HYGEIAN PTY LTD

Hygeian Wireless Temperature Management Systems TMS-4G and TMS-WiFi

May 2024

HYGEIAN PTY LTD

Table of Contents

HYGEIAN PTY LTD

About This Manual

This manual covers the deployment and operation of the Hygeian TMS-4G and TMS-WiFi Cloud-Based Wireless System to perform continuous monitoring, trending, alarming and reporting of the temperatures of fridges, freezers, rooms, tanks and equipment. The TMS-4G and TMS-WiFi packages can be scaled to any size from one monitored temperature on one single site to hundreds of temperatures on hundreds of sites.

TMS means Temperature Management System and the 4G and WiFi suffixes refer to the method of transferring the data to the cloud server (Using Telstra 4G or your local WiFi Router)

The complete Hygeian System contains a lot more than just Food Temperature Management. However, some organisations prefer to start off using the Hygeian System to do their temperature management first and then to move on to the next stage which comprehensively covers:

- Staff Activity Management
- Staff Training
- Spot Checking Foods and Recording their Temperatures digitally.
- Waste Identification and Management

What is the Hygeian Business Model?

Hygeian believes that our customers are better off focusing on their own business rather than having to maintain the sensors which provide their measurements. When you receive the transmitters and gateway you purchased, they are already calibrated, activated and proven working. The TMS-4G or TMS-WiFi are already preconfigured for you when you place the order for the equipment. You simply place the transmitters in their allocated locations, plug in the gateway to power, turn it on and within a few minutes you will see the live temperature data appear on the Hygeian Portal and get updated every minute.

The Hygeian model simplifies the process of implementing and then managing continuous monitoring. You do not need to spend thousands of dollars maintaining and annually calibrating precision wireless temperature transmitters. Your Hygeian Temperature Management System is subscription based. That means you will only pay a very affordable annual or monthly subscription to the system. The initial purchase of the gateways and wireless transmitters covers the first year's subscription which includes:

- Technical phone and online chat support for technical queries.
- Annual changeover of each wireless transmitter with a freshly calibrated one fitted with new batteries.
- Online availability of the WTX-275 Calibration Certificates.
- 4G transfer of data from the gateway to the server. Note that if you choose to use your own WiFi network to transfer data to the internet, the 4G fee is eliminated. It should be noted that the 4G network is generally the most reliable means of transferring data from the gateway to the Hygeian server.
- Storage of data on the Hygeian Cloud Server.
- Warranty replacement of any on-site sensors in the unlikely event of a failure.
- Warranty replacement of any on-site gateways in the unlikely event of a failure.

Every year, if you subscribe to the Hygeian Permanent Warranty and Exchange Program, Hygeian sends you freshly calibrated replacement wireless transmitters with new batteries already fitted. You exchange the newly arrived transmitters with the transmitters that are currently deployed on your site. You pack the replaced transmitters in the

HYGEIAN PTY LTD

packaging provided by Hygeian and return them to our factory or other address as agreed. Provided the replaced transmitters are returned within 30 days, Hygeian will not invoice you for the replacement transmitters.

Hygeian can also supply and manage the maintenance of suitable handheld tablets for staff to use to interact with the system. However, users may choose to supply their own handheld devices.

The Hygeian System is structured to be easily scalable. To understand this better read the next section on the Hygeian concept of Enterprise, Sites and Locations.

## What Are Enterprises, Sites and Locations?

An Enterprise is the overarching entity that has subscribed to the Hygeian System. It is normally the Head Office or owner of the Entity. An example would be the Head Office of a Chain of restaurants or the Head Office of an Aged Care Group

A Site is a business that operates under the enterprise. An enterprise may have only one site, or it may have any number of sites. Examples would be the Restaurants in the Chain or the Aged Care Facilities that operate as part of the Group

A Location is a place, a room or an item of equipment that belongs to a site. It can also be the role of a person on site, but that is more relevant to implementing the full Hygeian Management System

Examples of Locations on a site for temperature management are:

- Walk-In Freezers and Cool rooms.
- A Standalone Fridge or Freezer.
- A place in a Warehouse.
- A Hot Water Pipe
- A Bain Marie
- A Dining Area
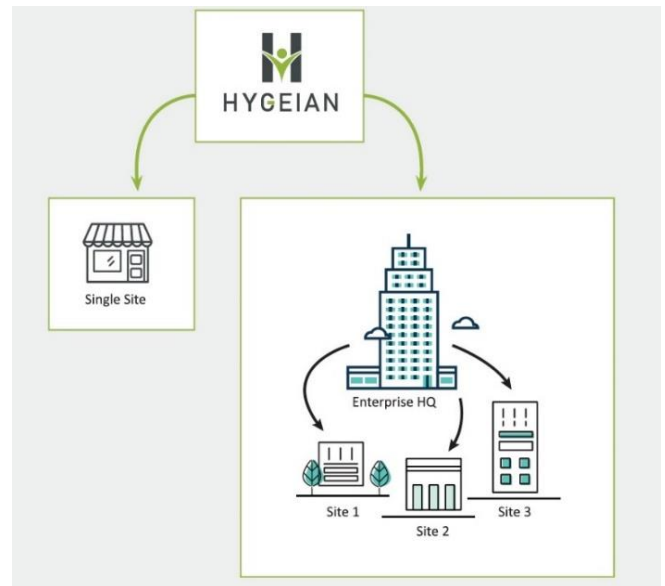
How are Hygeian TMS-4G and TMS-WiFi Systems Structured?

Here is a graphic showing how the system is configured to implement the features outlined.

It shows:

- The field equipment transmitting through the gateway to the server.
- Maintenance staff and contractors interacting with the system, carrying out their duties and confirming those via phone or tablet.
- The supervisory and management team and the Hygeian support team accessing the system by PC, interacting with the system, and carrying out their support functions.

Hygeian Temperature Management Configuration
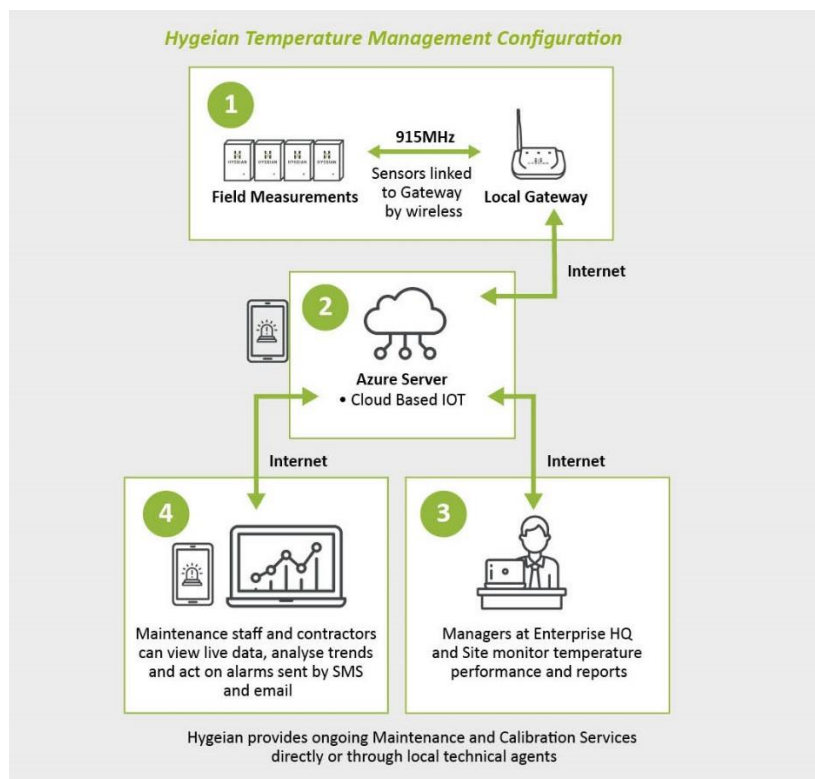
How Does the Hygeian System Manage Users?

A user is a person who has been sent an email and text invite by an Enterprise to join the system as a Site User, has accepted that invite and has been allocated rights to log into the Hygeian System by that Site's Administrator. Each user is assigned authorities called "claims" that control how much that user can see and do when logged into the system. In any enterprise a user can be initially set certain claims by allocating them a role. These are the 3 defined roles:

- Administrator (only 1 per Enterprise)
- Supervisor
- User

However, a user can have their claims adjusted temporarily or permanently by the Enterprise Administrator as needs change. A person may have the same user details across more than 1 site. For example, a technician may be responsible for maintenance on many sites and when that person logs in, they will be able to select which site they are working on. Their claims may be different on each site.

What is Site Process Monitoring?

Site Process Monitoring requires sensors which measure relevant process variables. The most important of these variables is temperature but there are other variables which also impact on product safety, product shelf life and process efficiency such as humidity and energy consumption. Sensors for a multitude of process variables are being developed by Hygeian and will be progressively released.

Why Is Temperature Monitoring So Critical?

Food temperature monitoring, alarming, and reporting are paramount in ensuring that potentially hazardous foods are safe to consume. Auditing requires proof that the system is measuring accurately and reliably. Wireless

temperature transmitters eliminate 99% of the cost of installation but need their batteries monitored and replaced before they are completely depleted. Temperature transmitters also need their calibration checked and recertified annually to meet current auditing standards. To ensure that the transmitters are producing reliable records minute by minute, the remaining battery energy, voltage and signal strength of each transmitter are measured and displayed live on the cloud by the Hygeian System.

What's the Alarm Management System?

There are 4 alarm points for each process variable monitored: two low alarms and two high alarms. Each can be enabled or disabled. Each can have emails and SMS messages attached to the alarms to notify users of their tripping and resetting. In addition to the process monitoring, there are alarms automatically generated for low battery voltage, low signal strength, loss of mains power and loss of connection to the server.

Example of a typical message from the Hygeian System:

Hi Warning! Mama's Kitchen Caringbah Chest Freezer above -12.0ºC for 40 min. Now -10.7ºC. Resets at -13.0ºC

Events such as carrying out a checklist can also be disseminated to users as required.

The tripping and resetting of alarms are all recorded on the system and listed in the Alarms Table. The data in the table can be filtered to show any process variable, any timeframe and the type of alarm or event.

Bar charts are also provided below the alarm table as a quick way of identifying which alarms occur most often.

What Reports Does Hygeian Generate?

A comprehensive reporting module is part of the Hygeian System. The reports cover many aspects of the system operation as well as summarising the records in an easy to digest format. The report settings include filters so that the reports can be tailored for individual needs.

The reports cover:

- Enterprise, Site and Locations.
- Users.
- Temperature Reports
- Calibration Records.

Temperature Report Example

TEMPERATURE SUMMARY

Sites in this Report		Report Generated
Karimbla		23 May 2024

Enterprise	Postal Address	Administrator
Karimbla Restaurant	Karimbla Restaurant	Deborah Broom
93 Karimbla Road	93 Karimbla Road	manager@karimblarestaurant.com.au
Miranda	NSW 2228	+61403371551
NSW 2228	Australia	
Australia		

Site	Postal Address
Karimbla	Karimbla
93 Karimbla Road	Australia
Miranda	
NSW 2228	
Australia	

Locations
Fisher and Paykels
Polar 1
Dessert Fridge
Polar 2
Kitchen Fridge
Olympus

Fisher and Paykels

May 2024

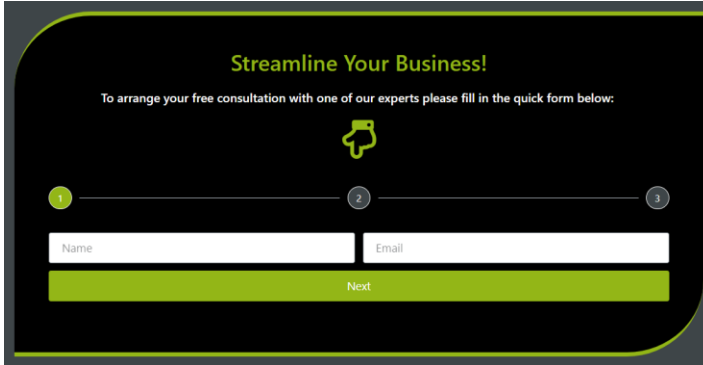| Day	Morning & Afternoon °C	Average for Period	Min for Period	Max for Period	Average for Day	Alarms for Day
1	-16.66	-16.66	-17.38	-10.23	-16.69	1
	-16.72	-16.72	-17.38	-15.77		
2	-16.95	-16.95	-17.84	-10.54	-16.73	1
	-16.51	-16.51	-17.69	-16.00		
3	-16.76	-16.76	-17.46	-10.39	-16.65	2
	-16.54	-16.54	-17.31	-10.39		
4	-17.15	-17.15	-17.61	-16.62	-16.94	1

< 1 / 10 >

Page 1 of 10

.

Chapter 2: Setting Up a Hygeian Account

Contact Hygeian either by form or phone:

- By form: Navigate to the Hygeian website and complete the simple online form at the bottom of the Temperature Management System page: https://hygeian.com.au/food-safety-system/

- By phone: during office hours call Hygeian on +61 439 741 877

Once you have made contact, one of our skilled representatives will speak to you, determine your requirements, and set up your account. You will be the Administrator of the Enterprise and you will receive an invitation email and text message during this call which will enable you to log in to the Hygeian System and see how the system is being set up while you are on the call.

The representative will create the sites you are going to manage and create the locations of temperature monitoring points you will need on each of the managed sites.

The temperature monitoring system hardware on each site consists of one or more Wireless Temperature Transmitters (Model WTX-275) and usually one gateway, model GW-100 The transmitters will be placed in the locations where they are to do the monitoring. By the time the discussion with the representative is complete, each location will be named, and the alarm points will be set up as standard for the types of locations.

Choosing the Location and Configuration of the Gateway

The standard GW-100 Hygeian Gateway connects to the 4G network and has its own built-in UPS (uninterruptible Power Supply) which will keep it running for up to 9 hours in the event of a power failure. The GW-100 can be located anywhere the received wireless temperature signals are strength 1 or above and there is good 4G coverage. If the site is large, it is possible that more than one gateway will be required, to ensure all transmitted wireless signals are received at adequate signal strength. There must also be mains at each gateway location to ensure the GW-100 has a continuous source of power to keep its batteries charged. Occasionally there might be poor mobile internet on site and the gateway may have to be connected to the organisation's NBN Router. In these instances, the Gateway can be configured to connect to your router via WiFi. The setup of the Gateway to log onto the WiFi router on site is described in this manual.

Choosing Transmitters for a Standard Measurement Environment

Each WTX275 transmitter is fitted with an internal precision temperature sensor. The transmitters are designed to let air enter the space where the electronics is housed. The transmitter batteries can operate in an air temperature of

-40ºC to +60ºC. This means that the transmitters can be directly mounted in freezers, fridges, cool-rooms, offices, packing rooms and any locations where the air is breathable.

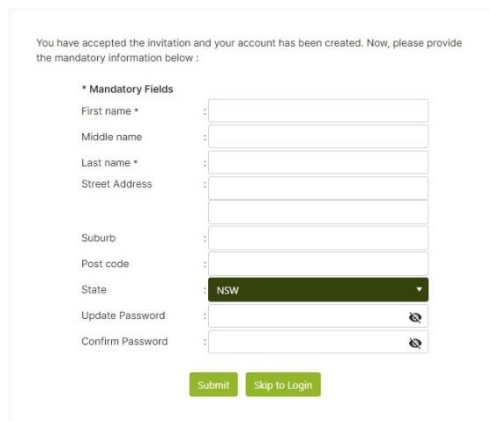## Choosing Transmitters for a Harsh Measurement Environment

In cases where the temperature to be measured is outside of -40ºC to +60ºC or is in a wet, oily, or corrosive environment that might damage the WTX275's electronics, an external temperature probe must be used and the WTX275 must be placed in a protected environment such as a polycarbonate IP65 enclosure. The full range of measurement of the transmitter using an external sensor is -50ºC to +250ºC. The WTX275 has a built-in socket for the external probe. Discuss these applications with the Hygeian Factory or your local Hygeian distributor before ordering the sensors.

The Enterprise Administrator

The person who signs up to rent the system is normally appointed as the Enterprise Administrator.
The Hygeian Representative will send out an invitation email to this person during the setup phone call.
The email body will look like the one below:
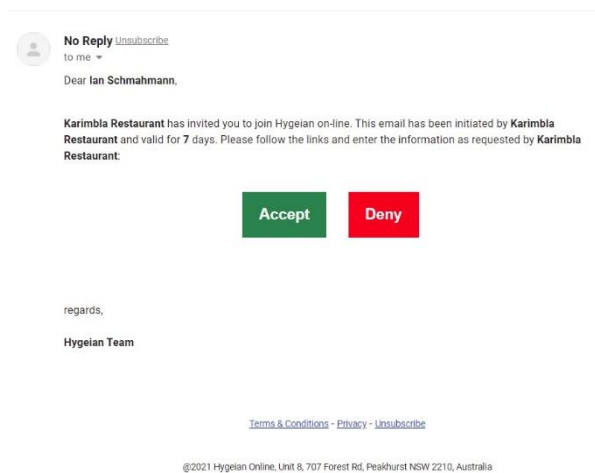
When the Accept Button is clicked by the recipient, they get taken to the following form on the Hygeian site

Notes About Payment

To get started you must purchase the gateways and a set of wireless transmitters outright at the commencement of the contract. Your purchase will include your first year's subscription and you will have no more to pay until the second year of operation. At the anniversary of your purchase you will be required to pay for ongoing data and 4G connection.

You can also subscribe to our PWE Permanent Warranty and Exchange Program The transmitters will be exchanged annually with freshly calibrated ones fitted with new batteries, as part of your subscription. You may choose to pay your subscription monthly or annually. If you pay annually, the annual fee will be about 33% lower than the total of 12 monthly payments.

The representative will issue an invoice for the purchase of the required transmitters and gateways and the first period of the subscription. He will also arrange for the transmitters and gateways to be prepared for shipping to your head office or your sites Freight costs to and from Hygeian any site in Australia are to the account of the system user.

Chapter 3: Using the Hygeian System

Initial Log in

Once you have filled in the form, Hygeian will set you up with Administrator Authority. The system is accessed through the domain https://hygeian.online. Click on the Hygeian logo first time and the login page will appear. Log in using the email address and the password you created when you filled in the online form.

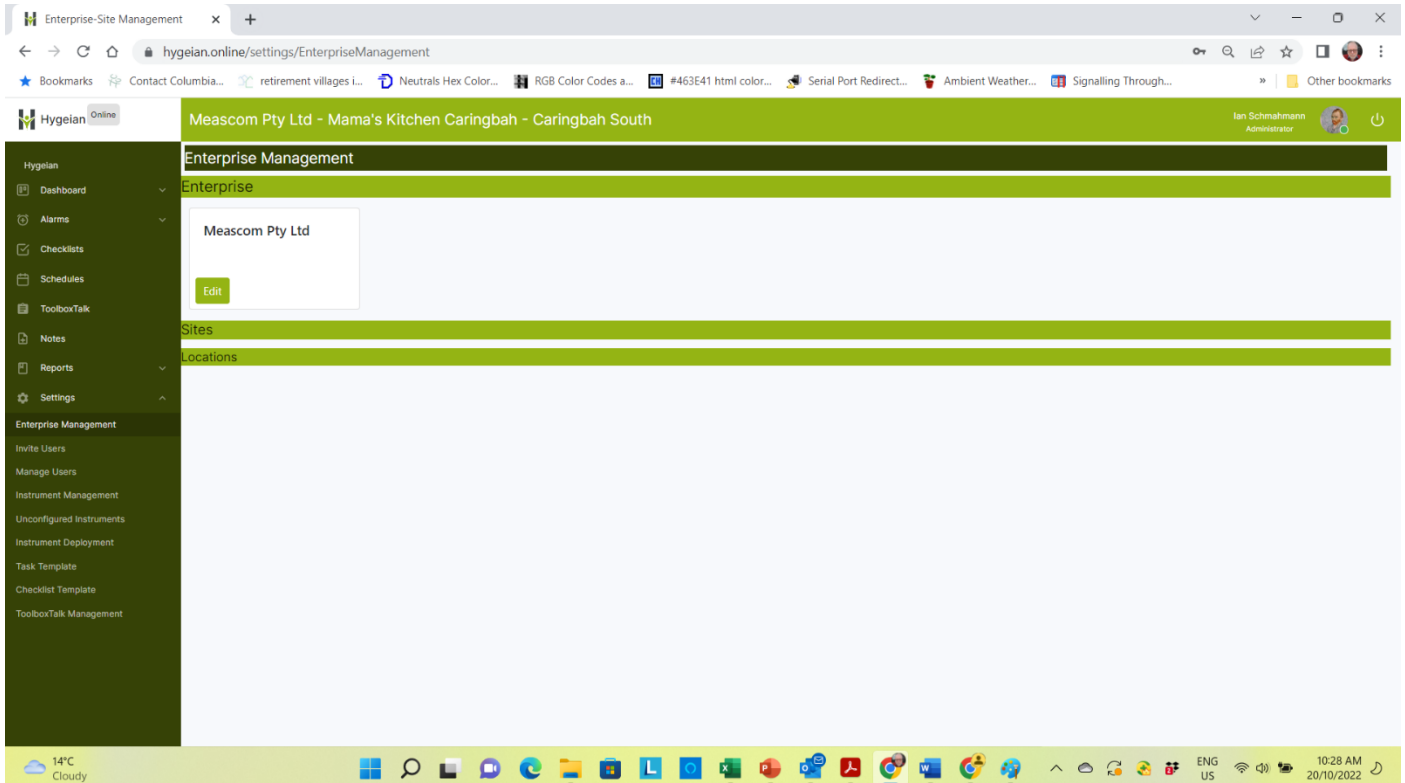As the administrator, you will be the person who invites other Users into the system.

Once you have familiarised yourself with the system, you can begin to invite other users to access your Enterprise as you see fit.

Creating and Editing Sites and Locations.

Once the Enterprise has been created at the initial sign up, the Enterprise Administrator will be able to log in and view the Enterprise.

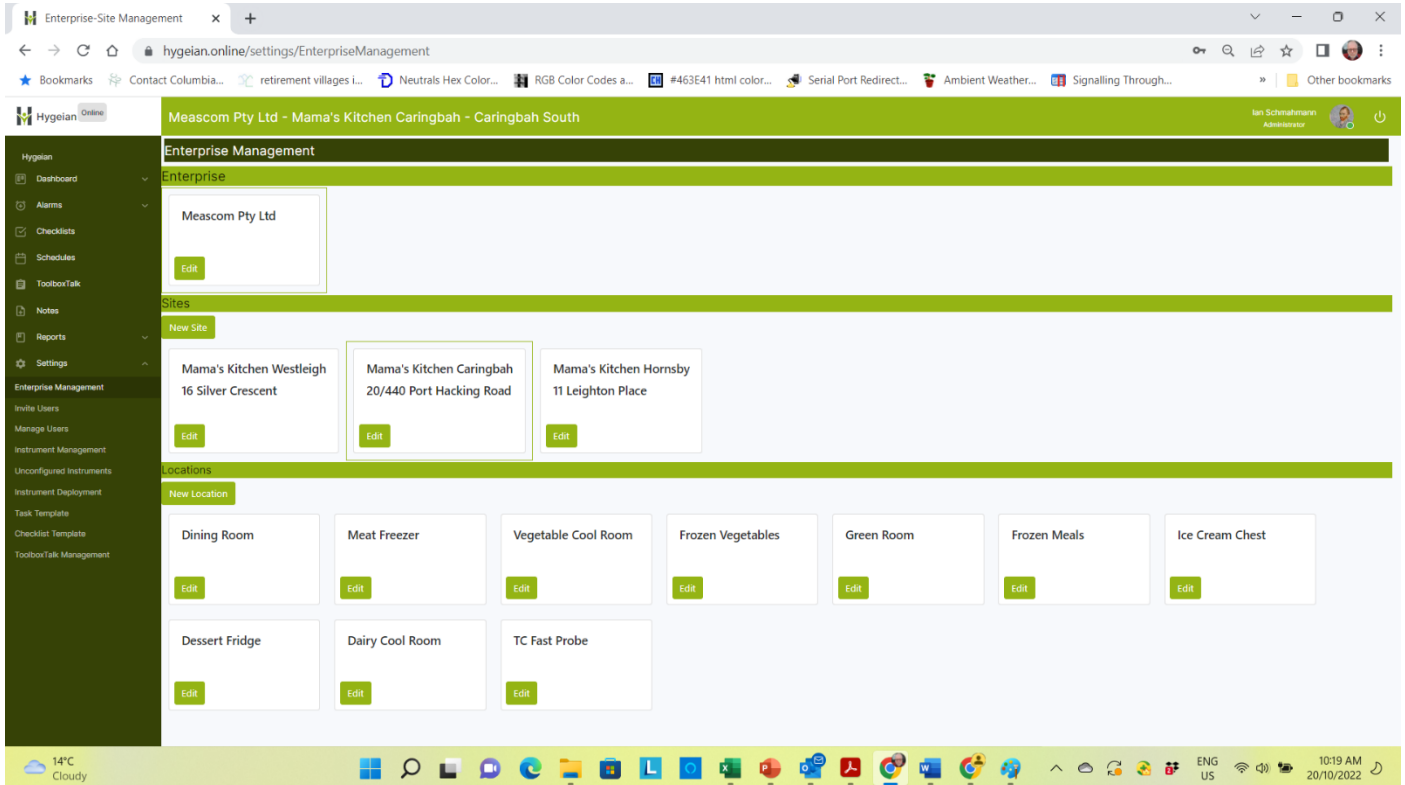To do so, navigate to Enterprise Management under Settings

You will see a page something like this:

HYGEIAN PTY LTD

Now highlight the Enterprise box by clicking on it.

You will see the sites that have been created so far.

If you highlight a site, the locations that have already been added, appear under it.

If you need to add additional sites, click on the "New Site" button. A popup window appears. Complete the details:

Site

Company

Name	Extended Name	ABN
Mama's Kitchen	Hornsby	91156003717

Street Address

Street Address 1	Street Address 2	Suburb/City
11 Leighton Place		Hornsby

State	Post Code	Country
NSW	2077	Australia

Mailing Address

Address 1		Suburb/City
11 Leighton Place	Address 2	Hornsby

State	Post Code	Country
NSW	2077	Australia

Update   Cancel

Complete the page. Click "Update" when the form is filled in.

Now you can add the locations associated with the site as shown below.

Click the "New Location" once you have selected the Site by clicking on it. A Location Window pops up. Fill in the details and click "Update"

Location

Location Name

Vegetable Cool Room

Location Description

Ground Floor, Rear of Main Kitchen

Notification Limits - Per Day

This sets the maximum SMS and Emails for a single Location. This is the default value.

SMS	Email
6	12

Notification Allocation - Per Month

This sets the maximum SMS and Emails added to the pool each month by default.

SMS	Email
60	120

Update   Cancel

If you wish to edit an existing location, click on the Edit button for that location, Make the changes and click Update button.

When adding a New Site to the system, you will need to order additional wireless temperature transmitters and a gateway to provide temperature monitoring on that site. Contact Hygeian Support for assistance in this system expansion.

Adding Users to the System.

Once you have set up all the Sites and the locations, you can invite System Users to access the added sites as well. You use the "Invite Users" tab, fill out the details of the invitee and send the invite.

Moving and Assigning Transmitter Status

These are the steps a user must take to manage the status of a transmitter and assign it to a location.

Before a User can deploy a transmitter in any location associated with their Enterprise and Site, Hygeian will first have assigned a new transmitter to that location. This will be done under the following circumstances:

a. A replacement has become due because 13 months have expired since the WTX275 transmitter currently in place in the location was sent from the Hygeian factory or distributor. Hygeian sends the replacement approximately 1 month before the calibration of the existing transmitter expires, to allow for an orderly and planned changeover. Hygeian receives this notification automatically in reports that are run every day at Hygeian.

b. Hygeian receives a notification that any currently deployed WTX275 has a battery that has dropped below 4.2V before the expiry of the calibration period.

c. Hygeian receives notification that a WTX275 is not transmitting to its assigned gateway and investigation on site shows that this instrument has been damaged or lost.

Hygeian will allocate each replacement transmitter to the location where the instrument to be replaced is currently deployed.

To deploy the instrument to that location, go to the "Deployment" tab in the navigation bar.

Deploying the Gateway

The Gateway is supplied with an antenna that must be screwed into place to ensure the gateway can receive the wireless signal clearly. Position the antenna so it is vertical.

A gateway can be placed on a flat horizontal surface such as a table or attached to a wall using two suitable screws and the keyholes on the underside of the gateway. Do not fix the gateway to a wall until it is in a location where it can receive signals from the wireless temperature sensors and connect easily to the internet connected network.

Internet Connection Options

The internet connection will be via one of the following:

- Telstra 4G using an internally fitted Telstra 4GX modem.
- The local LAN using its 2.4GHz WiFi network.

Check the underside label of the gateway to confirm the method of connecting to the internet.

The gateway should be set up in a position which will produce reliable results. This means:

- All wireless transmitters should show signals strength 2 or above once the gateway is connected to the internet. The best position is usually near the geographic centre of the transmitters that are to be covered by

the gateway, but the final position also depends on the amount of brick, concrete and steel used in the construction of the building.

- The WiFi network should be reliable in the chosen location if WiFi is to be used. Ideally the router should also be fitted with a UPS so that the network can continue to operate and report for several hours in the event of a mains power failure. Consult with Hygeian technical staff for more information on this topic.
- The Telstra 4G network signal should be strong (steady blue l.e.d. on the underside of the gateway) in the chosen position if the 4G network is to be used. The gateway will continue to operate and report the temperatures even if the mains power fails for up to 9 hours.

The gateway position will only be confirmed as suitable once it has been connected to the internet and the live data is appearing on the cloud so that the signal strength of each transmitter can be checked.

Having chosen the likely gateway position, plug in its powerpack to a mains socket close by to the gateway and plug the powerpack dc output into the gateway power receptacle. Slide the power switch to the "ON" position and note that the power led labelled "ON" on the top face of the gateway lights up.

The led marked "CONN" will initially light up for about 30 seconds while the gateway is starting up and loading its software. The "CONN" led will then extinguish and will only light up again once the gateway has determined that it has access to the internet. Once this connection has been established, the "CONN" led will remain lit except if the gateway determines that the internet connection has been lost.

Connecting to the Internet via 4G

To confirm the GW-100 is connected to the Telstra Network, look at the underside of the gateway and note the small hole where you can see a lit up led. The led will initially flash intermittently green and then switch to blue. Once it is steady and blue this means it is connected to the Telstra 4G network. Note that live data will begin to update about 2 to 5 minutes after the connection has been made.

Connecting to the Internet by WiFi.

If your gateway is Model GW100-WiFi it means you do not have 4G fitted. You will need to use WiFi to connect the gateway to the internet. The GW100-WiFi has an inbuilt WiFi capability and a simple Webserver that will enable you to connect it to the router by following a few steps.
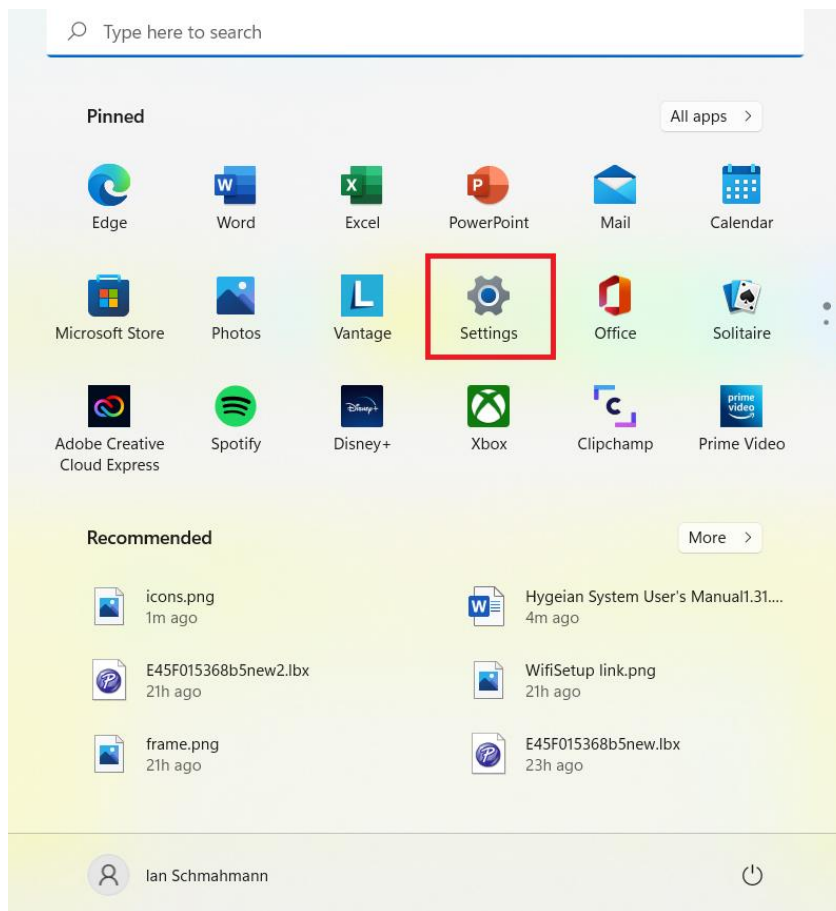
The process is as follows:

Set up a WiFi hotspot using your phone or PC.

1. **Using a Phone to Create a Hotspot.**
   a. Follow your phone instructions on creating a hotspot.
   b. Go to step 2c and follow the instructions.
2. **Using a PC to create a Hotspot.**
   a. Go to Settings by clicking on the 4 blue square icon and then the settings icon.

   b. When settings opens, select Network and Internet (third item in the column on the left.) and select Mobile Hotspot and turn it on:
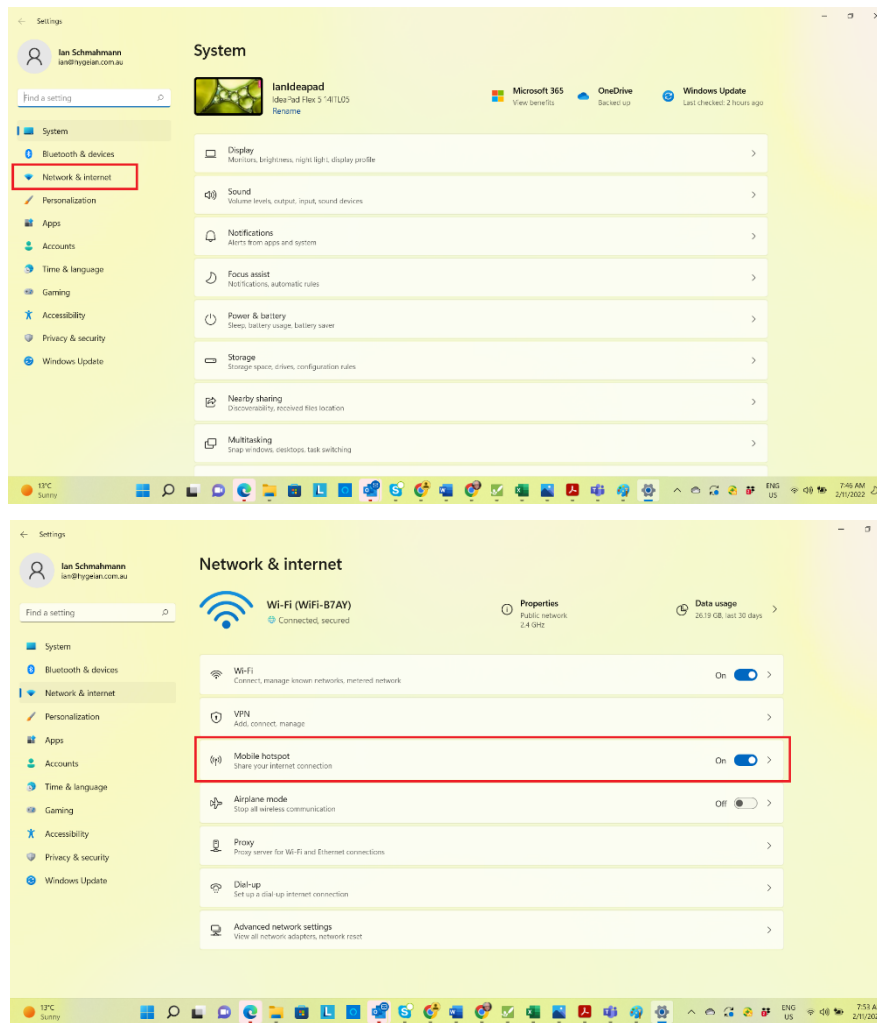
    c.   Click on the right arrow > and edit the Network Properties:

        i.   The Network name is Hygeian

        ii.   The Network Password is F00d$@fety Note the second two characters are zero zero

        iii.   The Band is 2.4GHz

    d.   Once you have set up the hotspot, within a few seconds, the hotspot should show the gateway has found it and has connected to it. It will report the IP address of the gateway on the hotspot. In this example the IP address is 192.168.137.132

3.   Next you access the gateway login page by copying and pasting the IP address into your browser.

HYGEIAN PTY LTD

4. The login page then appears on your browser.
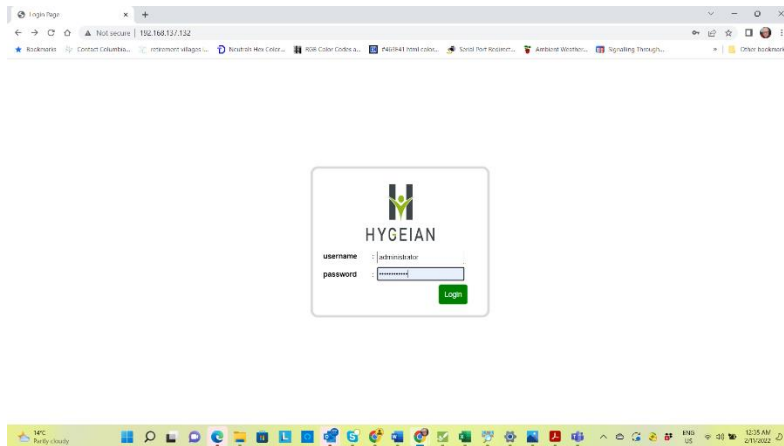
5. Log in to the settings page using the following details:
   a. Username: administrator
   b. Password: use the Ethernet MAC address without the colons: Example: E45F0153556B
   c. The Ethernet MAC address is printed on the label on the underside of the gateway. Type all letters with capitals.
   d. Once the Welcome page appears, click on the "Burger" (the 3 lines at the left)
   e. The "Settings" pane opens.
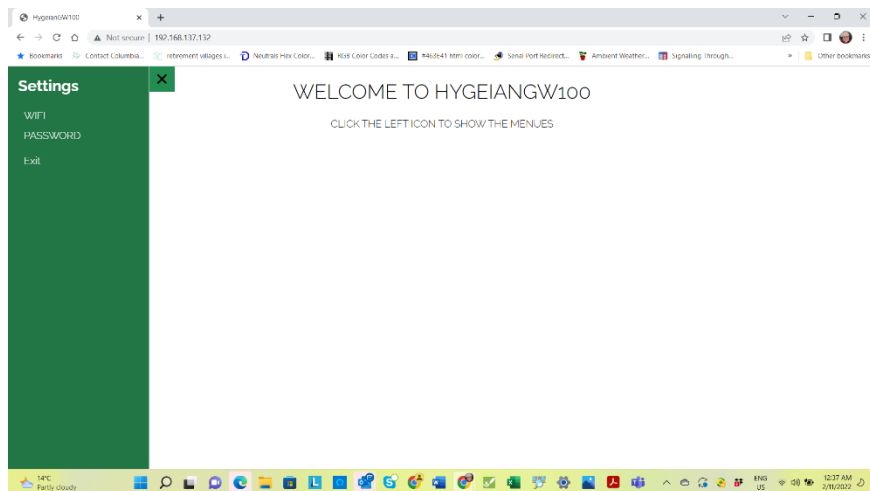
6. Click on the WiFi and a window will appear to allow you to enter the SSID and Password of the Router you wish the Gateway to be connected to after you turn off the mobile hotspot.
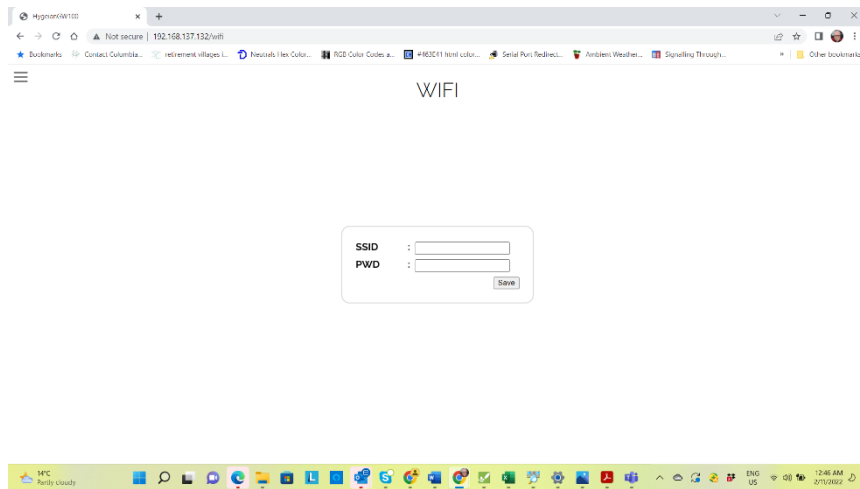
7. Click the "Save" button and after a few seconds a confirmation message that the settings have been saved will appear.
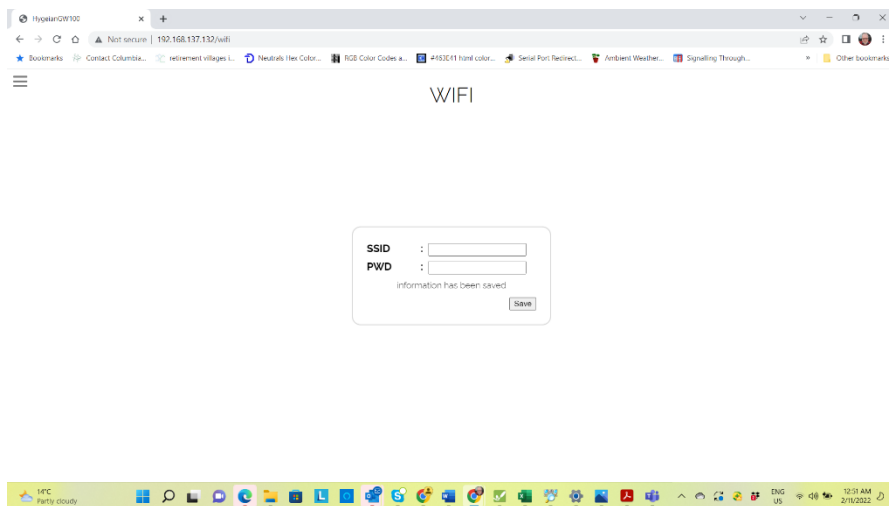
8. Exit the settings page and close the mobile hotspot.
9. Turn off the Gateway and turn it on again.
10. The gateway will now log on to the router and connect to the internet after powering up.
    a. The "CONN" led will turn on when the "ON" led first lights up.
    b. The "CONN" led will go out after about 30 seconds.
    c. Once the Gateway has completed its start-up, logged onto the router, and checked it is connected to the internet, the "CONN" led will again light up (after about another 60 seconds.)
    d. Note that live data will take about 2 to 5 minutes to start updating after the internet connection is made.

Choosing the Best Gateway position

When a Gateway is powered up it will begin receiving the Wireless data from all the transmitters within wireless range. You will note that the RTX led will flash each time it receives a packet of data from a wireless transmitter that is within range. Once the gateway is connected to the Hygeian Site, the signal strength of each wireless transmitter is

represented by the icon. A strength of 2, 3 or 4 is preferred. A strength of 1 can be reliable in some low noise environments but experience has shown that there will be times when the signal will not be picked up, as the 915MHz band is a shared band. Moving the gateway will usually resolve this problem and result in all signals being strength 2, 3 or 4. If a location is heavily shielded by steel and concrete, changing the WTX-275 to a WTX-275-EXT with external antenna will usually improve the signal strength by around 6dB

Using More than One Gateway on Site

In situations where the site is spread out or there is a lot of shielding of the wireless signals by virtue of the construction of the site, additional gateways can be added to the site in suitable positions to ensure all wireless signals are strong and reliable. The Hygeian System can operate faultlessly in this mode even if the signals from one or more WTX-275's are picked up by more than one GW-100.

Deploying the Transmitters

Mounting the Receptacles

Each of the original WTX-275 Temperature Transmitters will be supplied with a receptacle that magnetically holds the transmitter in place. The receptacle has two lengths of adhesive double-sided industrial tape mounted on the back. If the intended location of the receptacle and transmitter is shielded from the gateway by thick concrete or a lot of metal, it is always a good idea to check the signal strength first before putting the receptacle into permanent position. Place the transmitter in the intended location. If the location is metallic, you can just place it in position as the magnet inside the case will allow it to adhere temporarily while you check the signal. Wait for the next update which will occur in less than a minute. Provided the signal strength shows 2,3 or 4 waves on the signal strength icon, the position is ok.

Using an alcohol wipe, clear away any moisture from the fridge or freezer wall and make sure the surface is flat and clean. Peel off the red plastic to uncover the adhesive surfaces and firmly place it in position with the screw holes towards to top. Note that a sharp blade will make it easier to lift the edge of the red plastic covering the adhesive, so it can be peeled back using your fingers to grip the raised edge.

The receptacle also has two screw holes that can be used for 4G self-tapping Philips screws with cheese-heads, where appropriate. The screws might be necessary if the surface does not remain clean or is uneven. The screw heads must sit in the recesses.

Mounting the Transmitters

Each transmitter has its printed serial number label on the back of its case. Check the serial number against the location selected on the server, to make sure that each transmitter is being placed in the correct location.

Each transmitter has a magnet inside it, that is magnetically attracted to any receptacle. The transmitter will align itself and stay in place once it is brought close to the receptacle.

Do not simply attach the transmitter to a metal surface by means of its magnetic attraction to the metal. The magnet inside the transmitter will be powerful enough to hold the transmitter in place but the transmitter could be easily detached and fall, if bumped. Dislodgment of the batteries or damage to the case or electronics may result if the transmitter falls onto a hard surface.

There is no need to set up anything on the transmitter. It has an inbuilt sensor and will transmit its temperature every minute. It will also transmit its battery voltage.

HYGEIAN PTY LTD

Chapter 4: The Dashboard

There are four parts to the Dashboard:

- Live Monitoring. Normally you will select the "Live Monitoring Tiled"
- Temperature Trending
- Alarm Summary
- Checklist Completion Summary (not relevant for Temperature Management)

Live Monitoring Tiled

The dashboard shows the current values of the measured variables, signal strength of each transmitter as well as remaining battery energy.


Measured Temperature Range

The temperature is displayed on a dial as shown in the adjacent figure:

There are five coloured areas in the dial which are set by defining 4 alarm conditions (2 Low and 2 High Alarms):

Even if you do not activate the alarms, they must be defined so that the display can be scaled correctly. The WTX275 Wireless Temperature transmitter is capable of measuring over the full range of -50°C to +250°C, but normally only a small portion of this range is required for each application. Hygeian will set these alarm points up based upon our experience, but Site Administrators or Supervisors should adjust them for optimal performance based upon site conditions:

Freezer Dial

- The green area showing the range where the temperature is in the safe zone.
- Two Yellow areas where the temperature is in a Low Warning or High Warning Range. The default names for these two regions are Lo Alarm and Hi Alarm but you can rename them as desired.
- Two Red areas where the temperature is Very Low or Very High. The default names for these two regions are Lo-Lo Alarm and High-High Alarm but you can rename them as desired.
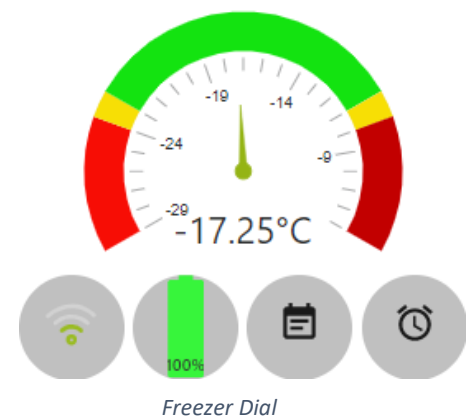
- Freezers typically should operate at -18°C but the temperature varies by several degrees either side in normally running conditions. To prevent nuisance alarms, the following are typical settings:
  - Low-Low Alarm at or below -24°C continuously for 45 minutes (Red Zone)
  - Low Alarm at or below -22°C continuously for 120 minutes (Yellow Zone which finishes at Red Zone)
  - Safe Zone from -22°C to -12°C (Green Zone)
  - High Alarm at or above -12°C continuously for 120 minutes (Yellow Zone which finishes at Red Zone)
  - High-High Alarm at or above -10°C continuously for 60 minutes (Red Zone)
- Fridges typically should operate at 2°C with an acceptable range of 0°C-4°C. To reduce the occurrence of nuisance alarms, the following are typical settings:
  - Low-Low Alarm at or below -1°C continuously for 60 minutes (Red Zone)
  - Low Alarm at or below 0°C continuously for 120 minutes (Yellow Zone which finishes at Red Zone)
  - Safe Zone from 0°C to 5°C (Green Zone)
  - High Alarm at or above 5°C continuously for 120 minutes (Yellow Zone which finishes at Red Zone)
  - High-High Alarm at or above 6°C continuously for 60 minutes. (Red Zone)
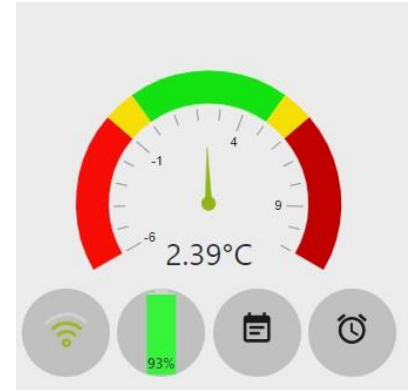
Fridge dial

How to Change the Display Range and the Zones on the Dial using the Alarm Settings

The process of changing the dial range is simple. Navigate to Settings and click it to open the list.

Click on Instrument Management and select the Location which needs updating. Now just type the values in to set up the temperature values where the dial colour change to Red, Yellow, and Green.

2 Selecting the Dial Range and Colours
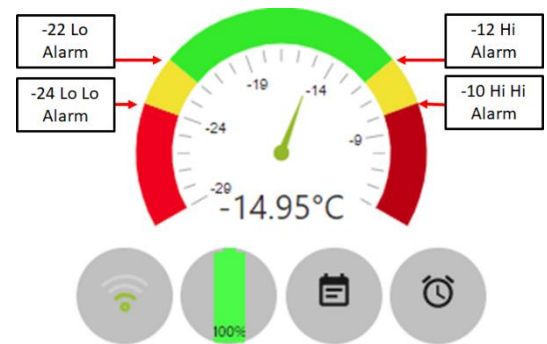
Note that the dashboard scaling works even if the Alarms have been disabled, as shown here. Do not worry about the Detailed Settings of each alarm. Only the setpoints are relevant for setting up the Dashboard.
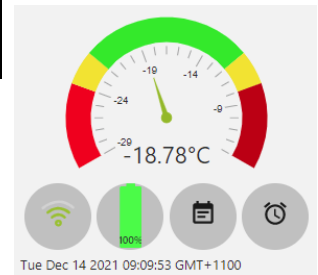
The Signal Strength Icon

The icon on the left shows signal strength from 0 to 4. The table below quantifies the signal levels at which the bars progressively light up. When no elements are lit up (Strength 0), the signal will be marginal and sometimes will disappear into the background noise. This occurs when the transmitter has been placed in a poor location relative to the gateway and the signal is being blocked by an obstacle or cancelled out by reflections. If this happens, either the transmitter or the gateway must be moved. Contact Hygeian if this is not possible as a different antenna on the gateway can potentially resolve this problem.

Signal Strength Bars	Measured dBm	Signal Quality
4	Greater than -78	Very Good
3	-79 to -90	Good
2	--91 to -102	Acceptable
1	-103 to -114	Low
0	less than-115	Marginal

Note that by touching the signal strength icon on a touch screen device or clicking on it with a mouse on a PC or laptop, you can toggle on and off the display of the latest measurement's date and time received from that transmitter.

## Battery Condition Monitoring

Remaining Battery Energy
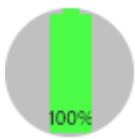
This icon is the second from the left in the group of 4 icons under the dial display. New AAA Lithium Iron Disulphide batteries are fitted to the WTX275 transmitters at the Hygeian factory or an authorised Hygeian Service Centre immediately before they are despatched. At the time the batteries are fitted, the Battery Install Date is updated, and the transmitter shows 100% remaining energy at that time. The transmitters consume a known and repeatable amount of energy for each transmission. Every 24 hours that a transmitter operates, its remaining energy is reduced by 0.216%. At the next calibration date, which is 396 days after the calibration was last done, the dashboard will show a remaining energy of around 14%. Once the remaining energy reaches 10%, the icon turns red.

A Note About Battery Voltage

Hygeian also monitors the battery voltage of each transmitter to ensure that the batteries can continue to supply energy for reliable transmissions. If the voltage drops below 4.2V before the next calibration date is due, Hygeian will instigate an early changeover, contact your administrator, and ship a replacement WTX275 to site. As soon as the replacement arrives on site, the currently deployed transmitter can be undeployed and returned to Hygeian, while the replacement unit can be deployed in its place.

Notes Icon.
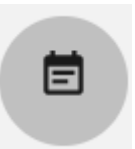
The "Notes" Icon (the second from right icon in the group of 4 under the dial display) opens up a Note Window so you can add helpful information into the records relating to that particular location. Those records can later be viewed as a list.

Alarm Icon

Touching any Alarm Icon (the right-hand icon in the group of 4 under the dial display), will open the Alarm Table with the filter set so that only that location's Alarm Records are displayed in the table.
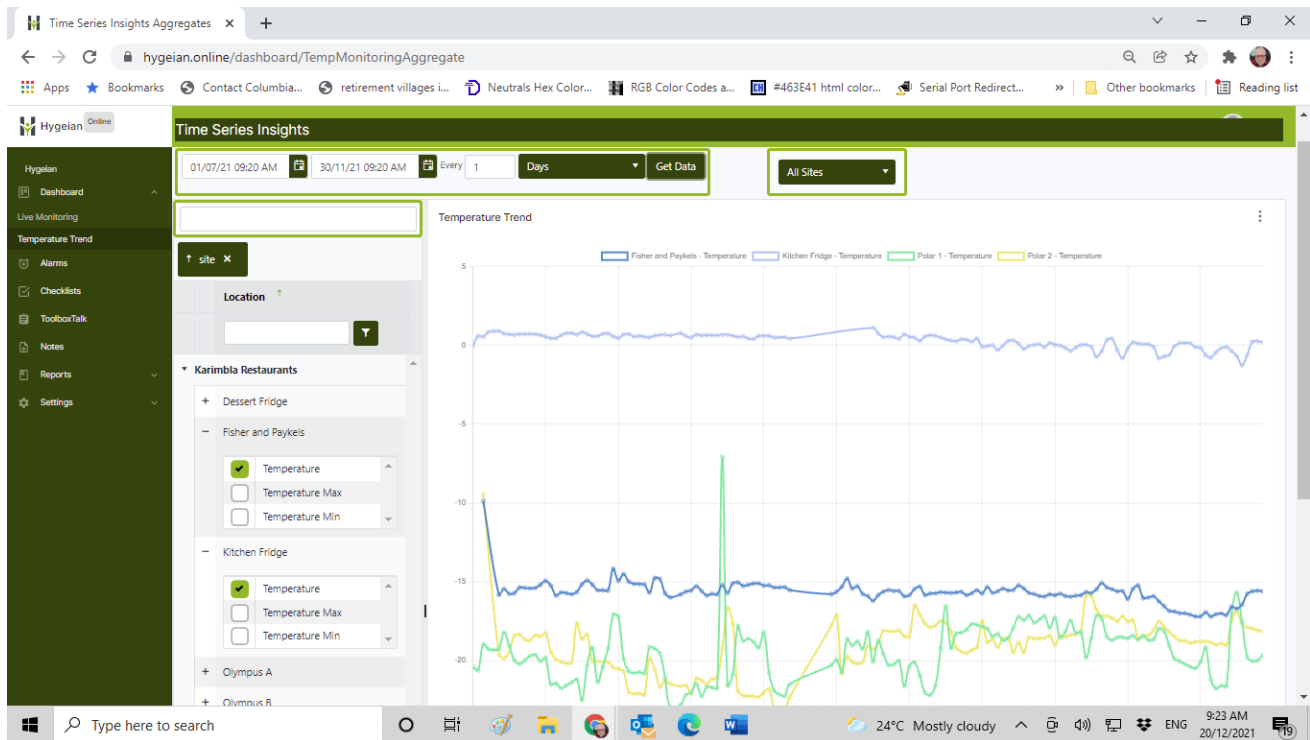
Temperature Trends

The "Temperature Trend" button opens the Trends History so you can easily visualise exactly what has happened to the temperature at any location over any period since it was first deployed and up to the past 5 years. Each trend has an average, a maximum and a minimum trace that can individually be turned on or off. The period over which the average is taken can be in minutes, hours, days, weeks, or months. The Y axis of the trend display scales automatically to fit the selected trend lines.

Below is an example of the trends for a system where there is a kitchen fridge and three freezers displayed. Note that the default report period is set as 24 hours from current time to 1 day ago in 10-minute periods.
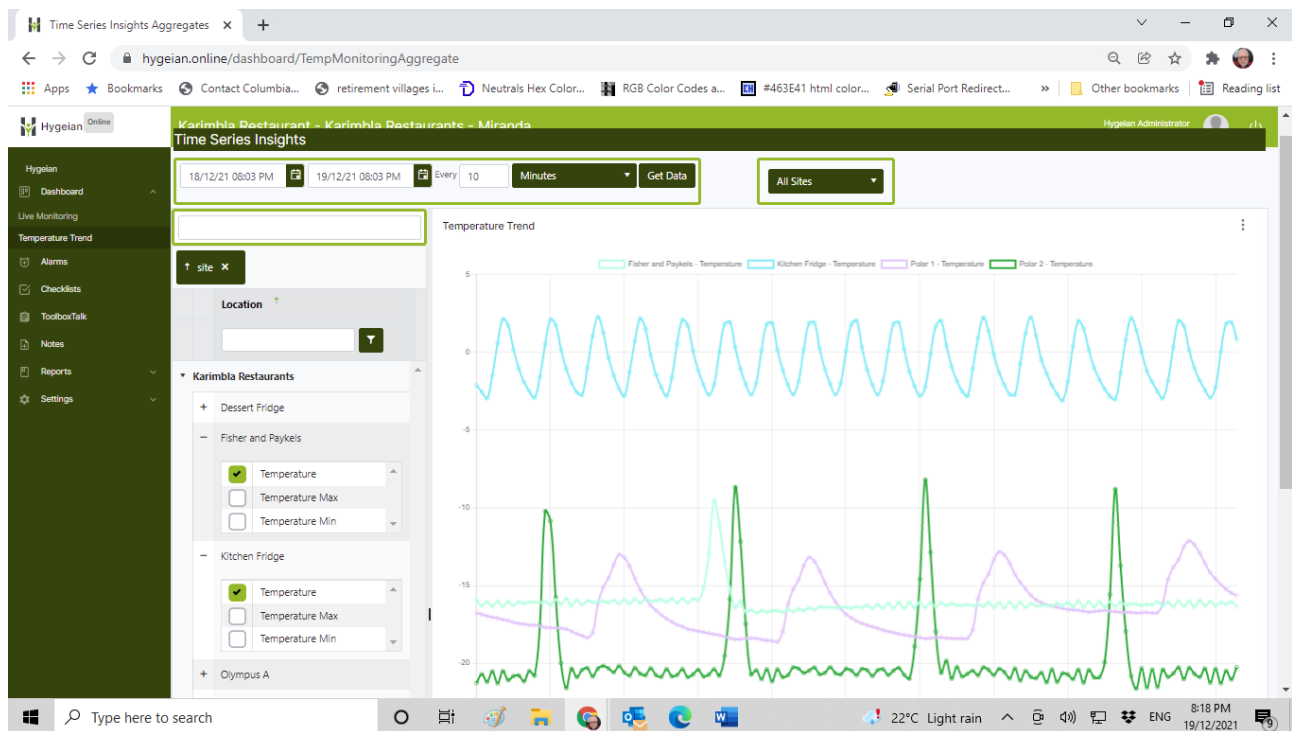
Here is a second example of the same four pieces of equipment being reported over 5 months in 1-day periods:
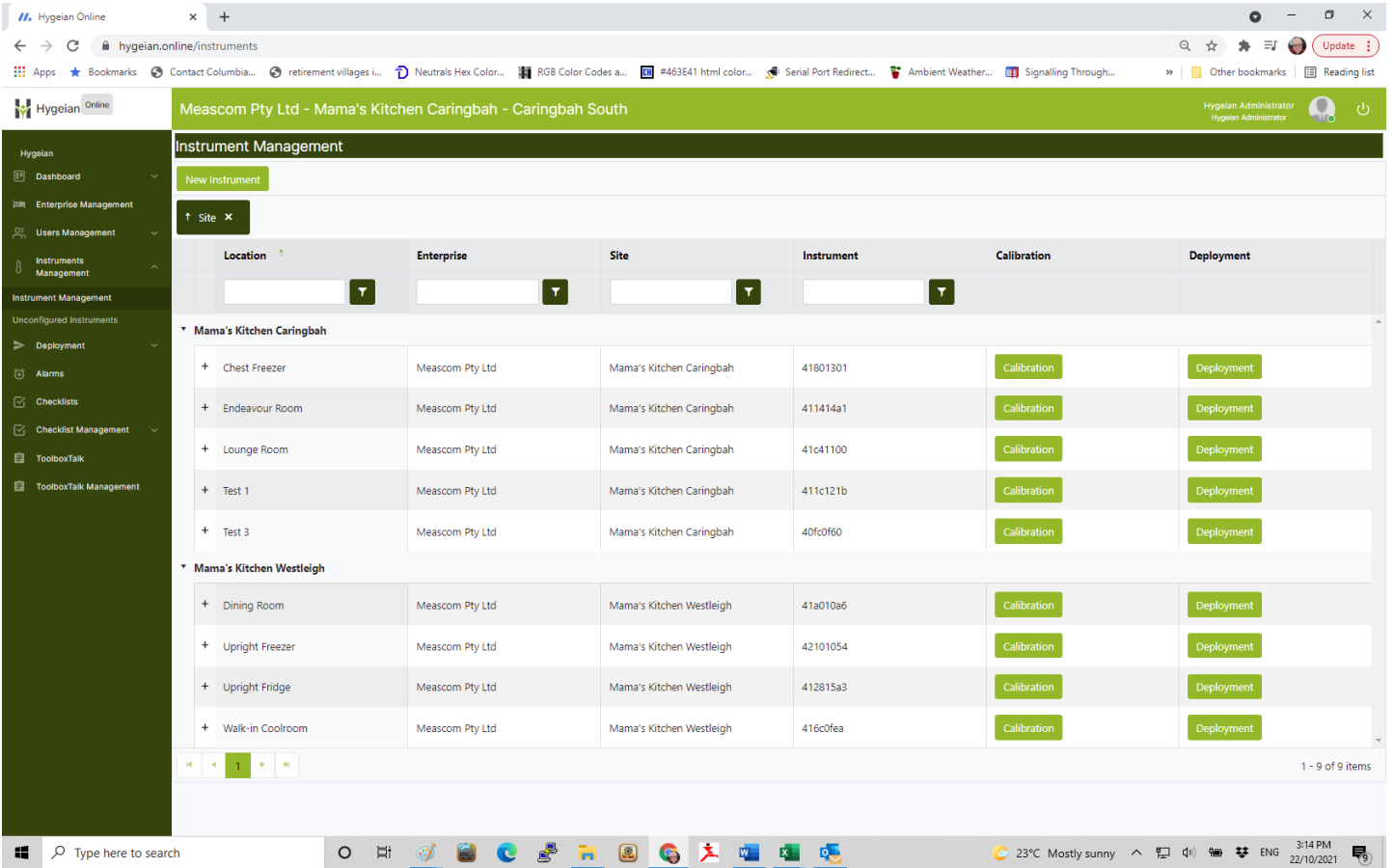

Interpreting the Trends

The daily average temperature of the fridge should be 2°C. Looking at the second example, one can see that the kitchen fridge daily average was already running about 1°C lower than necessary from July to mid-September and then it started running almost 3°C too cold from mid-September to end of November. That 2.5 to 3°C difference can translate into hundreds or even thousands of dollars extra in electricity expenses annually. The fridge setpoint needs to be adjusted.

Chapter 5: Alarms

Alarm Settings

The Alarm Settings are accessible under Instrument Management. The instruments for all the Sites belonging to one Enterprise for which the user has supervisor or administrator privileges, can be managed from one screen.
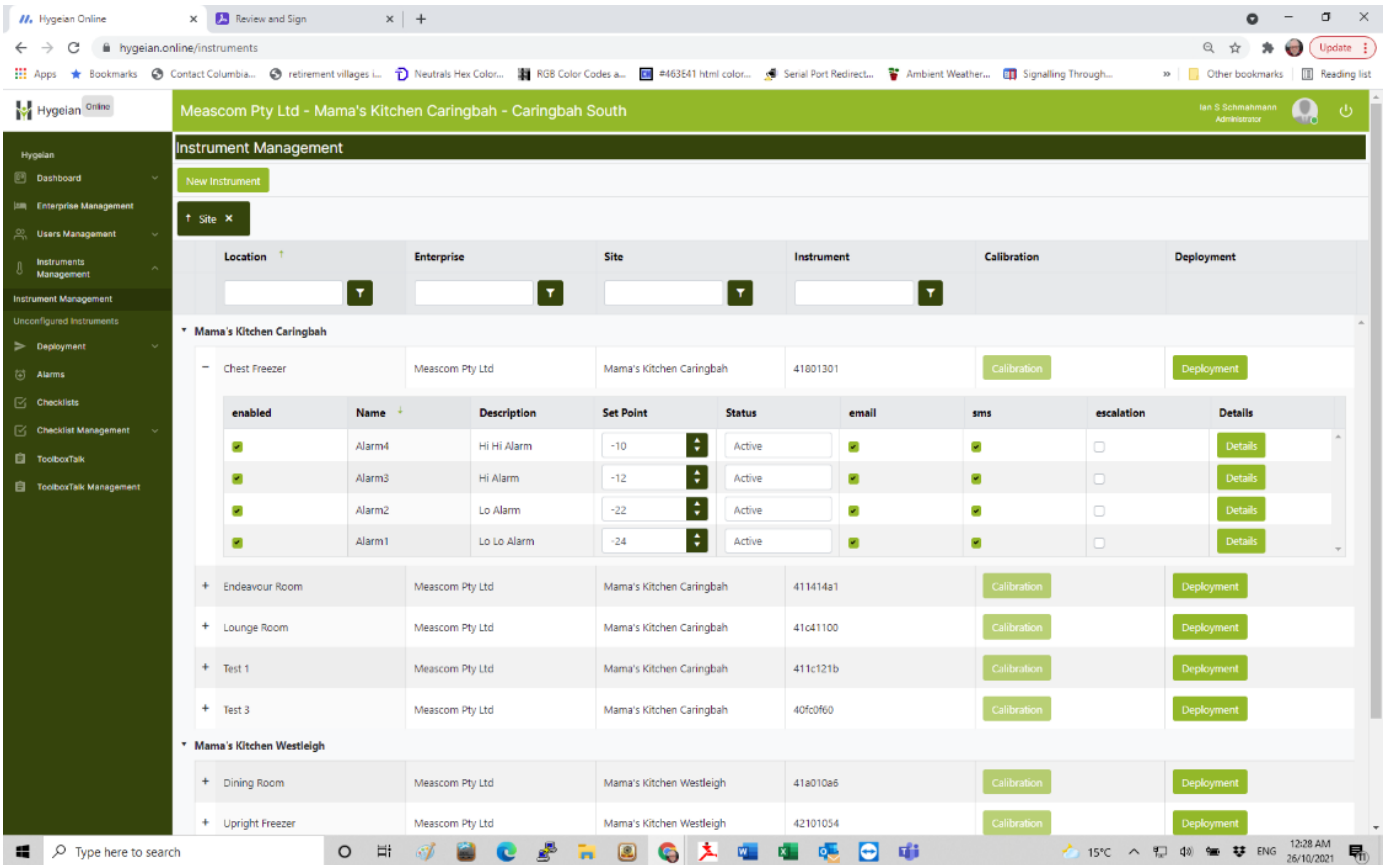
See also the Dashboard settings because the dial range is affected by the alarm settings.

Each monitored temperature has 4 alarms tied to it. The following are definitions of the measured and operational parameters associated with an alarm: You can access the alarm settings by clicking on the "+" sign next to the Location name.

For example, in the location called Endeavour Room, note how the settings window for the 4 alarms opens, when the + sign is clicked. The dial on the dashboard is scaled by the alarm setpoints so it is important that they are adjusted to suitable values, even if the alarms are not used for notifications or are disabled.

Note the following definitions:

a. **High Alarm**: An alarm will occur if the measured value remains equal to or greater than a settable value for a settable number of minutes.

b. **Low Alarm**: An alarm will occur if the measured value remains equal to or less than a settable value for a settable number of minutes.

c. **Setpoint**: The value against which the measured value is compared.

d. **Time Delay**: The settable number of minutes for a Low or High Alarm condition to be continuously present prior to the alarm being registered.

e. **Fleeting Alarm**: The alarm condition was present for less than the Time Delay and was thus not registered. This function may be removed from the system at some future date as customers do not use it.

f. **Deadband:** The value by which the measured value must move towards the non-alarmed state to allow a reset to occur. This applies only to alarms that have been registered.

g. **Reset point**:
   a. Setpoint – Deadband for a Registered High Alarm
   b. Setpoint+ Deadband for a Registered Low Alarm.

Each of the 4 alarms has a "Details" button which allows you to view additional settings in the Alarm Details pop up window. In this example the Details for the High-High Alarm are shown below:

The Disabled Start Date and Restart Date allow you to force an alarm to be disabled from a specified time and date to a later time and date. During that time, the Alarm Enabled checkbox will be unticked. There are numerous reasons why an alarm might need to be disabled for a period, such as equipment maintenance.

The name of the Alarm can be changed to something more specific, if desired. Use the "Description" field to rename the alarm.

The Dead Band of the alarm is the amount in Degrees C that the measurement must move away from the alarm condition (back into the safe region) to reset the alarm.

In the above example, the Setpoint is -10.0^{o}C and the deadband is 0.5^{o}C. The alarm operator is "Greater than or equal to", so if the Chest Freezer Temperature meets these criteria, the following sequences occur:

- The Date and Time the Trip occurred will be registered on the Alarm Table in the "Tripped At" column.
- The High-High Alarm Timer will start to time out for the Delay Period of 20 minutes.
- Provided that each time the system checks the latest value of the measured variable (once per minute) it is greater than or equal to -10.0^{o}C, the timer will continue to time out.
- If the measured variable is lower than -10.0^{o}C during this timing period, the timer will reset, and the date and time will be recorded in the 'Reset At" column. This record will be classified as a "Fleeting Alarm".
- Once the Time Delay has reached 20 minutes, the Alarm is registered. The High-High Alarm Date and Time will register on the Alarm Table in the "Alarmed At" column
- Once the Alarm Start Time and Date is registered, the temperature must reduce by 0.5^{o}C (be colder than -10.5^{o}C) for the alarm to reset. Once this occurs, the date and time are recorded in the "Reset At" column.

Alarm List and Alarm Chart

Each alarm is listed in the Alarm List which covers that site. See the example Alarm List below.

Note the filters which allow you to analyse the alarms.

Tripped At ↓	Alarmed At	Reset At	Set Point	Site	Location	Name
17 May 2024 07:42	17 May 2024 08:27	17 May 2024 08:47	-10	Karimbla	Polar 2	Hi Hi Alarm
17 May 2024 01:42	17 May 2024 02:27	17 May 2024 02:45	-10	Karimbla	Polar 2	Hi Hi Alarm
16 May 2024 12:40	16 May 2024 14:10	17 May 2024 11:30	-12	Karimbla	Polar 2	Hi Alarm
7 May 2024 09:23	7 May 2024 10:09	7 May 2024 10:20	-10	Karimbla	Polar 1	Hi Hi Alarm
24 Apr 2024 13:14	24 Apr 2024 14:16	24 Apr 2024 14:36	9	Karimbla	Dessert Fridge	Hi Hi Alarm
24 Apr 2024 11:59	24 Apr 2024 13:59	24 Apr 2024 15:00	7	Karimbla	Dessert Fridge	Hi Alarm

1 - 6 of 6 items

Alarm Chart

The alarm charts are displayed below the alarm list and provide some very useful ways of displaying the alarms to help identify the frequency of alarms occurring. In this example, Polar 1 had severe problems in February 2024
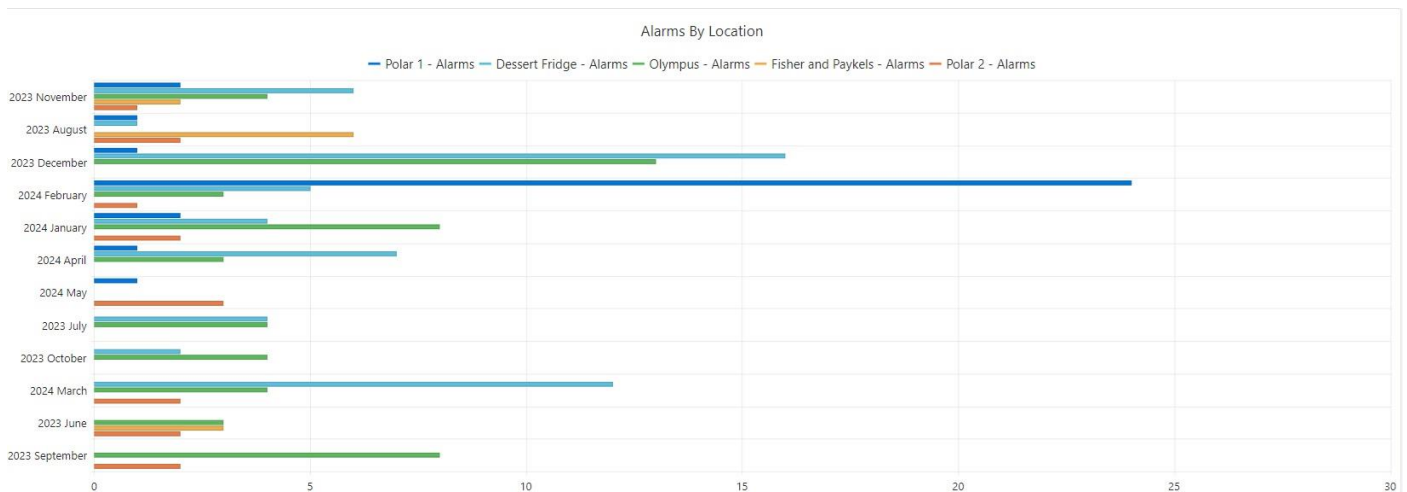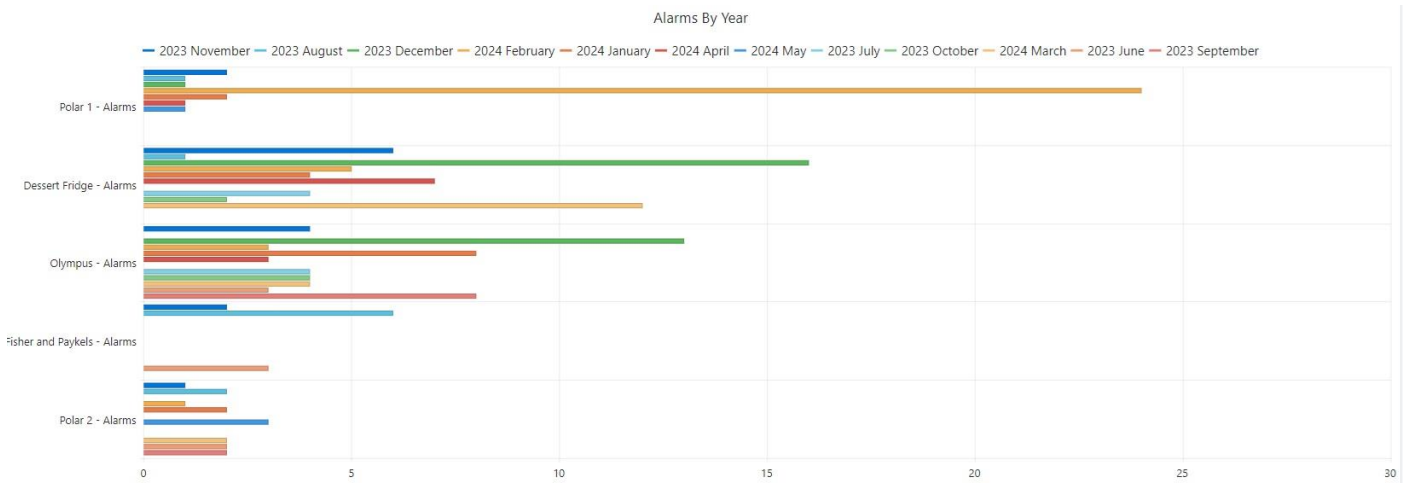
Message Templates

Standard Messages.

To ensure that the messages are cost effective, they have been constructed so that they are short, informative and allow sufficient space for the Site and Location names to be 40 characters each. If 80 characters are used in the site and location name in total, the message will be just under 160 characters in length, thus using up only 1 SMS per message.

The messages automatically include the following details:

a. The Alarm Description. As per the Alarm Details Popup
b. The Site Name. As Set by the User
c. The Location Name. As set by the User
d. The Setpoint. As set by the User in the Alarm Management Window
e. The Time Delay. As set by the User in the Alarm Details Popup
f. The current Temperature. As per the latest value on the dashboard

g. The Reset Point. This is calculated as (Setpoint – Deadband) for High Alarms or (Setpoint + Deadland) for Low Alarms where the Deadland has been set by the User in the Alarm Details Popup

Examples of Messages

A High Alarm Trip Message:

Hi Warning! Mama's Kitchen Caringbah Chest Freezer above -12.0^{o}C for 40 min. Now -10.7^{o}C. Resets at -13.0^{o}C

A Low Alarm Trip Message:

Lo Warning! Mama's Kitchen Caringbah Chest Freezer below -23.0^{o}C for 40 min. Now -23.7^{o}C. Resets at -22.0^{o}C

Reset Message

Hi Alarm Reset! Mama's Kitchen Caringbah Chest Freezer reset at -13.0^{o}C. Now -13.1^{o}C