

# Set-up & Operating Manual

## GlanAir

### GlanAir TD40

Particle Counter



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# 1. Introduction

## 1.1 Overview

The GlanAir TD40 measures particles from 0.35 to 40µm in diameter using a laser-based particle sensor and pump-less air flow system. An LCD display provides on board display of PM<sub>1.0</sub>, PM<sub>2.5</sub> and PM<sub>10</sub> values and wireless connectivity provides remote monitoring access for detailed analysis of PM readings, real time particle size histograms as well as temperature and humidity monitoring.

The TD40 measures the light scattered by individual particles carried in a sample air stream through a laser beam. These measurements are used to determine the particle size (related to the intensity of light scattered via a calibration based on Mie scattering theory) and particle number concentration. Particle mass loadings - PM<sub>1.0</sub>, PM<sub>2.5</sub> or PM<sub>10</sub>, are then calculated from the particle size spectra and concentration data, assuming a particle density and refractive index (RI).

## 1.2 Technical Specification

See [glan-air.com/resources/](http://glan-air.com/resources/)

# 2. Sensor Operation

## 2.1 How it works

The TD40 classifies each particle size, recording the particle size to one of 24 software “bins” covering the size range from 0.35 to 40 µm. The resulting particle size histograms can be evaluated using the online web interface.

All particles, regardless of shape are assumed to be spherical and are therefore assigned a ‘spherical equivalent size’. This size is related to the measurement of light scattered by the particle as defined by Mie theory, an exact theory to predict scattering by spheres of known size and refractive index (RI). The TD40 is calibrated using Polystyrene Spherical Latex Particles of a known diameter and known RI.

## 2.2 PM Measurements

The particle size data recorded by the TD40 monitor can be used to calculate the mass of airborne particles per unit volume of air, normally expressed as µg/m<sup>3</sup>. The accepted international standard definitions of particle mass loadings in the air are PM<sub>1.0</sub>, PM<sub>2.5</sub> and PM<sub>10</sub>. These definitions relate to the mass and size of particles that would be inhaled by a typical adult. So, for example, PM<sub>2.5</sub> is defined as ‘particles which pass through a size-selective inlet with a 50% efficiency cut-off at 2.5 µm aerodynamic diameter’. The 50% cut-off indicates that a proportion of particles of larger than 2.5 µm

will be included in PM<sub>2.5</sub>, the proportion decreasing with increasing particle size, in this case out to approximately 10 µm particles.

The TD40 calculates the respective PM values according to the method defined by European Standard EN 481. Conversion from the 'optical size' of each particle as recorded by the TD40 and the mass of that particle requires knowledge of both particle density and its RI at the wavelength of the illuminating laser beam, 658 nm. The latter is required because both the intensity and angular distribution of scattered light from the particle are dependent on RI. The TD40 assumes an average RI value of 1.5 + i0.

### Notes

The TD40 calculations of particle mass assume a negligible contribution from particles below approximately 0.35 µm, the lower limit of particle detection of the TD40 monitor.

The EN 481 standard definition for PM10 extends to particle sizes beyond the upper measurable size limit of the TD40. In some cases, this can result in the reported PM10 value being underestimated by up to ~10%.

## 3. Hardware Configuration

### 3.1 Requirements for Installing the TD40

The following is required in order to install the system:

- Access to a power connection
- Access to a wired internet connection for the gateway
- Once power is supplied and the data gateway is connected the unit will need to be added to your online monitoring account. Please note that you only need to add the monitor device ID to the online software.
- The monitor should be positioned within range of your GY36 gateway

### 3.2 Wireless Communication

The TD40 connects to the online monitoring system using Zigbee wireless communication. This enables multiple monitors to be installed and communicate back to a wireless gateway which converts wireless data to a single Ethernet point.

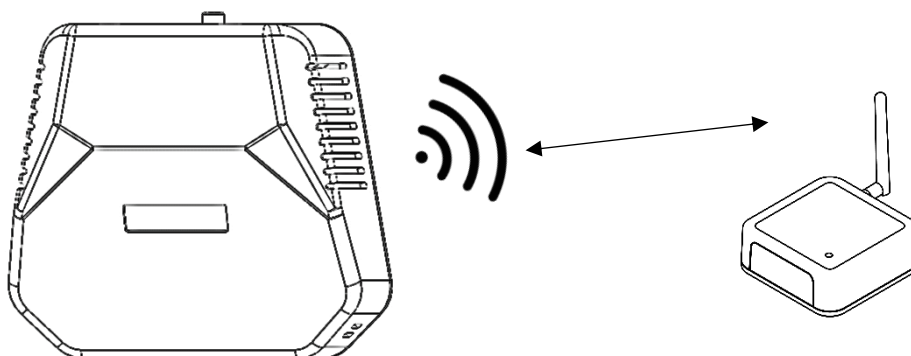


Figure 1 → TD40 Monitor with Wireless to Ethernet Data Gateway

### 3.3 LCD Display

The LCD displays the current temperature and humidity and cycles through a view of each PM value (PM<sub>1.0</sub>, PM<sub>2.5</sub> & PM<sub>10</sub>) as follows;

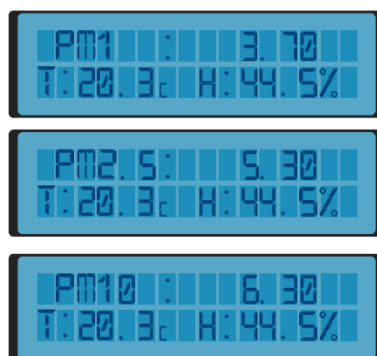


Figure 2 → LCD Display

Note, there are variations in LCD output between the TD40 SKUs. The TD40-i8 provides bespoke output for ISO-8 Cleanrooms with 0.5µm, 1µm and 5µm counts.

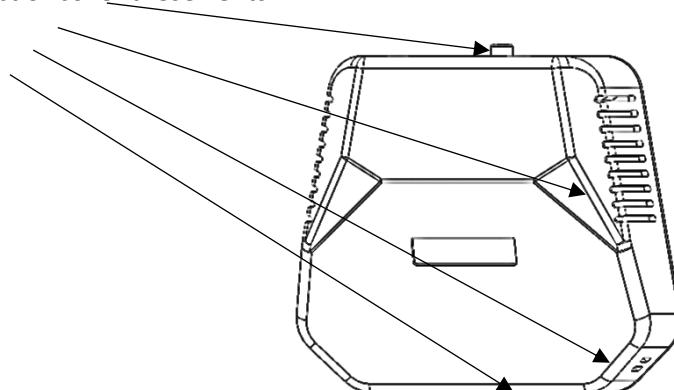
### 3.4 Where Best to Place the TD40

The TD40 continuously samples the air in its immediate vicinity, and throughout the day considering the migration of air in a room will monitor a wide area around the device. However, for optimum usage the system should be placed close to sources of particle contamination.

The unit can be wall mounted using the sensor enclosure mounting holes or placed flat on a desk or worktop.

**Note: Do not place the monitor upright on a desk as this will obstruct the flow of air to the temperature and humidity sensors which are at the bottom of the unit.**

Do not obstruct or cover these vents



Wall mounting holes on rear

Figure 3 → Where best to place

## 4. Power Supply

The TD40 is supplied with a 12V DC power supply. The converter operates at 100 – 240VAC on its input and is compatible with the mains power network of most continents.

## 5. Internet Connection

### 5.1 Wireless Ethernet Gateway Connection

Your wireless monitor will need to be in range of the gateway which may be up to 30m depending on the environment.

- To set up the Gateway please connect the Ethernet cable provided to the DATA HUB and then connect to an Ethernet point or a spare Ethernet port on your router.
- Power on the device after connecting the supplied power supply. The device will power on automatically and establish a connection with the monitor.

**Please note:** It can take up to 5 minutes for the gateway to pair with the monitor. You can check its status by viewing the monitor's dashboard for data arriving online.

### 5.2 Network Configuration

The DATA HUB will also by default automatically configure itself to your network settings using DHCP.

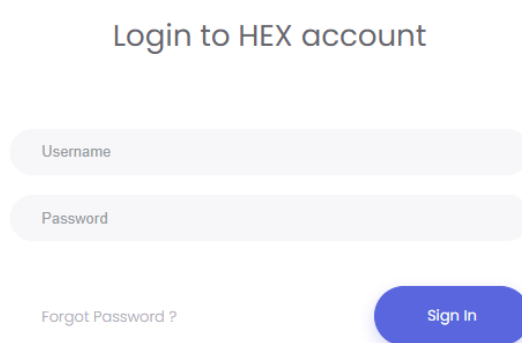
It is possible to configure the monitor to connect to a static IP address. Please see section on Gateway Network Configuration to complete this step.

## 6. Online Software Setup

### 6.1 Online Account Setup

To set up your online account to remotely monitor your IAQ monitor please navigate to <https://hex2.nuwavesensors.com/> on your computer internet browser.

On the webpage you will be prompted to sign in or create an account. As this is your first time to access the account please click 'Create Account' just under the sign in section.



The image shows a login interface for a HEX account. At the top, the text "Login to HEX account" is centered. Below this, there are two input fields: "Username" and "Password". To the left of the "Password" field, there is a link that says "Forgot Password?". To the right of the "Password" field, there is a blue button with the text "Sign in".

Figure 4 → Login Interface on Webpage

Please complete the form in order to complete the sign-up process. If you have any issues, please contact support at: [info@nuwavesensors.com](mailto:info@nuwavesensors.com) quoting the device ID of your monitor and gateway (found on the sticker on the back of both devices).

## Create Account

Username

Required. 150 characters or fewer. Letters, digits and @/./+/-/\_ only.

Email

Password

- Your password can't be too similar to your other personal information.
- Your password must contain at least 8 characters.
- Your password can't be a commonly used password.
- Your password can't be entirely numeric.

Password confirmation

Enter the same password as before, for verification.

Organisation or Business Name

Register

Figure 5 → Account Registration Form

### 6.2 Adding a monitor to your account

To add your new monitor, click **'Add Device'** from the **Manage Devices Page** and complete the form based on your monitor details;

- **Device ID:** Please enter the 16-digit sensor ID – this is the code on the sticker on the back of your monitor.
- **Name:** Example; Cleanroom 2A
- **Label:** Completing this field allows you to create groups of monitors based on your preference – example; 1<sup>st</sup> Floor. You can also leave this blank if you do not wish to create a group.



Figure 6 → 'Add Sensor' Interface Page

Once you have completed the above form click 'Add Sensor' button at the end of the form and your monitor will be added. To add another monitor at any time please repeat the steps above.

### 6.3 User Profile Settings

On the settings page you can edit and manage your user account details including;

- Change Password
- Change e-mail address associated with the account
- Address Location

Once any changes have been made click the 'Save Changes' button.

Figure 7 → Account Settings Page

## 7. Online Monitoring Dashboard

### 7.1 Current Particle Bin View

From here users can;

- View all current particle bin readings using histogram view
- View current status of PM<sub>1.0</sub>, PM<sub>2.5</sub>, PM<sub>10</sub> values
- View current temperature and humidity levels

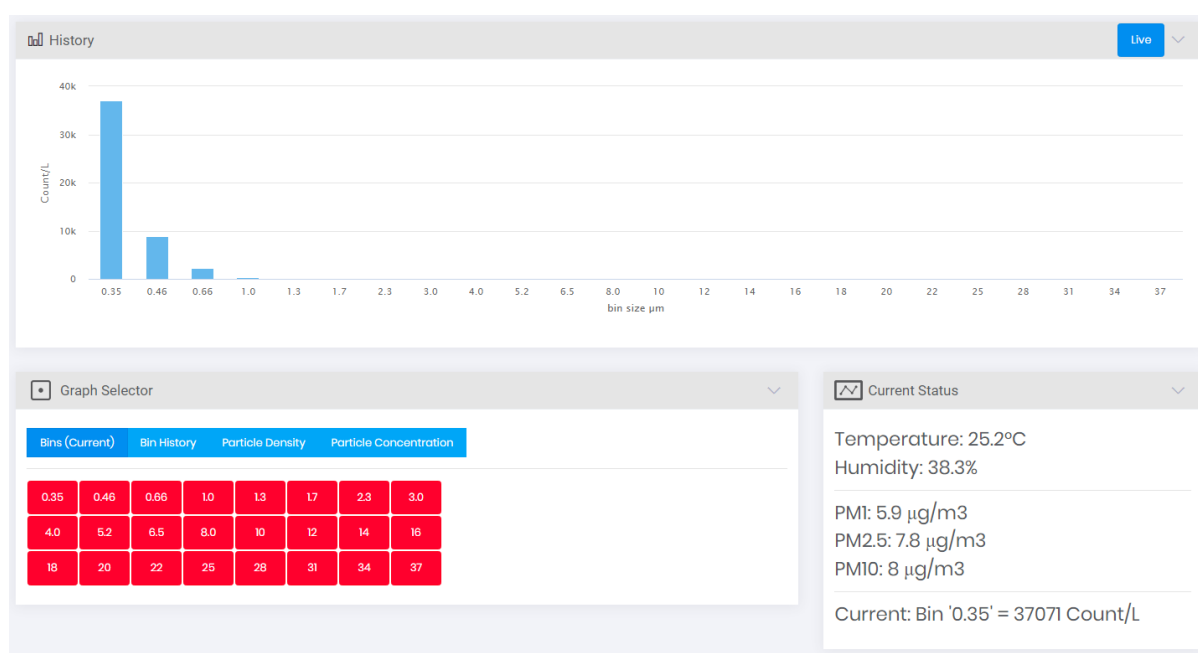


Figure 8 → Current Particle Bin View

### 7.2 Particle Bin comparison feature

Using this feature users can compare two particle bins using the bin selector buttons underneath the bar chart by selecting / de-selecting individual particle bins:

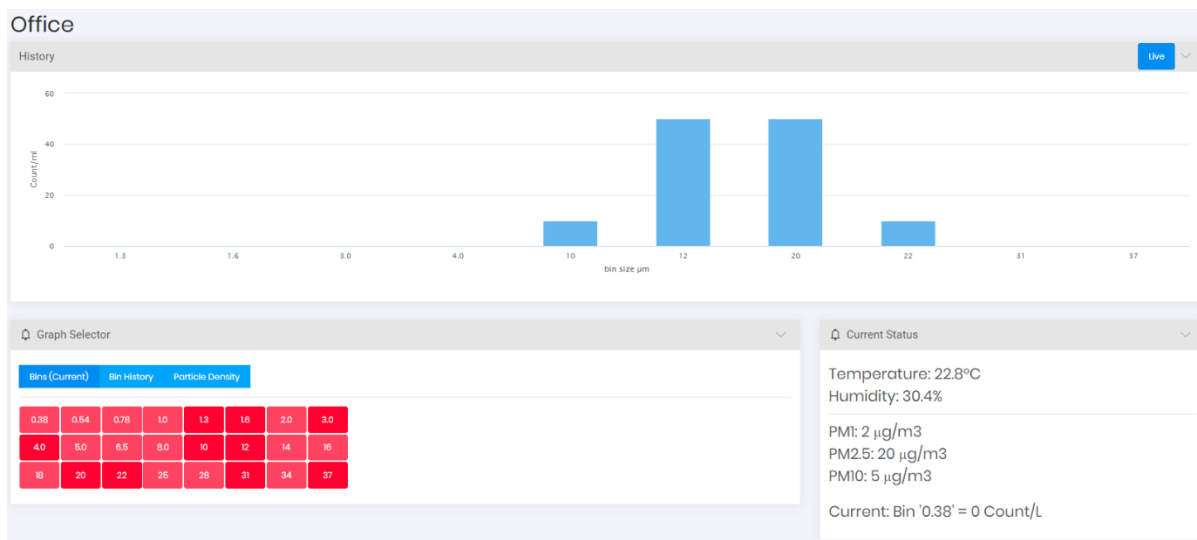


Figure 9 → Particle Bin Comparison Feature

### 7.3 Particle Bin History

To view detailed bin history by day, week or month, select bin history by particle size using particle size selector buttons underneath graph:

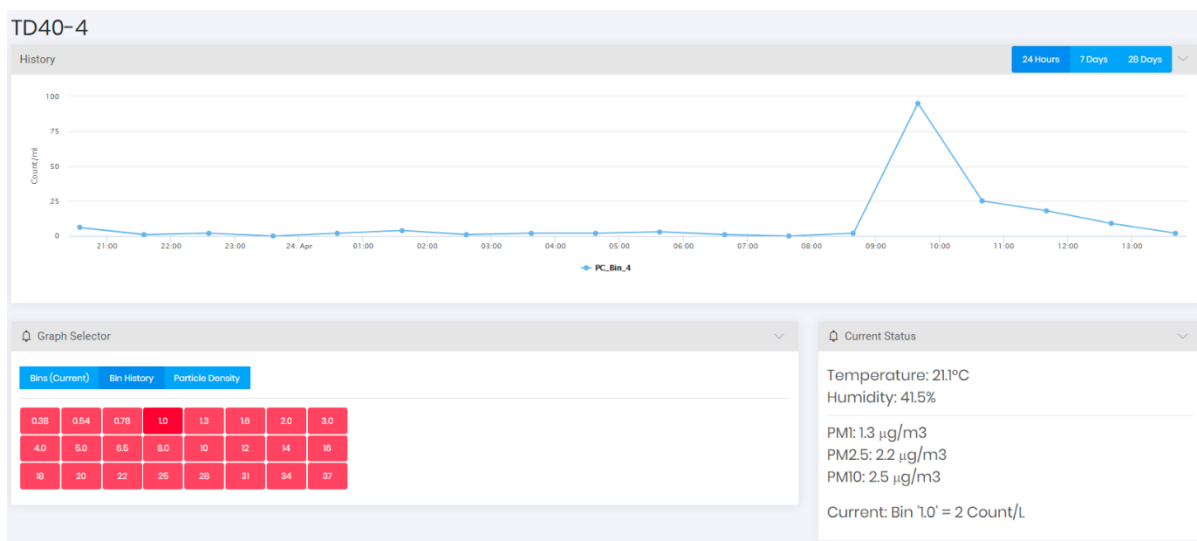


Figure 10 → Particle Bin History

## 7.4 Particle Density Graph View

To view particle density graphs by day, week or month:

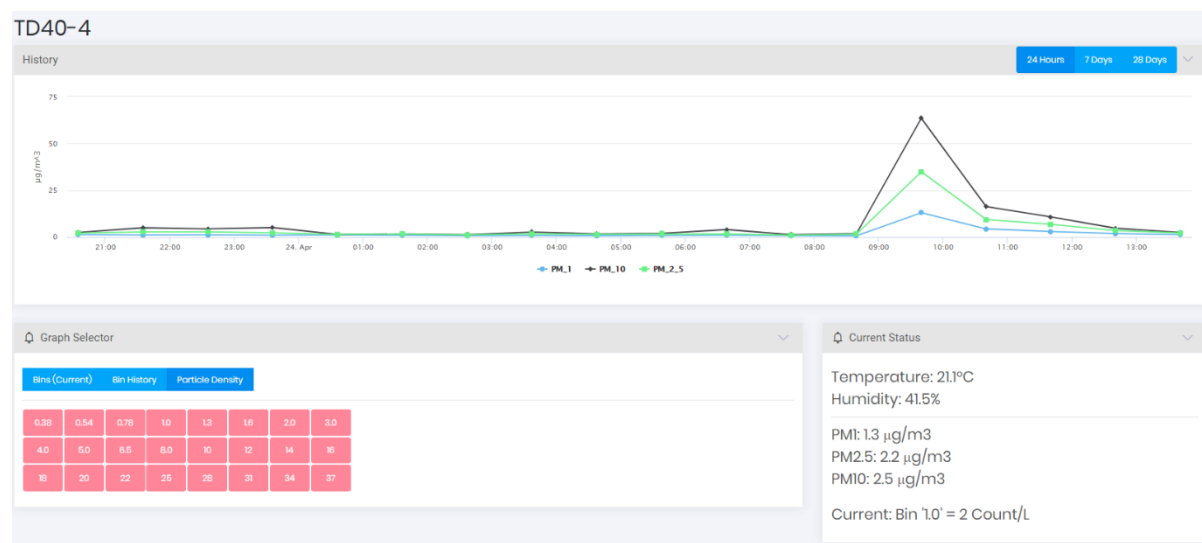


Figure 11 → Particle Density Graph View

## 7.5 Export Data Feature

To export data in CSV format for detailed offline analysis:

Data is e-mailed to the account holders e-mail address which is in the User profile settings page.

Home

### Sensor Data Export (CSV format)

Sensor

Start time

End time

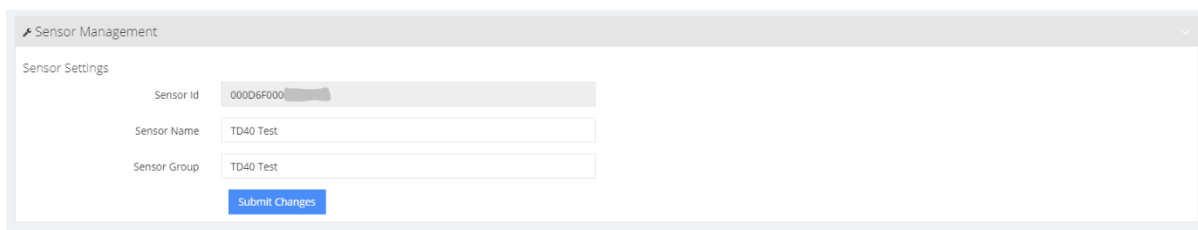
**Export**

Figure 12 → Export Data Feature

## 7.6 Sensor Naming Settings

At the bottom of each monitor you will find the sensor management settings. From here you can manage settings such as re-naming the sensor and group.

**Note:** To save and changes make sure and click ‘Save Changes’ at the bottom of the form.



The screenshot shows a 'Sensor Management' window with a 'Sensor Settings' section. It contains three input fields: 'Sensor Id' with the value '000D6F000', 'Sensor Name' with the value 'TD40 Test', and 'Sensor Group' with the value 'TD40 Test'. Below these fields is a blue button labeled 'Submit Changes'.

Figure 13 → Sensor Naming Settings

### Project Location Settings:

The project location can be manually set on the map by editing the location pin. Press the Edit Button to access editing settings.

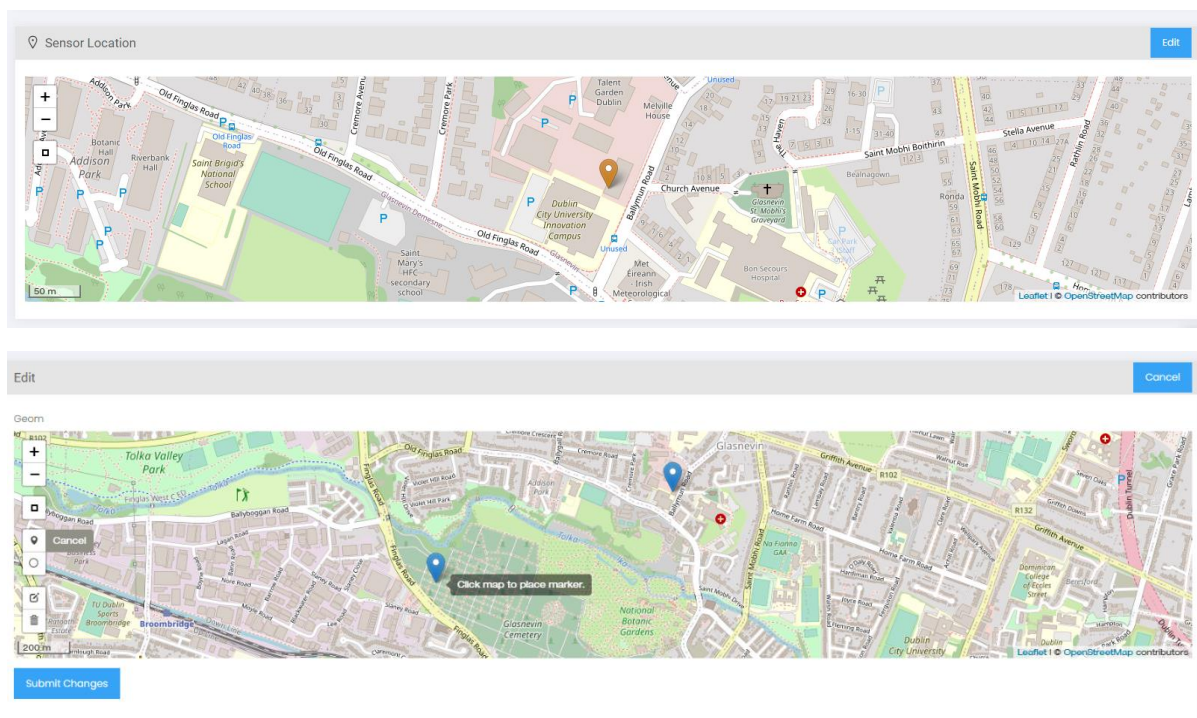


Figure 14 → Project Location Settings

Once the location has been selected, press ‘Submit Changes’ to save the project location.

### Time and Date Settings:

The time and date setting change the time zone settings for a particular device according to its location. Once this is changed the data on the graph appears in this time zone.

Please note that this does not affect the time zone data of any data downloaded by CSV which will always be saved in UTC format.

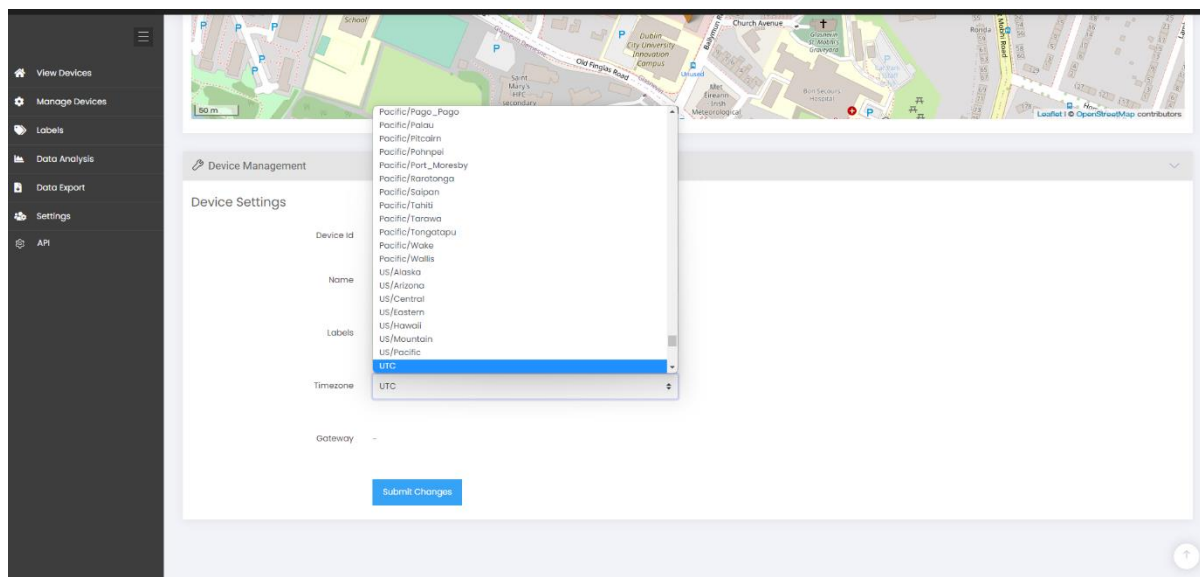


Figure 15 → Time and Date Settings

## 8. API

NuWave Sensors offers a RESTful API to monitor devices connected to our HEX monitoring software.

Resources regarding the API for your installed monitors are available at the following link address:

<https://hex2.nuwavesensors.com/api/docs/>

## 9. Gateway Network Configuration

The DATA HUB gateway is configured to use DHCP by default. This automatically detects network settings on most standard networks and the monitor will be able to send data online without changing any settings.

If you need to configure a port on your network for the gateway the port and server address details are as follows:

**Remote Port Number: 58122**

**Remote Server Address: gateway2.nuwavesensordata.com**

You can also edit the network settings and assign a static IP using the gateway web interface of the gateway which is accessible using an internet browser. To access the gateway you must know the IP address which can be found using the MAC address of the gateway (located on the bottom of gateway).

When prompted, enter the following username and password;

**Username:** 'admin'

**Password:** 'admin' or 'alpha'

If you have any issues, please contact [info@nuwavesensors.com](mailto:info@nuwavesensors.com)

Current Status	Module Name: <b>Gateway</b>	help
Local IP Config	Firmware Revision: 3010	<ul style="list-style-type: none"> <li>• <b>Run time:</b> run time means the minutes since latest reboot</li> <li>• <b>TX/RX Count:</b> TX/RX count give us a calculation of the total byte we have been received or send.</li> </ul>
TTL1	Current IP Address: 192.168.1.108	
Web to Serial	MAC Address: d8-b0-4c-c0-0e-7f	
Misc Config	Run Time: 9day: 1hour: 17min	
Reboot	TX Count(ETH) : 58985642/ bytes	
	RX Count(ETH) : 0/ bytes	

Figure 16 → Gateway Homepage

Current Status	IP type: DHCP/AutoIP ▾	help
Local IP Config	Static IP: 192 . 168 . 0 . 7	<ul style="list-style-type: none"> <li>• <b>IP type:</b> StaticIP or DHCP</li> <li>• <b>StaticIP</b> Module's static ip</li> <li>• <b>Submask</b> usually 255.255.255.0</li> <li>• <b>Gateway</b> Usually router's ip address</li> </ul>
TTL1	Submask: 255 . 255 . 255 . 0	
Web to Serial	Gateway: 193 . 168 . 0 . 100	
Misc Config		
Reboot	Save Cancel	

Figure 17 → Gateway IP Configuration Page

Current Status	<p>Baud Rate: <input type="text" value="19200"/> bps</p> <p>Data Size: <input type="text" value="8"/> bit</p> <p>Parity: <input type="text" value="None"/></p> <p>Stop Bits: <input type="text" value="1"/> bit</p> <p>Flow Control and RS485: <input type="text" value="None"/></p> <p>Local Port Number: <input type="text" value="23"/></p> <p>Remote Port Number: <input type="text" value="58122"/></p> <p>Work Mode: <input type="text" value="TCP Client"/> <input type="text" value="None"/></p> <p>Remote Server Addr: <input type="text" value="gateway2.nuwavesensordata.com"/></p> <p>Timeout: <input type="text" value="0"/> seconds (&lt; 256, 0 for no timeout)</p> <p>UART packet Time: <input type="text" value="0"/> ms (&lt; 256)</p> <p>UART packet length: <input type="text" value="0"/> chars (&lt;= 1460, 0 for no use)</p> <p>Sync Baudrate(RF2217 similar): <input type="checkbox"/></p> <p><input type="button" value="Save"/> <input type="button" value="Cancel"/></p>	help
Local IP Config		
TTL1		<ul style="list-style-type: none"> <li><b>baud:</b> 300~1024000bps(2 and 485 can only up to 115200bps)</li> <li><b>flowcontrol and RS485</b> default RS485</li> <li><b>local port</b> 1~65535. when TCP Client, set this to 0 means use random local port</li> <li><b>remote port</b> 1~65535</li> <li><b>packet time</b> 1~255ms,default 10ms;when baud &lt;=4800bps, pls set packet time to 50 ms</li> </ul>
Web to Serial		
Misc Config		
Reboot		

Figure 18 → Gateway TTL Configuration Page

Current Status	<p>Module Name: <input type="text" value="Gateway"/></p> <p>UPnP port number: <input type="text" value="6432"/></p> <p>weberver port number: <input type="text" value="80"/></p> <p>Module Id(use for indentify modue): <input type="text" value="1"/> (1~65535)</p> <p>Module Id type: <input type="text" value="0"/> (0/1/2/3)</p> <p>MAC Address: <input type="text" value="d8-b0-4c-c0-0e-7f"/></p> <p>User name: <input type="text" value="admin"/></p> <p>Pass word: <input type="text" value="admin"/></p> <p><input type="button" value="Save"/> <input type="button" value="Cancel"/></p>	help
Local IP Config		
TTL1		<ul style="list-style-type: none"> <li><b>module name</b> max length is 15 char</li> <li><b>Web port</b> default 80</li> <li><b>ID and ID type</b> we could use it for D2D</li> <li><b>Mac address</b> user could modify this MAC address</li> </ul>
Web to Serial		
Misc Config		
Reboot		

Figure 19 → Gateway Misc Configuration Page

### Static IP Settings - Reset to DHCP

After setting a static IP address on the gateway and it is no longer accessible on the network you can reset the gateway back to using DHCP using the following instructions:

1. Unplug the device.
2. Plug the device back on while using a reset pin or paper clip to press and hold the reset button
3. The LEDs will flash rapidly before changing to a cyan colour to indicate the reset is underway – the reset button can now be released.
4. After a few minutes the LED will revert back to its normal state of green before trying to establish a connection with devices and the internet.
5. The gateway should be accessible on the network again. Please login to ensure that DNS settings are set to 'auto' (the greyed out settings are ignored). Finally, reboot the gateway to complete the process.



parameter

IP type:

DNS type:

Static IP:  .  .  .

Submask:  .  .  .

Gateway:  .  .  .

DNS Server:  .  .  .

Figure 20 → Reset to DHCP

## 10. Maintenance and Calibration

The TD40 is shipped pre-calibrated. There are no user serviceable parts. Calibration is required typically every 2 years by returning the monitor to NuWave Sensors for a service.

## 11. Important Precautions

Caution! This device is recommended for use indoors and in a dry location only.

- Take care when using TD40 to route the power cable in a way that reduces the risk of injury to others, such as by tripping or choking
- Do not cover or obstruct vents around the TD40 monitor
- Only use the power adapter supplied with TD40
- Do not insert anything through the vent
- Do not inject gas, dust or chemicals directly into the TD40 monitor
- Do not use this device near water
- Do not drop or subject the device to undue shock
- Do not place in insect-infested areas. Insects can block vent openings to the sensors. Apart from periodic calibration (see 11.1) the TD40 is designed to be maintenance free, but you should keep it clean and avoid dust build up - especially around the air vents of the sensor which can reduce

performance. To clean the TD40:

- Turn off mains power and remove the power adapter plug from TD40
- Wipe the outside with a clean, slightly damp cloth. Don't use soap or solvents!
- Very gently vacuum around the vents of the TD40 monitor to remove dust obstructing the vent openings

The TD40 should be protected from certain external influences. Namely;

- The unit should not be placed near anywhere that may leak from above (unit is not IP68 rated)
- The unit should not be wet cleaned with cleaning products
- The output vents should not be blocked for any reason

Important Notes:

- Never use detergents or solvents on your TD40 monitor or spray air fresheners, hair spray or other aerosols near it
- Do not allow water get inside the TD40 monitor
- Do not paint your TD40 monitor

## 12. Recycling and Disposal

The TD40 should be disposed of separate from ordinary household waste at the end of its life in accordance with local regulations. Please take the TD40 to a collection point designated by your local authority to be recycled to help conserve natural resources.

## 13. Product Warranty

### Limited Product Warranty

THIS LIMITED WARRANTY CONTAINS IMPORTANT INFORMATION ABOUT YOUR RIGHTS AND OBLIGATIONS, AS WELL AS LIMITATIONS AND EXCLUSIONS THAT MAY APPLY TO YOU AS PART OF THE TERMS AND CONDITIONS OF SALE IN EFFECT AT THE TIME THAT YOU PURCHASE A NUWAVE SENSOR TECHNOLOGY LIMITED PRODUCT.

### What this warranty covers?

NuWave Sensor Technology Limited (“NuWave”) warrants to the original purchaser of this TD40 sensor (the “Product”) shall be free of defects in design, assembly material, or workmanship under normal use for a period of two (2) years from the date of purchase (the “Warranty Period”). NuWave does not warrant that the operation of the Product will be uninterrupted or error-free. NuWave is not responsible for damage arising from failure to follow instructions relating to the Product’s use. This Limited Warranty does not cover software embedded in the Product and the services provided by NuWave to owners of the Product. Refer to the licence agreement accompanying the software for details of your rights with respect to their use.

### Remedies

NuWave will repair or replace, at its option, any defective product free of charge (except for shipping charges for the product). Any replacement hardware product will be warranted for the remainder of the original warranty period or thirty (30) days, whichever is longer. In the event that NuWave is unable to repair or replace the product (for example, because it has been discontinued), NuWave will offer either a refund or a credit towards the purchase of another product from NuWave in an amount equal to the purchase price of the product as evidenced on the original purchase invoice or receipt.

### What is not covered by this warranty?

The warranty is null and void if the Product is not provided to NuWave for inspection upon NuWave’s request, or if NuWave determines that the Product has been improperly installed, altered in any way, or tampered with. The NuWave Product Warranty does not protect against floods, lightning, earthquakes, war, vandalism, theft, normal-use wear and tear, erosion, depletion, obsolescence, abuse, damage due to low voltage disturbances such as brownouts, non-authorised program or system equipment modification, alternation or other external causes.

### How to Obtain Warranty Service

Please review the online help resources at [glan-air.com/resources/](http://glan-air.com/resources/) prior to seeking warranty service. To get service for your TD40 sensor you must take the following steps;

Contact NuWave Sensors customer support. Contact information can be found by visiting [glan-air.com/](http://glan-air.com/)

Provide the following to the customer support agent;

The serial number found on the back of your TD40 sensor

Where you purchased the product

When you purchased the product

Proof of payment

Your customer service representative will then instruct you on how to forward your receipt and your TD40 as well as how to proceed with your claim.

It is likely that any stored data relating to the product will be lost or reformatted during service and NuWave will not be responsible for any such damage or loss.

NuWave reserve the right to review the damaged NuWave product. All costs of shipping the Product to NuWave for inspection shall be borne by the purchaser. Damaged equipment must remain available for inspection until the claim is finalised. Whenever claims are settled NuWave reserves the right to be subrogated under any existing insurance policies the purchaser may have.

### **Implied Warranties**

EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW, ALL IMPLIED WARRANTIES INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) SHALL BE LIMITED IN DURATION TO THE DURATION OF THIS WARRANTY. Some jurisdictions do not allow limitations on the duration of an implied warranty, so the above limitation may not apply to you.

### **Limitation of Damages**

IN NO EVENT SHALL NUWAVE BE LIABLE FOR INCIDENTAL, SPECIAL, DIRECT, INDIRECT, CONSEQUENTIAL OR MULTIPLE DAMAGES SUCH AS, BUT NOT LIMITED TO, LOST BUSINESS OR PROFITS ARISING OUT OF THE SALE OR USE OF ANY NUWAVE PRODUCT, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

### **Statutory Rights**

This warranty gives you specific legal rights, and you may have other rights, depending on your jurisdiction. These rights are not affected by the warranties in this Limited Warranty.

## 14. Troubleshooting

Problem	Possible Issue		Solution
No data arriving online after 15 minutes	1	Ethernet Cable not firmly connected on data hub	Power off both the DATA HUB and TD40 SENSOR by plugging out the power supplies. Please ensure that the Ethernet cable is firmly connected to both the DATA HUB gateway and the port on your broadband router. Apply power to both devices and check to see if data arrives after 15 minutes.
	2	Outside of wireless range	The wireless range of the sensor can vary greatly depending on the environment. To test this please plug the TD40 in close range to the DATA HUB. Data should arrive online once the solution to issue number 1 above has been tested.

Figure 21 → Troubleshooting Table

For all other queries please contact [info@nuwavesensors.com](mailto:info@nuwavesensors.com) stating the issue you having. Please provide as much detail as possible.