USER MANUAL

Guardian2

Guardian2 & Casella 24/7 Data Management System

HB4085-02

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Casella
Regent House,
Wolseley Road,
Kempston,
Bedford.
MK42 7JY
T: +44(0) 1234 844 100
F: +44(0) 1234 841 490
E: info@casellasolutions.com

Contents

Important notices

Manual handling

Take care when carrying or installing the Guardian2 particularly if working at height or holding the Guardian2 itself above head height during installation.

Note: If in doubt, check with your local health & safety representative who will advise you on whether two people are required.

Power

The Guardian2 is delivered ready wired for 110V operation but may also be operated from 240V. A competent electrician should fit the correct plug. Live mains runs through the product so all necessary precautions should be taken.

Note: If you have ordered Solar or Battery power options, please refer to page 49 of this manual for additional information.

Email notifications

In order to get the best response from the **Casella24/7 Data Management System** you (or your IT support staff) should add the following email address to your email system's whitelist (or safelist): no-reply@casella247.com

Note: Failure to do so may result in important email notifications from the **Casella24/7 Data Management System** being delayed or even blocked entirely.

Weekly checks

Due to the nature of construction sites, it is advisable to check the installation on a weekly basis i.e. for physical damage to the Guardian2's housing and cables and that air inlets/outlets are not blocked. At the same time, it is recommended that noise versions are calibrated using an acoustic calibrator at which time the microphone and it's enclosure can also be inspected. Dust versions should be checked to ensure that the air sampling inlet is not damaged or blocked. For further information refer to Service and Maintenance.

Caution – laser product

The particulate sensor is a Class3B laser and the sensor should not be opened to avoid exposure to the beam. The sensor uses a diode laser (max 25mW) which is Class 1 as a user does not have access to the source. The user must not open or access the laser source.

Introduction

Thank you for purchasing the Guardian2 and Casella 24/7 Data Management System.

Casella prides itself on providing precision instrumentation since 1799, supplying eminent figures including Darwin and Livingstone. A lot has changed in our 200 year history but what does remain is our commitment to reliable, trustworthy and credible solutions.

For more information or to find out more about Casella and our products, please visit our website at: http://www.casellasolutions.com.

The Guardian2 hardware and Casella247 Data Management Software are intended to be intuitive and easy to use but we recommend that you familiarise yourself by reading this user manual.

If you have any queries, concerns or problems with the products or service we've supplied, please don't hesitate to contact us either by email at: info@casellasolutions.com or by phone to Technical Support on 01234 847799.

Guardian2 system with particulate, noise and wind sensors

System description

The system consists of Guardian2 hardware which is installed at a sensitive façade(s) and **Casella 24/7 Data Management System**, which is hosted on an off-site server where data is accessed by a secure login and password.

Once power is connected, the instrumentation will power up and the custom designed mHUB datalogger, central to the Guardian2's operation, will establish communication with the server and begin to transfer data. This assumes that a mobile signal is available but the mHUB uses an on board electronic SIM which means it will search for the best available connectivity.

There are several versions of Guardian2 hardware which may be configured at the time of ordering to measure single or combinations of so-called agents; namely noise, dust and ground vibration with optional wind speed & direction. The latter could be important in dealing with complaints about dust since information about the prevailing wind conditions could prove that your site was not the cause of the fugitive dust.

Email and SMS alerts can be set up should any of the agents exceed set limits, allowing immediate actions to be taken to head off potential complaints, plus regular reports can be generated for compliance purposes.

Your organisation will have been given Administration rights in order to make local changes e.g. to set limits and generate reports and to enable other Users to be set up.

Taking delivery

The Guardian2 system has been assembled and tested prior to dispatch in accordance with your order. On receipt, please check the Guardian2 hardware itself and the other contents of the packaging against the part number in the table and the bill of materials. If you believe anything is missing or has been damaged in transit please notify Casella at once.

Model numbers

Depending on which Guardian2 system was ordered, the sensors will have been delivered as per the table below.

Guardian2 - Part Numbers

Part Number	Particulate (PM10 & PM2.5)	Noise	Vibration	Windspeed & Direction
208049D			●	●
208052D		●	●	
208054D		●		●
208057D		●		
208061D			●	
208063D		●	●	●
208170D	●	●	●	●
208171D	●	●		●
208172D	●		●	●
208173D	●			●
208174D	●	●	●	
208175D	●	●		
208176D	●			
208177D	●		●	

All systems as standard are delivered with a yellow 110V industrial cable and plug. A 240V (blue) cable with standard UK 3 pin plug can be specified at the time of ordering with part number 208084B.

Accessories

208041C – Replacement windshield enclosure system.

208104D – Windshield enclosure system extension kit (includes 5m extension cable and mounting brackets.

208083C – Spare 5m windshield extension cable

208022C – Replacement windshield foam

CEL-120/1 – Class 1 acoustic calibrator

N104007 – Vibration sensor extension cable (30m).

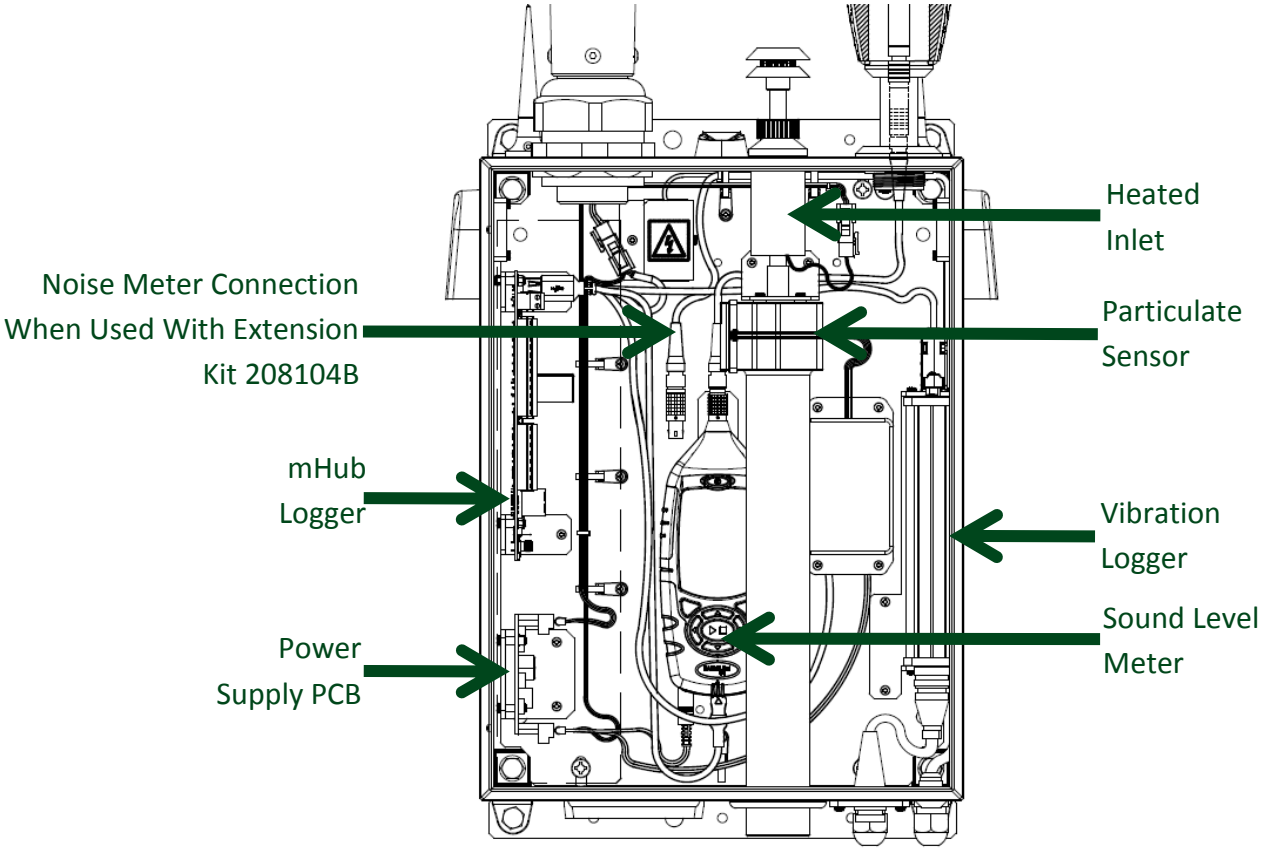
External sensors

The sensors attached to the outside of the Guardian2 will depend on the model ordered. See the diagram below for their description. These external parts will have been packaged separately to the main Guardian2 enclosure, and instruction on attaching them is included in the following manual.

Notes: The GPS antenna supplied may be different to the one pictured above. The vibration sensor is not shown in the picture above as it is situated outside of the main Guardian2 enclosure.

Internal configuration

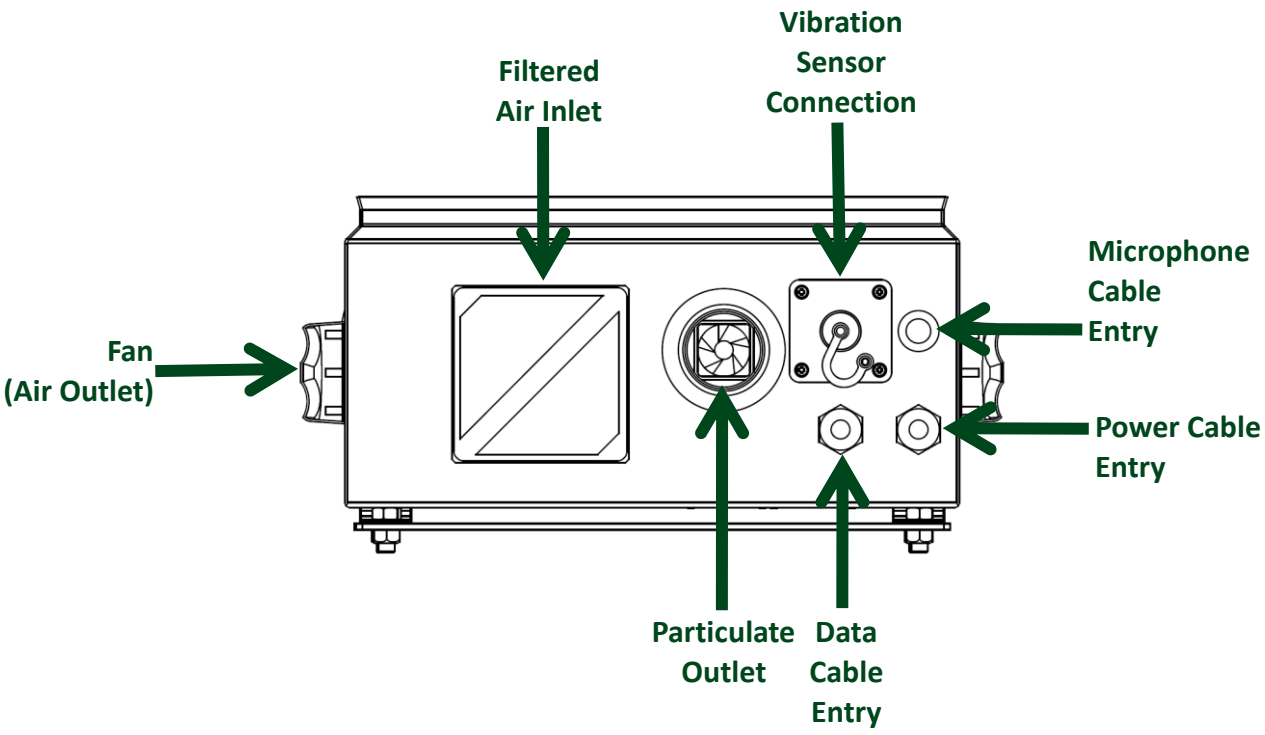
The diagram below illustrates the internal configuration of the Guardian2 unit when all sensors are fitted.



Notes: A rain cover is provided on the left of the enclosure which is not shown in the above diagram. Lift the rain cover as necessary.

Connections to the Guardian2

The diagram below refers to a Guardian2 with all sensors installed. Some connectors will be replaced with blanking plugs where sensors are not installed. All Guardian2 units will require the power connection to be wired through the power cable entry regardless of any other connections that need to be made.



Underside View of Guardian2

Note: The data cable entry will already have the cables to the data antennas fitted.

Noise versions

63X Sound level meter (installed in Guardian2)
Measurement Microphone and preamplifier
Outdoor Microphone protection system and support bracket (part 208104B - optional)
Microphone Extension Cable (part 208083C - optional)
CEL-120/1 Acoustic (Microphone) Calibrator (Optional)

Particulate versions (PM10, PM2.5 and PM1.0)

Particulate sensor will come installed in the Guardian2 for the applicable models.

Caution: The particulate sensor is a Class3B laser and the sensor should not be opened to avoid exposure to the beam.

Vibration versions

Geophone & 25m cable will be supplied. This will need connecting to the Guardian2 enclosure and siting the sensor in a suitable location. An additional two extension cables (N104007) can be fitted to the standard cable to give a total cable length of 85m.

Parts common to all systems

Data communication antenna (2-off), already fitted.
GPS antenna, already fitted.
U-bolts for 50mm scaffold fixing (2-off).
Case key.
User Manual (this document, HB4085 – downloadable from website).
Power cable (Yellow 110VAC supplied as standard, Blue 240VAC is optional).

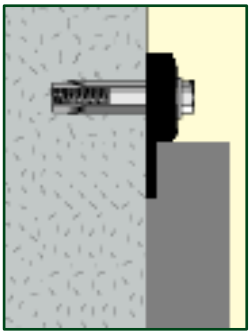
Note: If the wind speed & direction option has been specified, the sensor may be supplied fitted to the Guardian2 but will require aligning to North.

Installation of the Guardian2 hardware

Fixing

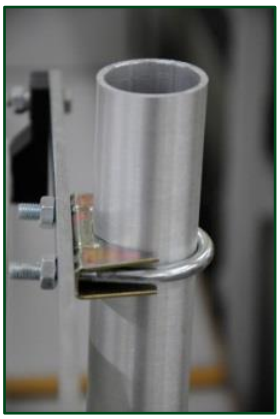
There are two mounting options:-

The first option is to fix the Guardian2 to a solid structure e.g. brickwork by using 4 off M8 x 50mm expanding rawl bolts or suitable alternative fixings depending on the material.



Use the brackets on each rear corner of the Guardian2 casing (with the cross braces removed) as shown.

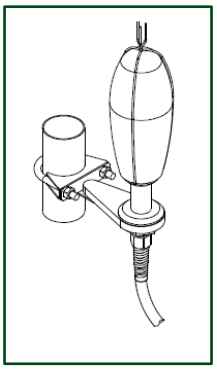
The second option is to fit the Guardian2 to a standard 50mm scaffold-style pole using the “U” bolts and cross braces provided. With the latter in place, the Guardian2 may be fitted to a scaffold-style pole using the holes centrally located on the top and bottom cross braces as shown.



Connecting the outdoor microphone enclosure

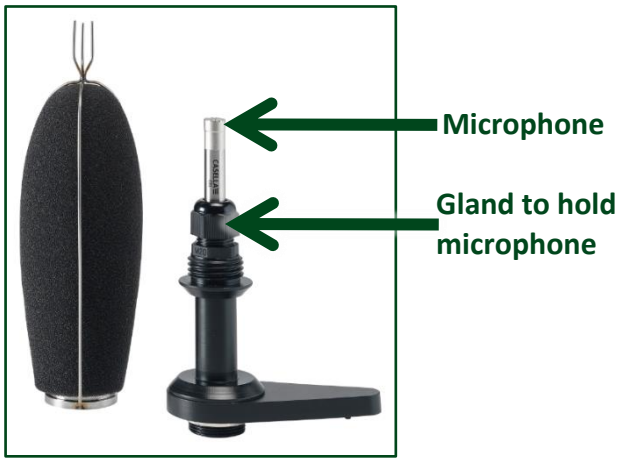
Noise versions of the Guardian2 require an Outdoor Microphone Enclosure to protect the sensitive microphone element from wind and rainfall. It requires a connection between the microphone and preamplifier located inside the Outdoor Microphone Enclosure to the sound level meter itself housed within the Guardian2 enclosure. If the Outdoor Microphone Enclosure has been delivered mounted on top of the Guardian2, an internal cable (part 208077B) should already have been connected.

If it is being remotely mounted, it requires a mounting extension kit (part 208104B) and microphone extension cable (part 208083C, included in 208104B). This can be mounted to a pole as shown below.



Outdoor Microphone Enclosure with mounting extension kit

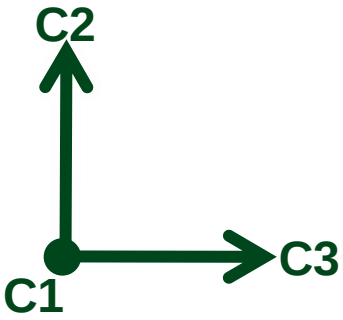
When using the microphone extension kit, the microphone and preamplifier must be connected to the input connector located on the underside of the casing on the right hand side as previously shown, using the extension cable which is part of the extension kit. There is a small red dot on the connector and also on the mating panel mounted socket on the Guardian2 and these should be lined up and simply pushed together. To remove, pull back on the outer knurled part of the connector to release the locking mechanism.



Ensure the tip of the microphone is about 60mm from the top of the gland. This will ensure it is half way up the windshield and create the best protection for the microphone. Once positioned tighten the gland to hold the microphone in place.

Connecting the vibration sensor (geophone)

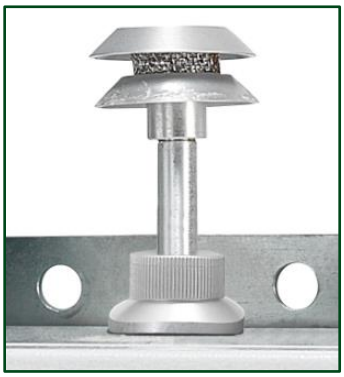
The geophone sensor (pictured below) will come complete with a cable of 25m. Site the sensor where it will not be damaged and with the arrow pointing at the potential source of vibration. An M5 hole is provided through the sensor to allow it to be securely mounted. The sensor should be fixed directly to a surface (e.g. concrete) using the mounting bolts provided. A spirit level shows if the sensor is vertical. Incorrect mounting will mean the frequency and amplitude of the measurements are affected. Connect the sensor cable to the underside of the Guardian2.



The arrow on the sensor block points along the longitudinal axis which is described as Channel 2 (C2 on casellaview247). Likewise, the vertical axis is C1 and the transverse axis is C3.

Particulate inlet

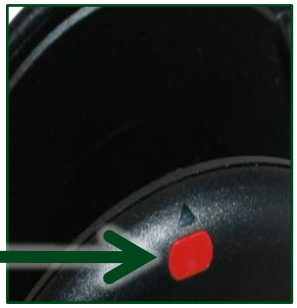
The dust inlet will have a screw on cover, remove the cover and attach the inlet as shown in the picture below if it is not already fitted to the Guardian2.



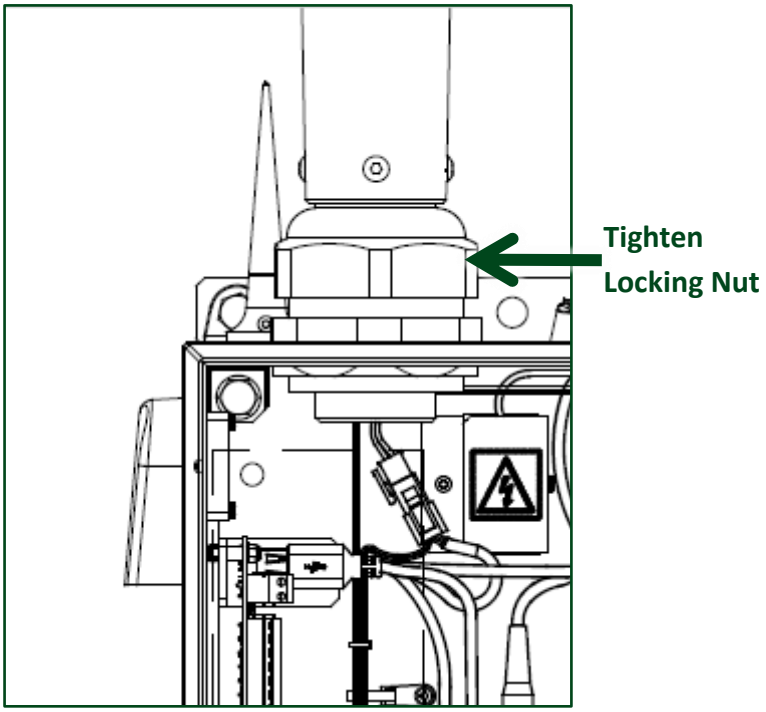
Setting the wind speed and direction

If fitted, the wind speed & direction sensor must be aligned to North. There is a small red mark on the underside of the wind speed & direction sensor and an embossed arrow, see picture below. Use a compass in order to locate North and rotate the assembly such that the red dot/arrow is facing North. Once set, tighten the large locking nut at the base of the sensor by hand to fix it into position and then recheck the alignment.

Once the sensor is aligned and screwed securely to the Guardian2 enclosure, the electrical connection must be attached to the logger.



Note: The sensor has a grommet to seal against water ingress. When aligning the sensor only rotate rather than lift to prevent the grommet becoming unseated.

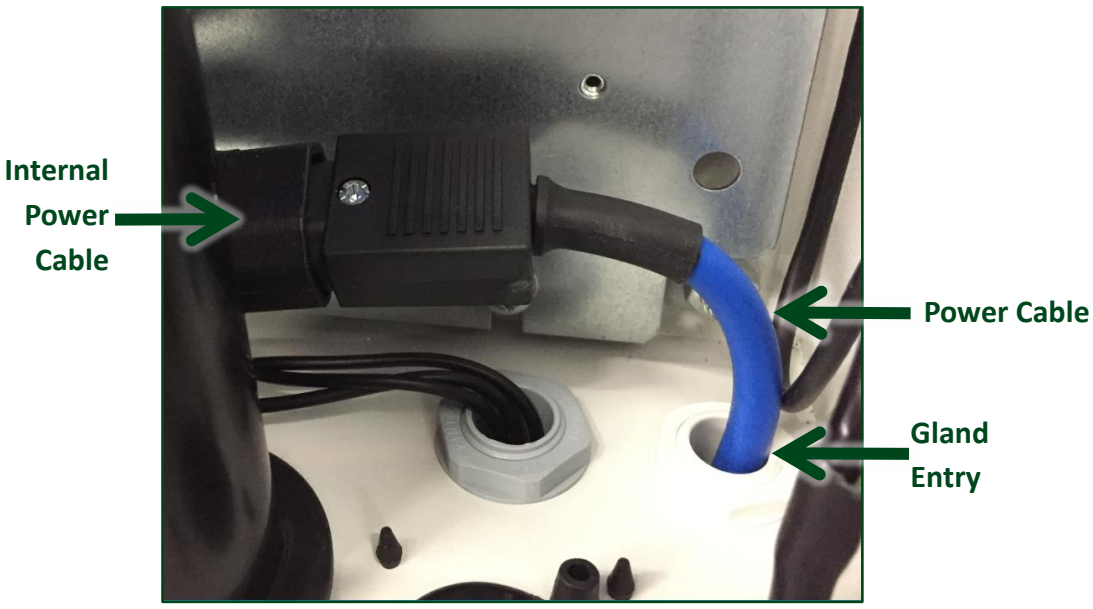


Data communication & GPS

There are three black wires extending from the Guardian2 which connect to two mobile communication antennas plus one GPS antenna. The data antennas have magnetic bases and should be mounted as high as possible to achieve the best reception for data transfer. The aerials should not be placed near the wind sensor. The GPS antenna can be located on top of the Guardian2, as can the data antennas if there is no wind sensor. The GPS antenna should have clear line of sight to a good cross section of clear sky.

Connecting power

The Guardian2 will need to be fitted with industrial plugs. A cable will be provided to connect the Internal Power Cable to an external plug socket. This cable will need feeding though the gland as shown below and connecting to the internal power cable.



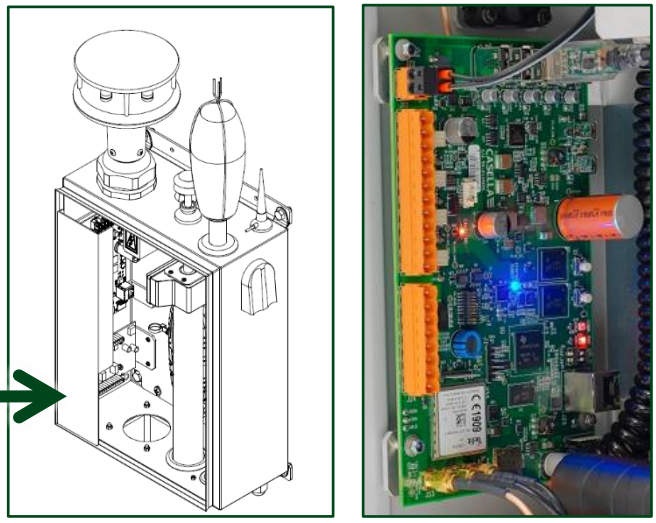
Once the cable has been fed through the gland to the outside, connect the correct plug as applicable. The 110VAC (coloured yellow) cable is supplied with the Guardian2 as standard. The 240VAC cable (coloured blue) is optional at the time of ordering and is supplied with a UK standard 3 pin plug.

Note: If you have ordered Solar or Battery power options, please refer to page 50 of this manual for additional information.

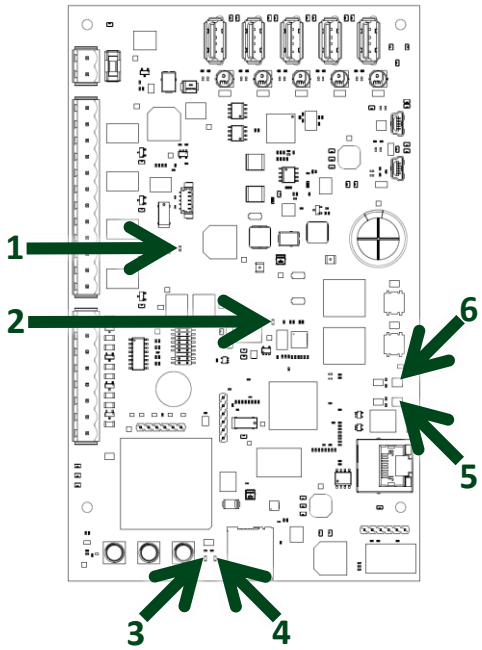
Switching on & commissioning

Open the Guardian2 using the case key provided and swing the rain cover located on the left-hand side up to view the mHUB datalogger (itself located on the upper left hand side of the enclosure). The rain cover is there to protect electronics and power if the enclosure is opened when it is raining. With power applied, after a few moments the Guardian2 will automatically switch on. You will see a series of flashing LEDs on the mHUB logger and the instrument(s) within the Guardian2 will also switch on.

Lift rain cover from bottom to access the mHub



General view of the Guardian2 (rain cover in place) and close up of the mHUB Datalogger



Layout of mHUB datalogger

Referring to the mHUB layout diagram above, the start-up sequence is :-

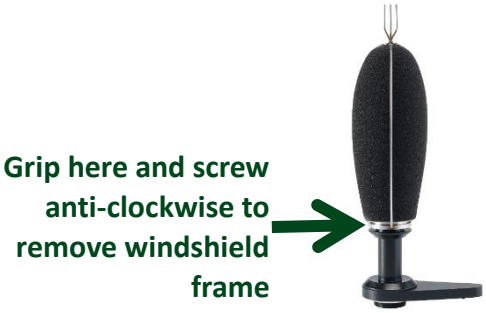
1. Red LED flashes to indicate that the on-board backup power supply is charging (see note below). After a while it will flash rapidly then permanently turn on, this may take up to 4 minutes.
2. The blue LED will then illuminate to indicate that the mHUB is being powered.
3. The green LED will then illuminate to indicate that the on-board modem is powered.
4. The amber LED will flash to indicate that it is connected successfully to a mobile network. If there is no network connection this light will be off. If it can find a network but is unable to register, the LED will be a solid amber.
5. The red LED will permanently turn on, shows there is an active cellular connection.
6. Under normal operation this LED will have a flashing amber element on a green background which shows the Linux operating system is working correctly and the time is being synchronised to the server.

Note: that the on-board backup power supply is only sufficient to perform an orderly shutdown to preserve data in the event of an external power outage. The Guardian2 will not continue to capture data without external power.

The Guardian2 is now running and data will be sent to the Casella24/7 Data Management System website.

Calibrating for noise

Open the Guardian2 using the case key provided. Identify the noise meter within the Guardian2 and press the keys in the order shown below to stop the measurement. The screen will go red at the top and bottom edges to denote the measurement has stopped.



Remove the outdoor wind/rain microphone protection enclosure (foam and frame assembly) by unscrewing (as above), exposing the microphone. Connect the acoustic calibrator (CEL-120) to the top of the microphone pushing down gently to make a seal, picture below.

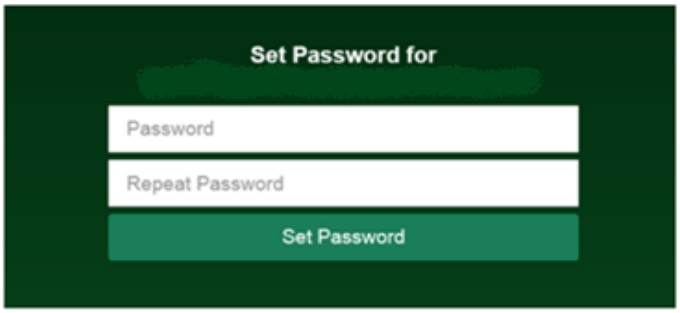
Note: Do not twist or screw on or off the calibrator on the microphone capsule.

The sound level meter will recognise that a calibration tone is present once the calibrator is switched on. Follow the instructions on the screen (pictured below) of the sound level meter to perform a calibration. Once complete remove the calibrator, press the large button (▶ ■) in the middle of the keypad, the display screen will go green at the top and bottom edges indicating that a measurement run is in progress. Reattach the microphone enclosure.

Note: It is recommended that calibration is performed regularly as part of a program of periodic checks to ensure the Guardian2 is working correctly.

Accessing data – Casella247.com

Log-in and password



In order to gain access to the ***Casella 247 Data Management System (Casella247)*** users are initially added either by Casella or their own Organisation Administrator. Once added, the new user will automatically receive an invitation email with a link to the website allowing them to specify their preferred password. There is also a 'Forgotten Password?' link on this screen, with which passwords can be reset.

Available user accounts

Casella247 supports two levels of user account; *Organisation Administrator* and *Standard User*.

Organisation Administrator (Admin):
Users with this level of account access are able to add and remove users, allocate and deallocate Guardian2 systems, configure Guardian2 systems and create reports and alert notifications.

Standard User (User):
Users with this level of account access are limited to which Guardian2s they have access to and then only have read access to the data generated by these systems.

These users are able to create and edit reports for any of the systems they have access to but are unable to change the way any of the Guardian2s operate or set alerts.

First time log-in

After you receive the invitation email from ***Casella247*** click on the link provided and you will be redirected to the ***Casella247*** website where you will be asked to specify a new account password.

Please remember that the data contained within ***Casella247*** is extremely important to your organisation and so you should make every effort to ensure the password you set is secure enough to resist any attempts by third parties to gain access to the system. Seek advice from your IT support if necessary.

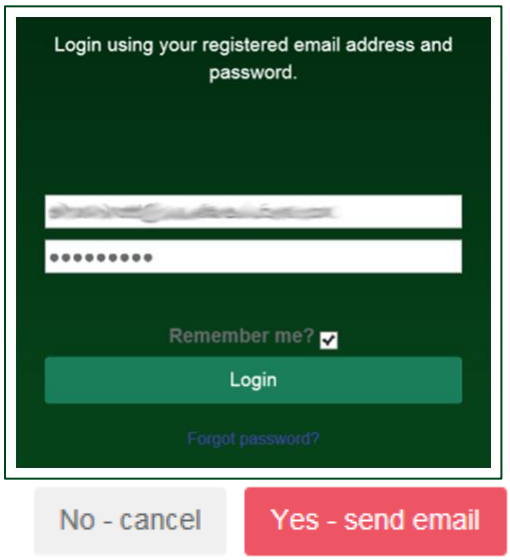
Enter a suitably secure password into the upper box and repeat it in the lower box, finally click the ***Set Password*** button. You should then be automatically re-directed to your ***Casella247*** homepage.

If this doesn't happen, manually type the web address (www.casella247.com) into your browser's address bar and log in using your email address and previously specified password.

Note: After being inactive for ten minutes users will be logged out automatically.

Log-in to Casella247

After your account has been created on the ***Casella247*** website and your password set, subsequent log-ins should be made directly to the main address (www.casella247.com). Either type this in manually or add as a bookmark to your browser:



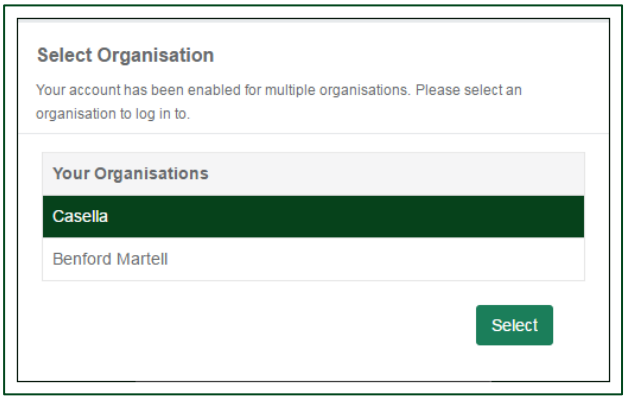
If you forget the password for your account, go to the main address (www.casella247.com) enter your email address used to create the account if necessary, then click on the ***Forgot Password*** link (located under the ***Login*** button).

When prompted, confirm that you wish to reset or cancel. Check your email inbox and when the reset password email arrives click the link and enter a new password (as you did the first time). If no email is received in a timely manner, check with your IT support.

Users of multiple organisations

It is possible for users to be granted access to more than one organisation on the ***Casella247*** system, such as third-party consultants or government officials for compliance purposes.

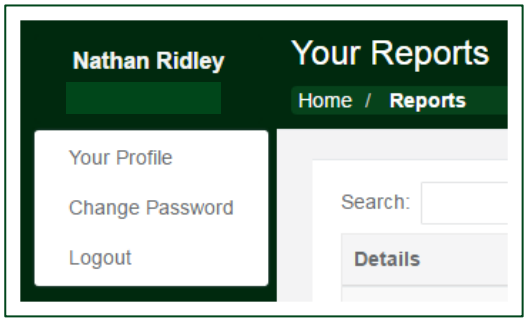
When this is the case an additional dialog is presented to the user after they have entered their username and password:



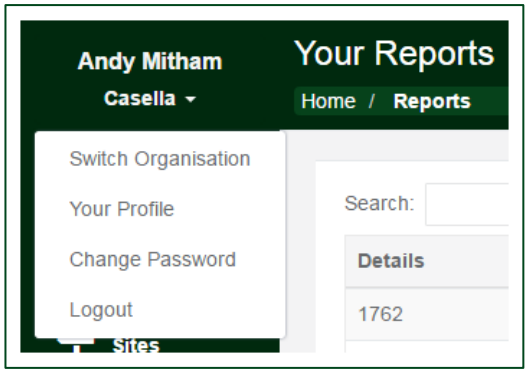
The user should highlight the organisation of interest and click the ***Select*** button.

Logging out (or switching organisations)

To log out from ***Casella247*** click on your username as displayed in the top left of the page and select the ***Logout*** option from the displayed menu:



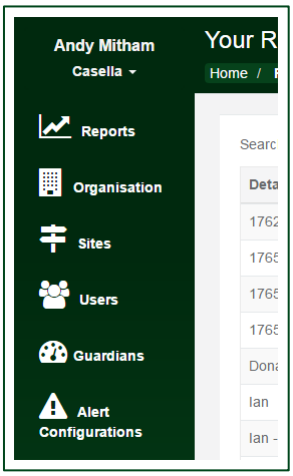
If you've been set up as a user for more than one organisation then the menu will also include the ***Switch Organisation*** option. This enables the user to switch between organisations without the need to manually log out and back in again:



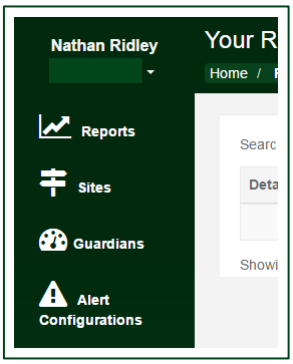
Site navigation

The main areas of the site are accessed via the options available in the ***Navigation Bar***:

Admin View



Standard User View



Reports

Any user can set up automated reports for Guardian2 data they have access to. In addition any existing report can be generated manually in order to access historical data from any specified time/date.

Users are free to create new reports, edit existing reports and delete reports no longer required.

Any reports created are linked to that user and will not interfere with reports created by other users of the system.

Automated reports can be sent to more than one recipient if required.

Note: Reports are the means of accessing data from Guardian2 units, reports must be set up in order to view data.

Organisation (admin only)

From here new users can be added to the system or existing users granted access to your organisation's Guardian2 data.

New users will automatically receive an invitation email once their account has been created and will have to specify their own password before they can log in.

Existing users of the system can be added to your organisation, but you must already know the email address they are using to log into the system (this is a standard security/privacy measure for the ***Casella247*** site).

Sites

In order to more easily track Guardian2 assets deployed in the field, the ***Casella247*** system operates on a principle of ***Sites*** and ***Locations***.

An organisation can contain one or more sites which in turn can contain one or more locations and each location contains a single Guardian2 unit.

By highlighting an available site in the displayed list all (active) Guardian2 stations associated with that site will appear as individual pins on the displayed map. Green pins are active, red pins mean the site has not communicating.

Admin users are able to change the structure of available sites and locations or add new ones and delete obsolete ones as required.

'Standard' users can only view the current structure and map data for (active) Guardian2s.

Note: Map pins are coloured to indicate if the Guardian2 is active. A green pin indicates an active site, where as a red pin will indicate the Guardian2 is not transmitting data to it's specified transmission (push) interval.

Add new users (admin only)

From here new users can be added to the system or existing users granted access to your organisation's Guardian2 data.

New users will automatically receive an invitation email once their account has been created and will have to specify their own password before they can log in.

Existing users of the system can be added to your organisation, but you must already know the email address they are using to log into the system (this is a standard security/privacy measure for the ***Casella247*** site).

Guardians

This page will list all the Guardian2s that the user has been permitted access to (Admins will see all Guardian2s for the organisation).

Standard users will be able to display when any particular Guardian2 was last active on the system and any alerts associated with it.

Admin users will be able to modify the operation of any Guardian2, including what parameters are recorded in the unit and how often.

Note: Individual users will need adding to each individual Guardian2 unit. If they are not added users will not receive automatic reports associated with the Guardian2.

Alert configuration

For standard users this page lists all alerts currently configured on the Guardian2 units the user has access to. This includes how the alerts have been configured, who is notified and a history of alert notifications.

In addition Admin users will be able to edit the alert configurations if required.

Setting up your organisation (admin only)

Your Organisation together with one or more Admin Users will already have been added to the ***Casella247*** system before any Guardian2 units were dispatched.

Each ***Admin*** user will have received an invitation email from the ***Casella247*** system and should aim to set their password as soon as possible after that.

As part of the Guardian2 manufacturing process new Guardian2s are automatically added to the organisation when they are commissioned prior to dispatch.

It is left up to the ***Admin*** to decide what structure (using ***Sites*** and ***Locations***) is required and which (if any) new users need to be added to the system.

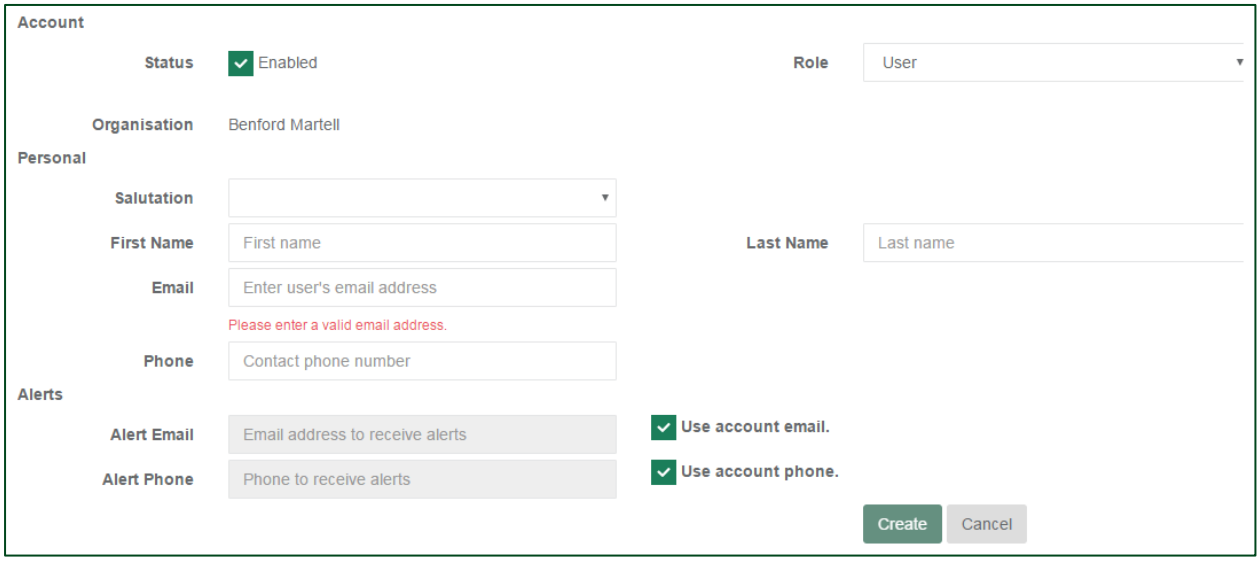
Once this ground work has been completed the ***Admin*** can then decide on what data is to be recorded and who should receive automated reports and alert notifications.

Users

Any organisation ***Admin*** is able to modify user accounts on the ***Casella247*** system for the given organisation.

Add new user

From the ***Navigation Bar*** select the ***Users*** option and click the + New User button, the following screen will then appear:



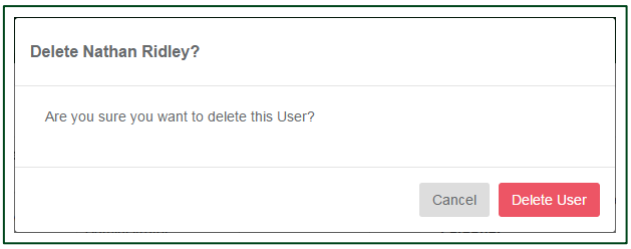
Fill in all the fields and for any new ***Admins*** change the ***Role*** field from ***User*** to ***Organisation Admin***.

By default alert emails and text messages are sent to the main account email and phone number. If these notifications need to be sent to different destinations then un-tick the ***Use account email*** and ***Use account phone*** options and fill in the corresponding ***Alert Email*** and ***Alert Phone*** fields with the required values.

Once all details have been entered click on the Create button. The Casella247 system will create the user account using the details supplied and automatically send an invitation email to the new user (using the email address specified).

Delete user

From the ***Navigation Bar*** select the ***Users*** option and highlight the user (to be deleted) from the list displayed. Click the ⊟ button (shown in the user's detail panel) and when prompted, confirm the operation by clicking on the Delete User button:



Edit user

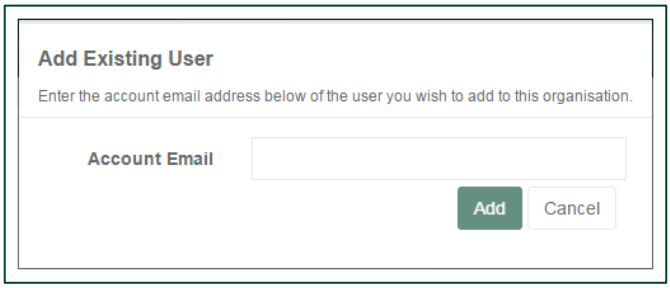
From the ***Navigation Bar*** select the ***Users*** option and highlight the user (to be edited) from the list displayed. Click the ✎ button (shown in the user's detail panel) to open the record in edit mode.

Once all changes have been made save them by clicking on the Update button.

Add existing user

From the ***Navigation Bar*** select the ***Organisation*** option then click the Add Existing User button:

Enter the email address of the existing user to be added to this organisation and click the Add button.



Sites

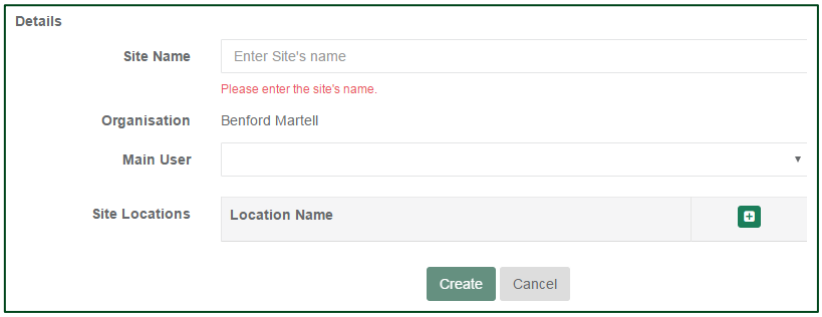
Any organisation ***Admin*** is able to modify the structure defined on the ***Casella247*** system for the given organisation.

To correctly identify any Guardian2 unit on the Casella247 system and in reports and alerts there should exist (a basic structure of) one site with one Location and one Guardian2.

As more Guardian2 units are added to the Casella247 system, this (basic) structure can be extended with new sites and locations to properly describe Guardian2 ownership and deployment.

Add New Site

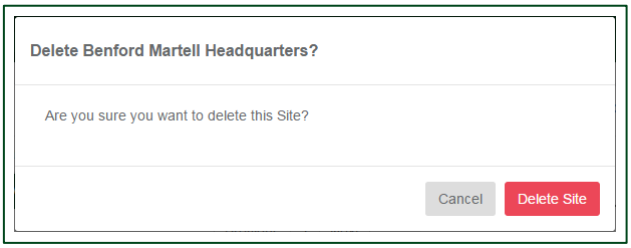
From the ***Navigation Bar*** select the ***Sites*** option and click the + New Site button:



Enter a suitably descriptive Site Name and select a user from the Main User list. One or more Locations can be added to the Site at this point, however this will be covered later on. For now click the Create button to add this new site to your organisation.

Delete Site

From the ***Navigation Bar*** select the ***Sites*** option and highlight the site (to be deleted) from the list displayed. Click the ⊖ button (shown in the site's detail panel) and when prompted, confirm the operation by clicking on the Delete Site button:



Edit Site

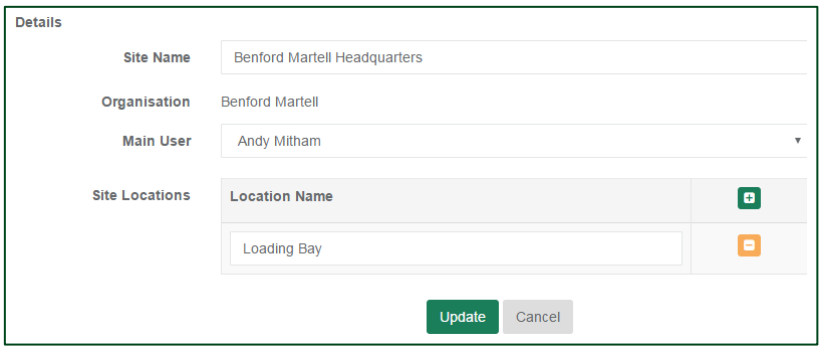
From the ***Navigation Bar*** select the ***Sites*** option and highlight the site (to be edited) from the list displayed. Click the button (shown in the site's detail panel) to open the record in edit mode.

Once all changes have been made save them by clicking on the Update button.

Locations

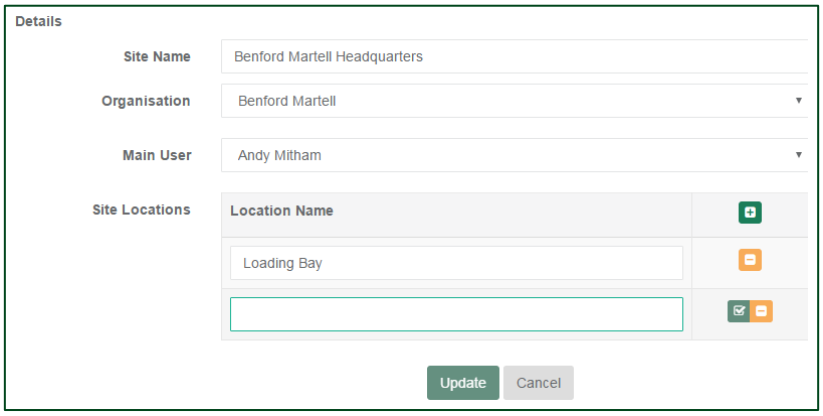
As referred to earlier ***Locations*** are managed from within individual ***Sites***.

From the ***Navigation Bar*** select the ***Sites*** option and highlight the site (for which Locations are to be modified) from the list displayed. Click the button (shown in the site's detail panel) to open the record:



Add New Location

From within the Site details page click on the ***Add Location*** button. This adds a new location line to the available ***Site Locations*** list:



Type in a suitably descriptive name and click the button to accept the new location.

This can be repeated for each new location to be added to the current site.

Delete Location

From within the Site details page click on the ***Delete Location*** button located to the right of the location to be deleted and when prompted, confirm the operation by clicking on the [Delete Location] button:

Any (all) deletions are made permanent by clicking on the Update button.

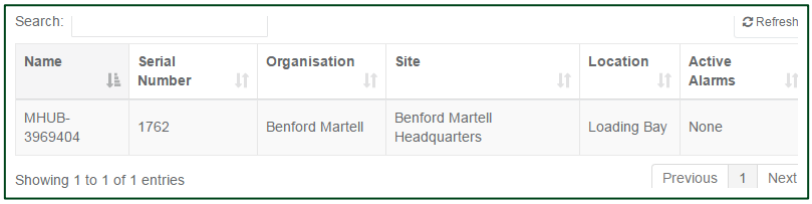
Edit Location

From within the Site details page, click on any of the items shown in the ***Location Name*** list and edit the displayed name as required. Once all changes have been made save them by clicking on the Update button.

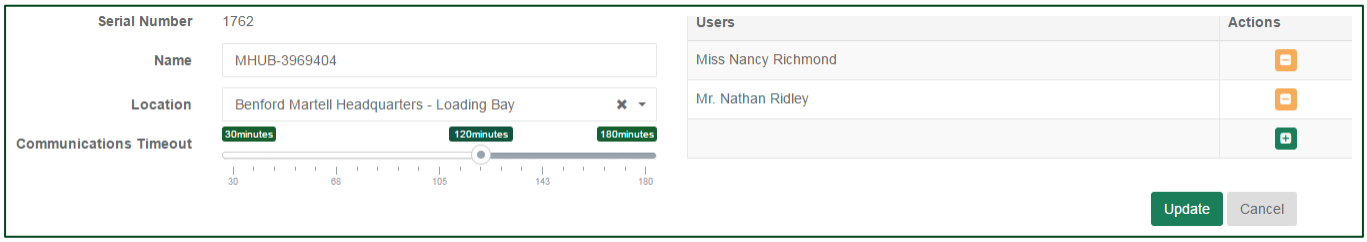
Guardians

In this section we deal only with those details of the Guardian2 that effect how it fits into the structure of the organisation and not how data is collected or alerts generated.

From the ***Navigation Bar*** select the ***Guardians*** option and ***Casella247*** will display a list of available Guardian2 systems:



To edit the details for a Guardian2 highlight it in the displayed list and select the ***Edit Details*** option:



Serial Number

The serial number is fixed during production and is used by ***Casella247*** to uniquely identify each Guardian2 registered on the system.

Name

This field allows users to identify Guardian2s using a naming scheme.

Location

This is where the user integrates the Guardian2 into the organisation's structure. From the list of available locations (actually Site/Location pairs) select the one that identifies where the Guardian2 is to be collecting data for.

Communications Timeout

Although Guardian2s operate autonomously in the field and regularly transmit data (or alerts) to ***Casella247***, there may be instances when network coverage is interrupted.

By setting a suitable value in this field ***Casella247*** can notify the user when these regular communications have stopped.

The timeout specified should be set to a value greater than the corresponding ***Push Interval*** (interval at which the Guardian2 regularly transfers logged data to Casella247), but low enough to ensure a rapid response to network outages.

Users

Only those users specifically listed here will be able to gain access to data collected by the Guardian2 using Casella247.

Once all changes have been made, click on the Update button to save them.

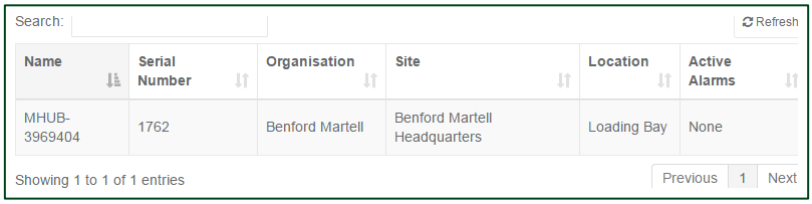
Configuring the Guardian2

In this section we explain how to configure the operational parameters of a Guardian2 including how data is collected and alerts generated.

Whenever a Guardian2 is commissioned in the field (or rebooted) part of the startup sequence is to synchronise its internal configuration with that held by ***Casella247***.

In doing this ***Casella247*** is made aware of the Agents currently connected to the Guardian2 (used during the edit procedure) and the Guardian2 is updated with the latest configuration held by ***Casella247***.

From the ***Navigation Bar*** select the ***Guardian*** option and ***Casella247*** will display a list of available Guardian2 systems:

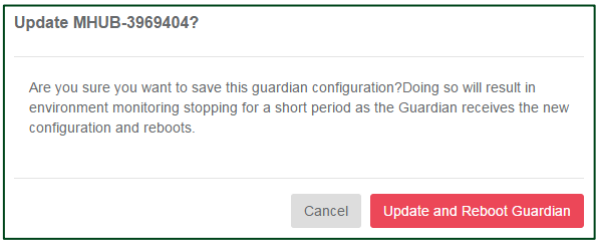


To edit the details for a Guardian2 highlight it in the displayed list and select the ***Edit Configuration*** option available from the details panel:

The Guardian2 configuration is sub-divided into two sections ***Data Collection*** and ***Alert Configuration***. As implied by the names ***Data Collection*** determines what (and how often) data is logged and ***Alert Configuration*** specifies what constitutes an alert condition and who should be notified in the event of an alert.

Because all the options available from within the Guardian2 Configuration effect the operation of the corresponding Guardian2 in the field; all necessary changes should be made before the Update button is clicked.

Once clicked ***Casella247*** will attempt to download the modified configuration to the ***Guardian2*** in order to update it:

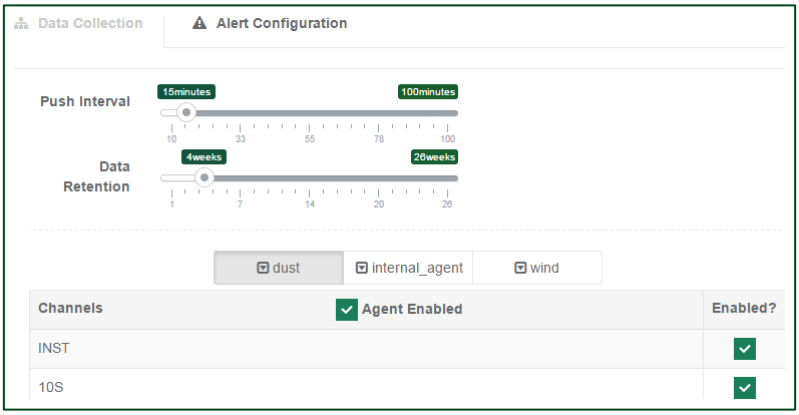


To update and reboot the ***Guardian2*** click the Update and Reboot Guardian button.

Note: If for any reason the ***Casella247*** is unable to update the Guardian2 at this time, the configuration will be placed in a queue and next time communication is established with the Guardian2, the update will occur automatically.

Data collection

The first fields ***Push Interval*** and ***Data Retention*** are always available; however which ***Agents*** get displayed beneath is determined by those attached to the ***Guardian2*** when last commissioned:



Push Interval

Data is logged from each attached Agent at their own specified (***Poll***) rate. This data is collected internally by the Guardian2 and then at each (***Push***) interval all data collected up to that point is compressed and uploaded to ***Casella247***.

In instances where network outages may prevent the immediate transfer of accumulated data, the Guardian2 retains the information internally and when next able to do so upload it automatically without any loss of information.

Note: It should be noted that very short ***Push Intervals*** may increase data charges, as smaller data payloads do not compress to the same extent as any larger ones generated over longer ***Push Intervals***.

Data Retention

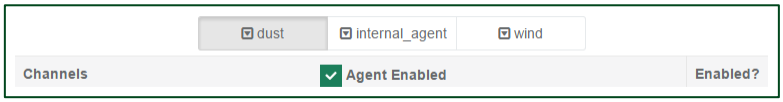
This setting determines for how long un-uploaded data will be retained by the Guardian2. As any Guardian2 has a finite storage capacity older data must be sacrificed in order to continue to log new data, in the event of a prolonged network outage.

Agent configuration

The Data Collection page will also contain a tab for each Agent currently active on the Guardian2. Each tab allows the user to pick and choose (with some restrictions) which parameters are logged and how often. Not all agents include options for ***Poll Interval*** or ***Store Interval***. These differences will be detailed in the relevant sections.

Agent Enabled/Disabled

All agents include an ***Agent Enabled/Disabled*** option which allows for all parameters to be logged (or not) without having to manually update each individual parameter:



Channels

To include a particular parameter in the collected dataset for an agent, put a ☑ (in the ***Enabled?*** column) to the right of the parameter name:

Poll Interval

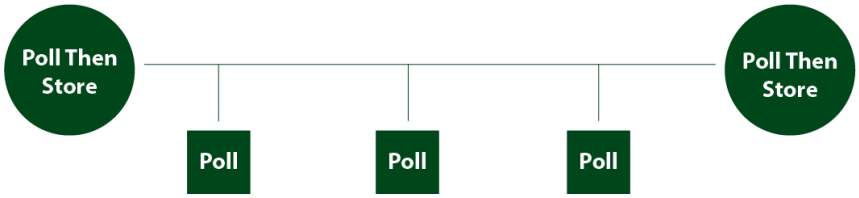
If included for the particular agent, the ***Poll Interval*** determines the rate at which parameter values will be logged.

At the specified ***Poll Interval*** the Guardian2 will request a new set of parameter values from the agent and log these ready for uploading to ***Casella247*** at the next ***Push Interval***.

Store Interval

If included for the particular agent, the ***Store Interval*** works in conjunction with the Poll Interval to allow calculated values to be generated from the agent data.

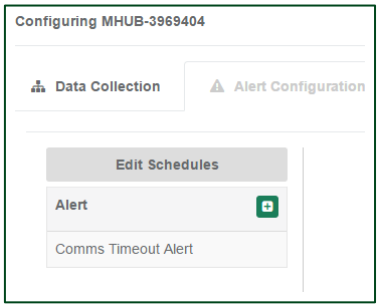
As with the other agents the ***Guardian2*** will request new sets of parameter values at the rate specified by the ***Poll Rate***; however these values will be held back until the ***Store Interval*** occurs. At this point the Guardian2 will perform any necessary calculations on the data to generate the final values to be logged.



So in the example above, the data from the 3 ‘Polls’ in the middle, will be included in the final ‘Poll’ and ‘Store’.

Alerts

By default ***Casella247*** monitors communication with each Guardian2 and maintains a (non-removable) Communications Timeout Alert. This can be used to notify the user should the Guardian2 fail to communicate new data within a specified time period. To activate this alert, add the users to the alert that need to receive the alerts and specify a schedule for the alerts to be sent. Other (optional) alerts can be added to the Guardian2 configuration, to allow the system to notify the user when measured parameters exceed specified limits, i.e. dust concentrations or noise levels. These (optional) alerts can operate in isolation or logically linked to generate a single alert from a compound set of conditions. The alert editor can be accessed from the ***Navigation Bar*** from either the ***Guardian2s*** option (via the Guardian2 detail panel) or the ***Alert Configurations*** option instead:

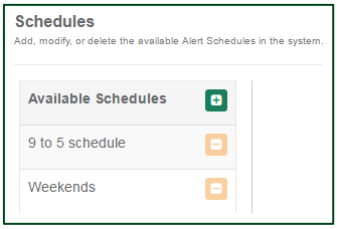


Another feature of the system is the implementation of Alert Schedules. These schedules allow different users to be notified of alerts depending upon the time of day or day of the week specified.

Note: Alert schedules are available to all Guardian2s registered with the current organisation and can only be modified by an ***Admin*** user.

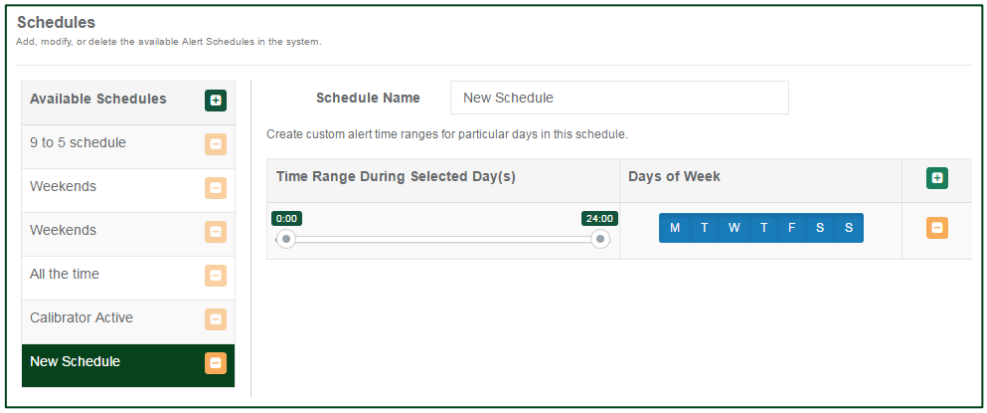
Alert schedules

From the Alert Configuration page select the Edit Schedules option:



Add New Schedule

Click the button (to the right of ***Available Schedules***) and ***Casella247*** will add a new schedule to the list and open it in the schedule editor:



Delete Schedule

Highlight the schedule to be deleted and click the corresponding button.

Once all deletions have been made, click the Save All button to make these changes permanent.

Alternatively click the Cancel button to discard these changes.

Edit alert schedule

Highlighting any schedule in the displayed list will populate the schedule editor (right panel) with the corresponding schedule settings.

By default a new schedule will contain a single ***Time Range…Days of Week*** entry. Additional entries can be added to the list by clicking the button (to the right of ***Days of Week***).

Schedule Name

To avoid confusion give the schedule a name which best describes the overall function of the schedule.

Time Range during Selected Day(s)

Use the two sliders to select the start and end times to be used in this schedule. This time period will be applied to each day selected using the Days of Week field.

Days of Week

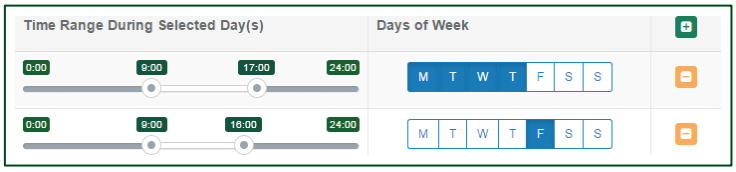
Highlight only those days that are to be included in this schedule.

Once all changes have been made, click the Save All button to make these changes permanent.

Alternatively click the Cancel button to discard these changes.

Example

To create a schedule that accepts alerts between 09:00 and 17:00 (Monday through Thursday), 09:00 to 16:00 (on Friday) but not at the weekend:

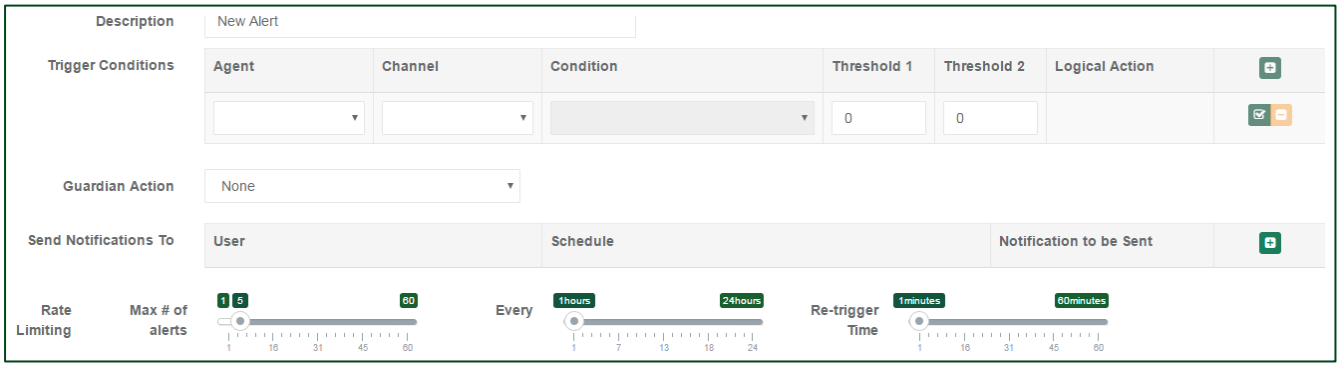


Note: An alert schedules must be set prior to configuring an alert. If an alert is not set the alert configuration cannot be saved

Alert configuration

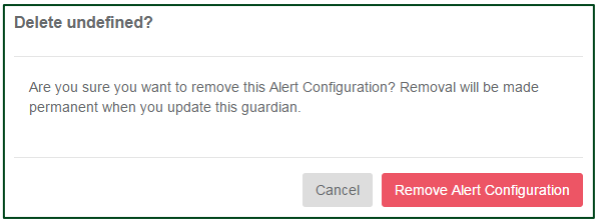
Add New Alert

Click the button next to Alert to add a new alert to the available list and open it in the Alert Editor:



Delete Alert

Highlight the alert in the displayed list and click the associated button. When the confirmation dialog appears click the Remove Alert Configuration button to delete the specified alert:



Edit alert configuration

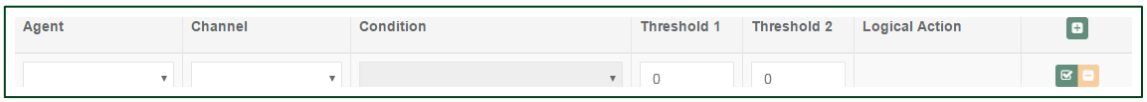
Once all changes have been made to the alert configuration click the Update button to transfer the modified configuration to the associated (deployed) Guardian2 in the field.

Description

Give the alert a descriptive name as this will be included in any notifications sent to the user by ***Casella247*** and will allow quick identification of the alert source.

Trigger Conditions

These conditions determine which measured parameter (or channel) is to be tested and against what limits the parameter value is to be compared:



By clicking the button (to the right of the Logical Action heading) an additional set of Trigger Conditions can be added to the alert.

This allows for compound conditions to be applied to a single alert notification.

For example: Trigger an alert notification when dust levels have exceeded a set level and prevailing wind conditions are blowing the resultant contaminate in an unfavourable direction.

Each Alert can have a maximum of three sets of Trigger Conditions defined.

Agent

Select the agent which hosts the channel the test is to be applied to. Only those agents currently connected to the Guardian2 unit will be available from the drop-down list.

Channel

Once the Agent has been selected this control will be populated with a list of channels available from the agent. Select the channel required from the drop-down list.

Condition

Select the test condition to be applied to the selected channel. ***Casella247*** can test for several conditions:

Below a limit	Threshold 1 is used as the condition limit value.
Above a limit	Threshold 1 is used as the condition limit value.
Inside a range	Threshold 1 is used as the lower and Threshold 2 as the upper condition limit value.

Outside a range Specific condition for the Wind agent/Angle channel and specifically for detecting the sector encompassing north.

Threshold 1

Where the trigger condition has a single comparison limit value, Threshold 1 is used as the comparison value.

Threshold 2

Where the trigger condition has two comparison limit values, Threshold 1 is used as the first and Threshold2 as the second comparison value.

Logical Action

This is only available when the Alert contains more than one Trigger Condition and dictates how the result of the current condition is applied to the result of the next Trigger Condition:

And Result of both Trigger Conditions must be true in order for the complete (compound) condition to be true.

Or Result of either Trigger Condition being true will cause the complete (compound) condition to be true. The compound condition is also true if both (component) Trigger Conditions are true.

Guardian2 Action

Any Alert can be used to activate one of the internal relay outputs available from the Guardian2 PCB. By default relays are de-energised and become energised when the alert condition becomes true. Relays automatically become de-energised when the alert condition is no longer true. The relays available have both normally open and normally closed sets of contacts.

Send Notifications To

Click the  button to the right of ***Notification to be Sent*** in order to add a recipient to the list of current recipients.

Note: If no recipients are listed then ***Casella247*** will be unable to send out notifications in the event of an alert occurring.

Multiple users can be selected as recipients of alert notifications, add one line for each recipient required:

User ***Casella247*** user to be notified when alert occurs.

Schedule Alert schedule to use when alert occurs. For more information refer to ***Alert Schedules***.

SMS If ticked a copy of the alert notification will be sent to the user's mobile number specified in the user's account profile.

Email If ticked a copy of the alert notification will be sent to the user's email address specified in the user's account profile.

Rate Limiting

Rather than bombarding users with multiple alert notifications when an alert condition exists, ***Casella247*** can be configured to limit the number and frequency of alert notifications sent.

Max # of alerts Specifies the maximum number of alert notifications ***Casella247*** will send (to any user) within the interval specified by the ***Every*** field.

Every Determines the interval of time multiple alert notifications are to be limited within.

Re-trigger Time Specifies the minimum interval between successive alert notifications within each interval specified by the ***Every*** field.

Note: For example (using the settings shown):

Max # of alerts: 5

Every: 1 hour

Re-trigger Time: 5 minutes

Each user specified as a recipient will receive 5 SMS (and/or email) messages, within each hour the alert condition exists and each subsequent notification will be sent 5 minutes after any preceding one.

If the initial alert condition occurs at **15:10** then the users will receive notifications at:

15:10

15:15

15:20

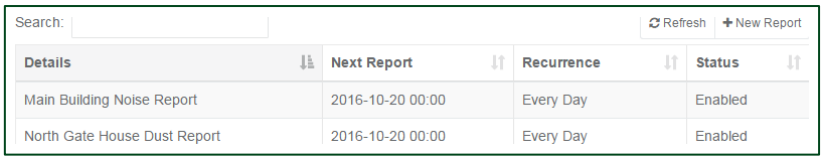
15:25

15:30

Then nothing else until **16:10** where upon Rate Limiting restarts.

Reports

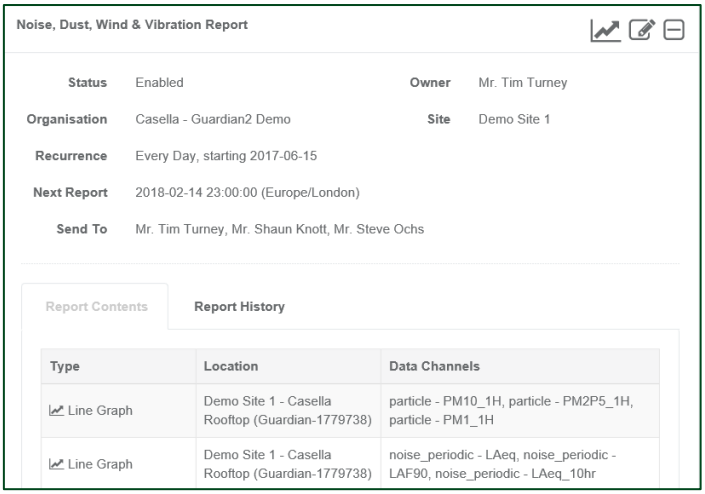
The default landing page after a user log-in is the ***Reports*** page. This page lists all the reports currently defined in ***Casella247*** that the user has access to:



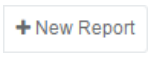
Scheduled reports

By default all reports are deemed to be Scheduled Reports and ***Casella247*** will automatically run these reports at their pre-determined time (and interval) sending the generated report to the specified recipients.

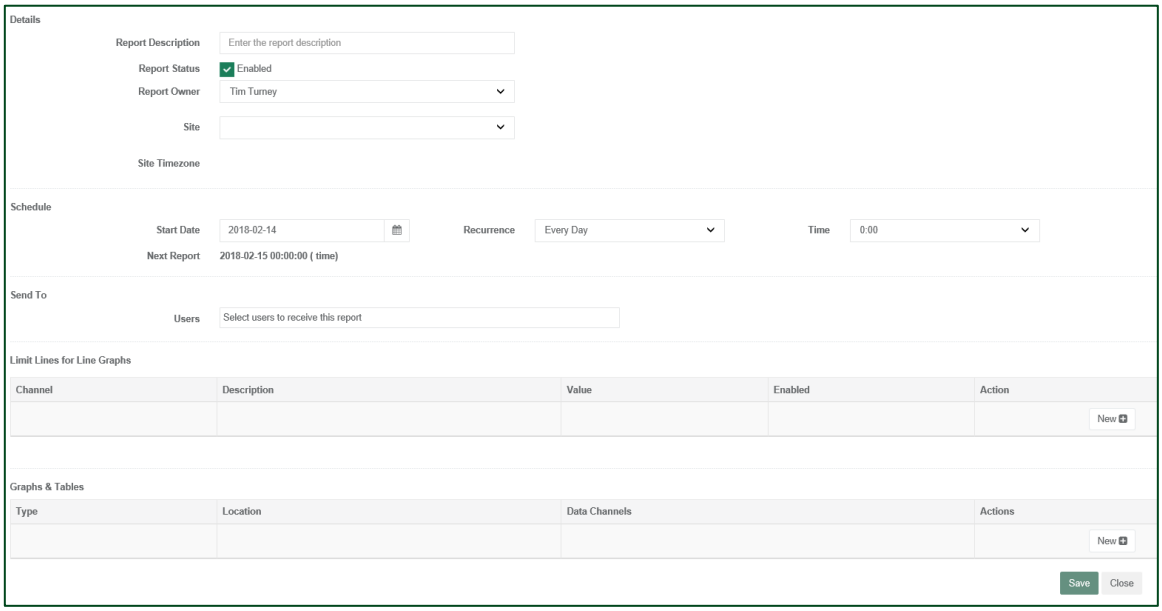
Highlighting a report in the list will cause ***Casella247*** to display the current configuration for that report in a separate panel:



Add Report

Click the 

button located at the top of the displayed list. A new report will be added to the displayed list and opened in the Report Editor:



Delete Report

Highlight a report in the displayed list and click the button displayed at the top-right of the report detail panel.

Edit report

Highlight a report in the displayed list and click the button. The selected report will be opened in the Report Editor.

Once changes are complete click the Save button to make these changes permanent.

Note: Most fields in the report editor screen are mandatory. If all the relevant fields have not been filled in or the check boxes have not been 'ticked', you will be unable to save the report and the icon will be displayed when selecting the save button.

Details

Basic details regarding report ownership and whether scheduled reports should be generated for it.

Report Description

Give the report a suitably descriptive name. This allows recipients of the report to quickly identify the source and content.

Report Status

Untick this option to temporarily stop ***Casella247*** from generating and sending reports based upon this template to users.

Report Owner

This user is granted (in addition to any Admin User) the ability to amend/delete this report.

Schedule

Determines when and how often reports will be generated by ***Casella247*** and sent to the specified recipients.

Start Date

Click on the **displayed date** to display the calendar (as opposed to the calendar icon). Select the date upon which the first Scheduled Report will be generated and sent based upon this template.

Recurrence

This specifies the interval between successive reports automatically generated and sent to the designated recipients. The available options are:

Every Day A new report will be generated every day covering the previous 24 hours of recorded data.

Every Week A new report will be generated every 7 days covering the previous 7 days of recorded data.

Every Two Weeks A new report will be generated every 14 days covering the previous 14 days of recorded data.

Every Four Weeks A new report will be generated every 28 days covering the previous 28 days of recorded data.

Time

From the drop-down list, select the hour the report is to begin from.

Next Report

This field automatically displays the date and time the next report (based upon this template) is due to be generated.

As Start Date and Time are modified this field automatically updates accordingly.

Send To

Specifies which users will receive a copy of the report generated by ***Casella247***. Users must have been added to the specific Guardian2 to be able to see data on reports.

Users

One or more users can be specified as recipients for generated reports. Each user will receive a separate copy of the report by email.

Limit Lines

Limit lines can be added to line graphs on reports. This may be used to illustrate specific levels of interest for a site.

Graphs & Tables

Each report is constructed from one or more sections, either a chart or data table. To add a new section to the report, click the New button in the **Action** column. Multiple graphs and tables can be shown on reports. For example, separate graphs can be displayed for noise and dust parameters.

Type

Three different types of report section are available:

Chart

Displays selected data as a line chart.

Data Table

Appends selected data to the report in the form of a CSV attachment.

Alert Table

Appends a list of previously generated alerts to the report in the form of a CSV attachment.

Location

From the available Guardian2s select one from which the report section will extract the necessary data.

Data Channels

From the available Agent/channel list select one or more parameters to be included in the report section.

Note: For a detailed description of the data channels please refer to the Data Channels section.

Actions

Click the button to save changes made to the current report section or click the button to discard any changes made.

Note: Ensure the is checked after adding individual channels or you will be unable to save the report.

Report preview (manual reports)

Any report currently available in the displayed list can be previewed by clicking the button in the detail panel.

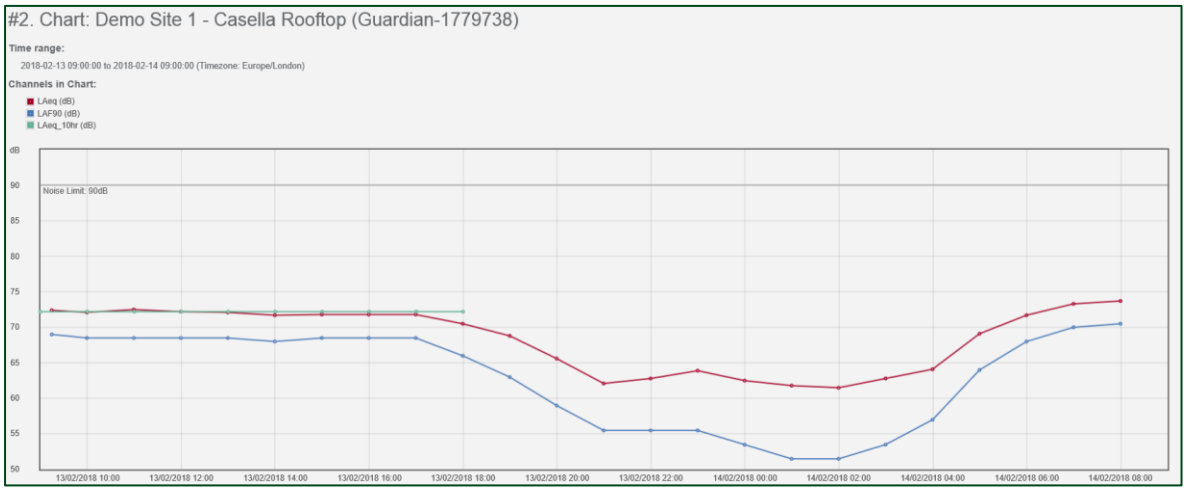
A prompt will then open to enter a start date/time for the report. The generated report starts at this point and includes the number of days specified in the report configuration.

Note: Each report generated in this way will open in a new browser window. Remember to close the browser window once the report is no longer required.

Manual Reports

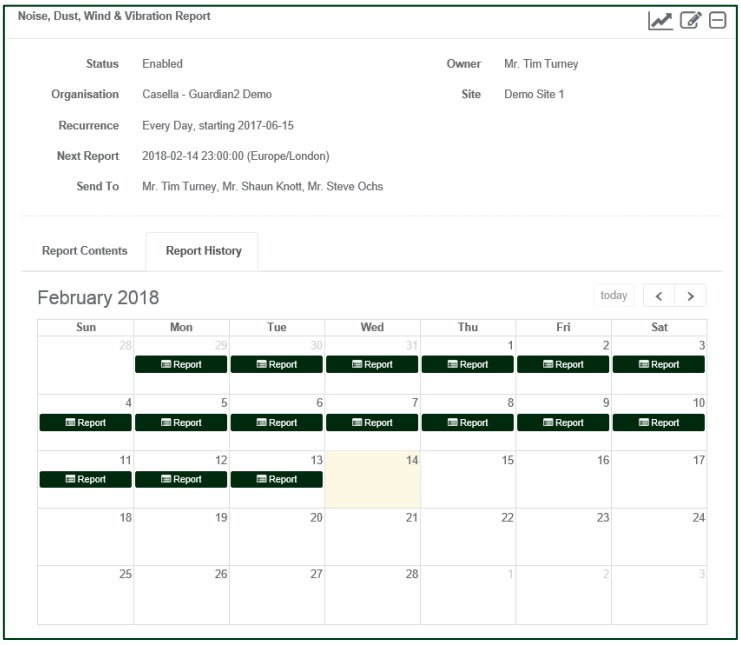
By unticking the Report Status (disabled) in the Report Editor, any report can be omitted from the automatic Report Schedule run by Casella247.

However, these reports can still be run manually at any time by clicking the Report Preview button. An example noise report is pictured below.



Regenerating past reports

It is possible to resend reports sent in the past. With the report selected, click the 'Report History' tab as shown below. A calendar will be displayed showing when the reports were sent. Click on the relevant report to resend it via email. Only the current user will receive the report in PDF format, not all of the users stipulated on the original report.



Data channels

The Guardian2 stores multiple parameters, described as agents in the Guadian2 configuration. Many of these agents have an abbreviated description and this section is to provide a full description of those agents.

Internal agents

Internal agents are stored by the Guardian2 and can provide additional information as necessary.

Channel	Description
Temp	Temperature (Celsius) recorded on the mHUB's sensor, located on the PCB
Supply	Voltage (V) of the power supply coming in to the Guardian2
Gps_loc	The GPS coordinates recorded by the GPS sensor
Relay	Four relays available, stores their output state (on/off as 1 or 0)
In	Four inputs, stores their state (energised/not energised as 1 or 0). On is defined as having 5-12VDC applied to the input terminal

Noise channels

Noise channels are split into two time intervals.

PER – Period data which is hourly values of the specific parameter.

PRF – Profile data which is 15 minute values of the specific parameter.

Both the hourly period and the 15 minute profile are set locally within the CEL-633 instrument located in the Guardian2 and cannot be changed remotely via casella247.com.

Channel	Description
PER_LAeq	Average 'A' weighted level over the period time
PER_LAFmax	Maximum 'A' weighted level over the period time with a Fast time response
PER_LASmax	Maximum 'A' weighted level over the period time with a Slow time response
PER_LZpeak	Peak unweighted level over the period time
PER_LAFmin	Minimum 'A' weighted level over the period time with a Fast time response
PER_LASmin	Minimum 'A' weighted level over the period time with a Slow time response

PER_LAF10	Noise level that has been exceeded for 10% of the period time
PER_LAF50	Noise level that has been exceeded for 50% of the period time
PER_LAF90	Noise level that has been exceeded for 90% of the period time, often referred to as the background noise level for a period
PER_LAF95	Noise level that has been exceeded for 95% of the period time
PER_LAF99	Noise level that has been exceeded for 99% of the period time
PER_LAeq_10hr	The average 'A' weighted level between 8am and 6pm local time. Often required for monitoring of construction activities
PRF_LAeq	Average 'A' weighted level over the profile time
PRF_LAFmax	Maximum 'A' weighted level over the profile time with a Fast time response
PRF_LASmax	Maximum 'A' weighted level over the profile time with a Slow time response
PRF_LCpeak	Peak 'C' weighted level over the profile time
PRF_LAF10	Noise level that has been exceeded for 10% of the profile time
PRF_LAF50	Noise level that has been exceeded for 50% of the profile time
PRF_LAF90	Noise level that has been exceeded for 90% of the period time
PRF_LAF95	Noise level that has been exceeded for 95% of the profile time
PRF_LAF99	Noise level that has been exceeded for 99% of the profile time

Particulate channels

Particulate matter (PM) is split into three size categories (PM1.0, PM2.5 and PM10) and over several rolling average time intervals (1 minute, 5 minutes, 15 minutes and 1 hour).

Channel	Description
PM1_1M	PM1.0 – one-minute rolling average
PM1_5M	PM1.0 – five-minute rolling average
PM1_15M	PM1.0 – fifteen-minute rolling average
PM1_1H	PM1.0 – one-hour rolling average
PM2P5_1M	PM2.5 – one-minute rolling average
PM2P5_5M	PM2.5 – five-minute rolling average
PM2P5_15M	PM2.5 – fifteen-minute rolling average
PM2P5_1H	PM2.5 – one-hour rolling average

PM10_1M	PM10 – one-minute rolling average
PM10_5M	PM10 – five-minute rolling average
PM10_15M	PM10 – fifteen-minute rolling average
PM10_1H	PM10 – one-hour rolling average

Vibration channels

The vibration sensor (Geophone) measures over three axis and combines the values to give an overall measurement (PPV).

Channel	Description
V1	Peak Particle Velocity (PPV) in mm/s
C1v	Channel 1 (vertical-axis) velocity in mm/s
C1f	Channel 1 (vertical-axis) frequency in Hz
C2v	Channel 2 (longitudinal-axis) velocity in mm/s – this axis is marked with an arrow on the sensor block
C2f	Channel 2 (longitudinal-axis) frequency in Hz
C3v	Channel 3 (transverse-axis) velocity in mm/s
C3f	Channel 3 (transverse-axis) frequency in Hz

Wind channels

The ultrasonic wind speed and direction sensor has two channels.

Channel	Description
Mag	The magnitude (speed) of wind in m/s
Angle	The wind direction in degrees

Solar and battery power options

Introduction

As well as mains power there are options available for when mains is not available or is intermittent in nature. The Guardian2 can be powered by solar panels, which powers a battery. A second option is to power the Guardian2 from a battery alone, then swap the battery for a fully charged one as required. Finally, a battery is used as a back up to the mains supply. All of these options require a second enclosure to house the battery and power controllers, plus additional cabling and accessories.

Solar power

This includes one or more 100w solar panel which charges a battery via a controller. This in turn is connected to the Guardian 2. Up to three solar panels can be connected together, each panel producing 100W of power. The number of panels required will vary depending on your geographical location. To select the number of panels required, pick the location below which best matches the latitude of the site for the Guardian2.

Regional Solar Energy Conditions	Recommended Solar Panel Rating	Example Locations
'High' 	100W	New York City - USA, Atlanta - USA, Beijing - China, Shanghai - China, Hong Kong - China, Dubai - U.A.E , Johannesburg - S.Africa, Sydney - Australia, Perth - Australia, Singapore, Buenos Aires - Argentina, Sao Paulo - Brazil, Campinas - Brazil, Auckland - New Zealand,
'Medium' 	200W	Chicago IL - USA, Pittsburgh - USA, Madrid - Spain, Sofia - Bulgaria, Melbourne - Australia, Vancouver Canada, Halifax - Canada, Toronto - Canada,
'Low' 	300W	Seattle - USA, London - UK, Southampton - UK, Paris - France, Frankfurt - Germany, Berlin - Germany, Praha - Czech Republic, Copenhagen - Denmark, Brussels - Belgium,

For more detailed information for a specific location please contact info@casellasolutions.com.

Important suitability factors to consider at a site include:

- Is there a suitable, safe location to mount the system and solar panels? *(Theft and unwanted access to potentially hazardous voltages)*
- Can the systems solar panels face due south (in the Northern Hemisphere) or North (in the Southern Hemisphere)?
- Will the solar panels be exposed to **direct** sunlight, with no risk of partial shading or obstruction *(from say trees, buildings, parked vehicles etc)* at any point during daylight hours? Consider especially low-level obstructions which may block direct sunlight during challenging winter months when the sun is low in the sky.

Solar Systems are designed with sufficient battery storage capacity to maintain operation during normal periods of poor weather. It should however be recognised that for some locations in temperate latitudes, extended periods of extreme winter weather (i.e Snow cover, Fog, etc) will always present a challenge to a practical and cost effective Solar design. During such extreme events, very occasional supplementary charging of the batteries using a mains charger may be necessary, and/or having a spare battery to swap out.

Parts

The solar panel system consists of three main parts:

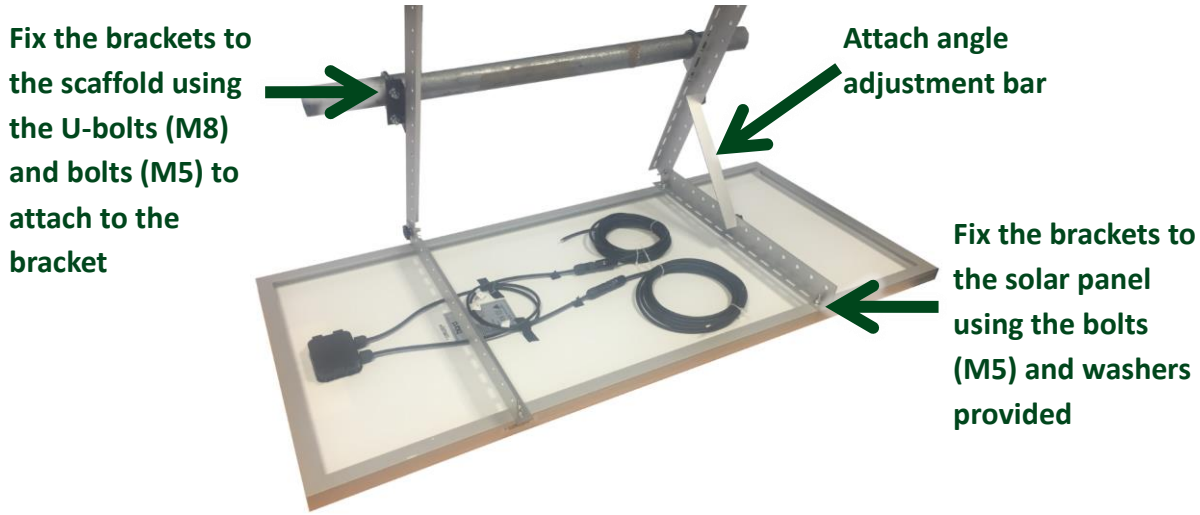
- An enclosure to hold the battery and solar controller (Part number 208500D) – includes cable to Guardian2.
- A battery (Part B162 ordered separately from the above enclosure) which fits in the base of enclosure 208500D.
- The solar panel array (one to three panels), which include mounting brackets for scaffold poles and the necessary cabling to 209500D enclosure.

Part Number	Description
208500D	GUARDIAN2 REMOTE PSU (SOLAR) S/A Dimensions (60x50x26cm)
B162	12V Leisure Battery 130AH
208512D	GUARDIAN2 SOLAR PSU - SINGLE PANEL ARRAY Dimensions (54x120cm)
208511D	GUARDIAN2 SOLAR PSU - DUAL PANEL ARRAY
208510D	GUARDIAN2 SOLAR PSU - TRIPLE PANEL ARRAY
VB5	Double Scaffold Coupler (optional)

Assembly

Place the enclosure (208500D) in a suitable location close to the Guardian2, cables provided from the solar panels are 5m in length. Mount the solar panels as per the guidance given above using the

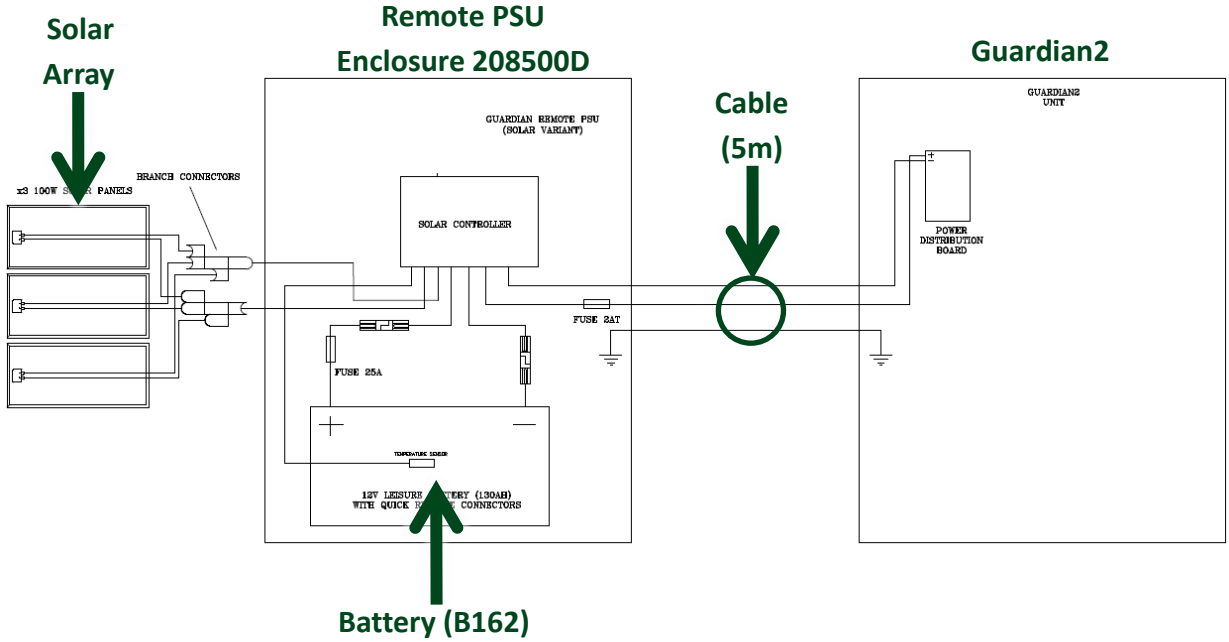
mounting brackets provided (illustrated below) and angle the solar panels at the correct angle, see Appendix 2. Wire the solar panels as shown in Appendix 1.



CAUTION

Solar panels generate significant electrical voltage and so connections should be handled with caution.

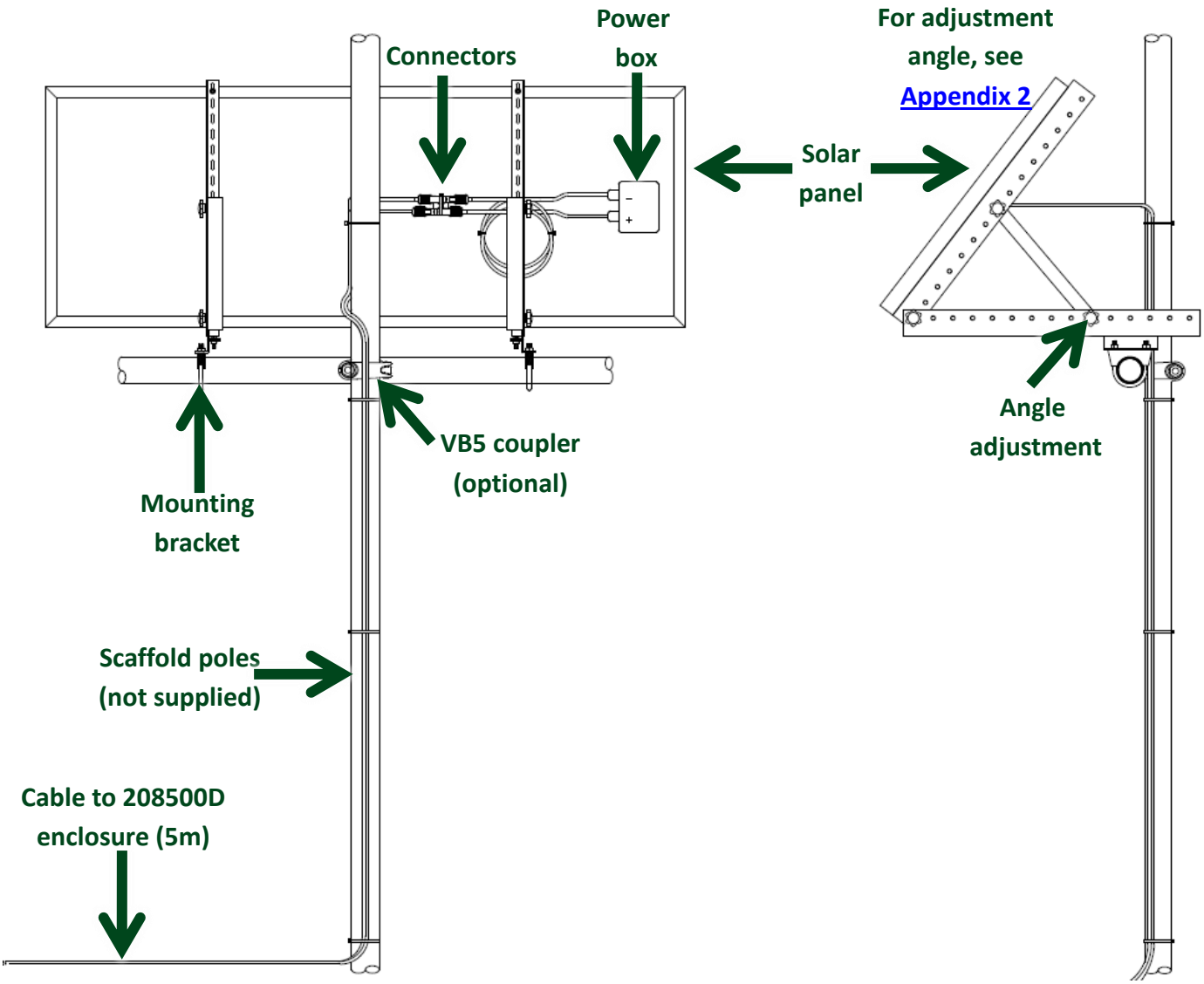
A schematic of how the system fits together is shown below. Wire the enclosure to the Guardian 2 using the cable provided, see 'Connecting power to the Guardian2'. Fit and connect the Lead Acid battery, see 'Connecting the battery'.



Note: The enclosure features a temperature sensor which disables charging above 65°C. This can be left loose within the enclosure.

An example of how to set up a single panel array is shown below mounted to scaffold poles (not supplied). Use cable ties to strap down loose cables as necessary. Detailed diagrams for assembling solar arrays and connecting the cables are shown in Appendix 1.

Once power has been connected the Guardian2 will boot up, so to the section 'Switching on and commissioning'.



Note: Solar panel arrays include U bolt mounts for scaffold poles and the relevant cabling.

Battery power

With a good quality 130Ah battery the Guardian2 (all sensors) will run for more than 5 days before failure. It is therefore recommended that the battery be replaced every 4 days to avoid data loss. The following considerations are important when working with high capacity lead acid batteries:

- It should be remembered that lead acid batteries are heavy, they contain corrosive chemicals a present an electrical fire risk if short circuited. Care should be taken when lifting, handling and transporting.
- Always recharge your battery as soon as you can after discharge and keep it as fully charged as possible during periods of in-activity.
- Avoid completely discharging your battery (Below 10.5V), this will significantly reduce its cyclic lifespan and may cause permanent damage.
- A disciplined routine of charging and exchanging discharged batteries with fully charge ones will be required to maintain continuous Guardian2 operation.

Example battery lives are shown below for different Guardian2 configurations:

Configuration	Battery Life (130Ahr Battery)
Noise	9 days
Dust	6.5 days
Noise and Dust	6 days
Dust and Wind	6.5 days
Dust, Noise, Wind and Vibration	5 days

Note: As the battery voltage drops below 10.5V power will be cut to avoid damage to the battery. Ensure you use the 'Alerts' system in casella247.com to ensure you have advanced notice before the voltage gets as low as 10.5V.

The battery is housed an external enclosure (208503B). The recommended battery is 130Ahr 12V 'Leisure' type battery. These batteries are sealed lead acid 'leisure' type batteries designed to offer deeper discharge characteristics and robust operation over multiple charge cycles. For maximum battery life, batteries should not be fully discharged or stored in a discharged condition. Batteries may remain connected to the charger to hold them in a fully charged condition prior to exchange. The battery enclosure has a cut off system to prevent batteries from going into a deep discharge state.

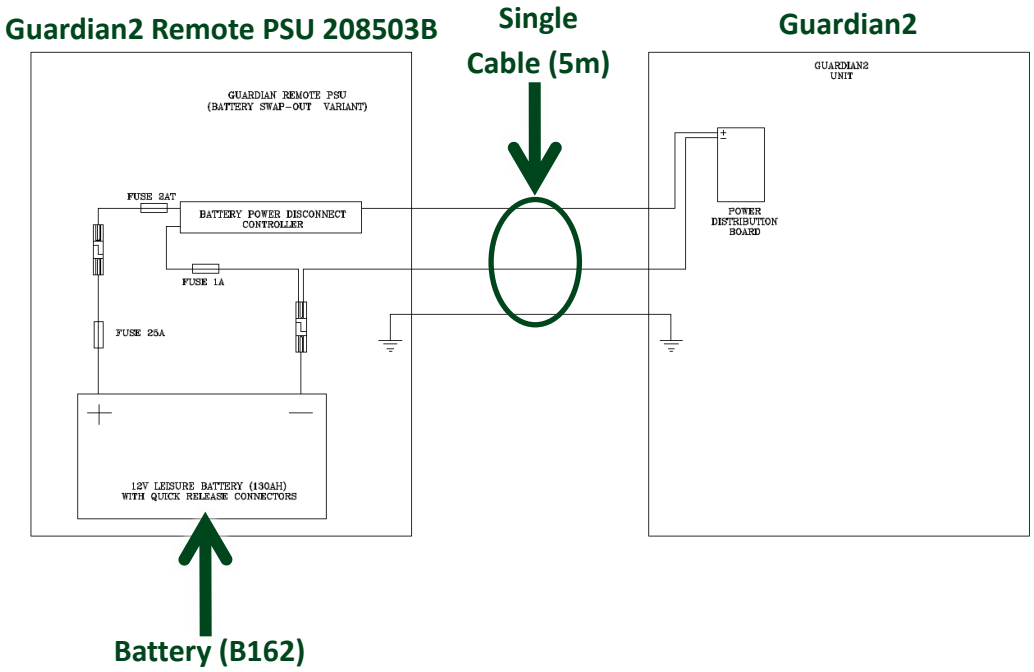
Parts

The battery power part system consists of the parts as described below. It is recommended that two batteries are use and while one is powering the enclosure, the other is being charged by a battery charger (part number CF43).

Part Number	Description
208503B	GUARDIAN2 REMOTE PSU (BATTERY SWAP-OUT) S/A
B162	12V Leisure Battery 130AH
CF43	Charger

Assembly

Place the remote enclosure (208503B) in a suitable location where it will not get knocked or damaged. Wire the enclosure to the Guardian 2 using the cable provided, see 'Connecting power to the Guardian2'. Fit and connect the Lead Acid battery, see 'Connecting the battery'.



Once power has been connected the Guardian2 will boot up, go to the section 'Switching on and commissioning'.

Note: As the battery voltage drops below 10.5V power will be cut to avoid damage to the battery. Ensure you use the 'Alerts' system in casella247.com to ensure you have advanced notice before the voltage gets as low as 10.5V.

Mains with battery backup

This option combines the normal mains power but uses a battery backup in case of power loss. This can be useful if there is an intermittent mains supply on site. The mains supply continually charges the battery which in turn powers the Guardian2.

Parts

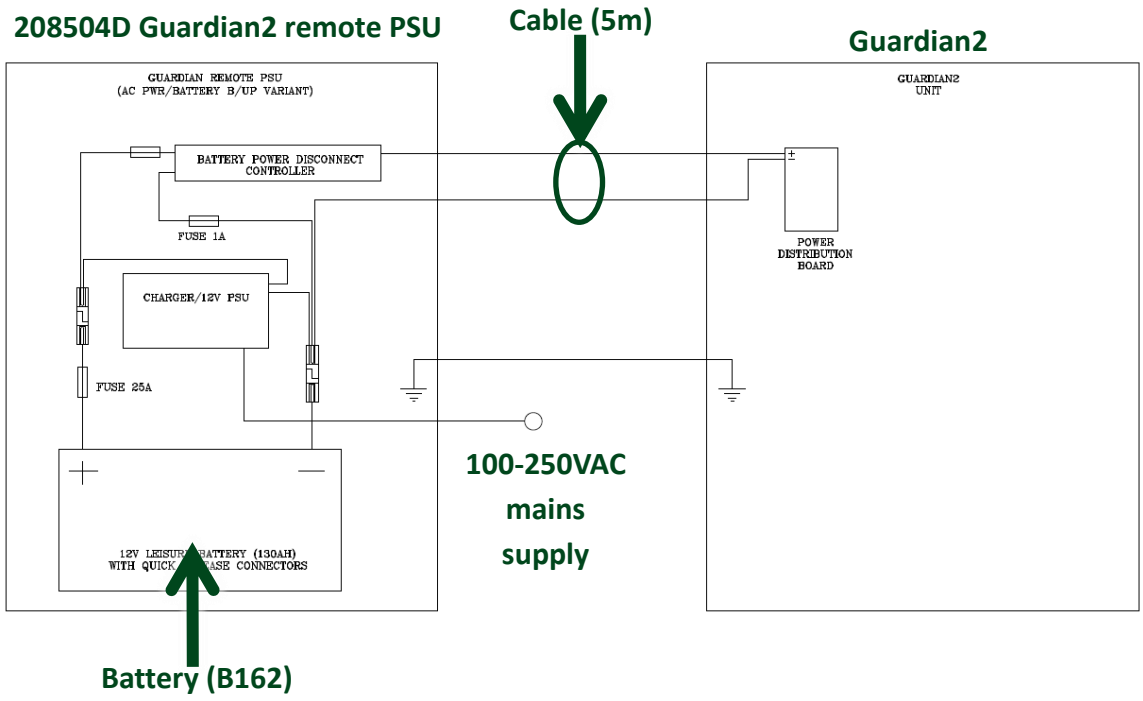
The system consists of an enclosure (208504D) which houses the lead acid battery and control equipment to charge the battery. The Lead Acid battery is ordered separately.

Part Number	Description
208504D	GUARDIAN2 REMOTE PSU (AC PWR/BATT BACK-UP) S/A
B162	12V Leisure Battery 130AH

Note: As standard the enclosure will come wired with a yellow 110VAC cable. If 240VAC blue cable is required, order part 208084B.

Assembly

Place the remote enclosure (208504B) in a suitable location where it will not get knocked or damaged. Wire the enclosure to the Guardian 2 using the cable provided, see 'Connecting power to the Guardian2'. Fit and connect the Lead Acid battery, see 'Connecting the battery'.



Note: As the battery voltage drops below 10.5V power will be cut to avoid damage to the battery. Ensure you use the 'Alerts' system in casella247.com to ensure you have advanced notice before the voltage gets as low as 10.5V.

Once power has been connected the Guardian2 will boot up, go to the section 'Switching on and commissioning'.

Connecting power to the Guardian2

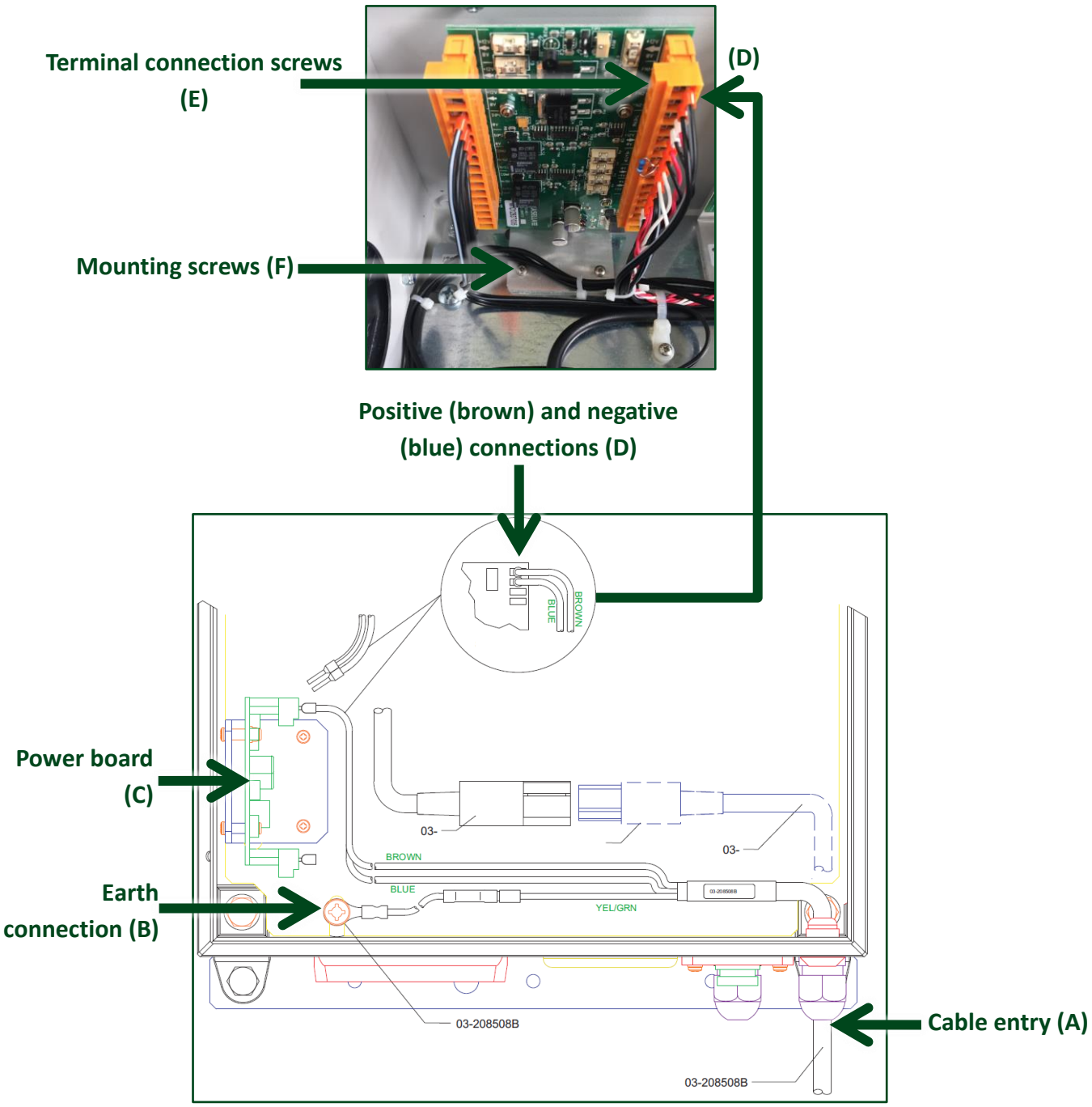
Use this section to connect power from external power enclosures 208500D, 208503D and 208504D. The enclosures will provide a 12VDC supply to the Guardian2 via a 5m cable. The Guaurdian2 will be delivered wired for a mains supply so electrical connections within the Guardian 2 will need to be changed to the power board, located in the bottom left of the Guardian2 enclosure.

CAUTION

DO NOT have the battery or mains connected whilst wiring the power cables.

To connect the power, refer to the illustrations below:

1. Run the power cable into the Guardian2 through the gland in the bottom (A).
2. Connect the earth (yellow/green) cable to the enclosure (B). Note the ring on the earth cable will be supplied separately and will need connecting to the cable.
3. The positive and negative (brown and blue) cables will then need to be connected to the power board (C) at point (D). A screwdriver (flat blade) will be needed to undo the terminal connections (E). If access is difficult the power board can be removed by undoing the mounting screws.


Terminal connection screws (E)
(D)
Mounting screws (F)
Positive (brown) and negative (blue) connections (D)
BROWN
BLUE
Power board (C)
03-
03-
BROWN
BLUE
YEL/GRN
Earth connection (B)
03-208508B
Cable entry (A)
03-208508B

Connecting the battery

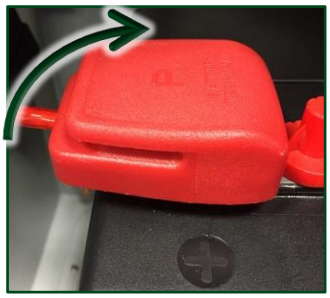
Each power enclosure comes with quick connector to enable easy connection of the lead acid battery. The connectors fit on standard 19mm pins on the top of the leisure lead acid batteries.

CAUTION

Lead acid batteries are heavy and manual handling precautions should be followed.

1. Lift the quick release connector (A).
2. Ensure the RED connector is attached to the positive side of the battery and the BLACK connector is attached to the negative side.
3. Press down on the top of the quick release connector to lock it in place.

Quick release connector (A)



CE Declaration of conformity

CE

Casella declares that the products supplied are individually in compliance with the essential requirements and other relevant provisions of applicable EC directives. A copy of the EU Declaration of Conformity for Casella manufactured products may be obtained by clicking on the product compliance documentation link at www.casellasolutions.com. Other certificates from 3rd party manufacturers are available on request.

WEEE information

The use of the WEEE symbol indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information about recycling of this product, please contact your local waste disposal service or contact the agent where you purchased the product.

Servicing & maintenance information

For an annual calibration of applicable sensors of the Guardian2 please contact Casella on 01234 847799, our regional offices or your local distributor. You can find your most local contact by visiting the 'where to buy' section of www.casellasolutions.com.

General

Guardian2 units should be inspected on a regular basis, especially if any data appears anomalous.

Routine checks should be performed, such as:

- Ensuring there is no external damage to the cabinet.
- Power and antenna data cables are not damaged or pinched.
- Any significant build of dust should be cleaned with a cloth moistened with soft detergent
- External fans are not blocked.
- The inlet filter is not blocked on the base of the enclosure – remove and clean if necessary by removing the bolts on the inside of the cabinet that retain the filter.
- If a particulate sensor is installed, inspect the inlet and outlet to remove any debris or blockage.
- Open the cabinet and ensure that all cables are connected and there is no water ingress.

Wind speed and direction

Cleaning

If there is any build-up of deposit on the unit, it should be gently cleaned with a cloth moistened with soft detergent. Solvents should not be used, and care should be taken to avoid scratching any surfaces. The unit must be allowed to defrost naturally after being exposed to snow or icy conditions, do NOT attempt to remove ice or snow with a tool. Do NOT remove black "rubber" transducer caps.

Servicing

There are no moving parts or user-serviceable parts requiring routine maintenance. Opening the unit or breaking the security seal will void the warranty and the calibration. In the event of failure, return the unit to your authorised distributor.

Vibration

Checking

There is no need for maintenance on the vibration sensor. Check should be made to ensure there is no damage to cables and that the sensor is securely fastened to the ground.

Noise

Checking

Ensure the windshield is not damaged. Windshields have a finite lifespan so if there are any signs of degradation, a replacement should be fitted, part number 208022C. Remove the windshield and ensure that there is no signs of moisture or damage to the microphone and preamp. The sound level meter should be routinely calibrated as per page 18 of this manual and it is worth performing additional checks if there have been any extreme weather events.

If dB levels being logged and are abnormally low (e.g. below 25dB) this could be an indication of a damaged microphone. Calibration should be undertaken as above and if the unit fails to calibrate, a replacement microphone should be sourced.

Particulate

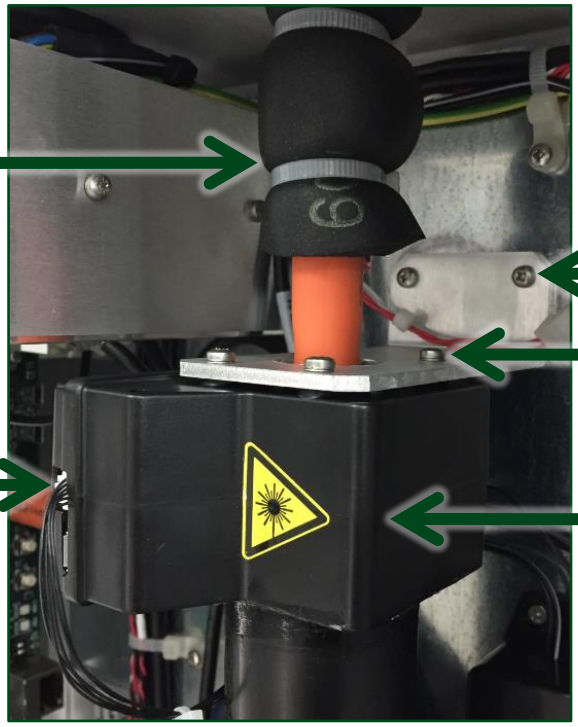
Replacement

The particulate sensor has a finite lifespan of about two years but does not require any maintenance or calibration in that time. It will become evident that the unit has failed if zero values are continuously outputted from the particulate sensor. A replacement particulate sensor is available, part number 208044C. The sensor comes complete with the tube to attach to the outlet of the Guardian2.

To replace the sensor, refer to the diagram below. Ensure power is switched off to the Guardian2 before replacing the sensor.

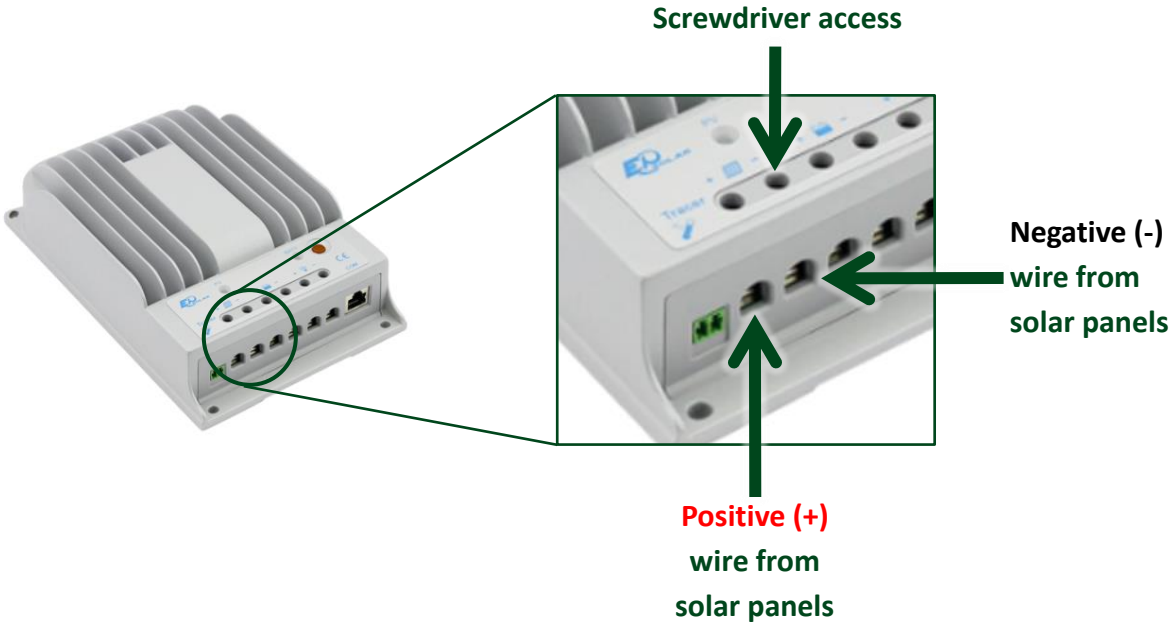
1. Remove the two sensor mounting screws (B).
2. Slide the particulate sensor (C) down by about 10cm.
3. Gently slide off the heated inlet (A) from the particulate sensor (C).
4. Remove the signal connector (E).
5. Pull the particulate sensor up so that the tube leaves the base of the Guardian2.
6. The sensor can now be removed from the mounting plate by removing the screws (D).

The new sensor can then be fitted by repeating the process above in reverse.

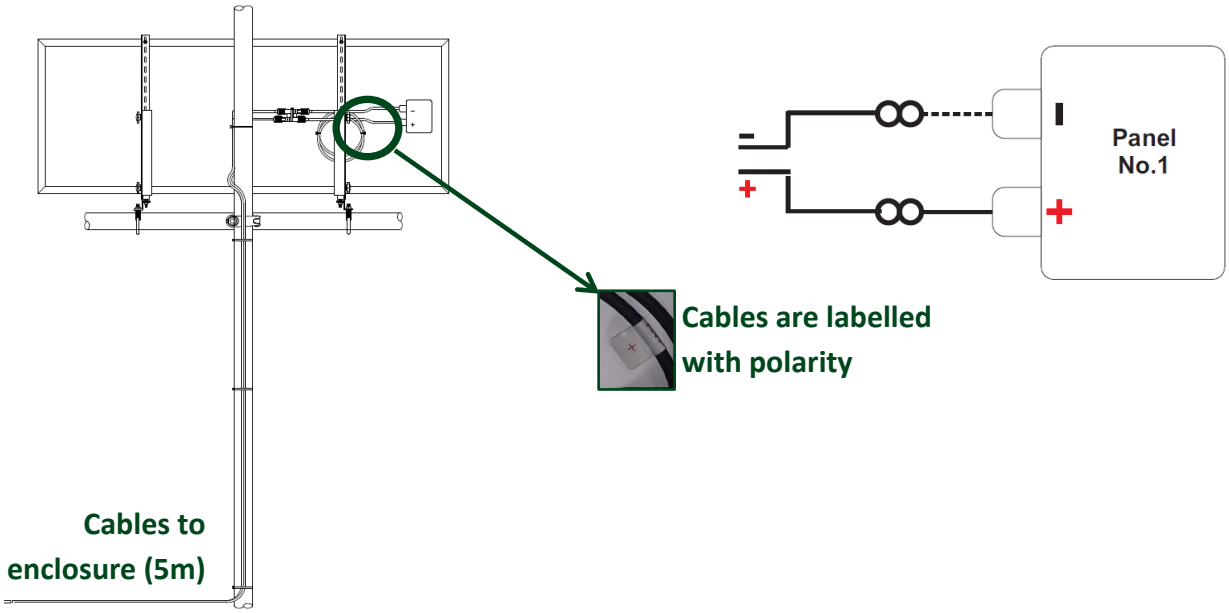

(A) Heated inlet
(B) Sensor mounting crews
(D) Mounting plate screws
(E) Signal connector
(C) Particulate sensor

Appendix 1 – solar panel wiring

From the solar panels, two wires need to be run to the Solar Remote PSU Enclosure 208500D, one positive and one negative. These cables can be routed through the glands in the side of the enclosure and connected to the solar controller within the enclosure, as illustrated below.

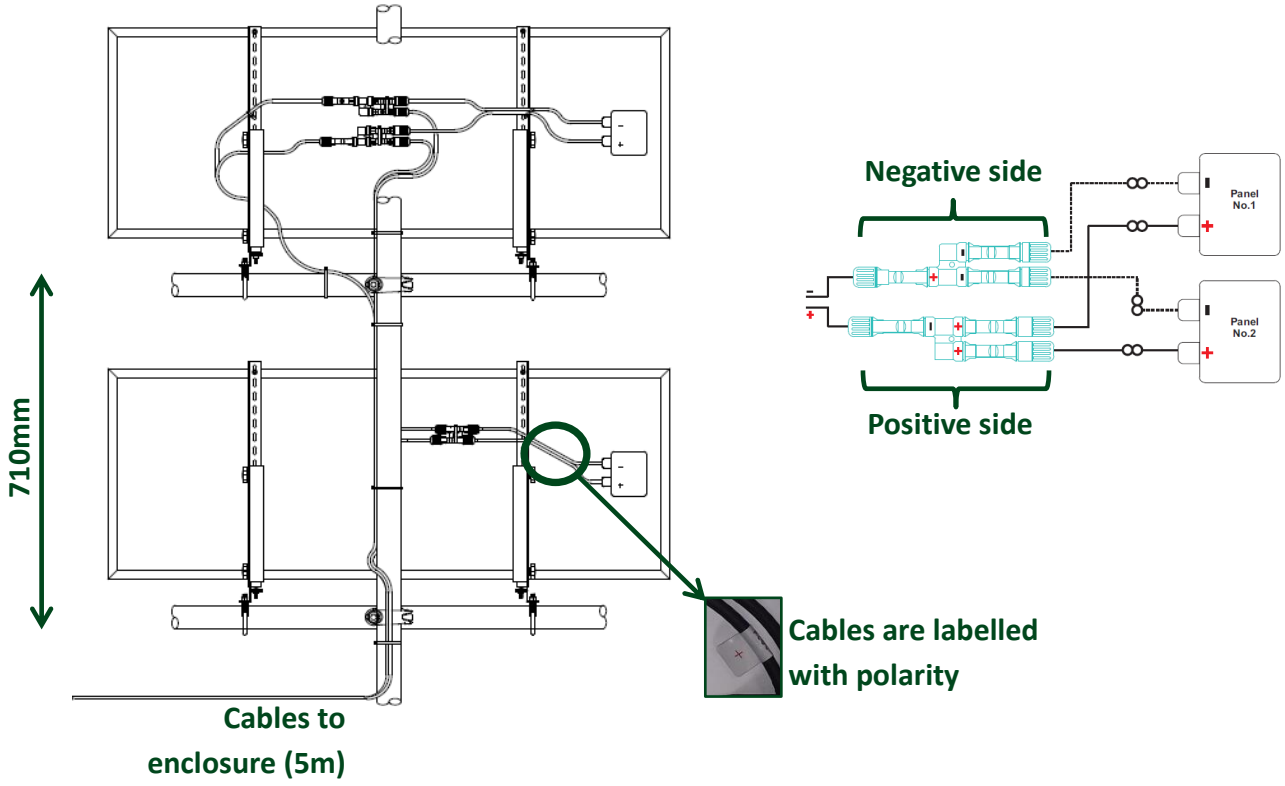


Single panel array



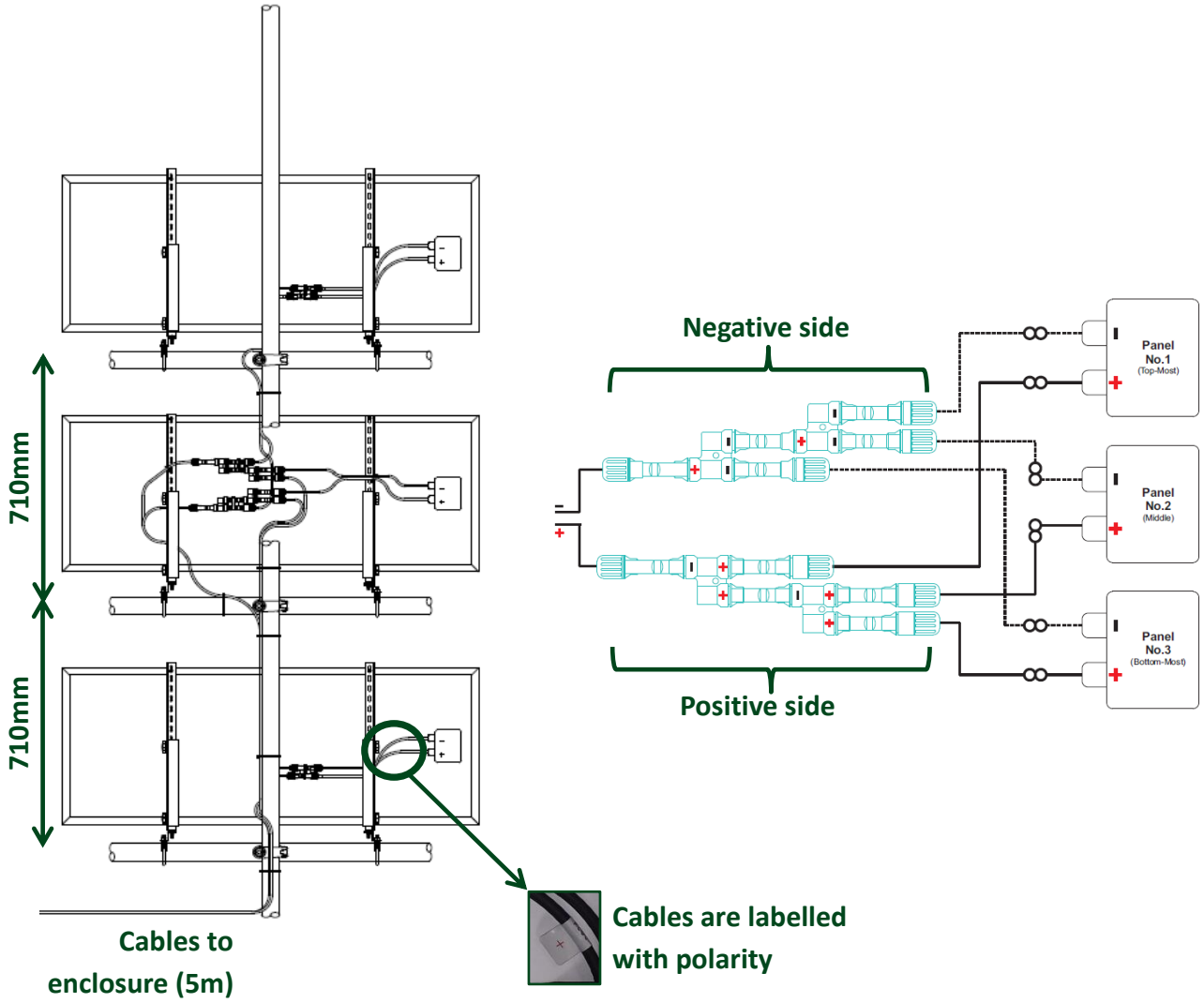
Dual panel array

Ensure there is a 710m spacing between panel mounts to prevent shading of the solar panels. When connecting panel 1 and 2 to the connectors, ensure that wires are connected with the correct polarity as illustrated below.



Triple panel array

Ensure there is a 710m spacing between panel mounts to prevent shading of the solar panels. When connecting panel 1 and 2 to the connectors, ensure that wires are connected with the correct polarity as illustrated below.



Appendix 2 – solar panel angle

Angles to adjust the solar panel to by location are shown below, together with the panel direction for specific locations and countries. See the diagram below the table which illustrates the correct angle to adjust on the solar panel.

Location	Country	Panel Direction	Optimum Winter Angle	Optimum year-round angle
Buenos Aires	Argentina	North	40	55
Melbourne	Australia	North	37	52
Sydney	Australia	North	41	56
Perth	Australia	North	43	58
Brussels	Belgium	South	24	39
Sao Paulo	Brazil	North	51	66
Campinas	Brazil	North	52	67
Sofia	Bulgaria	South	32	47
Vancouver	Canada	South	26	41
Halifax	Canada	South	30	45
Toronto	Canada	South	31	46
Beijing	China	South	35	50
Shanghai	China	South	44	59
Hong Kong	China	South	53	68
Praha	Czech Republic	South	25	40
Copenhagen	Denmark	South	19	34
Paris	France	South	26	41
Frankfurt	Germany	South	25	40
Berlin	Germany	South	23	38
Dublin	Ireland	South	22	37
Groningen	Netherlands	South	22	37
Auckland	New Zealand	North	38	53
Johannesburg	South Africa	North	49	64
Madrid	Spain	South	35	50
Stockholm	Sweden	South	16	31
Dubai	U.A.E	South	50	65
London	UK	South	23	38
Manchester	UK	South	21	36
Southampton	UK	South	24	39
New York City	USA	South	34	49
Chicago IL	USA	South	33	48
Seattle	USA	South	27	42
Pittsburgh	USA	South	35	50
Atlanta	USA	South	41	56
Singapore	Singapore	South	89	89

A more extensive list of countries and locations is available by clicking here. Refer to the following diagram to adjust the solar panel to the correct angle. It is recommended to set the angle for the optimum year-round value. If power becomes intermittent in winter months then adjust the angle to the optimum winter angle.