Overall result (all six sizes pass): Pass / Fail

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9. Troubleshooting

Find the symptom in the left column. Items marked “normal” are expected behavior, not faults.

9.1 Power-on and the screen

Symptom	Cause	What to do
Screen dark for the first few seconds after power-on	Normal. The display turns on once the system has booted.	Allow about 5 seconds.
Screen is on but very dim	Normal on a new unit. Brightness starts at its lowest setting, 25%.	Touch the brightness icon in the top bar to step up (section 6.1).
Screen stays completely dark after 15 seconds	No power, or a fault.	Check that the barrel connector is fully seated and the power supply is plugged in and live. If the screen is still dark, contact support.
Touches beep but nothing happens	You touched a card, a graph, or a label rather than a control. Not everything on screen is a button.	Touch the icons in the top bar, the colored size strip along the bottom, or the switches and boxes on a settings screen.
A brightness touch was ignored just after power-on	Normal. The startup fade can override it.	Touch the icon again once the screen is fully lit.

9.2 Readings and graphs

Symptom	Cause	What to do
“Connecting to sensors…” in the top bar at power-on	Normal. The particle sensors need about 8 seconds of warm-up.	Wait. The message clears when readings arrive.
“Connecting to sensors…” will not clear, or comes back later	The display has had no reading from the sensor unit for 90 seconds. Any readings on screen are the last ones received.	Remove power for 10 seconds and reapply it. If the message returns, contact support – this is an internal fault, not something you can correct.
Readings show as dashes	No data has been received from that sensor yet.	Wait for warm-up. If dashes persist after a minute, treat it as the case above.
A colored line is missing from the graphs	That particle size is switched off in Graph Settings.	Turn its switch back on (section 6.3).
The two graphs look similar but the numbers differ greatly	Normal. Each graph scales itself to its own data.	Read the numbers on the left edge of each graph before comparing.
The graph only covers part of the width	Normal. The graph fills over about eight hours, adding a point roughly every three minutes.	Nothing to do.
Occasional tall spikes on one graph while readings are otherwise normal	Usually a contaminated sensor. Particles that have settled inside the sensor get stirred up and counted, producing a brief blip rather than a sustained rise.	**Blow out the air intake with clean, dry compressed air** to dislodge the particles. This normally clears the spikes. See section 9.6 before you do it.

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One sensor reads far lower or flatter than the other	Its intake may be obstructed, or the two sensors genuinely see different air.	Check that the intake and outlet openings are clear (section 2.2). If they are clear and the difference persists, contact support.
Date and time are blank	The monitor has never set its clock, which it does over Wi-Fi.	Complete the Wi-Fi setup in section 3.1. The clock appears within a minute of connecting.

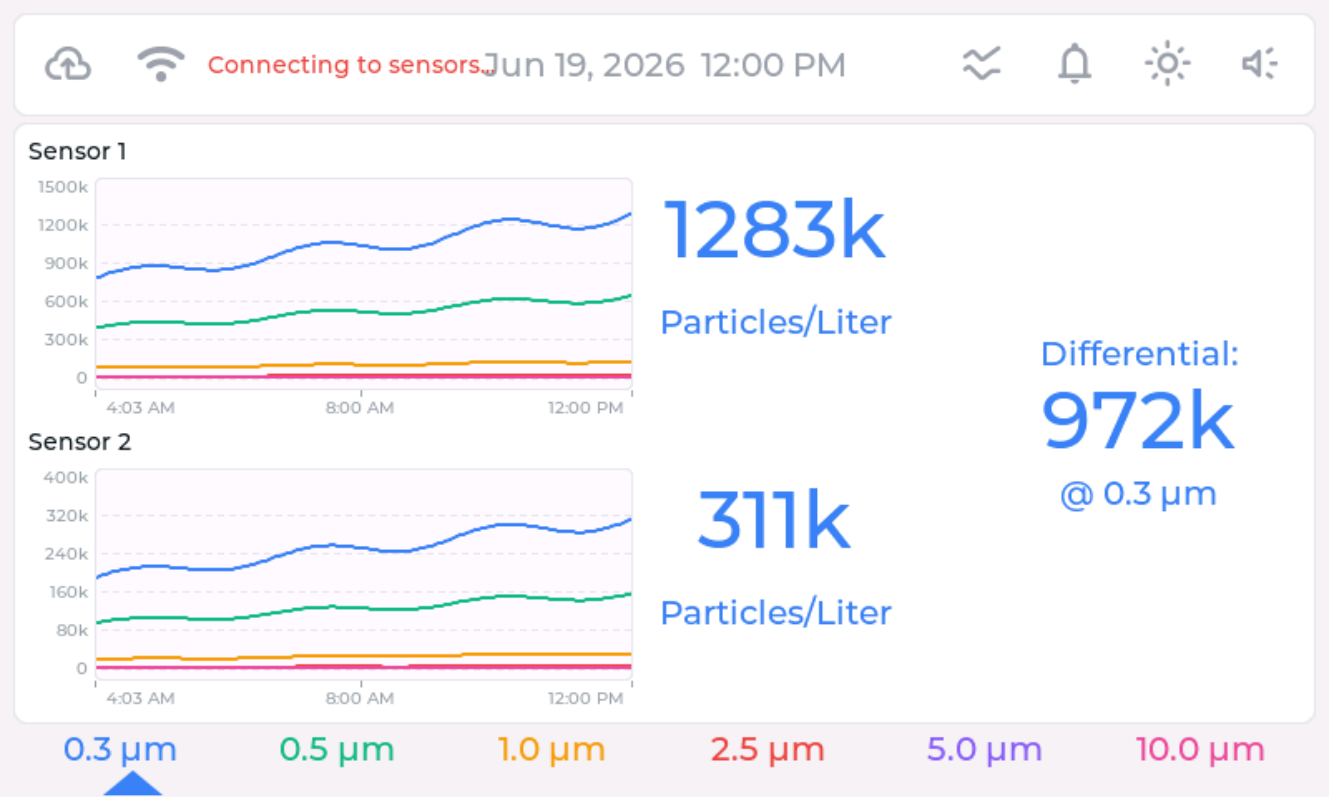


Figure 16. The "Connecting to sensors…" message. Readings already on screen are retained, so the display can look normal apart from this message – check the top bar before trusting the numbers.

9.3 Wi-Fi and uploading

Symptom	Cause	What to do
Wi-Fi icon is gray	Not connected to a network.	Open the Wi-Fi screen and check the title. Follow section 3.1 to connect.
Title reads "Couldn't connect"	Wrong password, or the network refused the connection.	Touch Select and re-enter the password, watching for capital letters. If it still fails, try a different network to confirm the monitor is working.
Title reads "Disconnected"	The monitor was connected and has lost the network.	Check that the access point is on and in range. The monitor retries by itself; if it does not recover, reconnect using section 3.1.

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Spinner keeps turning and no networks appear	The scan has not returned a result yet. The monitor retries about every 7 seconds.	Wait 15 to 30 seconds. If nothing appears, go back and reopen the Wi-Fi screen.
“No networks found”	The scan completed and saw nothing.	Confirm an access point is on and within range of the mounting position, and that it broadcasts its name. The monitor cannot join a hidden network.
My network is missing from the list	Weak signal at the mounting position, hidden network, or a 5 GHz only network.	Move the unit closer to test, and confirm the network is visible to other devices at that spot.
Wi-Fi green but cloud icon gray	On the network, but not connected to the CleanWatch+® service.	Confirm the network reaches the internet. If it does, the network may be blocking outbound secure connections – ask your IT group, then contact support with the unit’s hardware address.
Cloud icon green, but the web app shows gaps	Uploads happen once a minute and are not stored up and resent after an outage.	Expect gaps for any period the network was down. On-screen history is unaffected.
Hardware address at the bottom of the Wi-Fi screen reads “--"	The sensor unit inside the monitor has not reported in yet.	Go back to the main display, wait a few seconds, then reopen the Wi-Fi screen. If it stays “--” and readings are also missing, treat it as the sensor fault in section 9.2.

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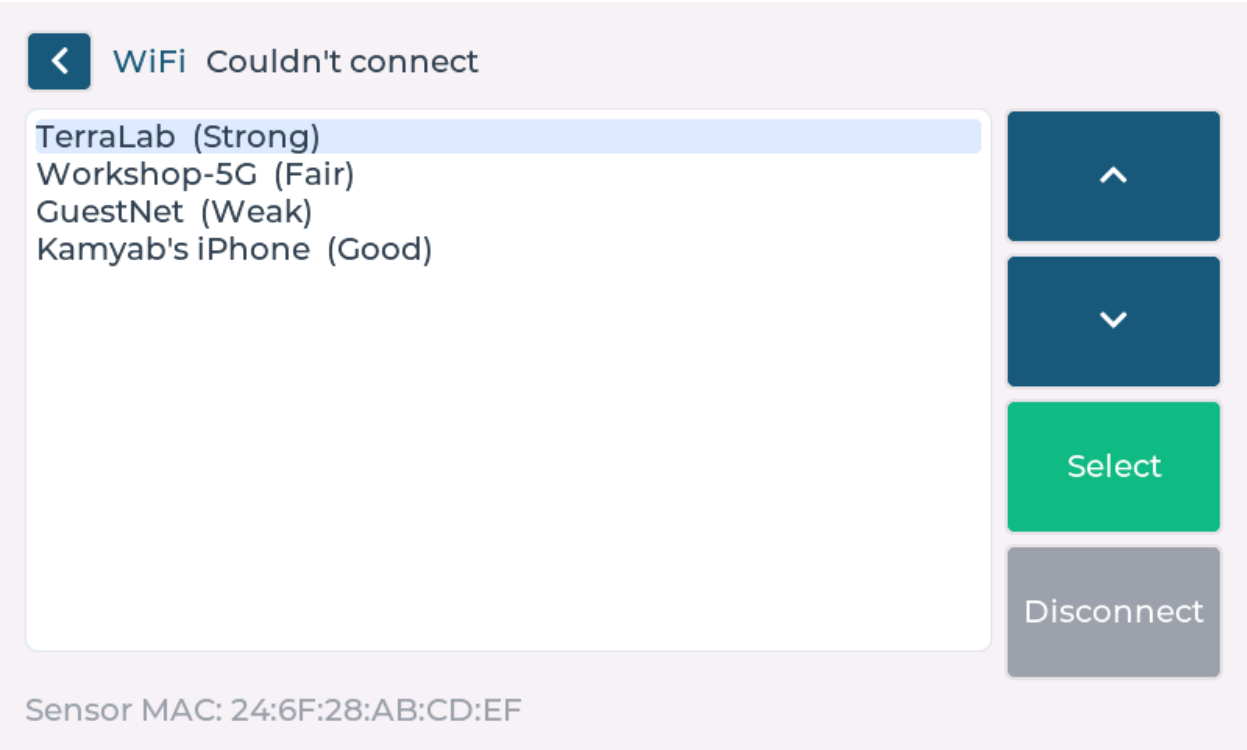


Figure 17. "Couldn't connect". The password was not saved, so you can try again straight away.

9.4 Alarms and sound

Symptom	Cause	What to do
Alarm does not trip even though the count is above the limit	The alarm is not active, its threshold is 0, or it is watching a different particle size from the one you are reading.	Open Alarm Settings and check all three: switch on, threshold above 0, and the right size on the colored button.
Alarm settings did not take effect	Settings are only applied when you touch the back arrow.	Reopen Alarm Settings, make the changes, and leave with the back arrow (section 5.2).
Beeping, but no red card on screen	You are on a settings screen. Only the main display shows the visual alarm.	Touch the back arrow to return to the main display.
Red dashed threshold line is not on the graph	The threshold is above the graph's current scale, so it falls outside the visible area.	Normal. Confirm the threshold in Alarm Settings; the alarm still works.
No sound at all, including touch beeps	The monitor is muted.	Touch the sound icon in the top bar. Muted is shown by a crossed-out speaker.
Alarm keeps sounding	The reading is still at or above the threshold. Alarms clear themselves, and cannot be acknowledged.	Address the particle source, or raise the threshold if it is set too tight. Mute silences the sound but leaves the alarm active.

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Alarm trips constantly at a normal count	The threshold is too low for this location, or set on a smaller particle size than intended – counts at 0.3 µm are far higher than at 5.0 µm.	Watch the reading for a while at the size you care about, then set the threshold above its normal range.

9.5 Names and settings

Symptom	Cause	What to do
A sensor name went back to "Sensor 1" or "Sensor 2"	The name field was left empty, which restores the factory name.	Rename it again, leaving at least one character (section 3.2).
A name is cut off with "…" in Graph Settings or Alarm Settings	Normal. Those fields are a fixed width. The main display shows the full name.	Use a shorter name if you want it to fit everywhere.
The keyboard stops accepting characters	Names are limited to 19 characters.	Shorten the name.
Settings were lost after a power cut	Settings are stored in the monitor and should survive. Alarm and name changes are only stored once you leave the screen with the back arrow.	Re-enter them, leaving each screen with the back arrow. If they are lost again, contact support.

9.6 Clearing a contaminated sensor

A sensor that has collected particles internally shows a characteristic pattern: readings sit at their normal level, then jump to a tall spike for one or two points and drop straight back. The spikes are the settled particles being disturbed and counted, not a real change in the air. A short blowout with compressed air usually clears them for good.

24. Note which sensor is spiking, so you can confirm afterwards that the right one improved.
25. Use clean, dry compressed air – the same grade you would use on any optical instrument. A compressed air duster can is sufficient. Oil or moisture in the supply will make the contamination worse. Maximum 90 psi.
26. Direct short bursts directly into the air intake: the left and right sides of a CleanWatch+®, or the back of a ParticleWatch® (section 2.2), into the contaminated sensor.
27. Wait a few minutes for the readings to settle, then watch the graph for a while. The spikes should be gone. Repeat this procedure if spikes continue.

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10. Specifications

Item	Specification
Display	5.0 in color touchscreen, 800 x 480 pixels, capacitive touch
Particle Sensors	Two independent laser particle sensors
Size channels	0.3, 0.5, 1.0, 2.5, 5.0, and 10.0 µm (cumulative)
Units	Particles per liter (pcs/L)
Measurement Range	0 to 10,000,000 pcs/L
Reading interval	2 seconds
Logging interval	1 minute
Alarms	Two independent, one per sensor; user-set size and threshold; audible and on-screen
Warm-up	About 8 seconds from power-on
Network	Wi-Fi 2.4 GHz, requires a visible (non-hidden) network
Cloud upload	One record per minute over an encrypted, mutually authenticated connection
Power input	Low-voltage barrel jack, 12 – 24 Volts DC, 30 Watts
Enclosure dimensions	CleanWatch+®: approximately 9.25 x 5 x 2 inches ParticleWatch®: approximately 9.3 x 5.5 x 5.5 inches
Enclosure material	Stainless Steel
Mounting	CleanWatch+®: wall mount, two teardrop holes on back side ParticleWatch®: set-top box
Airflow	CleanWatch+®: intake both sides, outlet bottom. ParticleWatch®: intake back, outlet both sides.
Antenna	CleanWatch+®: top. ParticleWatch®: back.
Counting accuracy	+/- 30%
Tubing	Supplied with unit for extending particle sensor reach.
Tubing maximum length	7.75 inches
Tubing minimum bend radius	2.25 inches


NOTE

Wi-Fi is 2.4 GHz. The monitor cannot join a 5 GHz-only network, and cannot join a network that does not broadcast its name.

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11. Warranty

https://www.terrauniversal.com/warranty/

Thank you for ordering from Terra Universal!

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Appendix A. Screen icon reference

The top bar is the same on every screen.

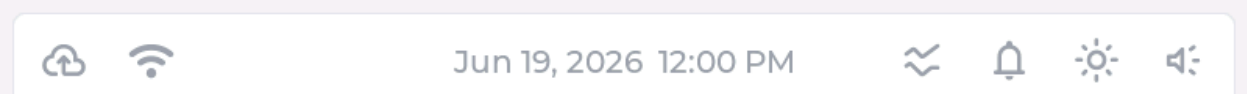


Figure 18. Top bar, left to right: upload status, Wi-Fi status, date and time, graph settings, alarms, brightness, sound.

A.1 Status indicators (left) – not buttons

Icon	Name	What it tells you
Cloud with an up arrow	Upload	Green: readings are reaching the CleanWatch+® service. Gray: they are not.
Signal arcs	Wi-Fi	Green: connected to a network. Gray: not connected. Touch it to open the Wi-Fi screen.

The Wi-Fi icon is the one exception on the left: it reports status and also opens the Wi-Fi screen.

A.2 Controls (right)

Icon	Name	What it tells you
Wave in a box	Graph settings	Opens Graph Settings: sensor names and which particle sizes are graphed.
Bell	Alarms	Opens Alarm Settings. It stays gray – it does not change color when an alarm trips.
Sun	Brightness	Steps the backlight through 25%, 50%, 75%, and 100%.
Speaker	Sound	Turns all sound on or off. A crossed-out speaker means muted.

A.3 Elsewhere on screen

Item	What it does
Back arrow, top-left of any settings screen	Returns to the previous screen and saves what you changed. On the Sensor Label screen, it returns to Graph Settings; everywhere else it returns to the main display.
Colored size strip along the bottom of the main display	Touch a size to select it. The triangle marks the selection; the large readings and the Differential follow it.
Red “Connecting to sensors…” in the top bar	No reading has arrived from the sensors for 90 seconds. See section 9.2.