A Cloud Based Management System


Automation Products Group, Inc.
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APG

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## 3. TROUBLESHOOTING & SUPPORT

Section 1

# INTRODUCTION

## 1.1 OVERVIEW

The purpose of this Explorer Manual is to provide users with guidance on how to use the features of Explorer.

**Key features include:**

- Sensor data delivery to user
- Sensor alarm notifications
- Two-way communication between user and sensors
- User controlled sensor and gateway configuration

This introductory section will instruct users on how to register, log in/out, and basic navigation of the website.

The "Using Explorer" section will cover the main features of Explorer and show step-by-step instructions on how to use them.

If a user is having trouble or receiving error messages, the "Troubleshooting & Support section will instruct users on how to best resolve their issues.

## 1.2 REGISTRATION

To use Explorer a user must be registered. To get to the Registration page, click on the “Sign Up” icon in the top right of the Login page.


*Sign Up Icon*

**Fill in the requested information and click the “Sign Up” button.**


*Registration*

A verification email will be sent to the provided email address, and once verification has been completed the user will be registered.

## 1.3 LOG IN

**Users will need to input their username and password to log into Explorer.**


*Log In*

If a user has forgotten their password, they can click the “Forgot Password” button the create a new password.

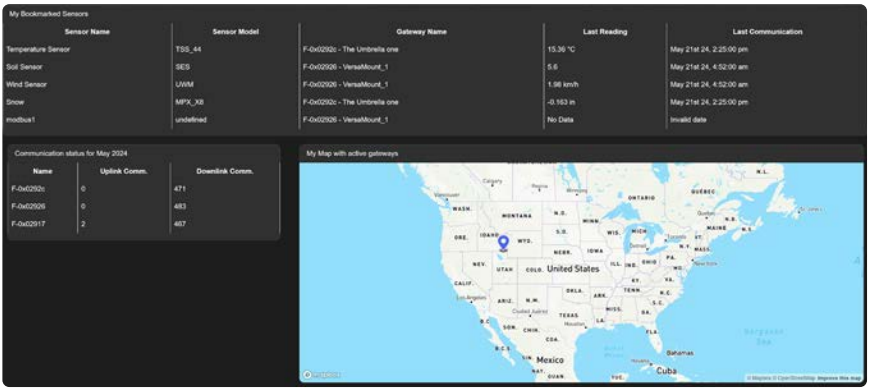
# 1.4 ORGANIZATION & NAVIGATION


*Basic Navigation Icons*

From left to right:

- "Home"
- My View
- Dark/Light Mode Toggle
- Profile
- Log Out

## 1.4.1 HOME PAGE




*Home Page*

The "Home" page has three displays: most recent communications, monthly communications, and a map of active gateways. It is designed to give users a brief overview of their gateways.

- The most recent communications displays the five most recent communications from the current gateways.
- The monthly communications display keeps track of uplink and downlink communications for the current months for each of the current user's gateways.
- The gateways shows where the gateways are located based on telemetry data. This will only show if the current user has access to the gateway's GPS telemetry.

## 1.4.2 MY VIEW

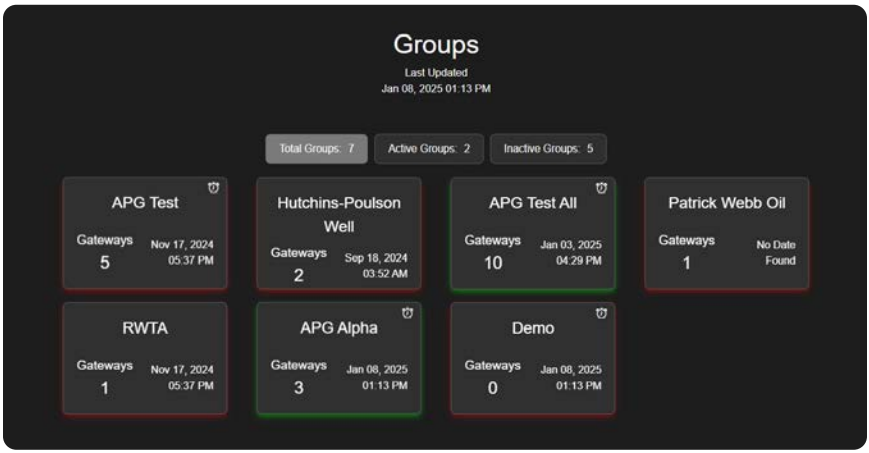
The My View page is the principle page for navigating and interacting with your gateways and sensors. This page allows users to drill down to specific information while also providing overview information at every level.

There are four different levels of information: Group, Gateway, Sensor, and Register. The Group and Gateway levels show detailed information and configuration settings of their respective level.

- **"My Sensors"** One of the navigation controls that shows your current position in different levels. Each indented group is a different level, starting at the Group level and ending at the Sensor level.

- **Root Level** At the root level you will see all the groups you have access to as cards. These group cards show the group name, the number of gateways in that group, a timestamp of the most recent communication for all those gateways, and aggregted informational icons (see section 1.4.3).

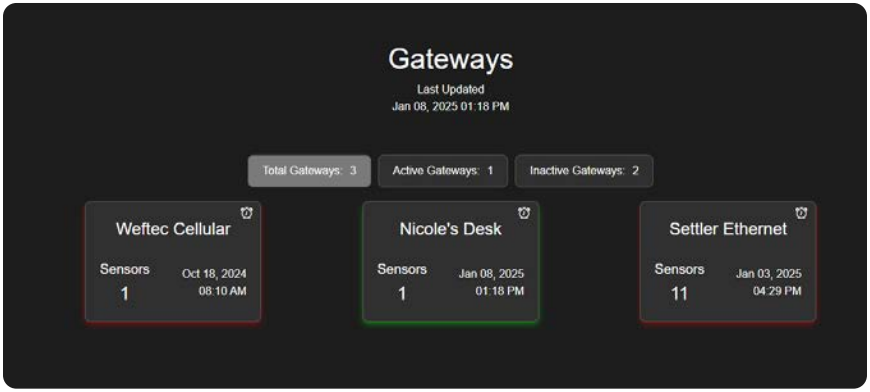
- **Group level** At the group level you will see all the gateways that are members of the currently selected group. The gateway cards show the gateway name, the number of sensors in the gateway, a timestamp of the most recent communication for all the sensors, and aggreggated informational icons (see section 1.4.3).




*Group Cards*

- **Gateway Cards**

The gateway level shows each sensor that is attached to the currently selected gateway. These sensor cards display the sensor name, a sparkling of the last 30 readings of the sensor, and informational icons (see section 1.4.3).

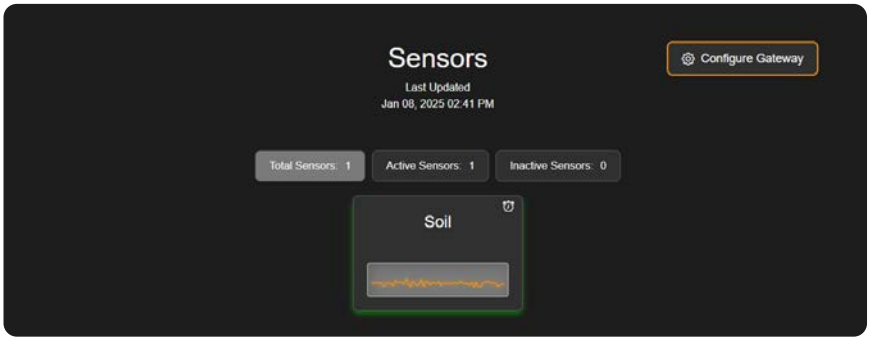



*Gateway Cards*

- **Sensor Level & Register Level**

**Overview:** Displays gateway and sensor specific information, as well as the register selection (see section 2.4.3).

**Tabbed Layout:** Detailed information and configurations for the currently selected sensor and register. Section 3 of this manual covers each tab.




*Sensor Cards*

## 1.4.3 CARD ICONS

The card icons appear throughuot the Groups, Gateways, and Sensors views

**Displayed from left to right:**

- **Blinking Red Alarm Clock** — Indicates an active alarm.
- **Alarm Clock (White/Black)** — Indicates that alarms have been set (color depends on the selected theme).
- **Orange Envelope** — Signifies that there are pending messages that need to be sent to the gateways.
- **Yellow Triangle with Exclamation Point** — Represents errors or timeouts encountered when a gateway attempts to communicate with a sensor (e.g., protocol errors or timeouts).
- **Hover Functionality** — Hovering over any icon displays count information:
  - "3 Alarms Set"
  - "1 Alarm Triggered"
  - "6 pending Messages"
  - "4 Errors/Timeouts"

## 1.5 LOG OUT

*Log Out*

Clicking on the Log Out icon will immediately log out the current user and direct the current user to the Log In page.

Section 2

# USING EXPLORER

The following sub-sections provide detailed, step-by-step instructions on how to use the various functions or features of Explorer.

## 2.1 INVITATIONS & PHANTOM USERS

**Invitations can be sent to email addresses from the Profile page.**

Once an invitation has been sent, a "Phantom" user is created with the inviter's current configuration and access attributes. These Phantom users can then be added to groups and have access attributes modified. When the invitee registers, the Phantom user becomes a regular user.

### 2.1.1 HOW TO INVITE OTHER USERS

- **Step 1** Click the Profile Button in the upper right-hand corner.
- **Step 2** Click the Invite Button.
- **Step 3** Input the invitee's email address, click "Invite".


*Profile Button* *Invite Button*


*Invite Input*

## 2.2 GATEWAYS

Gateways are a piece of the gateway system that communicates between the sensors and the website. All users can control the communication frequencies as well as the request register readings from the “Gateway Control” tab:

**Step 1** Click “My View”.


*My View Button*

**Step 2** Select the group the gateway is a member of.


*Gateway Group*

**Step 3** Select the gateway.


*Gateway*

## 2.2.1 GATEWAY READING CONTROL (GRC)

Gateway Reading Control allows the user to determine how a gateway device communicates with its sensors.

- **Sensors** — Previously define sensor selection.
- **Modbus Sensors** — **Register Address:** The Modbus register address to read

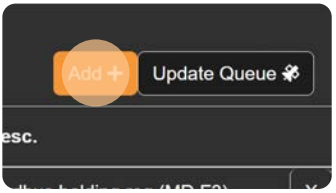
  **Register Quantity:** The number of registers to read starting at "Register Address" value.


- **4-20mA Sensors** — **Power Line:** Which power line communicates with the 4-20mA sensor.

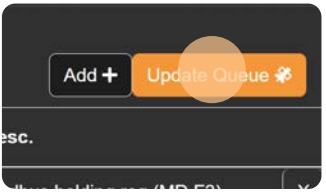

- **Function** — The type of read (protocol dependent).

## 2.2.2 HOW TO CREATE A NEW GATEWAY READING CONTROL

- **Step 1** — Click "Add".
- **Step 2** — Adjust row as needed.
- **Step 3** — Click "Update Queue".

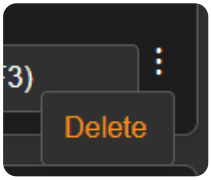



*GRC Add Button*




*GRC Update Queue Button*

## 2.2.3 HOW TO DELETE A GATEWAY READING CONTROL

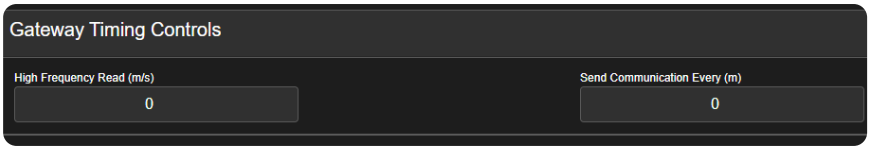



*GRC Delete Button*

- **Step 1** Click the 3 vertical dots to see the menu.
- **Step 2** Click “Delete”.
- **Step 3** Click “Save & Queue”.


*GRC Save & Queue Button*

## 2.2.4 GATEWAY COMMUNICATION SETTINGS



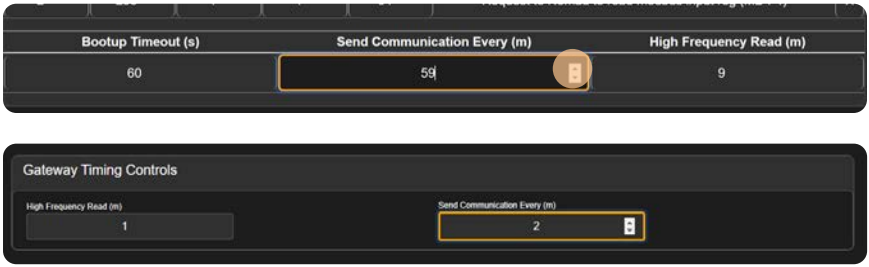

*Gateway Timing Controls*

Users can adjust gateway sensor reading and communication settings according to their need. **See Section 2.2.1 for a description of the configuration settings.**

**Step 1** Click “Gateway Control”.

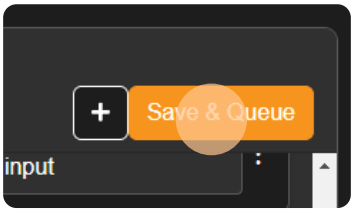

*Gateway Control Menu Options*

**Step 2** Adjust communications settings.




*Communication Settings Adjustment*

**Step 3** Click “Save & Queue” to confirm changes.




*Gateway Control Update Queue*

**Table 1. Gateway Configuration**

| Setting | Description | Default |
|---|---|---|
| High Frequency Read (minutes) | How often the gateway will read sensor values without sending (used for alarm detection). | 10 |
| Send Comm. Every (minutes) | How often the gateway will read and send sensor values. | 60 |

## 2.2.5 GATEWAY LOCATION

**If a user has access to GPS data, then they will see a "Gateway Location" tab in My View that shows the gateway's recorded location.**

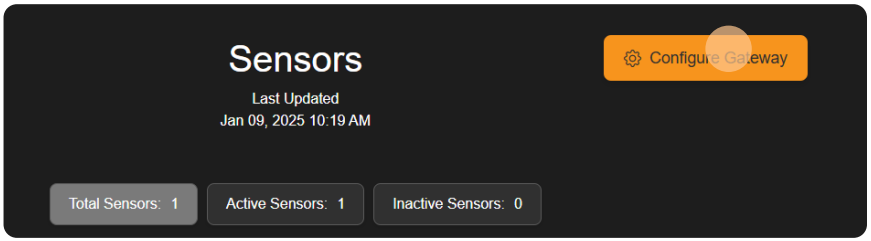
This feature requires gateway telemetry data that may not always be available.

*Note that Ethernet-connected gateways will not have GPS data, but they will be able to set the GPS location themselves.


*Gateway Location*

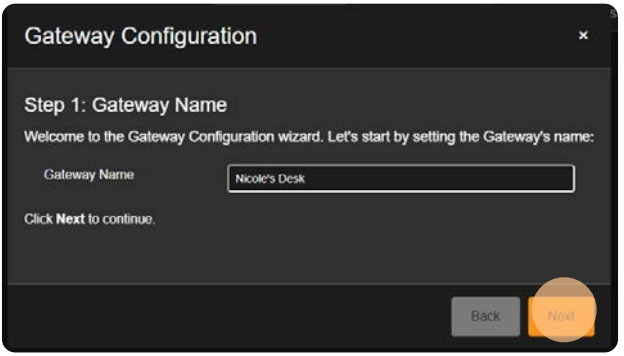
## 2.2.6 GATEWAY CONFIGURATION WIZARD

**On the Sensors page in My View, you can use the gateway configuration wizard by clicking on the "Configure Gateway" button.**



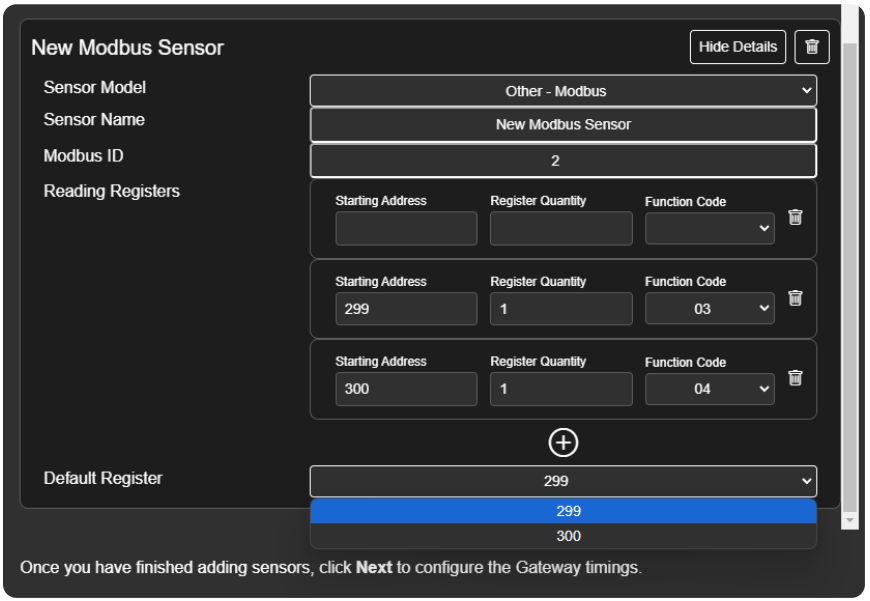

*Configure Gateway Button*

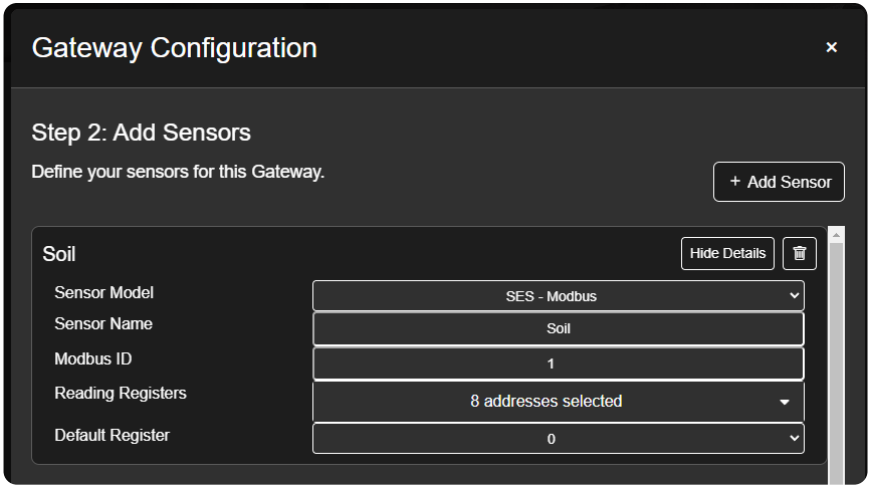
**Wizard Step 1** Name the gateway. The name will save when you click “Next”.




**Wizard Step 2** Add sensor configurations to the gateway. The sensors will save when you click “Next”.

GCRs (see 2.2.1) will be created and saved automatically from these definitions.




Adding APG Modbus sensor:

- Select the corresponding APG sensor model from the Sensor Model Dropdown.
- Name the sensor.
- Set the Modbus ID
- Select which registers you'd like to track with the Reading Registers dropdown.
  *Note: These registers are pre-configured based on the APG Model selected.
- Select the default register from the Reading Registers you selected above. This can be changed later, see Section 2.4.3

**Adding Generic Modbus sensor:**

- Select the “Other—Modbus” model from the Sensor Model.
- Name the sensor.
- Set the Modbus ID.
- Click on the plus sign to add a register definition.

  Define the starting register, the number of registers to read, and the Modbus function code.

  Repeat until you have added all the registers you wish to read from.
- Select the default registers from the Reading Registers you added. This can be changed later, see Section 2.4.3.

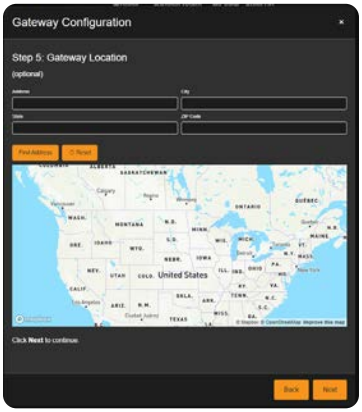
**Adding 4-20mA Sensors:**

- Select the sensor model.

  Select “Other—4-20mA” for non-APG sensors.
- Name the sensor.
- Set the 4-20mA power line

**Wizard Step 3** Gateway Timings. The timings will save when you click “Next”.

**Set the gateway communication settings. See section 2.2.4**



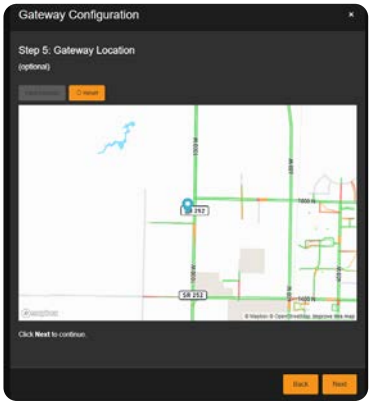

*Unset Location*

**Wizard Step 4** Gateway Alarms (optional). Any alarms you define will be saved and the Set Alarms command will be queued in the Message Center when you click “Next”.

**Set gateway alarms. See Section 2.3**

**Wizard Step 5** Gateway Location (optional). The location will be saved when you click “Next”.

This step shows a map of the current location of the gateway.




*Set Location*

If the location is already set, then you'll see a market of the currently set location.

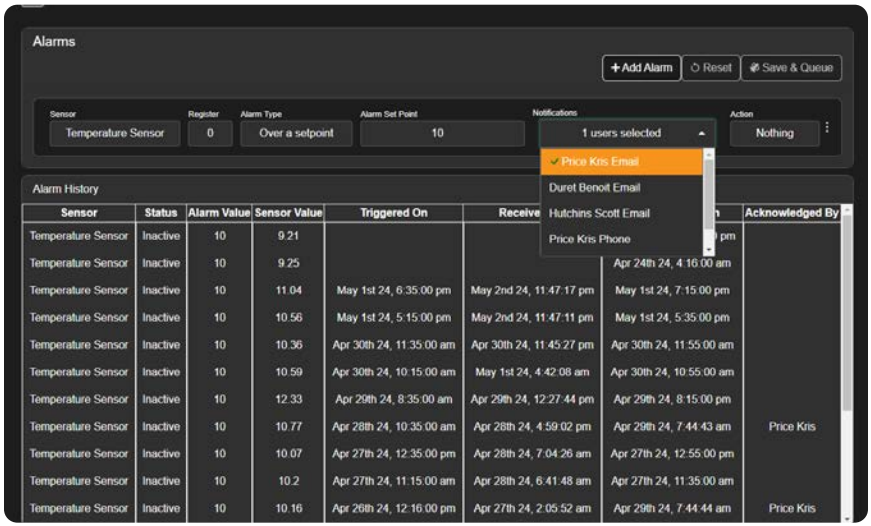
If the current location is wrong, or you've never set the location:

- Fill in the address with all fields.
- Click "Find Address".
- The map should zoom to the address provided, and place a market on the map.

**Wizard Step 6** Clicking "Finish" will complete the wizard. Any pending commands in the message center will be sent.

## 2.3 SENSOR ALARMS

Alarms are handled at the gateway level but are defined at the sensor level. When a user selects the Alarm tab in My View they will see all sensors' set alarms and alarm history for the gateway.

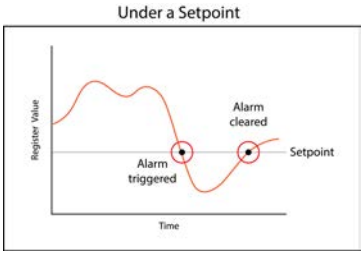
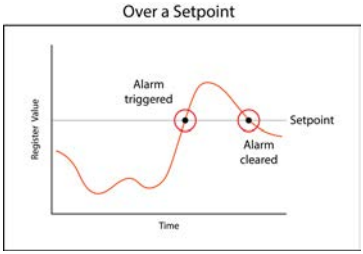
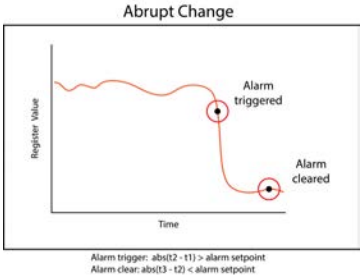



| Sensor | Status | Alarm Value | Sensor Value | Triggered On | Received | Cleared | Acknowledged By |
|---|---|---|---|---|---|---|---|
| Temperature Sensor | Inactive | 10 | 9.21 | | | pm | |
| Temperature Sensor | Inactive | 10 | 9.25 | | | Apr 24th 24, 4:16:00 am | |
| Temperature Sensor | Inactive | 10 | 11.04 | May 1st 24, 6:35:00 pm | May 2nd 24, 11:47:17 pm | May 1st 24, 7:15:00 pm | |
| Temperature Sensor | Inactive | 10 | 10.56 | May 1st 24, 5:15:00 pm | May 2nd 24, 11:47:11 pm | May 1st 24, 5:35:00 pm | |
| Temperature Sensor | Inactive | 10 | 10.36 | Apr 30th 24, 11:35:00 am | Apr 30th 24, 11:45:27 pm | Apr 30th 24, 11:55:00 am | |
| Temperature Sensor | Inactive | 10 | 10.59 | Apr 30th 24, 10:15:00 am | May 1st 24, 4:42:08 am | Apr 30th 24, 10:55:00 am | |
| Temperature Sensor | Inactive | 10 | 12.33 | Apr 29th 24, 8:35:00 am | Apr 29th 24, 12:27:44 pm | Apr 29th 24, 8:15:00 pm | |
| Temperature Sensor | Inactive | 10 | 10.77 | Apr 28th 24, 10:35:00 am | Apr 28th 24, 4:59:02 pm | Apr 29th 24, 7:44:43 am | Price Kris |
| Temperature Sensor | Inactive | 10 | 10.07 | Apr 27th 24, 12:35:00 pm | Apr 28th 24, 7:04:26 am | Apr 27th 24, 12:55:00 pm | |
| Temperature Sensor | Inactive | 10 | 10.2 | Apr 27th 24, 11:15:00 am | Apr 28th 24, 6:41:48 am | Apr 27th 24, 11:35:00 am | |
| Temperature Sensor | Inactive | 10 | 10.16 | Apr 26th 24, 12:16:00 pm | Apr 27th 24, 2:05:52 am | Apr 29th 24, 7:44:44 am | Price Kris |

*Sensor Alarms*

## 2.3.1 ALARM TYPES

Table 2. Gateway Configuration

| Type ID | Type | Alarm Triggers |
|---|---|---|
| 1 | Under | Sensor reading goes below the set value.<br>  |
| 2 | Over | Sensor reading goes above the set value.<br>  |
| 3 | Abrupt | The absolute difference between two consecutive sensor readings is larger than the set value.<br>  |

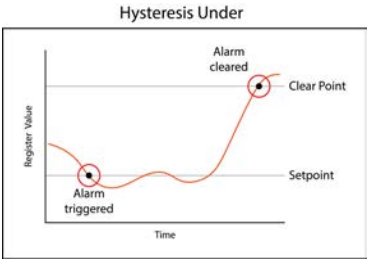
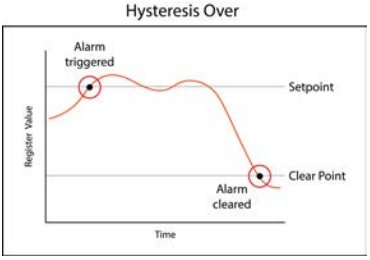
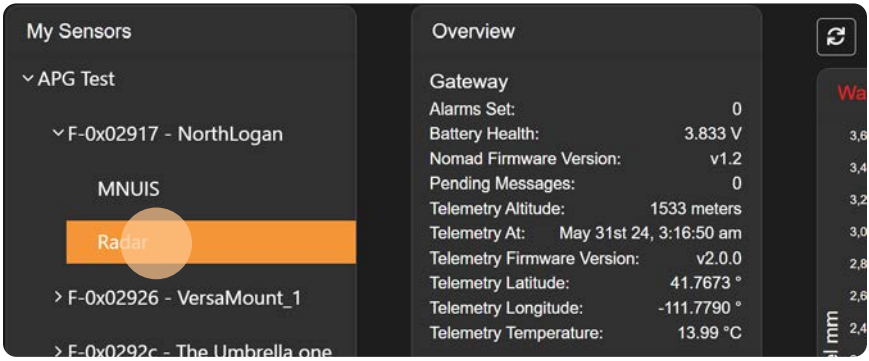
| Type ID | Type | Alarm Triggers |
|---|---|---|
| 4 | Hysteresis Over | If the value of the sensor, for the specified register, is under the set-point, turn on the alarm.<br><br>To turn off the alarm, the value of the sensor needs to be out of the hysteresis window.<br><br>  |
| 5 | Hysteresis Under | If the value of the sensor, for the specified register, is over the set-point, turn on the alarm.<br><br>To turn off the alarm, the value of the sensor needs to be out of the hysteresis window.<br><br>  |

Table 3. Gateway Configuration

| Action ID | Action | Description |
|---|---|---|
| 1 | Turn P1 ON | Gateway will turn Digital Output 1 **ON** |
| 2 | Turn P1 OFF | Gateway will turn Digital Output **1 OFF** |
| 3 | Turn P2 ON | Gateway will turn Digital Output **2 ON** |
| 4 | Turn P2 OFF | Gateway will turn Digital Output **2 OFF** |
| 5 | Nothing | Gateway will **do nothing** (Alarm notifications will be sent out) |

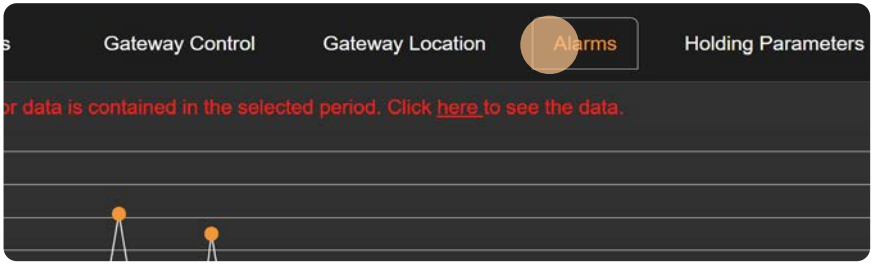
## 2.3.2 HOW TO ADD AN ALARM

**Step 1** Select sensor.



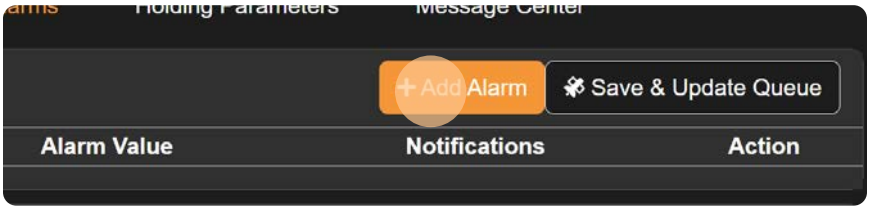

*Sensor Selection*

**Step 2** Click “Alarms”.



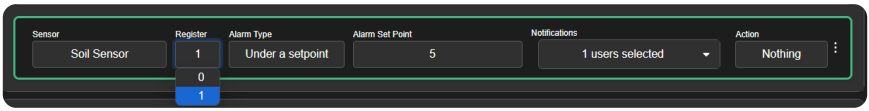

*Alarm Menu Options*

**Step 3** Click “Add Alarms”.



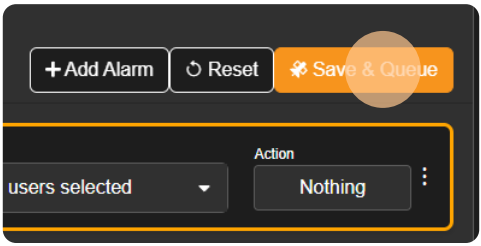

*Add Alarm*

**Step 4** Set the alarm configuration.




*Alarm Configuration*

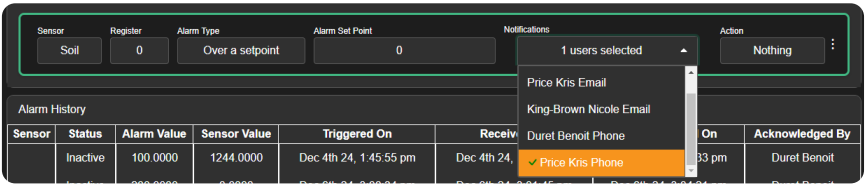
**Step 5** Click “Save & Update Queue”.




*Save & Update Queue Button*

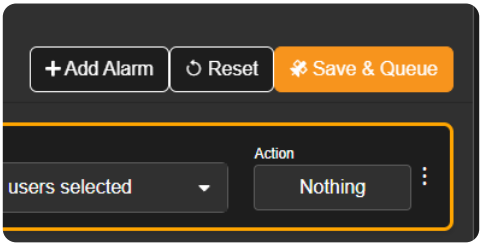
## 2.3.3 HOW TO EDIT AN ALARM

**Step 1** Configure alarm to you specifications.




*Alarm Specifications*

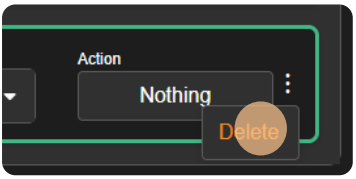
**Step 2** Click “Save & Update Queue”.



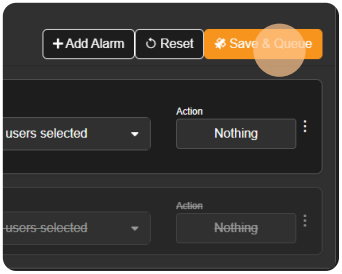

*Save & Update Queue Button*

## 2.3.4 HOW TO DELETE AN ALARM

- **Step 1** Click the 3 vertical dots to open the menu for the row and click “Delete”
- **Step 2** Click “Save & Queue”




*Alarm Delete Button*



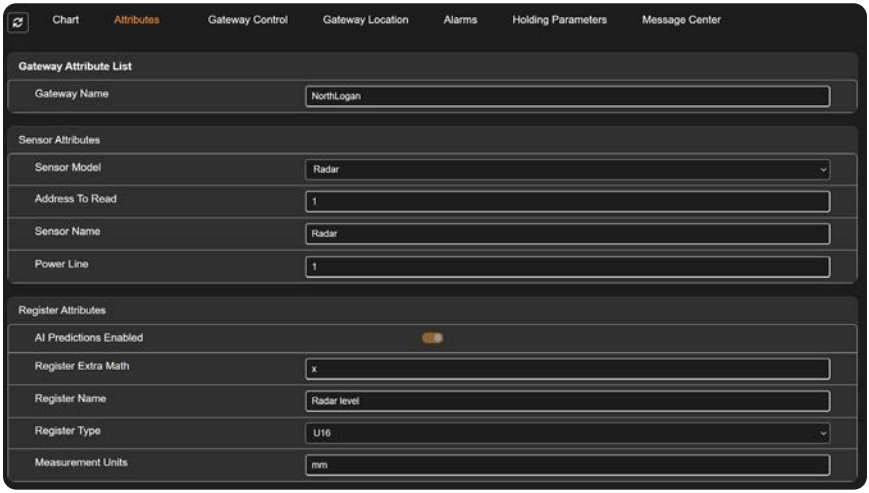

*Save & Queue Button*

### 2.3.5 ALARM HISTORY

The “Alarm History” table will show all previously triggered alarms as well as all actively triggered alarms. The gateway will clear its own alarms if the sensor value returns to a ‘safe’ reading.

> **NOTE:** *Using satellite communications can cause some messages to become unordered. It is possible for Explorer to receive an alarm cleared message before receiving an alarm triggered message. To better inform the user, the Alarm History table includes the “Triggered On”, “Received On”, and “Acknowledged On” timestamp columns.*

## 2.4 ATTRIBUTES




*Attributes Page*

## 2.4.1 SENSOR ATTRIBUTES

The user can configure the sensor configuration by changing the values in the **Sensor Attributes** list. Any changes to these values will automatically be saved to the database.

Table 4. Sensor Attributes

| Name | Action |
|---|---|
| Sensor Model | The model of the sensor. |
| Address to Read | The address of the register holding the sensor value. |
| Sensor Name | User defined alias for the sensor. |
| Power Line | Which power line the sensor is using. |

## 2.4.2 REGISTER ATTRIBUTES

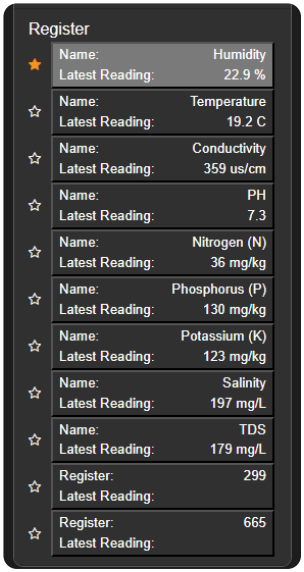
The register attributes let Explorer know how to format the register values for display to the user.

Table 5. Register Attributes

| Name | Description |
|---|---|
| Register Extra Math | Equation used to convert this register's values.* |
| Register Type | The data type stored by this register. |
| Register Name | The name of the register |
| Measurement Units | The unit string associated with the measurement (e.g., Â°C, mg/L). |
| AI Predictions Enabled | Indicates whether AI predictions are enabled for this register. Contact APG Sales for assistance with enabling AI predictions for your gateway |

*Explorer converts to and from the register, meaning this equation must be bijective and should be kept simple.

## 2.4.3 REGISTER SELECTION

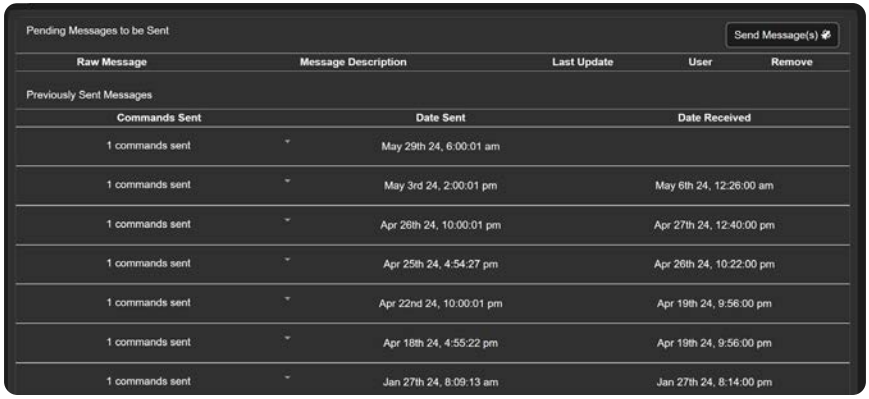



**Star Selection:** Determines which register data is loaded by default when the sensor is selected. Additionally, the starred register determines which register data is used for the sensor card sparkline display.

For more information on defining the register name, conversion equation, and units, refer to Section 2.4.2.

# 2.5 MESSAGE CENTER

The “Message Center” is where outgoing messages are queued and send to gateway devices.




*Message Center Page*

## 2.5.1 SENDING MESSAGES

Configuration changes to a gateway or a sensor are encoded into hexadecimal messages and assembled in the Message Center. Users will see a notification if any pending messages are waiting to be sent.

**To send the messages simply click the “Send Message(s)” button.**

## 2.5.2 MESSAGE HISTORY

Messages that have been sent are saved and can be viewed in the Message Center. Messages that have been received and acknowledged by the device have a “Date Received” timestamp.


*Message History*

# 2.6 CHART

The Chat tab will visualize a sensor’s register values over time.


*Sensor Value Chart*

## 2.6.1 CHART OPTIONS

**Number of Readings**

The number of readings can be changed to:

- Last 30 readings
- Last hour
- Last 12 hours
- Last 24 hours
- Least 7 days
- Last 30 days
- Custom

**Alarms**

Toggle to display alarms as dashed blue horizontal lines.


**AI Options**

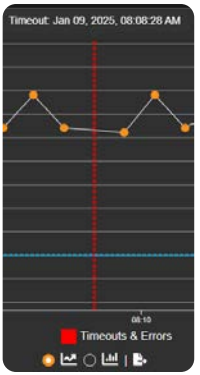
Toggle to enable AI predictions

Temporarily remove outliers from the displayed data

Toggle for data imputation

**Timeouts & Errors**

Toggle to display timeouts and errors as dashed red vertical lines. Hovering over these markers will show additional details.



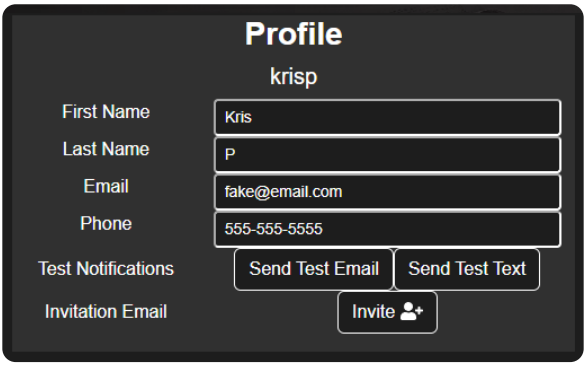
## 2.6.2 EXPORT DATA

Users can download a CSV file that contains the current chart visualization data. The column headers of this downloaded data are:

- sensor_id
- sensor_type_id
- address
- lastupdate_ts
- last_update_user_id
- sensor_data_id
- sensor_data_value
- receive_date_time
- sensor_address

# 2.7 PROFILE

The Profile page is for users to add or change basic user information, test notifications, and invite other users.




*Profile Page*

## 2.7.1 USER CONTACT INFORMATION

The user's contact information is used almost exclusively for alarm notifications. Users should keep this information updated and use the test notification to ensure that alarm notifications are delivered.

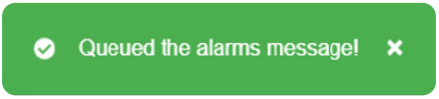
Section 3

# TROUBLESHOOTING & SUPPORT

## 3.1 ERROR MESSAGES

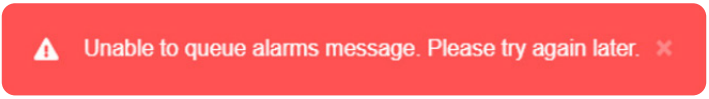
The result of Explorer saving information to the database is displayed to the user using pop up notifications (examples below). These notifications will be shown at the bottom right of the website.

**When data was saved successfully the user will see a green notification along with a brief description:**




*Example of a Successful Database Interaction*

However, whenever there is a problem saving data, the user will see a red notification.




*Example of an Unsuccessful Database Interaction*

**NOTE:** *If an error message appears, any changes the user was attempting to make will NOT be saved until the error has been corrected.*

## 3.2 TROUBLESHOOTING

**The most common reason for a user to run into problems with Explorer is disruption of their Internet connection.**

- **Step 1** The first step of troubleshooting should always be to check that the user's device has a connection to the Internet.

  The second most likely reason a user will experience problems is if Explorer's website host is down. Once the user has ensure that they are connected to the Internet, the second step is to wait. This will give the hosting service time to get back online.

- **Step 2** Wait one hour before resuming work on Explorer.

  If user still has problems after these two steps, please see **Section 3.3** about getting support.

## 3.3 SUPPORT

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