eTracker

CDMA & GSM M2M

3G Cellular / Cloud-Based

Data Acquisition System (DAS)

User Manual

For Sales & Service Contact

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1. PRODUCT OVERVIEW

For Stevens, M2M stands for "Measurements to Mind" and means – *what the sensor Measures the Mind sees*. The Stevens eTracker is the link (or gateway) between the sensors and online data analysis, visual insight, and control via the Internet. Using industry cloud-computing terminology, the eTracker is the Platform as a Service (PaaS), whereas the cell network and cloud service (Stevens uses Amazon EC2) is the Infrastructure as a Service (IaaS), and the on-line data management software (Stevens-Connect for Stevens) is the Software as a Service (SaaS).

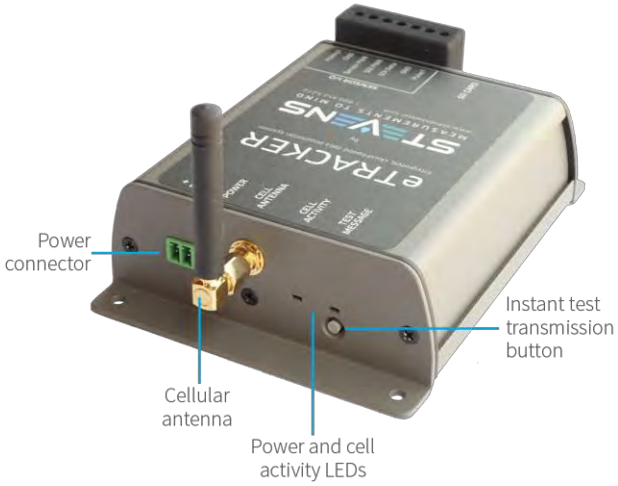
Stevens eTracker is a paradigm shift in data acquisition that embraces the rapidly growing IoT (Internet of Things) where all the configurations, data logging, computations, processing and interaction with the sensors is online, and accessed anywhere there is Internet connectivity. eTracker is part of the cloud-computing process that is merging sensors, information technology, and communications infrastructure under one interface experience. This is a shift from isolated configuration, programming, logging and control of hardware to a centralized, cloud-based platform process.

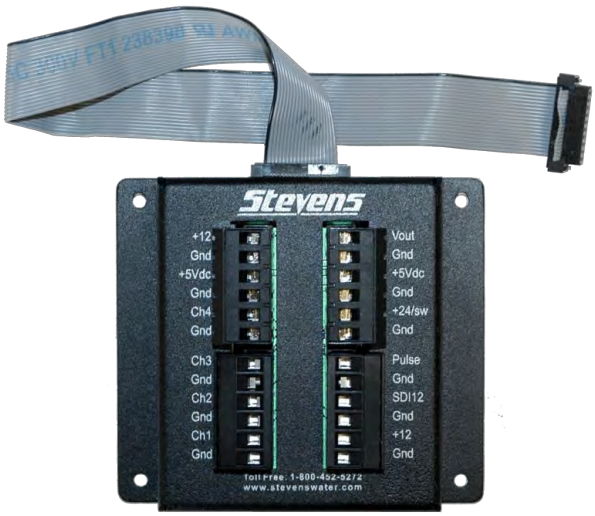
The Stevens eTracker is a complete data acquisition system (DAS) that operates over cellular data networks, allowing the configuration and transmission of data from sensors in any location within the cellular service area. Communication is made via HTTP and uses Internet compliant data stream to directly interact the same as all information on the Internet. This enables data to be uploaded directly to the "Stevens-Connect" SaaS web-based program which provides centralized station control and data management service for display, storage, computation and graphical analysis.

The eTracker DAS has advanced buffering capabilities allowing for data packets to be queued ensuring reliability during periods of high cellular data traffic over network towers, or if cellular service is interrupted. Advanced low-power modes allow eTracker to idle for use with low-power solar systems. Logging of sensor measurements can occur up to once per second, and transmissions can be scheduled to occur at a variety of intervals and as often as every 2 minutes. Between logging and transmitting, the modem will remain in a low-power state to maximize battery life. eTracker sensor interface and reporting is remotely configurable via "Stevens-Connect" web-based software, to allow the user to change how the connected sensor will log their data as well as how often transmissions will take place.

Applications Include:

- Water resource management
- Meteorological
- Soil monitoring
- Scientific research
- Aquaculture
- Agriculture
- Tank levels
- Mining
- Groundwater monitoring
- NGO air & water monitoring devices
- Bioremediation
- Tidal and port systems
- Environmental and climate monitoring
- Pipeline conditions
- Stormwater
- Most sensors to cellular M2M communication





Optional full sensor interface module for multiple analog or pulse sensors

2. SPECIFICATIONS

2.1 Technical Specifications

LED Indicators
(See Section 3.6 for LED behavior)
Power: indicates power to the unit
Cell: indicates state of connection to cellular network
Test Message: button/LED to engage Test Message Mode (see 6.0 for detail).

Power Input Voltage
10 to 18 Volts DC
Reverse polarity protection
Current Consumption:
TX: 250 mA
RX: 150 mA
Logging: 35mA
Idle (between Logs & Tx): <2 mA

TX Output Power
24.3 dBm (270 mWatts)

Sensor inputs
4 Analog Channels – single ended
Sensor power: 24V switched
Voltage range & resolution:
Analog to digital (0 to 2.5 VDC)
21-bit resolution
Logging: 10 seconds to 24 hours
4 Pulse Channels
Continuity or TTL (Transistor Transistor Logic)
0 V to 2.2 -5.0 V
Maximum sample rate: 10 pulses per second per channel
Logging: 1 second to 24 hours

SDI-12 Channel
62 SDI-12 sensors (up to 9 parameters per sensor)
SDI-12 sensor power: 12 V Switched
Logging: 1 minute to 24 hours (sensor dependent)

Reporting interval
2 minutes to 24 hours (sensor dependent)

Ports
SD Flash Card (FAT 32):
- Data backup
- HTTP destination setup
- APN setup if using GSM network
- Cell connection diagnosis
- Firmware upgradable

24 pin 2mm Header: for sensor interface
SMA Connector: for cellular antenna

Physical
10.78 ounces (305.6 g) without antenna
Dimensions (H x L x W)
1 3/8 x 5 1/8 x 3 ¾ inches (3.5 x 13 x 9.7 cm)
Extruded anodized aluminum housing

Environmental
95% non-condensing
Operating Temperature: -30 C to +60 C
Lightning protection: AC transient voltage suppressor (TVS) on each sensor port input

Cellular Module

	GSM	CDMA
FCC	RI7HE910	RI7DE910-DUAL
CE Mark	CE 1909	n/a
Frequency in MHz	850, 900, 1800, 1900	800/1900

2.2 Part Numbers

Items sold separately

Part Number	Item
80060-60B	eTracker for GSM *
80060-60A	eTracker for CDMA *
80060-502	Mini Sensor Interface box
80060-505	Full Sensor Interface box
93777	Antenna, ruggedized, 900Mhz, 3DB, whip with N Female
92824-002	Cable Assembly, cell modem to bulkhead, N to SMA, 2 ft.
92845-010	LMR400, N-to-N, Antenna Cable length per 10 feet
93772	Antenna, 900 Mhz, 9DB, Yagi with N Connector
93950-108	Antenna, Wide-Band Yagi, 9dB, with N Connector

Table 1. Part numbers & Accessories Options

* Each eTracker includes a power cable with flying leads, a dipole dual-band cellular 800/1900 MHz antenna, and a 2Gbyte industrial grade SD Card. While any SD Card (Including SDHC) with FAT 32 will work, an industrial grade SD Card is recommended. Select a full or mini sensor interface module (see Section 3.1) based on the application.

3. PHYSICAL CONNECTIONS TO eTRACKER

3.1 Sensor Connections

Sensor connections are made through the sensor I/O interface using either a full sensor interface, or a mini sensor interface. Figure 1 shows the interface devices and Table 2 & 3 detail the I/O for the full sensor interface and mini sensor interface, respectively.

Figure 1: Full and Mini Sensor Interface (not to scale)

Full Sensor Interface Connections

IO connection	Purpose	IO connection	Purpose
GND	Ground	AUX-RX	Diagnostic
CH1	Analog Input	AUX-TX	Diagnostic
GND	Ground	GND	Ground
CH2	Analog Input	RS232-RX	Future growth
GND	Ground	RS232-TX	Future growth
CH3	Analog Input	PULSE4	Digital Input
CH4	Analog Input	GND	Ground
SensPWR	Switched 24 V Sensor Power	PULSE3	Digital Input
Vout	Control Voltage Output (future growth)	GND	Ground
GND	Ground	PULSE2	Digital Input
SDI12	SDI12 Data I/O	GND	Ground
BATTsw	Switched SDI12 Power	PULSE1	Digital Input

Table 2

Mini Sensor Interface Connections: (marked on eTracker top label)

IO connection	Purpose
PULSE1	Digital Input
GND	Ground
SDI Data	SDI Data I/O
SDI PWR	Switched SDI12 Power
Sensor PWR	Switched 24 V Sensor Power
GND	Ground
Analog1	Analog Input

Table 3

The full sensor interface module has GDT (gas discharge tube) on each input for additional lightning protection, as well as a switch to add a 100 ohm resistor for each analog input when using current sensors.

3.2 Power Connection

A power cable with flying leads is provided to make power connections directly to a +12V battery through a solar regulator load terminal or any other power source that supplies +10 to +16VDC and can source the necessary current for the unit. Although the eTracker is reverse battery protected, and will not cause damage to the unit if accidental reverse connections take place, please be mindful of the polarity of the wiring.

3.3 Antenna Connection

The eTracker is supplied with a small cellular antenna, which needs to be screwed onto the SMA jack where the label is marked “Cell Antenna” and positioned vertically for proper operation. Finger tightening is adequate. Alternative antennas can also be used in the event that more antenna gain is needed for a good network connection, as measured by RSSI (received signal strength indicator). The antenna needs to be placed outside of any metal enclosure that the eTracker is placed in.

3.4 SD Card

The SD Card included with eTracker is industrial grade with 2Gbyte of memory space. The SD Card with FAT32 format (32 bit File Allocation) keeps track of all your files and helps the computer locate them on the disk. Per industry standards, FAT32 supports up to 2 terabytes of hard disk storage. Most SD Cards use FAT32. Older cards less than 2 Gbyte or earlier FAT format cards will not work with the eTracker. The purpose of this card is:

- Data from sensor measurements (date / time stamped) backup
- HTTP destination setup
- APN setup if using GSM network
- Cell connection diagnosis
- Loading firmware updates

3.5A Data Backup

A backup data file is stored on the SD Card for all the data that is sent to the HTTP destination. The SD Card is automatically updated with any new logged data every 5 minutes. The format of the file is ASCII, and the extension is .DAT. The file name will be the date when the data backup began. For example, if you plug in and begin transmitting date on Oct, 10, 2015, then the file name will be 20151010.dat.

The eTracker appends this file for one month. At the beginning of each month a new backup data file is created that will include all sensor measurement taken for the month. The way to get another file started sooner than once per month is to cycle power in which a new file is started as a result of this power reset. No data or configurations are lost when power is interrupted.

Should the SD Card not be inserted correctly or missing, the eTracker will still operate (assuming the eTracker has been programmed with the correct service provider and data destination information, see 3.5B). The data will be logged to the internal data buffer until successful connection to cellular network and to the HTTP destination. However, without the SD card, the data buffer will be cleared after successful transmission and no data will be backed up at the eTracker site.

3.5B Destin.txt for destination and GSM configuration

When the eTracker first powers up, it will look at a file on the SD Card titled destin.txt. This file contains the HTTP destination information and GSM APN (Access Point Name) information. It defaults to:

Domain: data.stevens-connect.com
Folders: /incoming *(this is fixed for stevens-connect server)*
Port #: 80 *(this is fixed for stevens-connect server)*
APN: aer.aerisapn.net *(this example uses an Aeris SIM card. Your cellular carrier will provide this)*
Username: *(if network requires it, left blank otherwise)*
Password: *(if network requires it, left blank otherwise)*

If Stevens has not pre-configured the eTracker's APN before shipping, the user can open this destin.txt file on the SD Card and change any of the lines related to the APN (specifically, APN, username and password). The file is opened by removing the SD Card from the eTracker and connecting it to a computer using either the computer's SD card slot, if such SD Card port is integrated with the computer, or via a SD Card to USB adapter. Then open the file under the drive indicated for that SD Card on the computer.

The default settings are assuming that Stevens-Connect is being used as the web-based tool to analysis and display the data. If a different cellular carrier is used, be sure to only make changes to the APN information. This APN is given by your cellular service provider.

For CDMA cellular communications, there is no APN. Instead, the eTracker is pre-configured with the mobile equipment identifier (MEID) to direct the data to Stevens-Connect cloud-based service. The MEID is a globally unique number identifying a physical piece of CDMA mobile station equipment. If the user plans to transmit the data to a server other than Stevens-Connect, Stevens will need to provide the user with the MEID number for the eTracker, which the user will need to provide to their database network personal for programming.

Once the destin.txt file is saved, reinsert the SD Card into the eTracker SD Card slot. When the eTracker is powered on, this information on the SD Card will be automatically read by the eTracker. The new destination configuration will be permanently saved in the eTracker's non-volatile memory. From this point forward, this eTracker uses the information in the non-volatile memory, and not from the SD Card.

Note: The Station Unique Identifier (SUI) number is <u>not</u> the APN. The SUI is printed on a sticker located on the side of the eTracker enclosure and also inside (if the sticker with the number is removed). The SUI is not changeable and will be used for online configuration using the Stevens-Connect Station setup page to link to that individual eTracker (see Section 5.2 configuration process).

3.6 LED Indicators

LED	Power	Cell Activity: Attempting to connect to Cell network	Cell Activity: Connected to cell network
CDMA	Flashes Green every 2 seconds	Quicker flashes Red at a rate < 1 per second. Time in this state: Typically < 1 min **	Slower Flashes Red at a rate > 1 per second. Time in this state: Typically <30 sec **
GSM	Flashes Green every 2 seconds	Solid Red Time in this state: Typically <1 min **	Flashes Red at a rate > 1 per second. Time in this State: Typically <30sec **

** The actual time is cellular network dependent base on the network's current usage demands. The eTracker is designed to attempt cellular network connection for up to 1 minute. To conserve power, after 1 minute the eTracker will stop the cell connection attempt, assume the cell network is busy, save the data in the buffer, and send it the next scheduled transmission with any new data.

The Test Message LED indicates whether or not the eTracker is in Test Message Mode. See Section 6 on Test Message Mode for a detailed explanation of Test Message Mode switch/LED behavior.

4. CONFIGURATION PROCESS OF eTRACKER via STEVENS-CONNECT

4.1 Downloading Configuration to eTracker DAS

Configuration of each eTracker is done on-line via Stevens-Connect. The eTracker being configured does not need to be on, and connections (see section 3) do not need to be made to change the configuration. The configuration will be automatically downloaded to eTracker once it is powered-on. See section 5.2 Initial Station Setup.

For the eTracker to download the on-line configurations file:

- Provide power connection (see Section 3.2)
- Make sure the SD Card information is correct (see Section 3.5B), and properly inserted in the eTracker SD Card slot.
- Connect to Stevens-Connect and configure the Station page with the eTracker's SUI number (See Section 5.2).

After these steps, each time eTracker is powered on (and each time it performs a schedule transmissions), the eTracker compares its internal configuration to the one online. Any updates to the on-line configurations that have been saved under Stevens-Connect website will be automatically updated on the eTracker. You do not need to be logged into Stevens-Connect for the eTracker to retrieve this configuration file. If no configuration has been made there yet, the eTracker defaults to a pre-programmed internal configuration to begin.

The configuration downloaded contains all the information to get eTracker set up. Configuration of the eTracker is easy. The information saved to the eTracker's non-volatile memory includes transmit interval, station name, information on sensors that connect to specific I/O, how often the sensors are to be interrogated, and warm-up time. This and other configuration information is maintained in the cloud on Stevens-Connect. All sensors and sensor parameters are configured using Stevens-Connect.com.

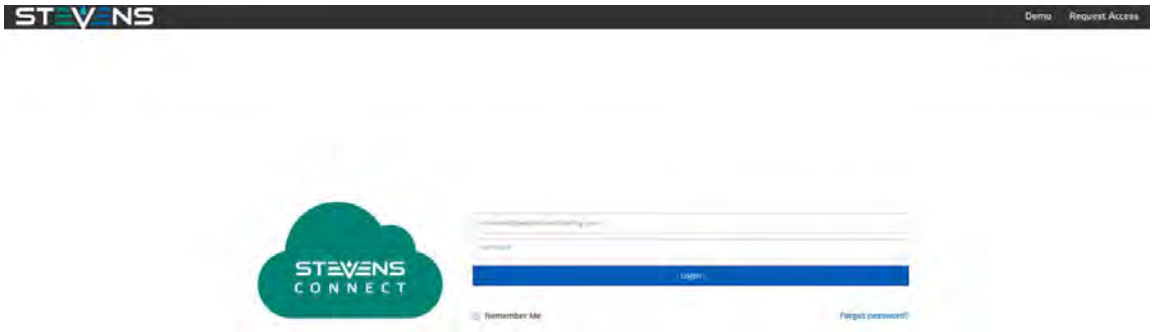
Login at www.stevens-connect.com to get started using your custom login information provided by Stevens or Stevens' distributor. Contact Stevens directly if you need this information to be resent.

5. USING STEVENS-CONNECT FOR CONFIGURATION OF STATION, REPORTING, AND SENSORS

Go to www.stevens-connect.com.

5.1 Login to Stevens-connect.com

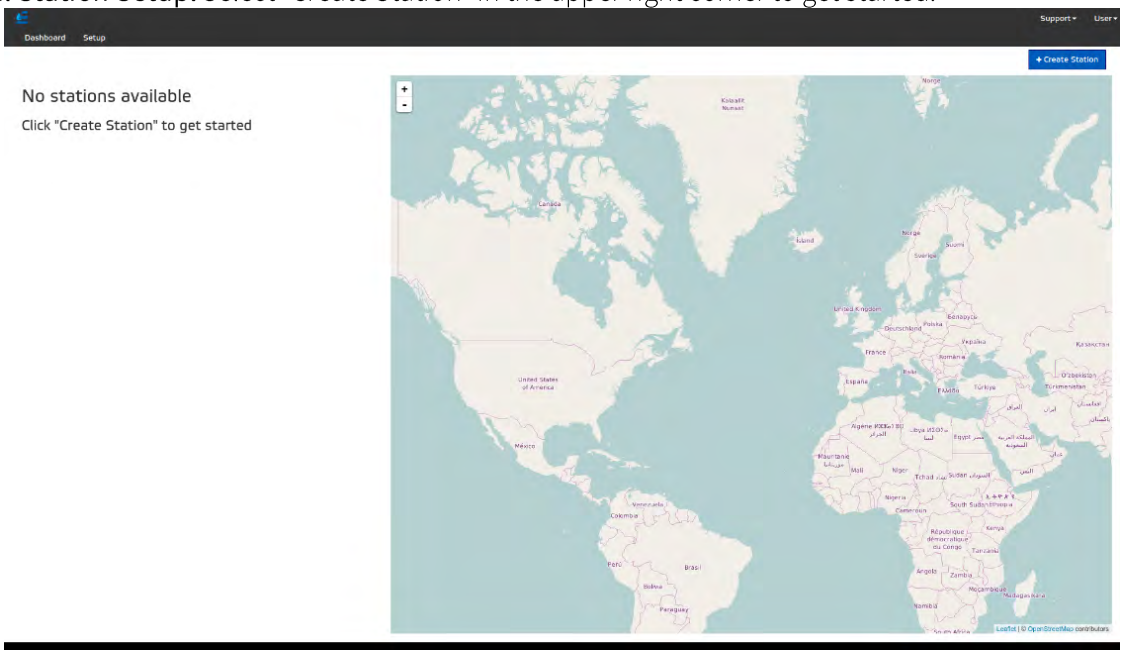
Log in using your custom login information (email address and password) received from Stevens or Stevens' distributor. Select "Login".



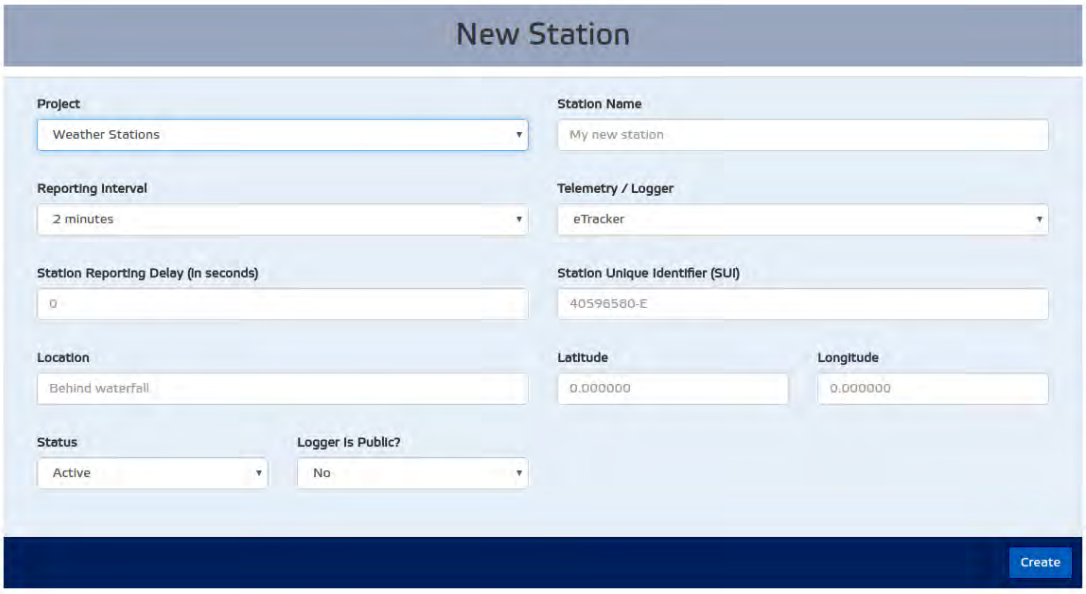
The Password can be changed by using the pull down menu under the user name located at the upper right section of the Stevens-Connect page.

5.2 Setting up a New Station

Initial Station Setup. Select "Create Station" in the upper right corner to get started.



After selecting "Create Station" the following screen will appear:



Project is the name you provided to Stevens or to Stevens' distributor that defines the project, water shed and/or region that has one or more eTrackers or other stations that use GOES, other cell modems, or

other telemetry radios within this Project area that report the data to Stevens Connect. This Project name should already be populated within the pull-down list. To change the Project Name, select Company under the user drop-down menu (See Section 7).

Station Name can be any descriptive identifier you choose for that station where the eTracker is located. This can be up to 65 characters.

Reporting Interval defines how often the eTracker will transmit and report sensor data and system status. The reporting interval is a pull-down selectable time between every 2 minutes to every 24 hours. Reporting time begins at the top of the hour from midnight. See Station Reporting to modify this begin time.

Telemetry / Logger is the source of data telemetry radio configured to send data to Stevens-Connect. This pull down list includes:

- Other (which includes Stevens Cell-Net with other loggers / RTUs or other cell modems programmed to send data via HTTP protocol to Stevens-Connect)
- Cell-Net + Dlight (Stevens data logger)
- Cell-Net + DL3000 (Stevens data logger)
- Cell-Net + MSO (a multi-parameter weather sensor)
- Cell-Net + AIO (a multi-parameter weather sensor)
- eTracker

Select eTracker, which should be the default setting.

Station Reporting Delay is the delay in reporting from the top of the hour (see Reporting Interval). Enter the number of seconds required. For example, if 180 seconds is selected and the Report Interval is 30 minutes, the actual report time will be twice per hour at 3 minutes and 33 minutes after the top of the hour. The default value of zero will be sufficient for most situations. This Station Reporting Delay feature is primarily to capture all sensor warm-up time and SDI-12 sensor wait time that may be occurring during scheduled transmissions. Without this delay, any sensor logging by the eTracker during transmission will be sent the next scheduled transmission, no data is ever lost. If sensor data being logged at time of transmission is important to have before such transmission begins, calculate the warm-up time of any analog sensors and SDI-12 Sensor(s) response time to determine the total sensor measurement cycle time. Calculate the necessary Reporting Delay in seconds so that logging and reporting are not occurring at the same time. For most long-term monitoring applications, this delay is not necessary and simply enter "0" since all data will be transmitted within two reporting cycles.

Station Unique Identifier (SUI) is located on the label on the side of your eTracker. **It is very important to fill in this field because this establish wireless link between eTracker and Stevens-Connect!** The

data passed to and from the eTracker over the cellular network is dependent upon this SUI. The SUI is not changeable and will be used for online configuration using the Stevens-Connect for each eTracker. You can have multiple eTrackers for the same Project Name, but each eTracker has its own SUI number.

Location can be any descriptive identifier you choose to assign to the GPS coordinates Latitude and Longitude. This name is not required. This location name is for reference and currently only used on the Stevens-Connect Info page under the Dashboard tab.

Latitude and Longitude values automatically ties the station to a pin indicator on the map of the Dashboard page, so it is also important to include these fields. The format is in decimal degrees (up to 8 decimal places) and is manually entered. The eTracker does not have an integrated GPS to determine these values. If the eTracker is every moved, this Latitude and Longitude will need to be manually updated.

Status defaults to Active, which means this station is ready for eTracker to start logging and transmitting the sensor measurements. Select Inactive while the station and sensors are being set up and configured to avoid unwanted measurements transmitted.

Logger is Public is a pull down selection of Yes or No. "Yes" allows viewing of the station data without the need for login information. The station can viewed publically using an automatically generated URL www.stevens-connect/public/[PUBLIC KEY]. You can find your PUBLIC KEY in the Company Profile (see Section 7). "No" means the public has no access to view the data. "No" restricts access to Stevens-Connect via email and password login protocol.

After this initial station set up information is completed, select "Create" button on this screen. This will save this Station configuration in Stevens-Connect. When the eTracker is powered and begins communication over the cellular network, the eTracker will find this new station set up and save the Reporting Interval and Station Reporting Delay into the non-volatile memory of the eTracker. After you select "Create", the Station summary for your newly created station will appear:

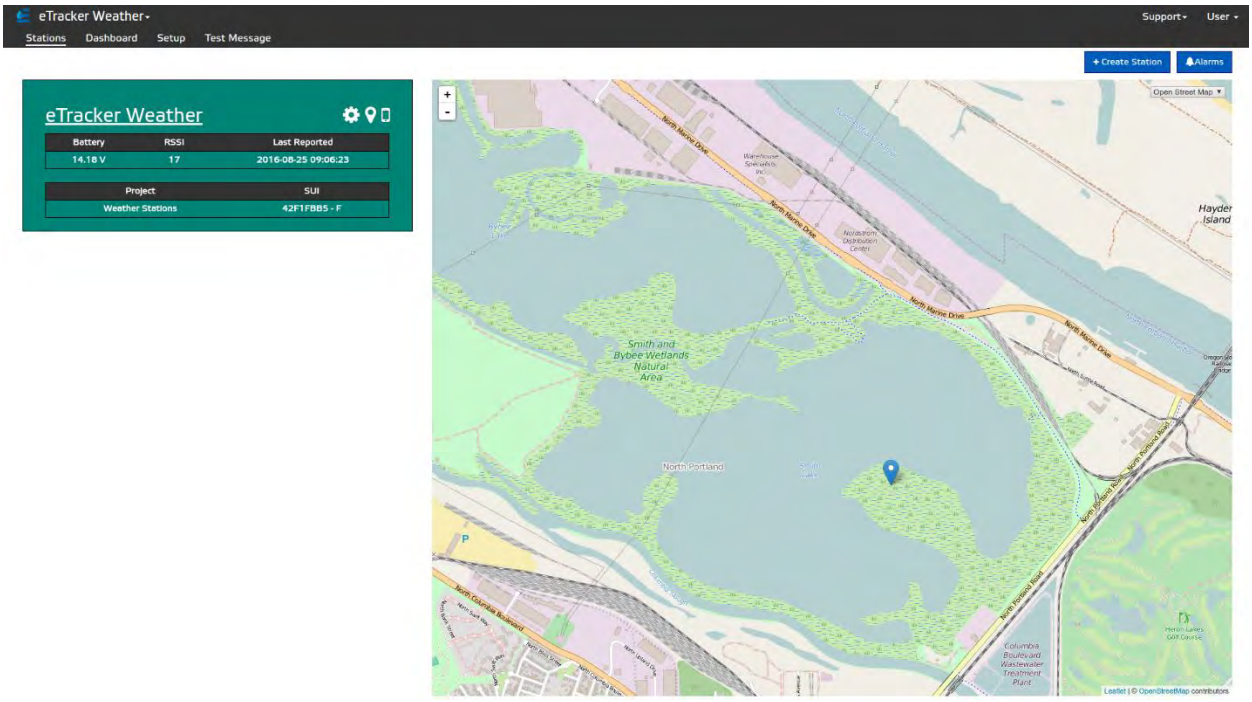
5.3 Setting up Sensor Configurations

Now you are ready to connect your sensors to the eTracker via a Full Sensor Interface or a Mini Sensor Interface as outlined in Figure 1. (See Section 3.1 Sensor Connections for wiring instructions).

Note: The sensors do not need to be connected to the eTracker at the time of the station and sensor configuration, but the Analog and Pulse sensor configuration channels need to match how the sensor I/O Interface will physically be connected.

CONFIGURATION OF SENSORS. All configuration is done online using the eTracker configuration features of Stevens-Connect.com. After any configuration changes are saved, the eTracker will automatically update upon the next scheduled transmission. eTracker will also update its configuration on start-up, therefore by cycling power, configuration changes can be updated immediately.

Log into Steven-Connect (See Section 5.1). The information page with all stations and map with location of the stations will appear (Assuming you have step up the Station per Section 5.2) similar to this:

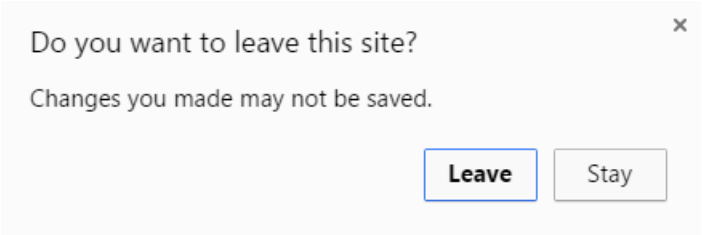


With your mouse curser, select the station configuration you want to view and/or modify. The Dashboard for that station will appear.

If the Dashboard page has not been configured (See Section 8), this Dashboard area will be empty. At the top, select "Setup". The following screen with configuration options along the left side will appear.

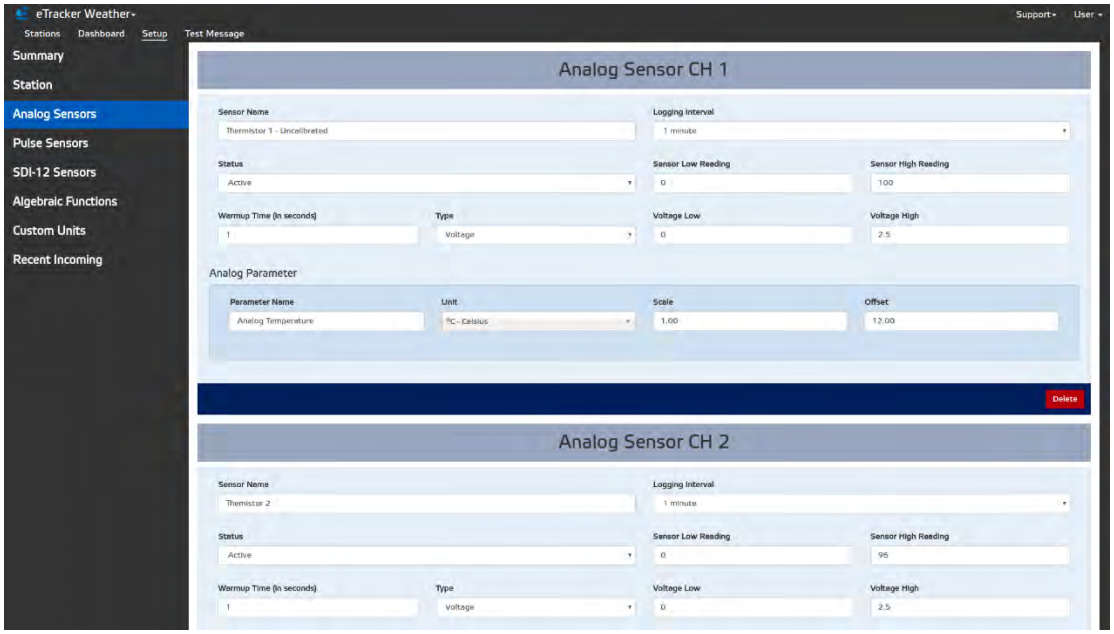
Save Changes. Any new sensor configurations or modification needs to be saved by selecting "Save All Changes" at bottom of the screen. You can make other changes within the "Setup" feature without saving each time you move to another sensor or station page. The user can also back out of a change with the "Revert Changes" selection which also appears any time a change is made. Before you exit the "Setup" features section, select "Save All Changes". If you leave the "Setup" feature **without** selecting "Save All

Changes", such changes made will be lost. If you try to leave this "Setup" feature without saving, the following warning will appear:



5.3A Analog Sensors

Select Analog Sensors to add either a voltage output sensor or a 4-20mA current output sensor.



There are 4 channels available. Select the channel for the attached sensor and fill in the fields as indicated. If the Mini Sensor I/O Interface is being used, only select Analog sensor 1.

Sensor Name is the reference name for all measurements reported for that sensor. The sensor name is alpha / numeric. An example of a sensor name could be the manufacturer model number, like the Stevens SDX. The number of characters in the sensor name is limited to 65.

Logging Interval is a pull down menu to select a frequency between 1 second and 24 hours for the eTracker to get the sensor measurements. Make sure that the Logging Interval is at least as often as the station's Reporting Interval. For example, if your Reporting Interval is every hour, use a logging interval that is shorter than or equal to one hour. Also, confirm with the sensor's manual that this logging interval is acceptable because some sensors have a specific warm-up time.

Set the **Status** to Active when ready for eTracker to start logging the sensor measurements. Select Inactive while the sensor is being set up to avoid unwanted measurements.

Warmup time in seconds is the time the sensor requires to warm up before taking a measurement, which should be specified by the respective sensor's operation manual. eTracker will turn on the sensor in advance of reading by the number of seconds entered here.

Type is a pull-down menu to select either voltage or current sensor type. The screenshot above shows a "Voltage Sensor" configuration. The voltage range fields appear allowing the user to enter the voltage range of the sensor. If "Current" is selected, then the voltage range disappears and assumes 0.4 to 2V because the 100 ohm current resistor is switched in on the Full Sensor Interface box for that channel.

If a Mini Sensor Interface is connected to eTracker, then a 100 ohm resistor must be placed between GND and Analog1 to connect a 4 – 20mA current-type sensor. Install this resistor and the sensor while the power is disconnected. Failing to install this resistor could result in damage to the eTracker. The Sensor PWR output is 24V, therefore the purpose of this resistor is to lower the input voltage of the sensor to the analog input range of eTracker (0 – 2.5V). In the case of 4 – 20mA current sensors, the default range for the voltage is 0.4 to 2V.

The Large Sensor Interface has four integrated 100 ohm resistors that can be switched-in using the 4 DIP switches on the bottom of the Large Sensor Interface. Simply set the switches to Current for the channels using 4-20mA sensors. Failure to set the switch to Current for the channel with a 4-20mA sensor could result in damage to the eTracker.

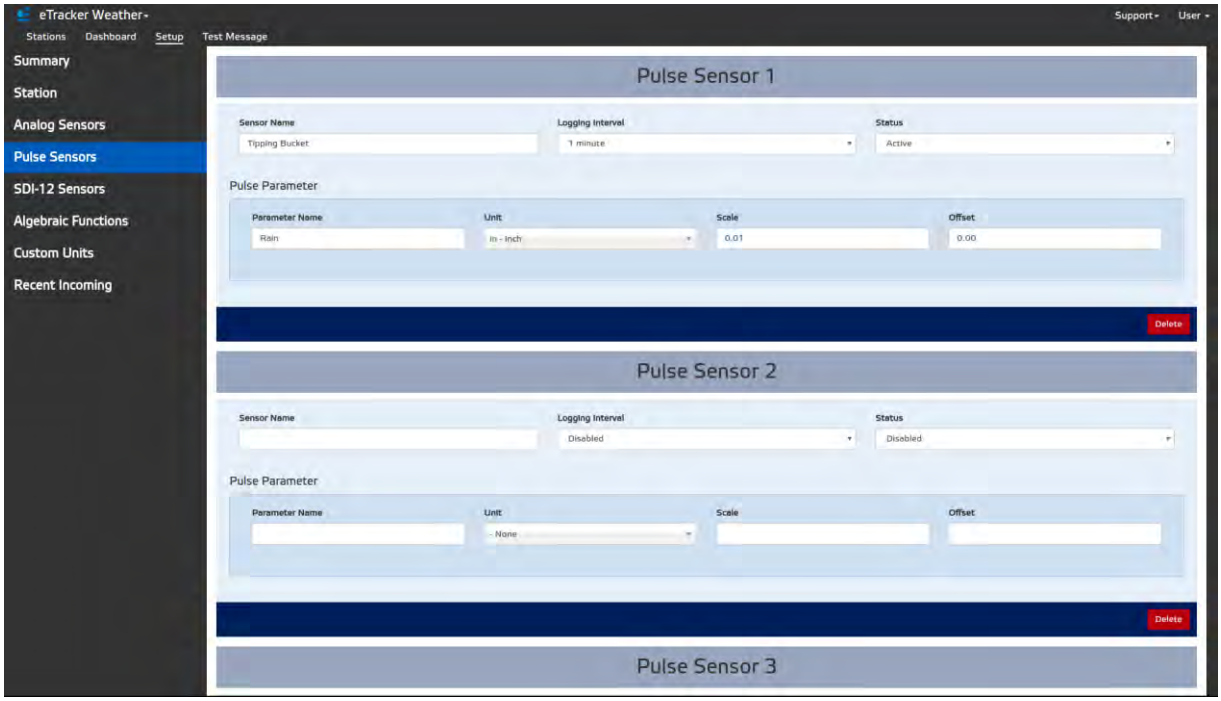
Enter the analog parameters as they apply to the sensor in use:

- **Parameter name.** While the sensor name maybe the manufacture of the sensor or model number, the Parameter Name is the measurement parameter of that sensor. For example, you may have a Stevens SDX Pressure Sensor, and the parameter be denoted as "Water Level".
- Assign **units,** if they apply. They are the sensor output's unit of measure. If not applicable, select "None". For example, water level units would be a depth expressed in mm-Millimeters. This is for displaying units of measure terminology on charts and graphs. There is no mathematical adjustment to the sensor's values by selecting the units of measurement. If a unit desired is not listed, a unit of measure can be added under "Add Additional Units" (see Section 5.6).
- **Scale** is a multiple or a fraction of the sensors measurement to be logged and reported.
- **Offset** is an addition or subtraction of the sensors measurement to be logged and reported.

  Note: Offsets entered in the sensor setup can also be determined and entered using the test message process (see Section 6 Test Message Mode).

5.3B Pulse Sensors

Select **Pulse Sensors.** If your station includes a sensor that has a pulse output, then it needs to be connected to a pulse input on eTracker. Four (4) pulse sensors inputs can be configured with eTracker. If the Mini Sensor I/O interface is being used, only select Pulse Sensor 1.



Sensor Name is the reference name for all measurements reported for that sensor. The sensor name is alpha / numeric. An example of a sensor name could be the manufacturer model number or type like a Rain Gauge. The number of characters in the sensor name is limited to 65.

Logging Interval is a pull down menu to select a frequency between 1 second and 24 hours for the eTracker to get the sensor measurements. Make sure that the Logging Interval is at least as often as the station's Reporting Interval. For example, if your Reporting Interval is every hour, use a logging interval that is shorter than or equal to one hour. eTracker is capable of tracking pulses up to 10 pps (pulses per second). If it is set up to log every second, then at the 10 pps rate, it will show the number 10, time-stamped every second.

Set the **Status** to Active when ready for eTracker to start logging the sensor measurements. Select Inactive while the sensor is being set up to avoid unwanted measurements.

Enter the pulse sensor's parameters as they apply to the sensor in use:

> **Pulse Parameter**. While the sensor name may be the manufacture of the sensor or model number, the Parameter Name is the measurement parameter of that sensor. For example, you may have a Tipping Bucket, and the parameter be denoted as "Rainfall".
>
> Assign **units**, if they apply. They are the sensor output's unit of measure. If not applicable, select "None". For example, rainfall units could be "in" for inches or "mm" for Millimeters. These units will be displayed on charts and graphs. There is no mathematical adjustment or conversion to the sensor values in selecting the units of measurement. If a unit desired is not listed, the unit of measure can be added under "Add Additional Units" (see Section 5.6).
>
> **Scale** is a multiple or a fraction of the sensors measurement to be logged and reported.
>
> **Offset** is an addition or subtraction of the sensors measurement to be logged and reported.
>
> > **Note:** Offsets entered in the sensor setup can also be determined and entered using the test message process (see Section 6 Test Message Mode).

Pulse measurements are stored as a count per logging interval, however the data can be displayed as a count value or accumulated value when viewing the data in the dashboard.

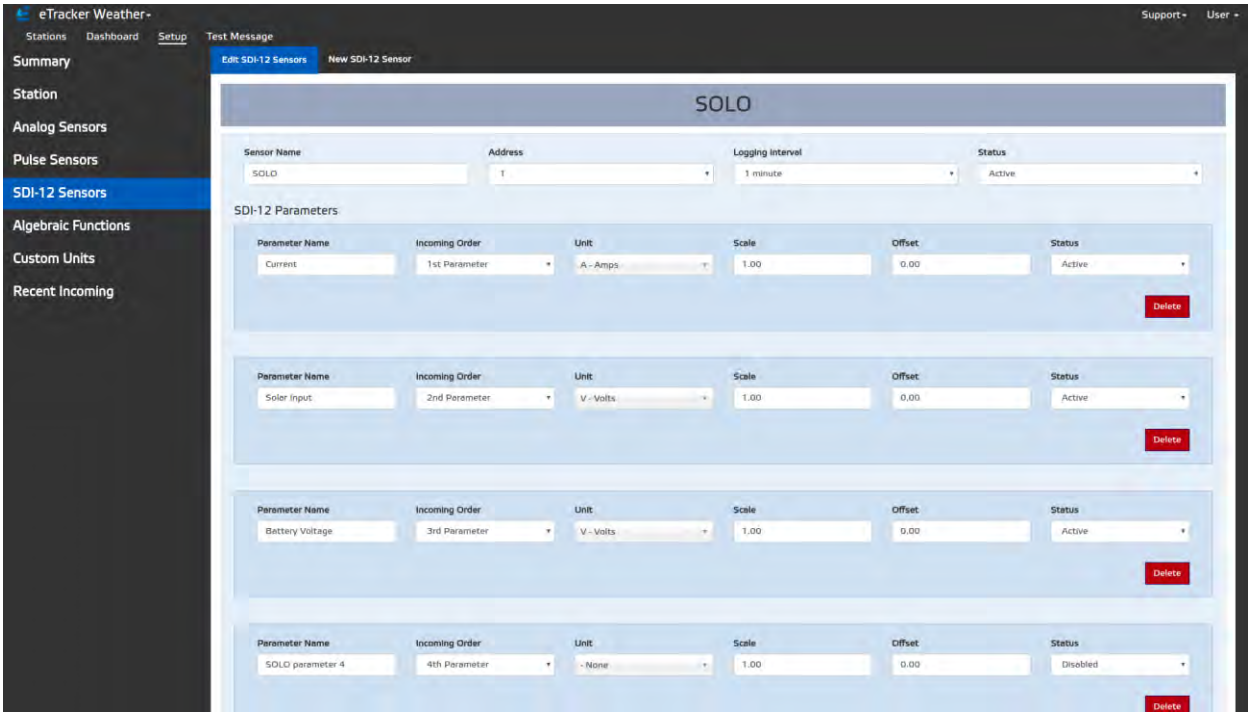
5.3C SDI-12 Sensors

Select SDI-12 Sensors. In this page you can add up to 62 sensors with up to 9 parameters per sensor.

Select "Edit SDI-12 Sensors" to modify an existing sensor.

- or -

Select “New SDI-12 Sensor” to add a new sensor.



Sensor Name is the reference name for all measurements reported for that sensor. The sensor name is alpha / numeric. An example of a sensor name could be the manufacturer model number. The number of characters in the sensor name is limited to 65.

Address is the selectable SDI-12 address (alpha / numeric characters). The SDI-12 sensor address needs to be pre-programmed into the sensor. Each SDI-12 sensor connected to an eTracker needs to have a separate address. Refer to your SDI-12 sensor manual for instruction on setting up the address and other SDI-12 commands. Stevens provides a separate product called the SDI-12 xPlorer to easily facilitate programming SDI-12 sensors with your computer.

Logging Interval is a pull down menu to select a frequency between 1 second and 24 hours for the eTracker to get the sensor measurements. Make sure that the Logging Interval is at least as often as the station’s Reporting Interval. For example, if your Reporting Interval is every hour, use a logging interval that is shorter than or equal to one hour. Also, confirm with the sensor’s manual that this logging interval is acceptable because some SDI-12 sensors have longer response times.

Set the Status to Active when ready for eTracker to start logging and transmitting the sensor measurements. Select Inactive while the sensor is being set up to avoid unwanted measurements.

Number of Parameters is configured in "New SDI-12 Sensor" page. The number of parameter per sensor will depend upon the sensor itself and how the sensor is programmed per SDI-12 command protocol as defined by the sensor's manual. Select the number of parameters for the sensor during the New SDI-12 Sensor setup process between 1 parameter per sensor up to 9 parameters per sensor. Once a new SDI-12 sensor is set up, a new parameter can be added under the "Edit SDI-12 Sensors" page.

SDI-12 Parameters. Under the Edit SDI-12 Sensors page, each SDI-12 parameter programmed in the sensor for output needs to be configured. The number of available parameters to configure is determined per the Numbers of Parameters set under the "New SDI-12 Sensor" page.

Parameter Name will reference each SDI-12 sensor's parameter measurement. The parameter name is alpha / numeric. The number of charactesr in the sensor name is limited to 65. Each parameter's measurement value can be determined by referring to the SDI-12 sensor's user manual.

Incoming Order is the index into the string of parameters that a particular SDI-12 sensor reports. This order is needed to correctly match the measurement in a string of numbers with the assigned parameter name. Refer to the SDI-12 sensor manual for instruction about how the sensor's measurements are outputted.

Assign **Units**, if they apply, to the sensor's output. If not applicable, select "None". This is for display on charts and graphs. There is no mathematical adjustment or unit conversion to the sensor values in selecting the units of measurement. If a unit desired is not listed, the unit of measure can be added under "Add Additional Units" (see Section 5.6).

Scale is a multiple or a fraction of the sensors measurement to be logged and reported.

Offset is an addition or subtraction of the sensors measurement to be logged and reported.

> **Note:** Offsets entered in the sensor setup can also be determined and entered using the test message process (see Section 6 Test Message Mode).

Set the **Status** to Active when ready for eTracker to start logging and transmitting that parameter measurements. Select Inactive while the parameter is being set up to avoid unwanted measurements.

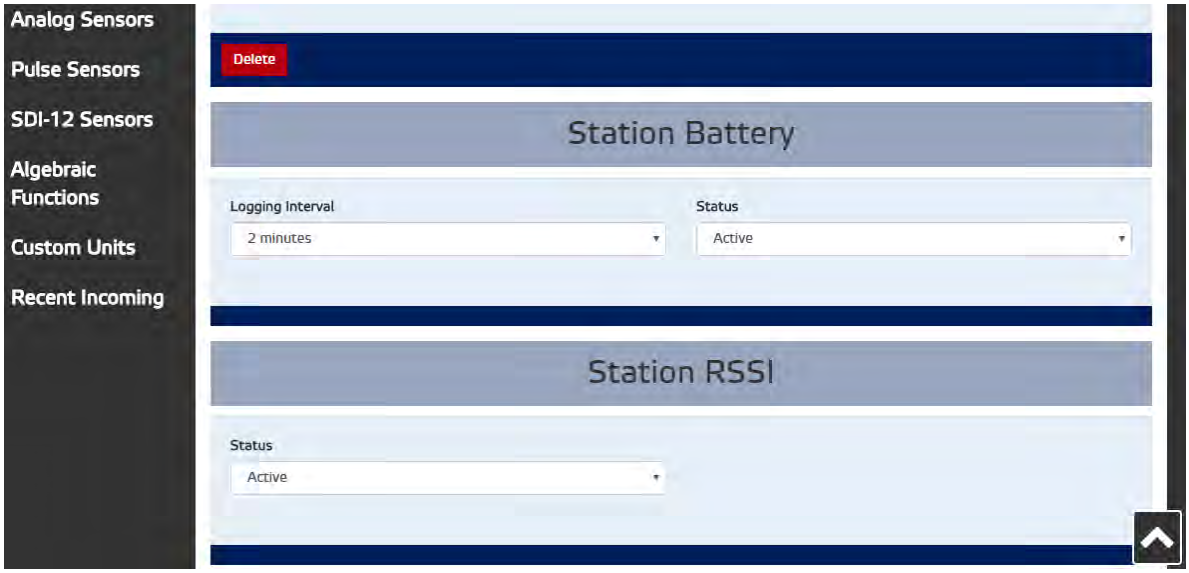
5.3D Battery Voltage and RSSI Logging and Reporting

The eTracker can log the battery voltage and RSSI for diagnostic references of the Station.

The RSSI (Received Signal Strength Indicator) is the received signal strength index between the modem and the cell tower. The measurement result for RSSI is a signal quality number related to dBm. The RSSI is displayed as a number from 0 to 31, which is proportional to a radio signal level at the receiver of -51 to -113 dBm (the negative numbers are typical levels in dBm at a receiver). See Section 10.4 for more information on RSSI.

To log and report the battery voltage and/or RSSI, first go to Setup, and then to Station to be in the Modify Station screen:

Scroll to the bottom of the Modify Station page to find the Station Battery and Station RSSI section. Under the Station Battery, select the pull down Logging Interval between 1 second to every 24 hours. Under both sections, select Status as Active or Inactive for these parameters. This logged information will be reported based on the Station's Reporting Interval.



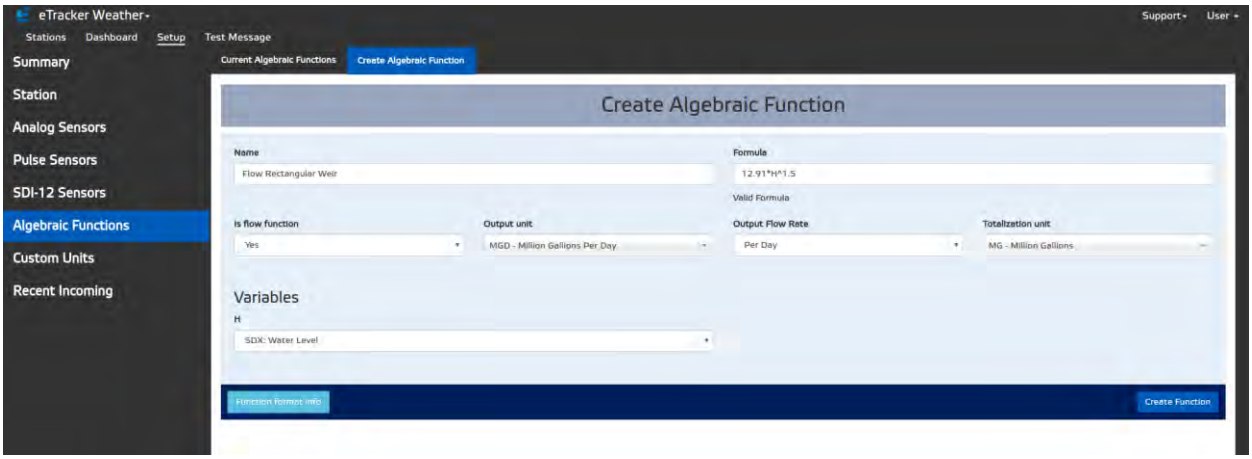
5.4 Algebraic / Custom Calculations

An advanced feature of Stevens-Connect is the ability to perform simple to complex math functions using any of the sensor measurements as variables and display the resulting calculated data as separate graphs and data tables.

Select Algebraic Functions to create a function to apply to your data. These functions can be used when viewing data in the "trends" section of the station dashboard. The Algebraic Function is a post-processing feature of Stevens-Connect for displaying calculated values on-line only. These functions and values are not saved in each eTracker.

Some programming-like features are available when creating a formula. For example, the Algebraic Function can include "if" statements.

Select "Create Algebraic Function" to program a new mathematical calculation.



Name will be the reference for each Algebraic Function. The number of character in this name is limited to 65.

Formula. Enter the formula to calculate a value based on the variable(s) from the sensor(s) measurements. Each variable of the formula should be denoted as an alpha variable of "a" through "z" in this formula field. Each time the formula has this type of variable entered, a variable field is automatically created for that variable with a pull-down selection of the sensor value or parameter which that variable represents.

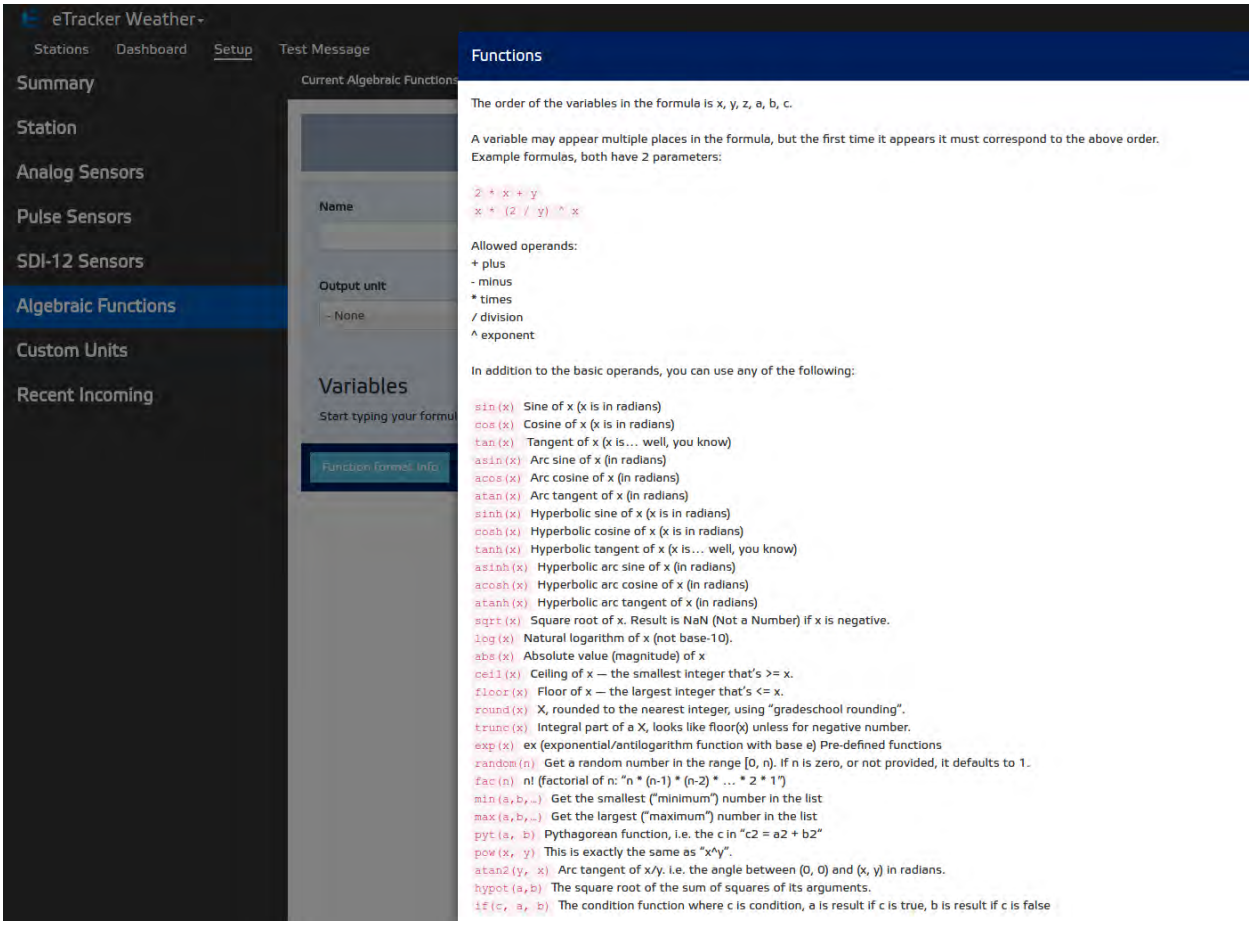
If the formula uses more than one variable, the formula's calculation will be performed only when the all the variables in the formula are within the **Max Sample Window**. This window of sensor intervals can be

adjusted. It is recommend that variables (i.e. sensor measurements) in the same formula have the same logging interval.

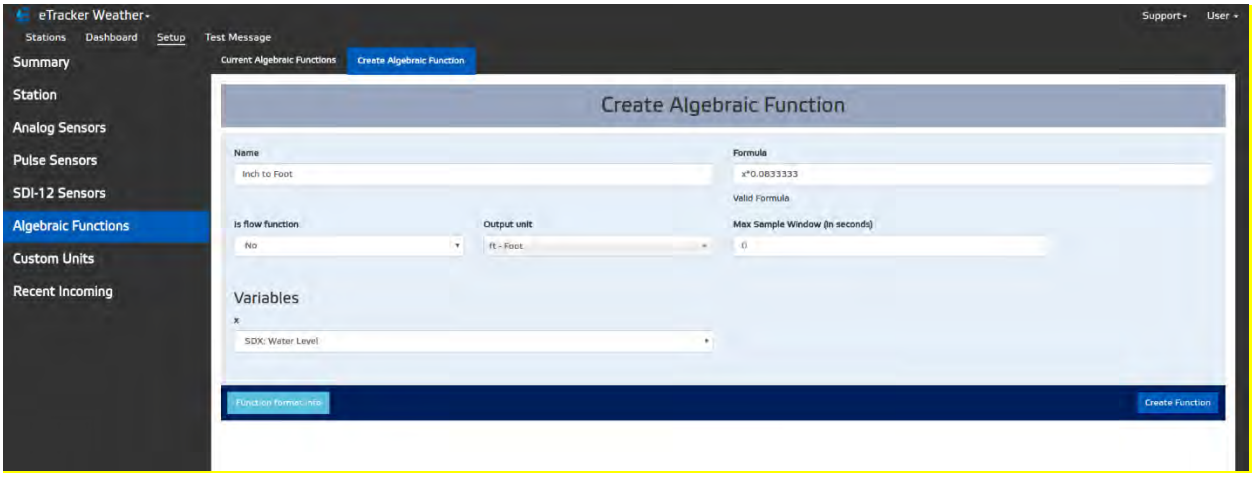
Output Unit, if it applies, is the calculated units of measure. If not applicable, select "None". This is for display on charts and graphs. There is no mathematical adjustment or unit conversion to the sensor values in selecting the units of measurement. If a unit desired is not listed in the pull down menu, a unit of measure can be added under "Add Additional Units" (see Section 5.6).

Max Sample Window allows for multiple sensor data points to be used as variables in a formula that are asynchronous (different logging intervals) to one another. In order to capture this asynchronous data you must enter a sample window (in seconds) in order for the data points (with don't occur at the same moment) to be used in the formula. If all of your variables are coming from the same sensor (such as multi-parameter SDI-12 sensor), you can leave this field set to zero. If you are using variables from different sensors, account for warm-up time and SDI-12 measurement cycle to provide a reasonable window to capture those variables for the formula's calculation.

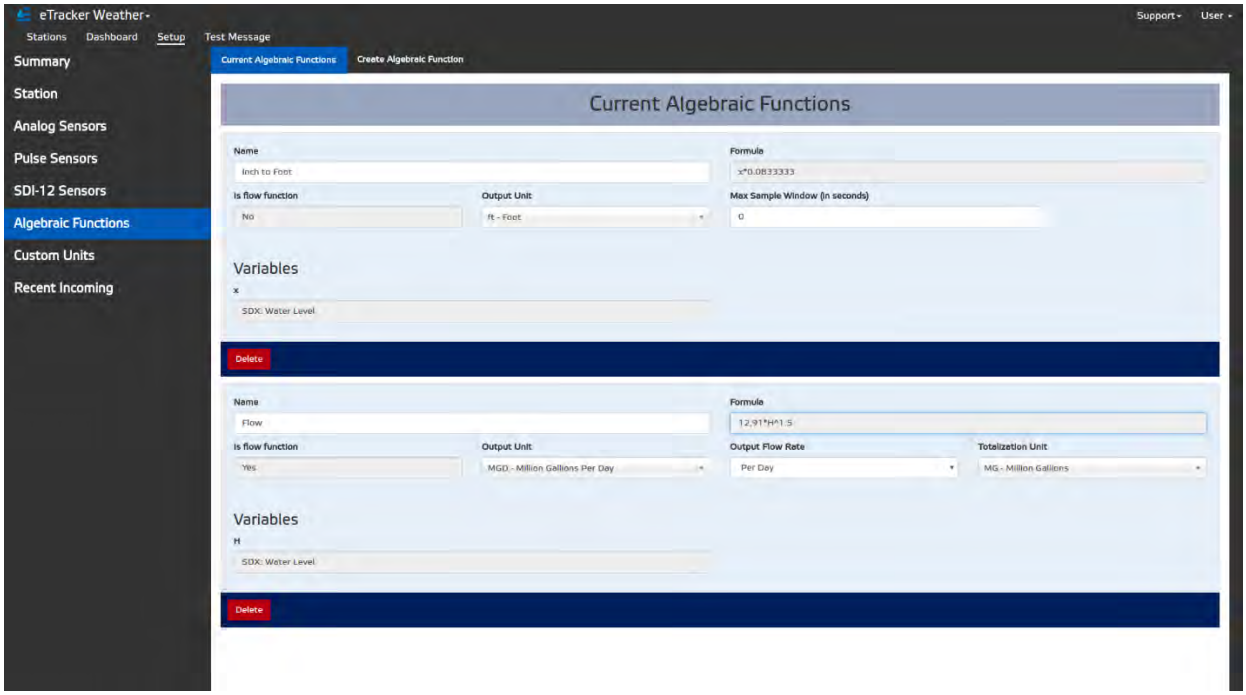
Function format Info button provides a reference for creating a formula. Acceptable mathematical operations are listed which can be entered into the formula field. Please refer to this page if there is ever a question about how to create a formula.



Select **Create Function** button when the Algebraic Function is finished. This saves the function and the resulting calculation will be output as a variable with all the sensors measurement outputs.



Once you Select Create Function, the page will show this new function as the Current Algebraic Functions.



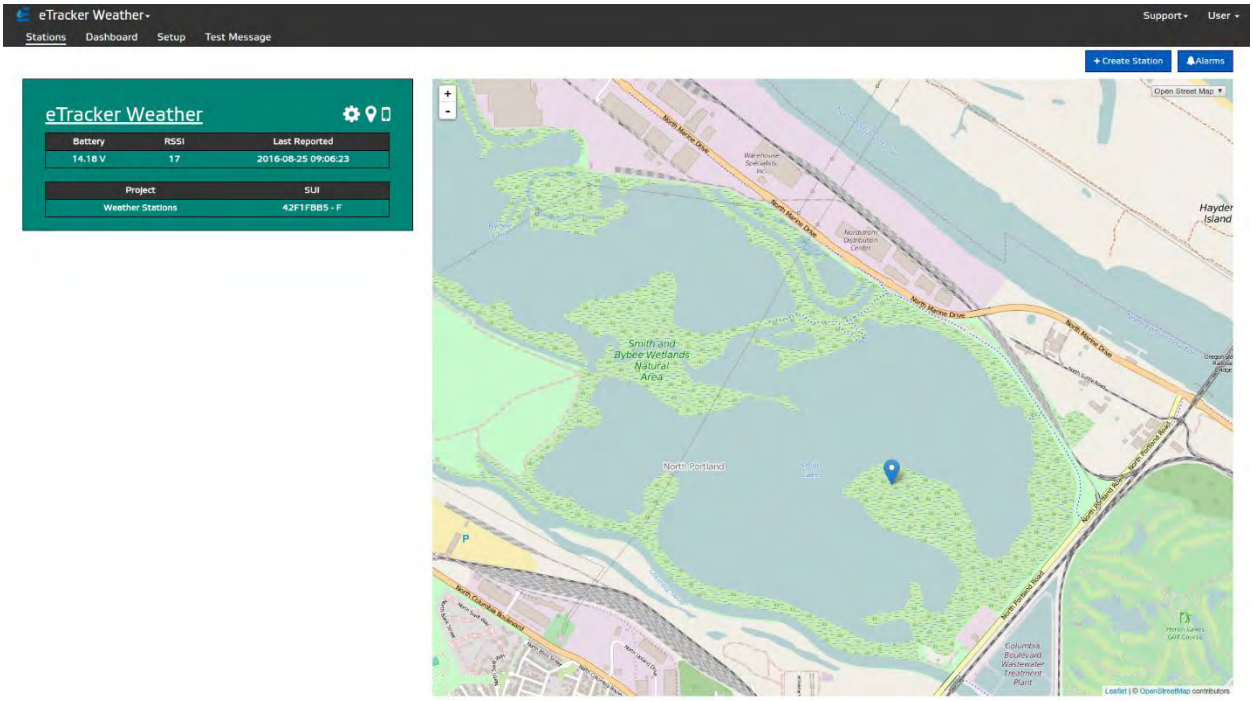
This Current Algebraic Function can now be used when displaying the data in Trends under Dashboard.

5.5 Custom Units

Under the sensors and Algebraic Formula, the units can be applied, which is the output units of measure. This is not a required field is used for displaying such units of measure terminology on charts and graphs. The units are selected from a pull down menu. If a unit desired is not listed, such unit of measure can be added under the Custom Units. Any units added here can be used throughout your company's projects and stations.

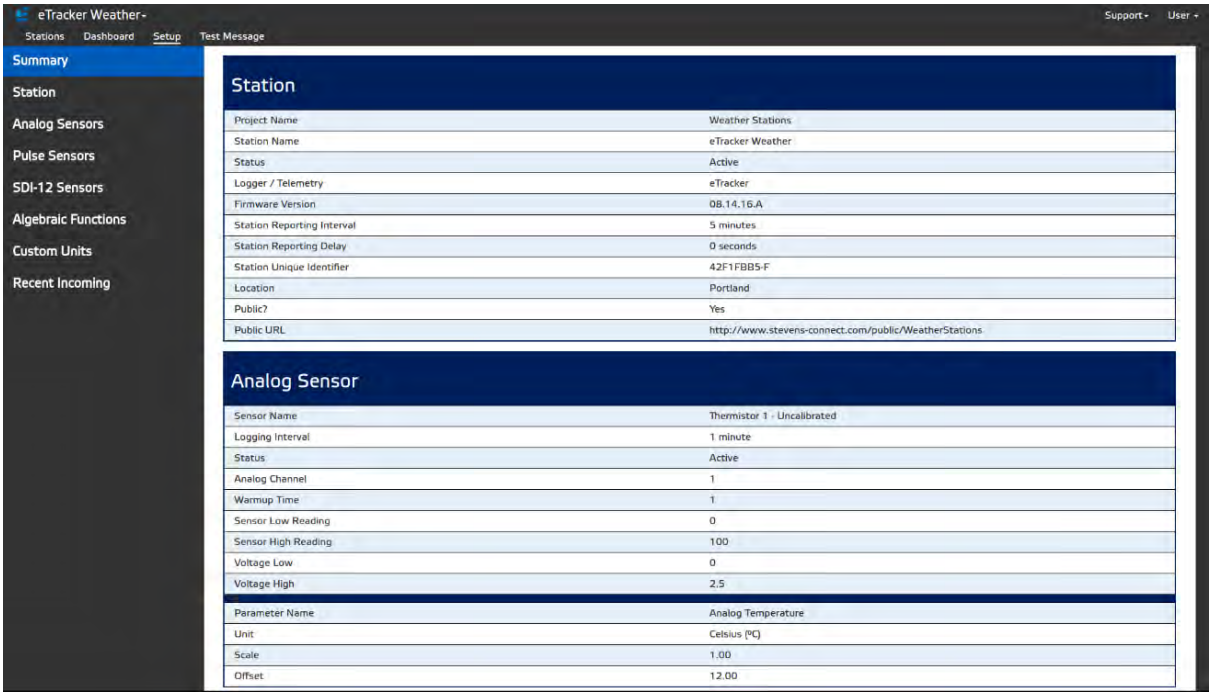
5.6 View and Modify Station, Sensors, Functions and other Configurations

To modify the configurations settings of an existing station, simply log into Stevens-Connect (See Section 5.1) and the information page of all your stations and map with location of the stations will appear similar to the following screen:



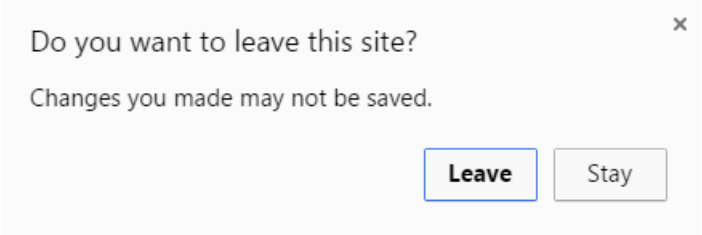
With your mouse curser, select the station configuration you want to view and/or modify. After selecting the station. The Dashboard for that station will appear. If the Dashboard page has not been configured (See Section 8.1), this Dashboard are will be empty.

At the top, select “Setup”. Then the following screen with configuration options along the left side will appear.

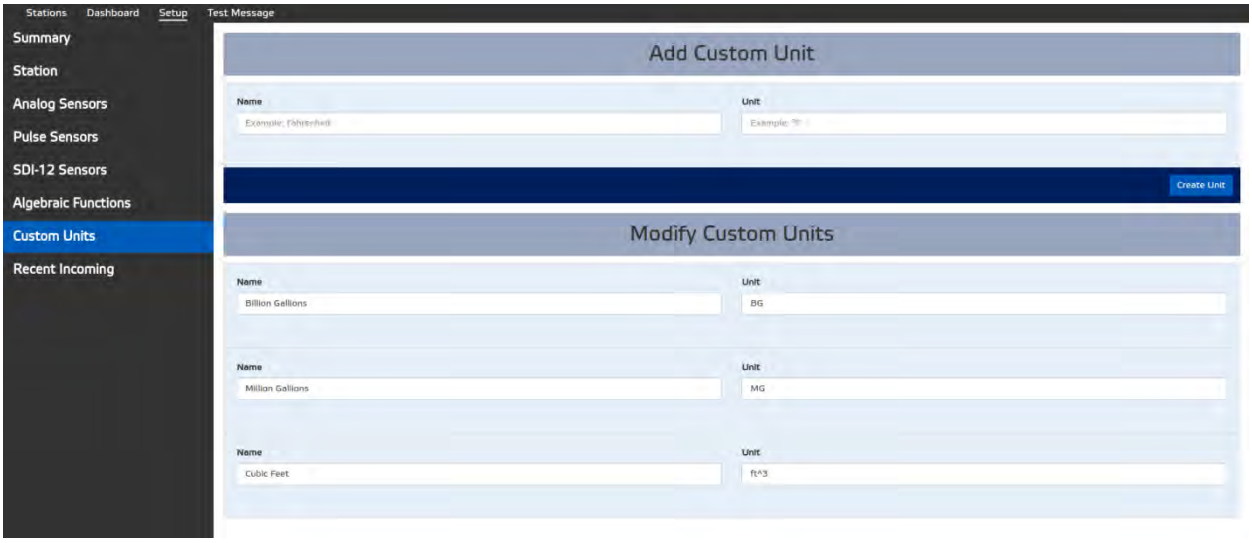


Select **“Summary”** to view how the station and all the sensors are currently configured. If this is the first time to this page and no sensors have been set up yet, this page will be only contain the station configuration.

Select the configuration setting (Station, Sensors, Functions) you want to view and/or modify. Make any changes necessary and then select “Save All Changes” at bottom of the screen. You can make other changes within the “Setup” feature without saving each time you move to another sensor or station page. Before you leave the “Setup” features section, select “Save All Changes”. If you leave the “Setup” feature **without** selecting “Save All Changes”, such changes made will be lost. If you try to leave this “Setup” feature without saving, the following warning will appear:

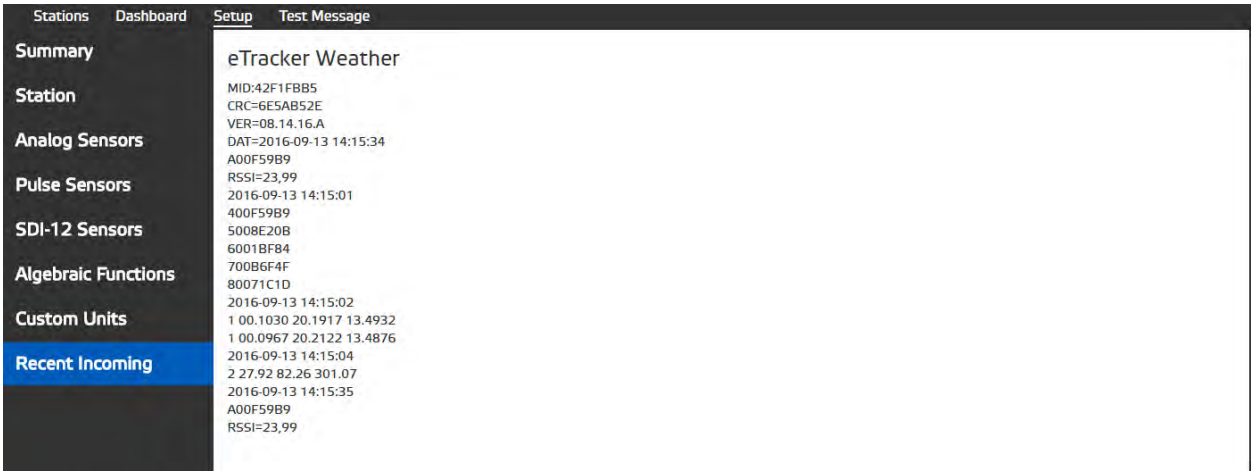


If no changes have been made, this warning will not appear.



5.7 Recent Incoming Messages

Recent Incoming is a use for diagnostic purposes. It will display the most recent packet of raw data that was reported by the station. This raw data is not intended to be easily understood.



6. TEST MESSAGE MODE

Test Message Mode is a feature for obtaining near real-time readings from a deployed eTracker. It gives the installer confidence in the following before leaving the Station site:

- The sensors are properly connected and reporting.
- Sensor names and addresses are properly defined.
- Transmission via the cellular network and the Internet is working.
- Any offsets are correctly adjusted so that the sensor's measurement agree with any physically observed measurements (such as a staff gage).

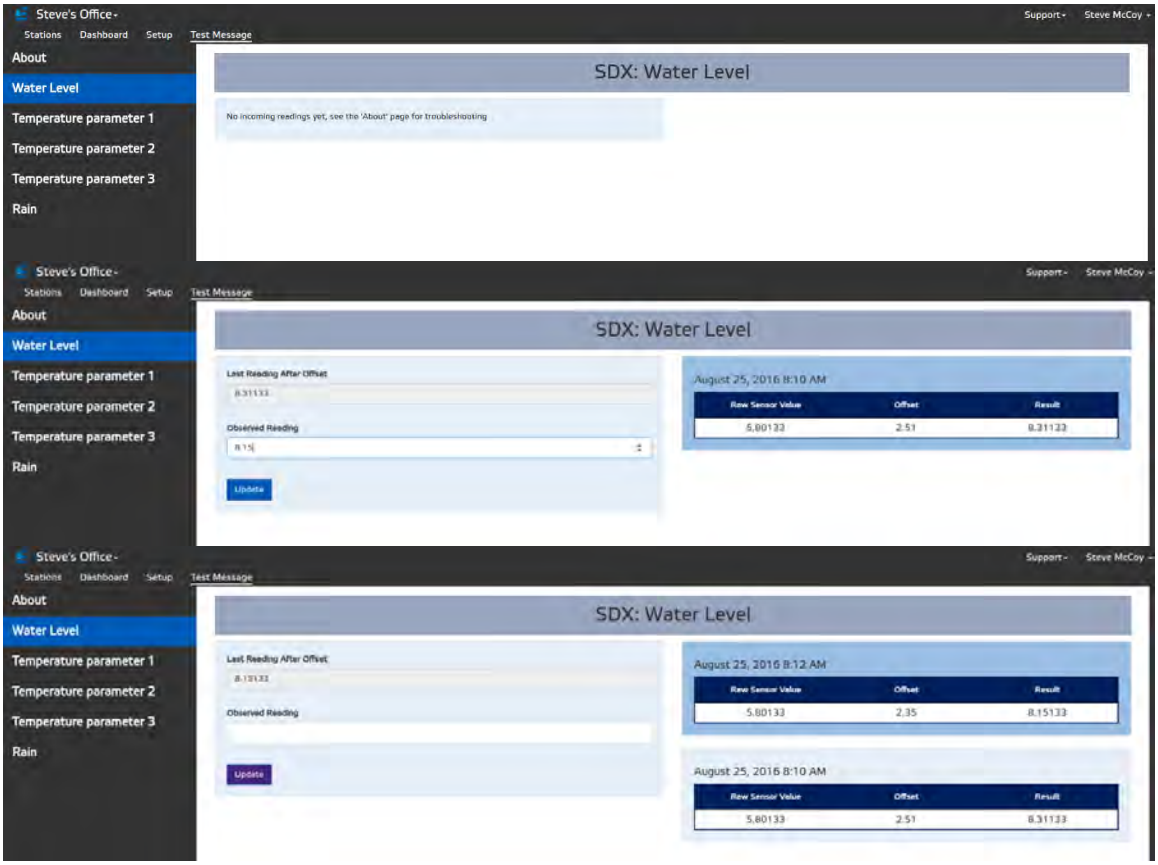
Note: The Test Message Mode procedure does not verify the internal logging process or that data is being saved to the SD card during normal operations. For this procedure, please verify the data is being received by Stevens-Connect (see Section 8.) *after* the eTracker and all sensors are set to Active Status mode AND after the first scheduled transmission (see Section 5.2 under Reporting Interval). This verification can be done at the site using a smart phone connected to the internet or calling someone authorized to connect to the site via Stevens-Connect.com.

To use Test Message Mode:

1. Power the eTracker in the field and let it begin to transmit as described by its station and sensor(s) configuration.
2. Ensure that the Test Message LED is not lit.
3. Push and hold in the Test Message button for at least 2 seconds while observing the Test Message LED. After 2 seconds, the Test Message LED will go solid green. Release the button. The solid green LED indicates that the eTracker is in the process of initializing the cellular radio and establishing a connection to the cellular network tower.

4. After approximately 1 minute, the Test Message green LED will start to flash slowly at a 1 flash per second rate. This indicates that the unit is in Test Message Mode. It will begin to transmit sensor data every 2 minutes.

5. Log in to Stevens-Connect (see Section 5.1), select the station name to test, and select "Test Message". In the left menu, select the sensor parameter you wish to view. The **Last Reading After Offset** section will display the most recent sensor measurements. The user can make the necessary adjustments by inputting the physically observed measurement in the **Observed Reading** field to adjust the sensor measurement with the physical readings taken in the field, and then select **Update** to save this offset adjustment. The following three images show the process:



When the user is finished with Test Message Mode, press and hold the Test Message button for 2 seconds. Observe that the Test Message LED goes from flashing to solid green then release the button. This indicates that the eTracker is exiting the Test Message Mode and going back to normal deployed mode. When it is successfully back in normal deployed mode, the Test Message green LED will turn off. This solid green status should last approximately 60 seconds, depending on the cellular service provider network.

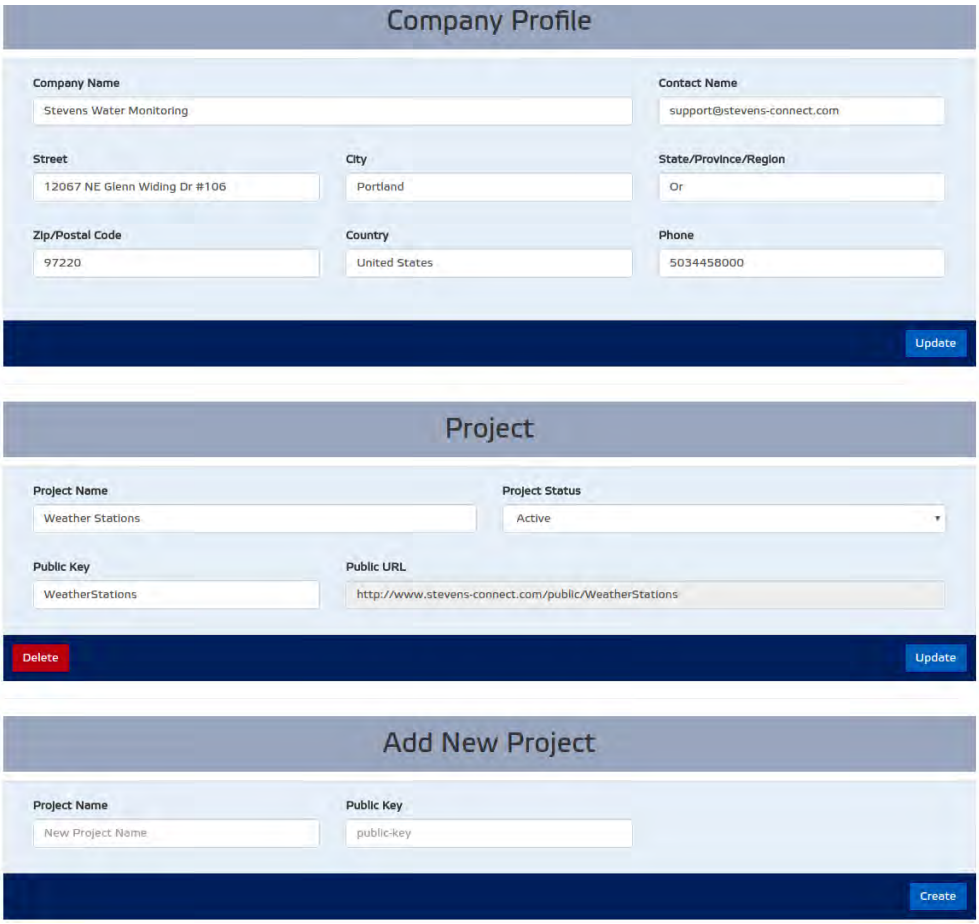
While the eTracker is in Test Message mode, the eTracker will measure configured sensors and transmit every 2 minutes. As a precaution, the eTracker will automatically return to normal deployed mode 60 minutes after Test Mode has been activated, just in case the user forgets to put it back into normal deployed mode before leaving the remote site.

7. THE COMPANY PROFILE

The Company Profile is accessible under the user name pull-down menu (located in the upper right) by selecting **Company**. The Company Profile shows subscription contact information for use by Stevens. This will initially be completed by Stevens for your first eTracker purchase. If the user edits or deletes this Company Profile information, it will not impact the performance of the eTracker or Stevens-Connect.

The Company Profile page also includes information about the users Project, just under the Company Profile section.

Project Name is initially provided to Stevens or to Stevens' distributor that defines the project, water shed and/or region that has one or more eTrackers or other stations that use GOES, other cell modems, or other telemetry radios within this Project's area that reports the data to Stevens-Connect. The Project Name may be changed here, which will automatically change the Project Name for all eTrackers associated with the previous Project Name. The Project Name will be a selection window under the eTracker Setup Station page. See Section 5.2



Public Key is a keyword that forms a unique URL for public access to view your project data. Only stations that are set to "Public" will be viewable with this unique URL. The public stations will be viewable using an automatically generated URL www.stevens-connect/public/[PUBLIC KEY]. If "Station is Public" is set to "No" for all of your stations (in the Setup Station page), then this Public Key is not necessary.

Project Status defaults to Active, which means that all the stations under the Project are ready to start logging and transmitting their sensor measurements to Stevens-Connect. Selecting Inactive will cause Stevens-Connect to not report on any information for the stations under the Project.

Congratulations! You have completed the setup & configuration process for eTracker!

Next: how to view the reported data

The previous sections of this manual were focused on setting up and configuring the eTracker to log and report measurements data.

This section shows how to customize the presentation and analysis of the reported measurements.

8. VIEWING DATA ON-LINE USING STEVENS-CONNECT

There are a variety of ways to view and arrange your data for display on Stevens-Connect using HTML5 markup language, including Dashboard Widgets of most recent measurements, graph options, tables, and more. The source of the data is from remote sensor measurements transmitted via eTracker, Cell-Net, third party cell modems, GOES, Iridium, INMARSAT, or other telemetry devices with connection to the Internet via HTTP protocol.

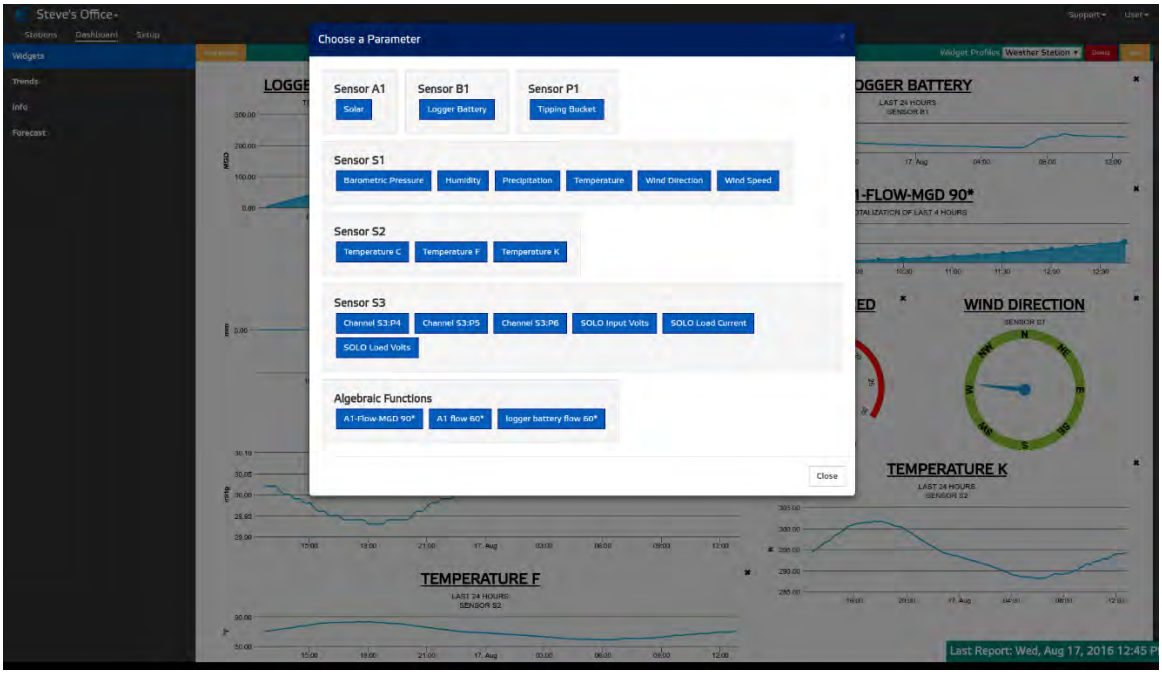
8.1 Dashboard Widgets

Setting up Widgets on the Dashboard allows for a quick view of the most recent data. The page will display when the last reported data and successful transmission come through, with a date & time stamp. Use the selected widgets to present your data in a customized graphical presentation.

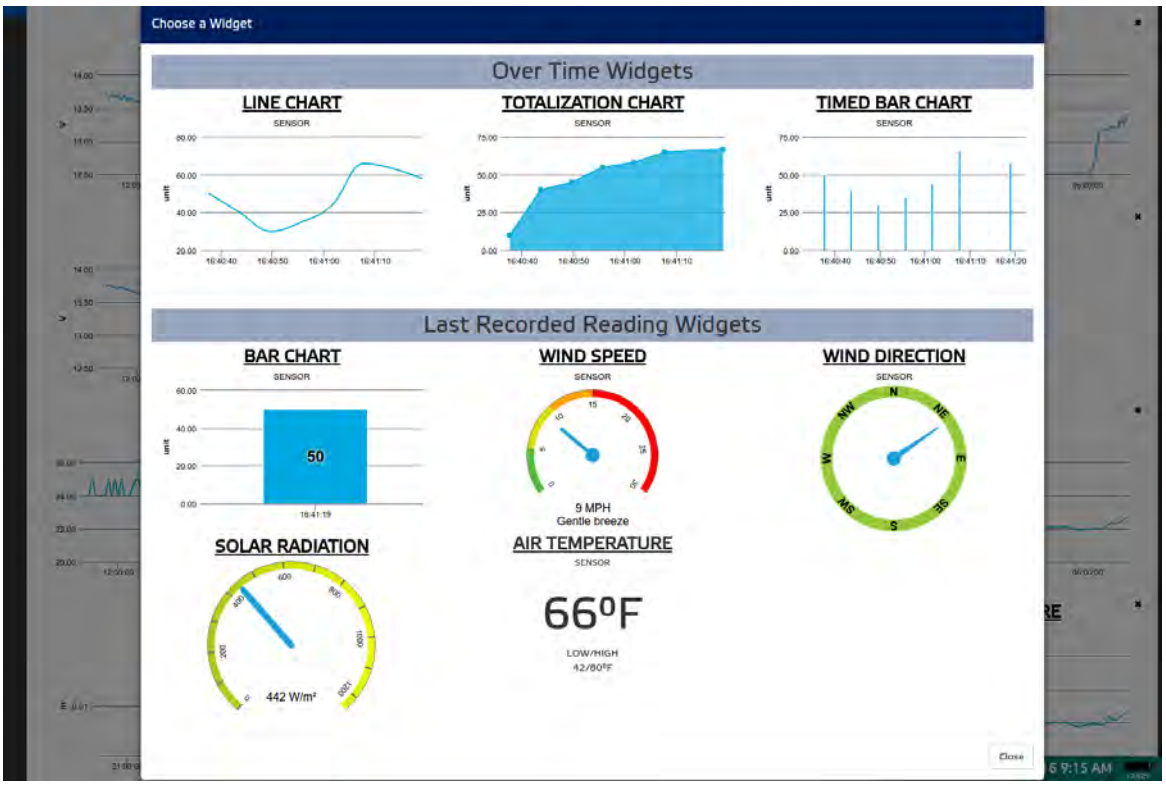
First, select the Station you want to create a Dashboard for.

To add a new widget, go to the Dashboard page and select the “New Widget” button (yellow box) near the upper left of the screen.

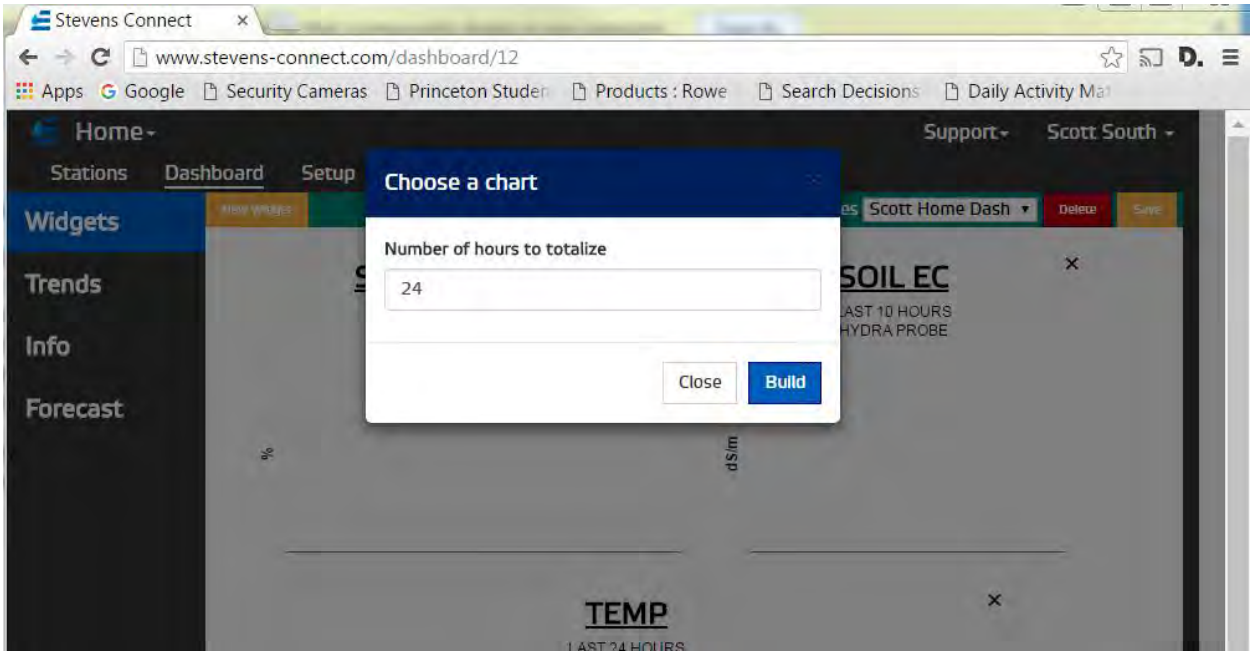
Choose a parameter that you want the widget to represent. Samples are below.



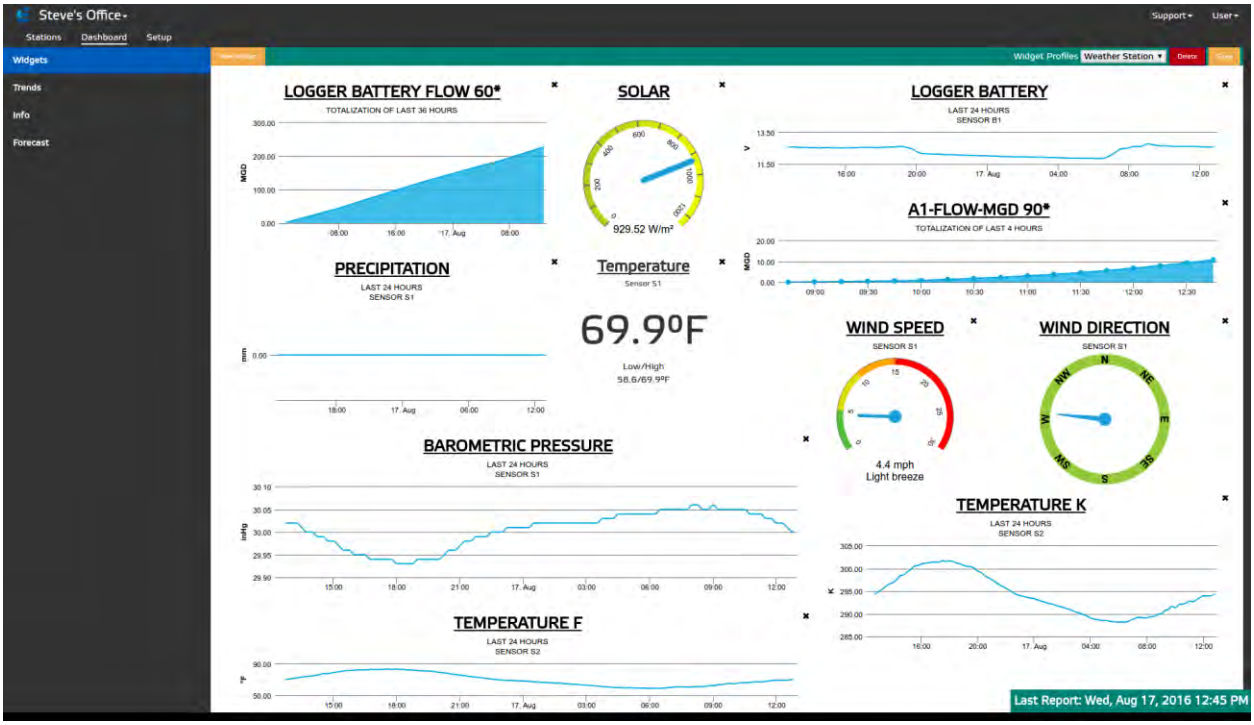
Select the widget to represent that parameter on the Dashboard:



For Line Charts and Totalization Charts, select the number of hours to present the data.



The new widget will appear on the Dashboard.



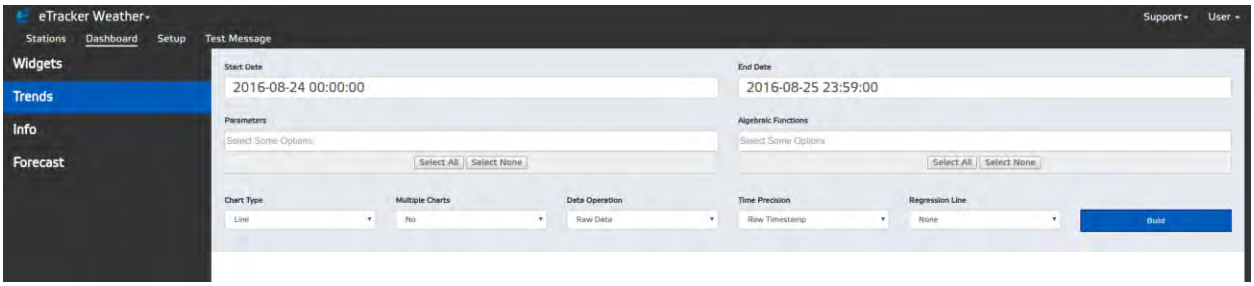
You can now adjust the size or position of the widgets to be presented on the Dashboard.

Select "**Save Layout**" at the bottom of the screen or "Save" near the upper right of the screen to save changes to the Dashboard. You can use either save button.

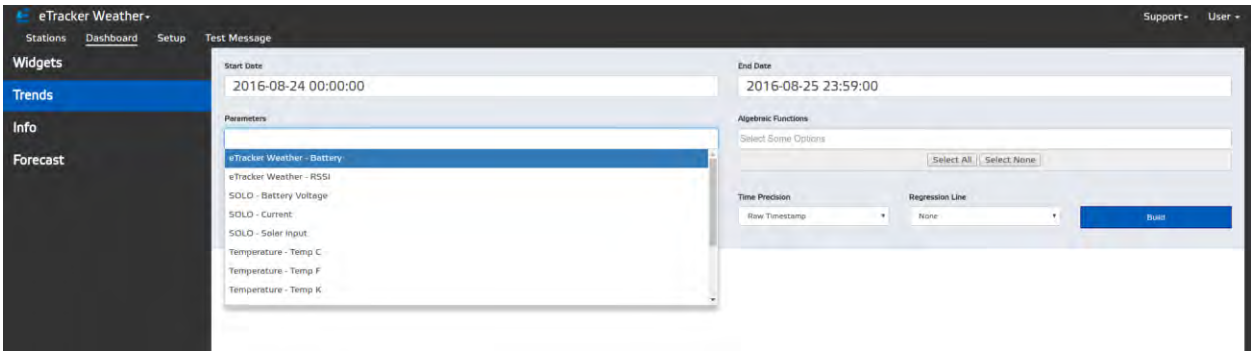
Once saved, the Dashboard will display in this way each time you log into Stevens-Connect when you view this particular station. Also, if you make the viewing of data open to the public (see Section 7 – The Company Profile), this Dashboard presentation is what the public will see.

8.2 Trends

Select trends to view and analyze your data in a bar or line chart for visual analysis of a different data / time ranges and/or quick visual correlation view of multiple parameters and/or functions.

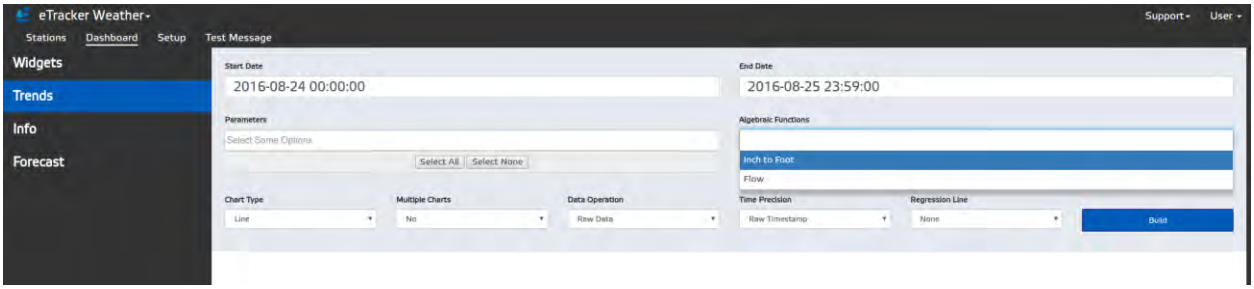


Select the **Parameters** (sensor data) you want to graph. Click in the Parameter box and all parameters will appear in a drop-down menu when you select for this field:



You have the option to select individual sensor parameters or Select All, or Select None will clear this field.

Select any **Algebraic Function** you want to view. The result of the algebraic function is calculated in real-time and does not modify your original data.



You have the option to select individual functions or Select All, or Select None, which will clear this field.

Choose the Data and Time range of the parameters to chart using **Start Date** and **End date**. Clicking in these fields will present a calendar to select the start and the end date. Also, at the bottom of this calendar you can select the hour and minute to start and end the chart. The default start time is Midnight and the default end time is 23:59:00.

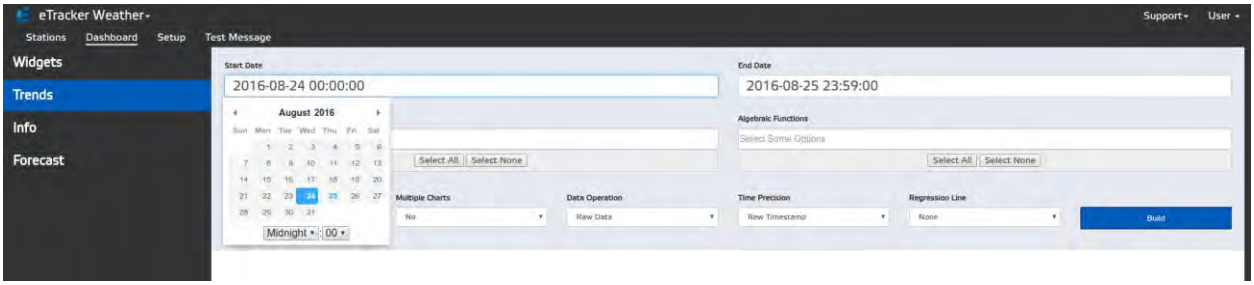
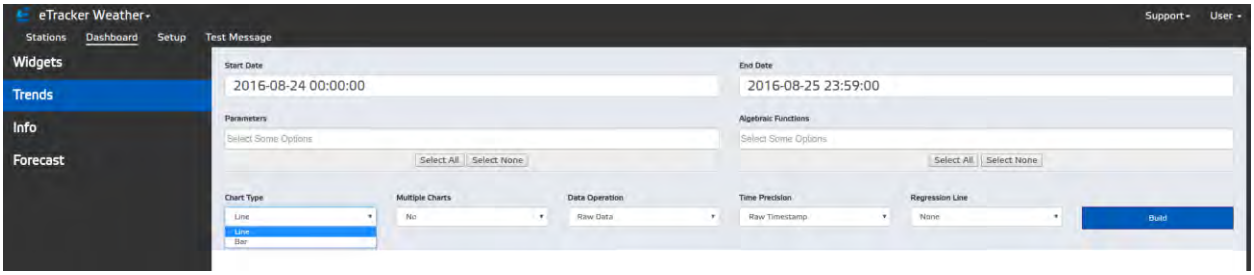


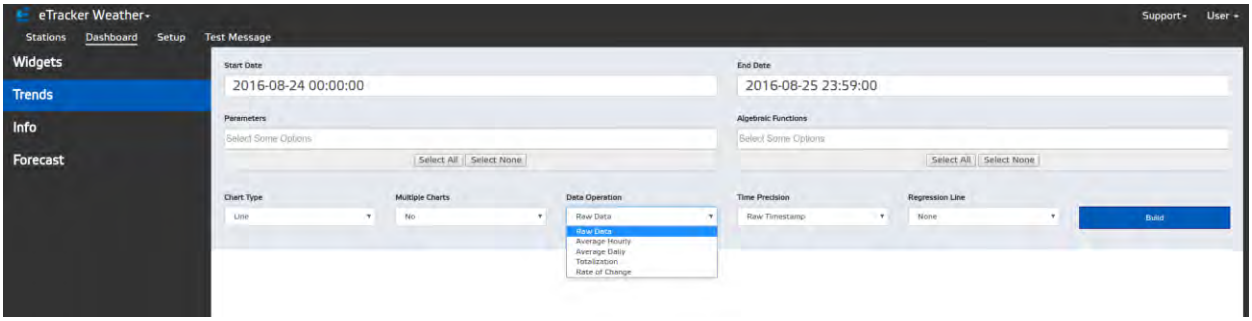
Chart type is a pull down menu option of a line or bar chart.



Multiple Charts is a pull down menu of yes or no. **Yes** means all parameters selected will each be presented on a separate chart. **No** means all parameters selected will be presented on one chart.

Other chart options include:

Data Operation: View the Raw Data, or view it averaged, totalized, or the rate of change.

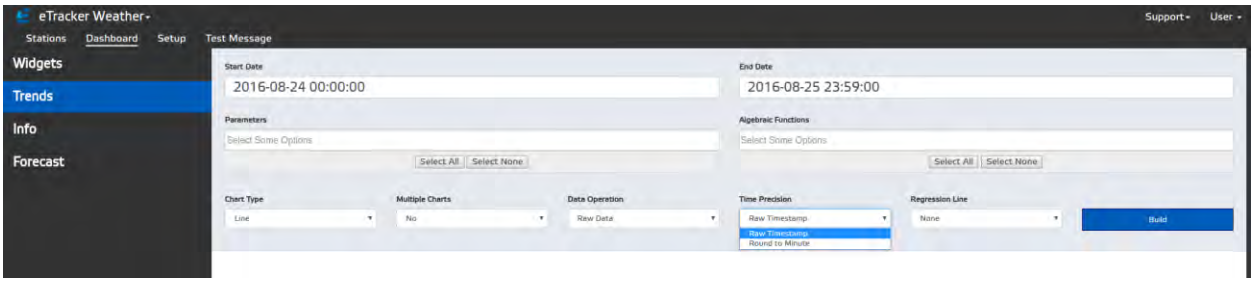


Raw Data is the sensor and/or function values (adjusted for any configured offset and scale) with no averaging, totalization or rate of change.

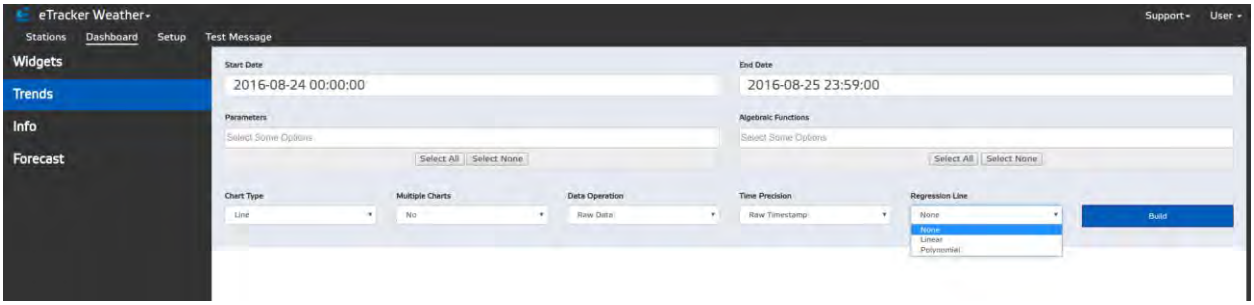
Average Hourly is the average value of the parameter(s) measurements and function(s) calculated during each hours.

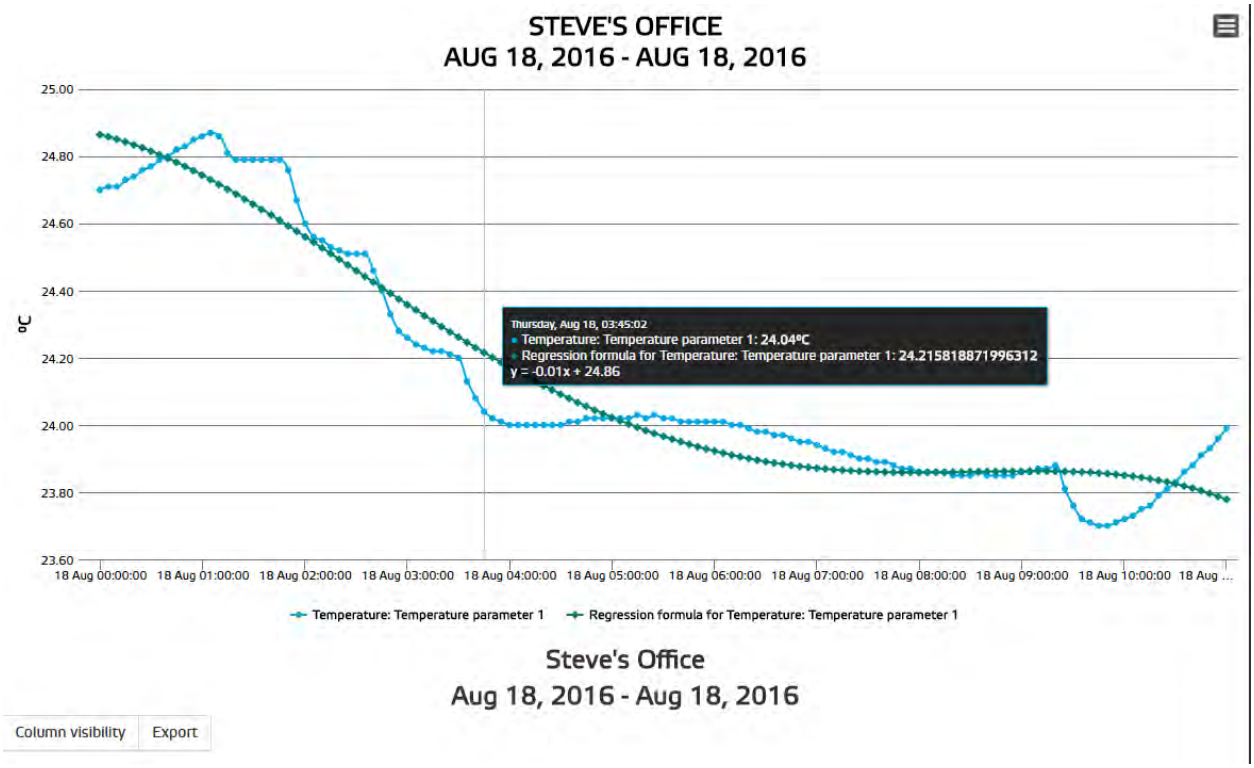
Average Daily is the average value of the parameter(s) measurements and function(s) calculated during a 24 hour beginning at midnight. If the date range selected is only one day, this average will be only one value per measurement.

Time Precision presents the actual measurements time stamp (**raw timestamp)** or the time stamp can be **round to minute,** which will truncate the seconds of a measurement time stamp.



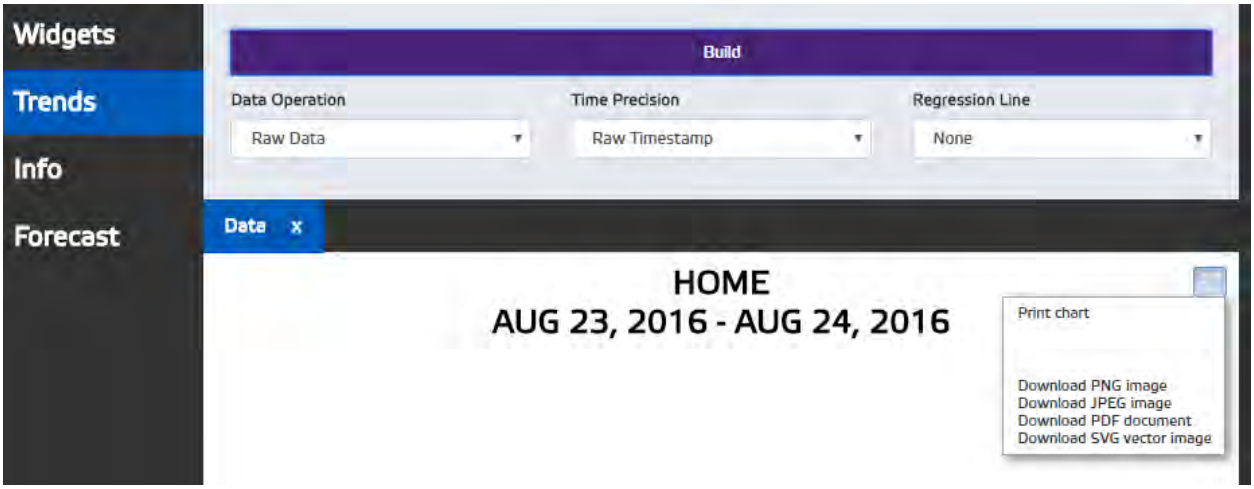
Regression Line: This selection overlays either a linear or polynomial progression line with the data that is graphed when you build it.



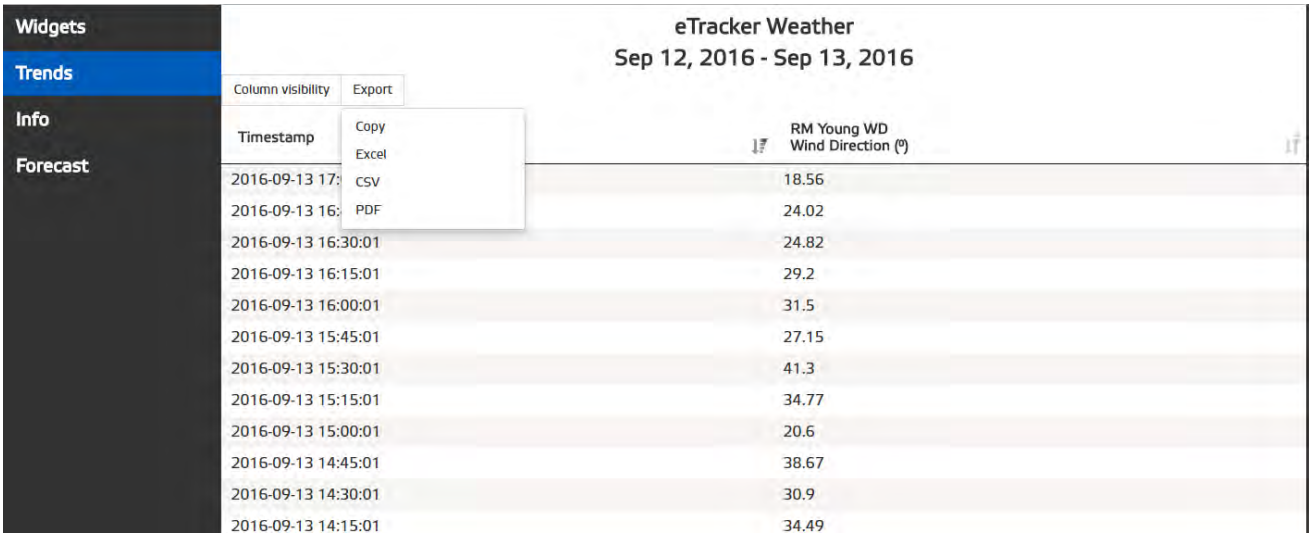


When ready to display the graph, Select **Build.** The time scale graph will appear along with the raw data in table format (scroll down below the graphed data).

Users can choose to output the data to a PNG Image, JPEG image, PDF document, or SVG vector image by electing the three line box in the upper right of the graph.

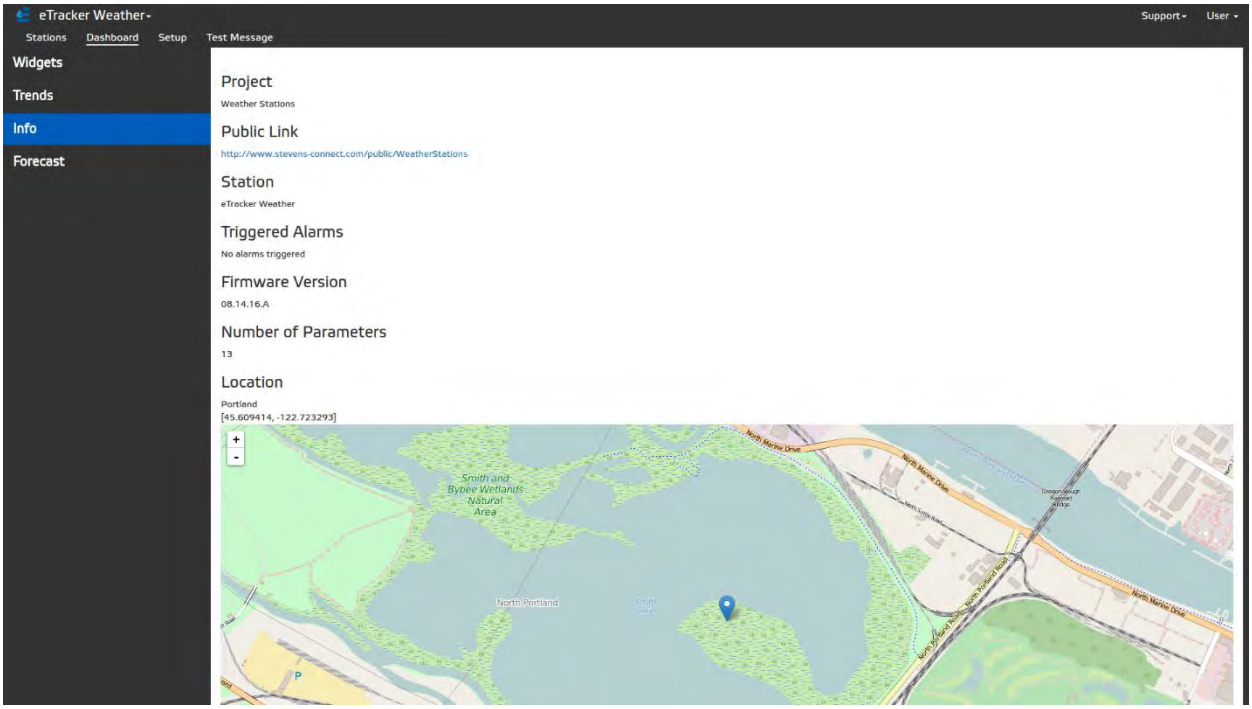


Users can also Export the data with its time stamp to Excel, CSV, PDF, or just copy it to the clipboard to paste in a document.



8.3 Info

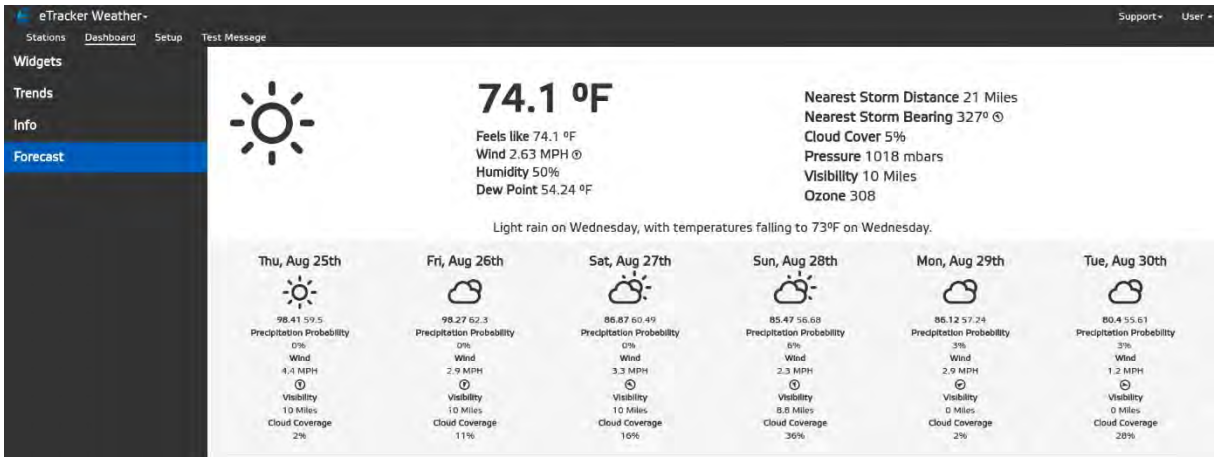
Info is under the Dashboard tab and presents a high level summary of the station's setup similar to this:



8.4 Forecast

Forecast is a link to a weather forecast page for the Station location, which is determined based on the Latitude and Longitude location. If the Latitude and Longitude are not entered under the Station setup page (See section 5.2), the map location and this weather forecast page will not appear.

Note: this weather forecast information comes from a separate, integrated web service and not from any weather sensors located at the Station.



9.0 ALARMS

Alarms are a way to be immediately alerted when readings reach a particular value. *Users can be alerted with an email or text (SMS) message when an alarm is triggered. Stevens Connect supports 6 different alarm types:

1. High Value Triggered:

Alarm is sent when sensor value or algebraic function reaches or exceeds trigger value. An alarm cleared message is sent when value is at or below Clear Value.

2 Low Value Triggered:

Alarm is sent when sensor value or algebraic function reaches or is below trigger value. An alarm cleared message is sent when value is at or above Clear Value.

3 High Rate of Change:

Alarm is sent when sensor value or algebraic function changes by a supplied value over a specified number of minutes. Alarm cleared message is sent when condition no longer applies.

4 Low Rate of Change:

Alarm is sent when sensor value or algebraic function changes by supplied value over specified number of minutes. Alarm cleared message is sent when condition no longer applies.

5 Totalization Between Dates Reaches Value:

Alarm is sent when totalization of parameter or algebraic function reaches specified value from one date to another. When end date has been reached, alarm will expire and will not trigger again.

6 Totalization Between Time Span Reaches Value:

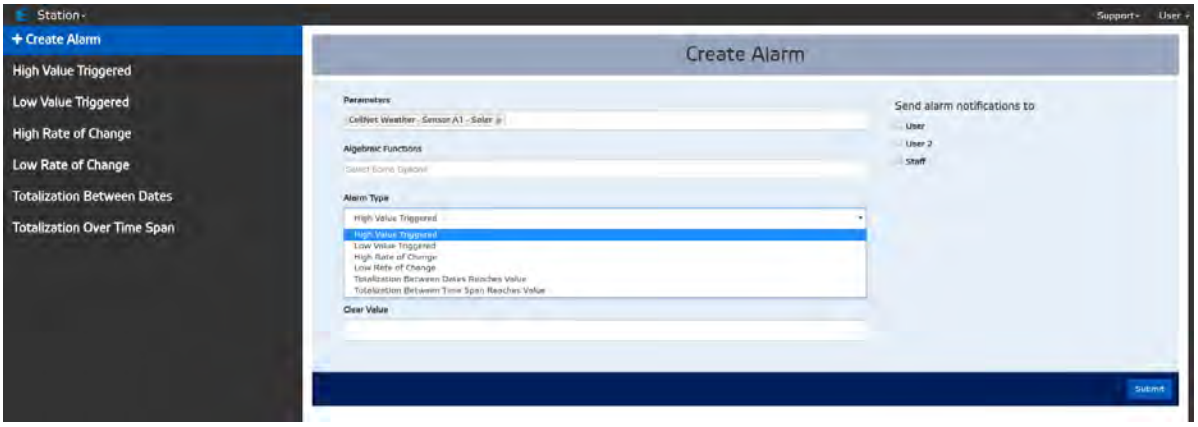
Alarm is sent when totalization of parameter or algebraic function reaches specified value over the number of hours specified.

*Users can be viewed in the "user" pull-down menu at the top right of the screen. New Users can be added here and the method of contact and be selected or modified.

9.1 Create Alarm:

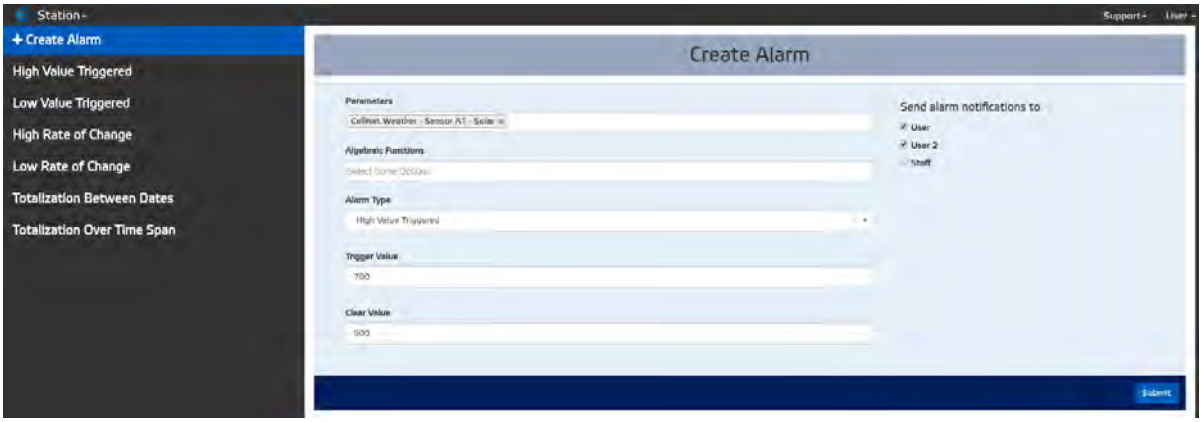
Select Parameters and/or Algebraic Function to create an alarm for.

Select an Alarm Type.

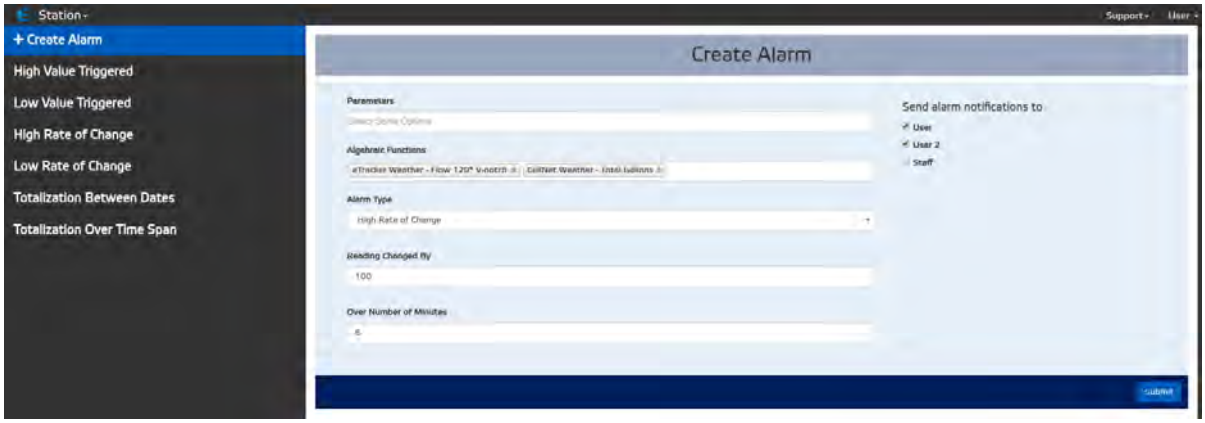


Select users to Send alarm notification to. This will notify the user when an alarm is triggered or cleared.

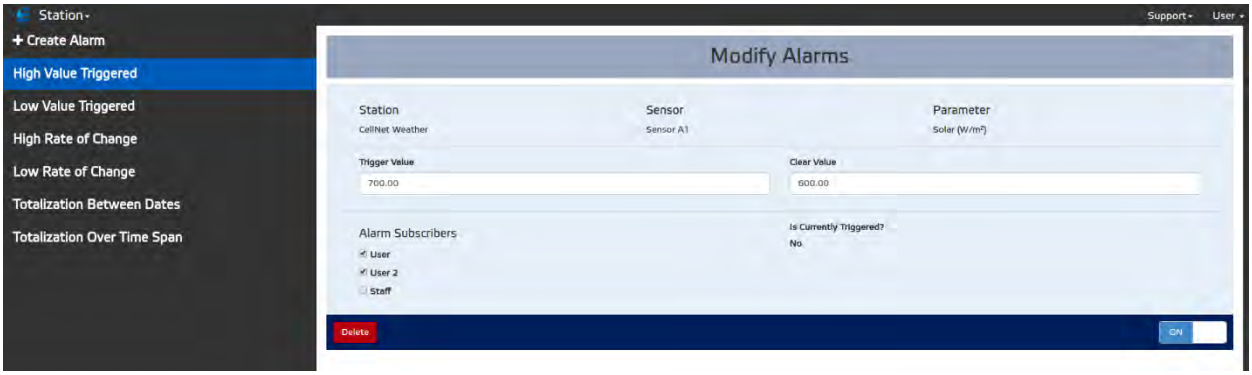
Set Trigger Value and Clear Value.

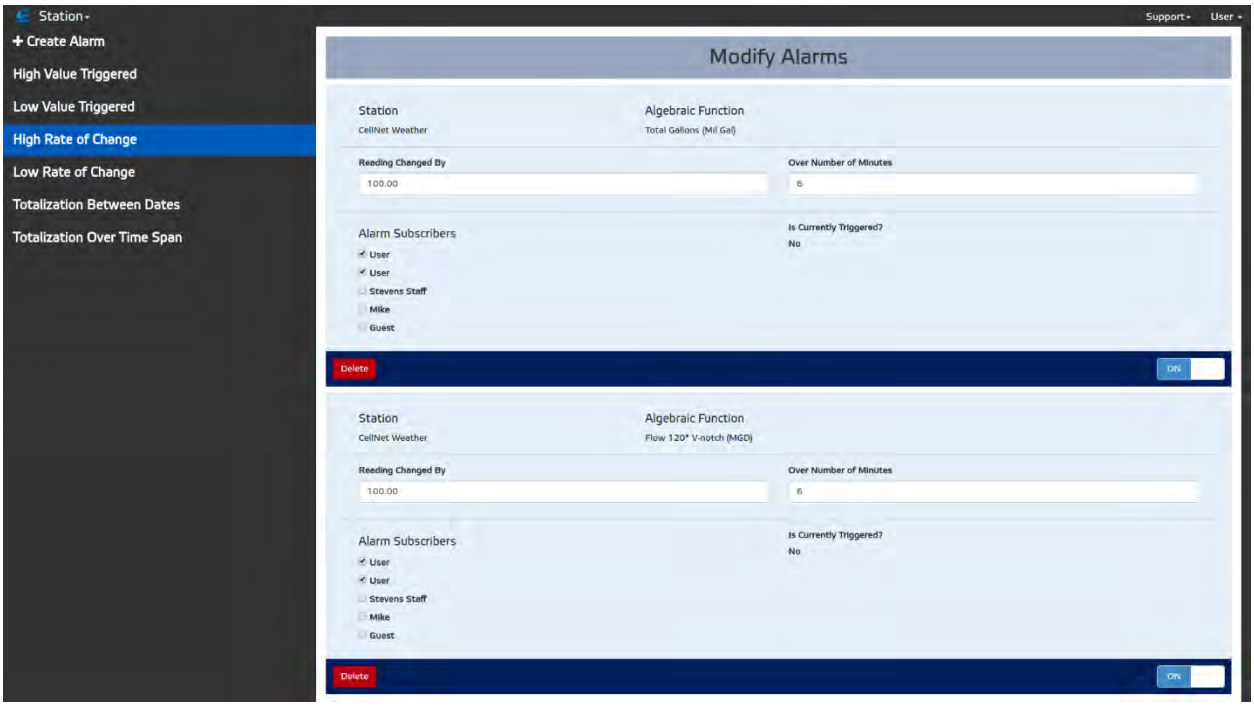


Create identical alarms for multiple parameters / algebraic functions. This is useful when there are identical sensors on multiple stations.



Below “+Create Alarm” you can view or modify alarms by selecting the alarm type that has already been set.





10.0 TROUBLESHOOTING

10.1 Using DIAGNOST.log file

On the SD Card there is a file titled DIAGNOST.log. The purpose of this file is to help troubleshoot the connection of eTracker to the cellular network. This file is appended upon each power-up. The contents of this file are intended for connection diagnostic purposes by Stevens Technical Support.

10.2 What if the modem works during the day but not at night?

If it is operating on a solar powered system, check the battery or the power system. There might be a blown fuse in the power system. Use a hand-held volt meter to check the voltage going to the modem. It should be around 12 volts. The battery voltage can also be verified from Stevens-Connect after a transmission.

10.3 What do I do if there is poor coverage from the cell tower?

The RSSI will indicate the quality of the coverage. The eTracker has an SMA connector, which allows a higher gain antenna to be used. You may need an SMA to Type N Bulk head connector (Part Number 92824-002), an N to N cable (92845-010), and a higher gain and/or directional antenna. See part number list in Table 1 of section 2.2.

10.4 What is RSSI and how do I interpret the number?

The RSSI (Received Signal Strength Indicator) is number that represents the received signal strength between the modem and the cell tower. The measurement result for RSSI is a signal quality number related to dBm. The RSSI is displayed as a number from 0 to 31, which is proportional to a radio signal level at the receiver of -51 to -113 dBm (the negative numbers are typical levels in dBm at a receiver). See additional detail at:

http://www.metageek.com/training/resources/understanding-rssi.html
https://en.wikipedia.org/wiki/Received_signal_strength_indication

The chart below can be used to interpret the RSSI for troubleshooting purposes.

CDMA

RSSI	Quality
31	Excellent
30	Excellent
29	Excellent
28	Excellent
27	Excellent
26	Excellent
25	Excellent
24	Excellent
23	Excellent
22	Excellent
21	Good
20	Good
19	Good
18	Good
17	Good
16	Good
15	Good
14	Good
13	Good
12	OK
11	OK
10	OK
9	OK
8	OK
7	Marginal
6	Marginal
5	Marginal
4	Marginal
3	BAD
2	BAD
1	BAD
0	BAD
99	very BAD

GSM

RSSI	Quality
31	Excellent
30	Excellent
29	Excellent
28	Excellent
27	Excellent
26	Excellent
25	Excellent
24	Good
23	Good
22	Good
21	Good
20	Good
19	Good
18	OK
17	OK
16	OK
15	OK
14	Marginal
13	Marginal
12	Marginal
11	Marginal
10	Marginal
9	Marginal
8	Marginal
7	Marginal
6	Marginal
5	Marginal
4	Marginal
3	Marginal
2	BAD
1	BAD
0	BAD
99	very BAD

Appendix A – Changing the SIM Card

Normally a GSM version of eTracker unit would be shipped with a SIM card already installed. Stevens has relationships with multiple carriers as a VAR (value added reseller) for their data plans. In the event that the end customer wants to use their own local GSM carrier, a SIM card needs to be installed.

To do so, simply follow these steps:

1. Ensure that the power is disconnected from your eTracker GSM unit.
2. Remove the Sensor Interface Box from the eTracker.
    a. If it is a Mini Sensor Interface, loosen the screw that holds this box to the main enclosure, and then disconnect it.
    b. If it is the Full Sensor Interface, then unplug the ribbon cable assembly connected to that port.
3. Remove the two screws on the antenna side at the outer edge of the end-plate that holds the end-plate and accent-plate to the enclosure. Do not remove the center screw.
4. Slide out the PCB card from the enclosure just enough to expose the SIM card holder on the top of the unit.
5. Pull back and up on the clip to free the SIM card that has been installed. Slide it out of the clip and replace it with the new SIM card. Push the clip back down and lock it in place.
6. Slide the PCB card back into the enclosure and replace the screws that hold the end plate and accent plate in place.
7. Connect the Sensor Interface Box again.
8. Ensure the SD card destin.txt file has the correct APN for the SIM card carrier. Recall in section 3.4 that the file on the SD card needs to be updated in the event of a change of destination or if the SIM card has changed. For example:

Domain: data.stevens-connect.com
Folders: /incoming
Port #: 80
APN: aer.aerisapn.net
Username:
Password:

In the case of changing a SIM card, the APN: line will need to be changed for the carrier being used. This can take on many formats and can also include a Username and Password, although this is rare and often left blank.

9. Assuming good cell coverage and the connection of an antenna, repower the unit. Your eTracker GSM will connect with the tower and server, retrieve its setup information, apply this configuration to the unit, and begin transmitting your data.

Appendix B – Warranty

Stevens Water Monitoring Systems, Inc. warrants that the product you have purchased will be free from defects in material and workmanship. This warranty covers all defects which you bring to the attention of Stevens within two years from the date of shipment. If your Stevens product is defective, Stevens will repair or replace it and will ship it back to you free of charge. You must return your Stevens product within two years of the ship date, shipping prepaid, to our factory at this address: Stevens Water Monitoring Systems, Inc. 12067 NE Glenn Widing Dr. #106, Portland, Oregon 97220 (800) 452-5272. In any correspondence with us, or if you send us part of the product but not all, please include both the model and the serial number of the product. Your rights and remedies are limited to those sent out in this warranty. Stevens Water Monitoring Systems, Inc. disclaims all implied warranties, including the warranties of merchantability and fitness for a particular purpose. This warranty does not cover damage due to improper installation or use, lightning, negligence, accident, unauthorized modifications, or incidental or consequential damages. Stevens shall not be liable for special, incidental or consequential damage. In no event will Stevens' liability to you exceed the purchase price of your Stevens product. Before returning any unit, please obtain and complete a Returned Materials Authorization (RMA) from Stevens which will help best resolve any issues.