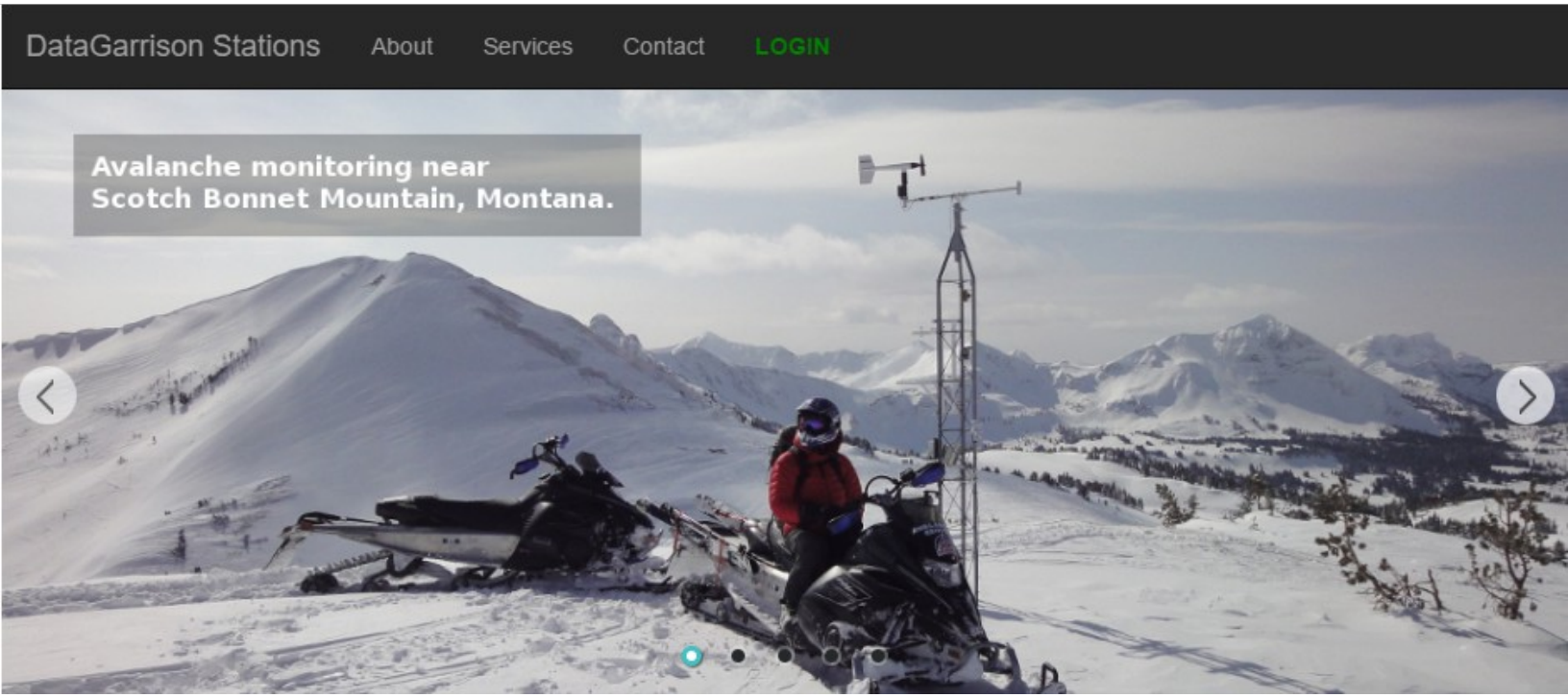
DataGarrison.com
WEBSITE USER INTERFACE MANUAL



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Brief Overview

DataGarrison is a secure server for storing and accessing remote sensor data from DataGarrison environmental monitoring stations. It provides users with real-time* data access in dash board, graphical, and raw formats over an encrypted SSL connection. DataGarrison Stations from Upward Innovations Inc are solar-powered modules that sync with DataGarrison.com via satellite or cellular networks at user-defined intervals.

Customers access their data through a password-protected web portal at https://DataGarrison.com/.

*Latency is proportional to user-defined transmission intervals.

DataGarrison.com

Customers can access any DataGarrison Station with an active service plan at DataGarrison.com. Service plans include the required satellite or cellular access fees and are bundled with a secure user account at DataGarrison.com.

Service plan calculator: https://datagarrison.com/#P

A service plan calculator at DataGarrison.com calculates the cost of the appropriate plan based upon expected data usage.

Service Plan Calculator

Logging interval 15 (minutes)

Transmission interval 360 (minutes)

Sensor 1	Sensor 2	Sensor 3
Temperature	Wind speed and direction	Barometer
Sensor 4	**Sensor 5**	**Sensor 6**
Rainfall	None	None
Sensor 7	**Sensor 8**	**Sensor 9**
None	None	None
Sensor 10	**Sensor 11**	**Sensor 12**
None	None	None
Sensor 13	**Sensor 14**	**Sensor 15**
None	None	None

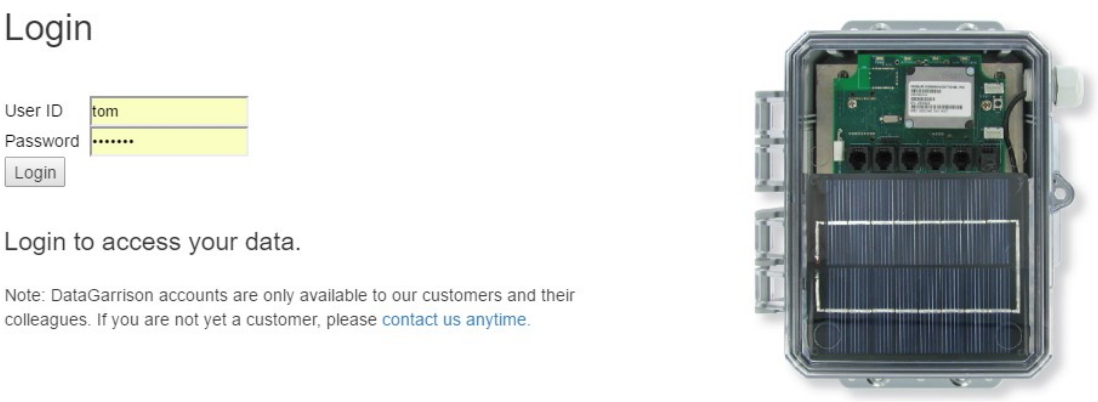
Calculate service plan

*PAR stands for photosynthetically active radiation

IMPORTANT: If any sensor is accessed via its ModBus or SDI-12 protocol, select ModBus/SDI-12 in the respective drop-down list regardless of what type of measurement is being made. Not doing so will result in an erroneous service plan calculation.

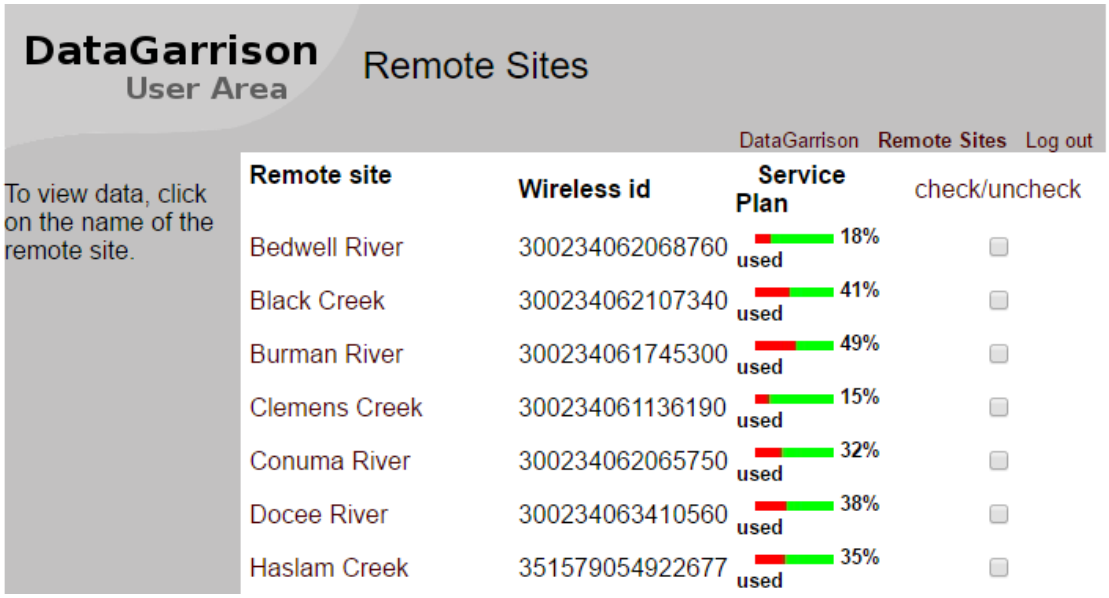
Logging in: https://datagarrison.com/#l

Users log into their DataGarrison.com accounts from the Login page as shown in the picture below.



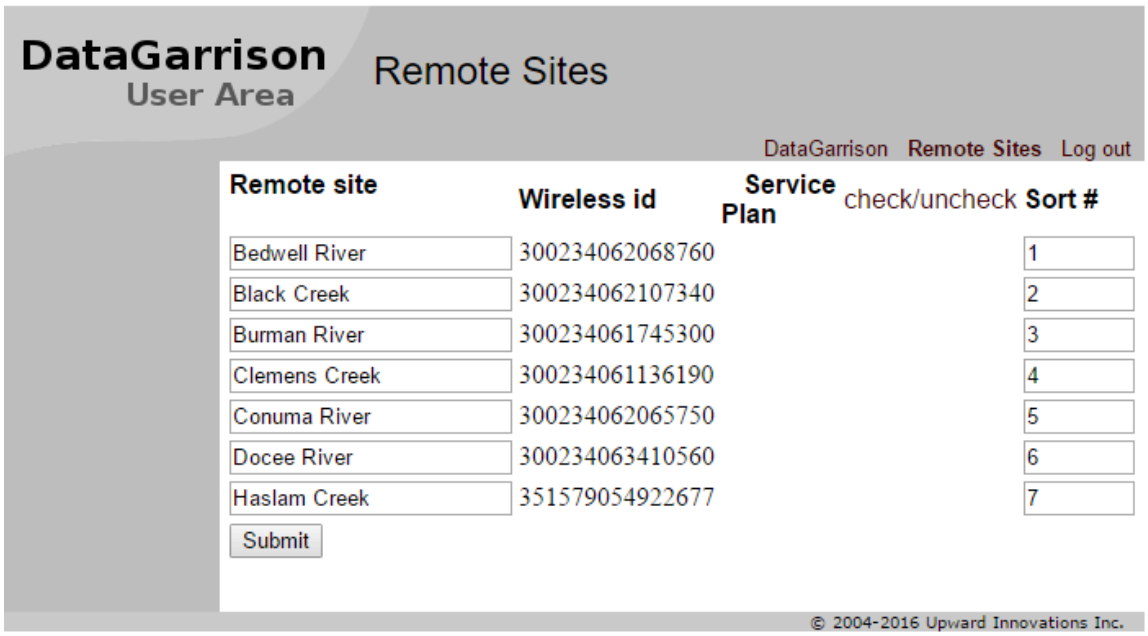
Remote Sites Page

Once you have successfully logged into your DataGarrison.com account, you will be shown a list of stations that have been activated for that account. View any station's data by clicking its 'Remote site' name. If only one station is activated in your account, you will be automatically redirected to that station's plotting page. In either case, the *Remote Sites* page is available by clicking on the 'Remote Sites' link on the navigation menu.



Editing a remote site's name

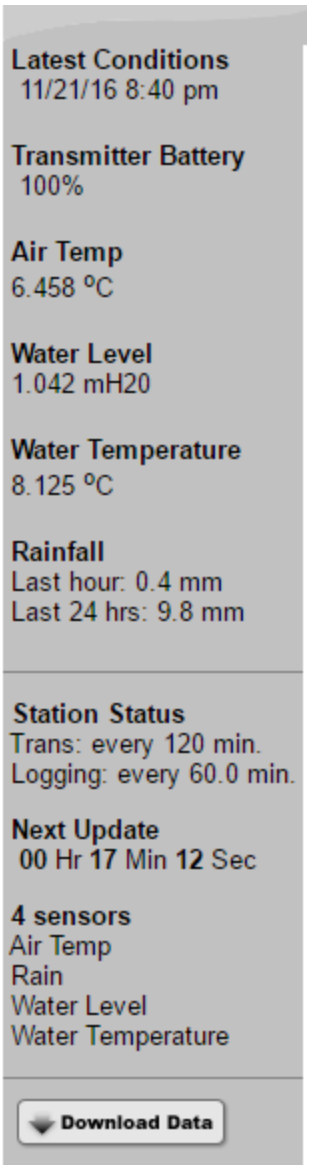
You may change the sites' display names and the order in which they appear on the *Remote Sites* page by clicking 'Edit names of remote sites' at the bottom of the page.



After editing the site names and/or the sort sequence, click 'Submit'.

Device conditions

Upon selecting a station, you will be taken to the plotting page for that device. On the left side of the page you will see the current conditions of that unit.



Navigation

The navigation menu at the top of each page have the links described below.

DataGarrison: Brings you to the DataGarrison.com home page.

Remote Sites: Shows you all the devices available in your user account.

Control Panel: Allows you to download raw data files, view station and sensor information, and control your station by sending configuration commands.

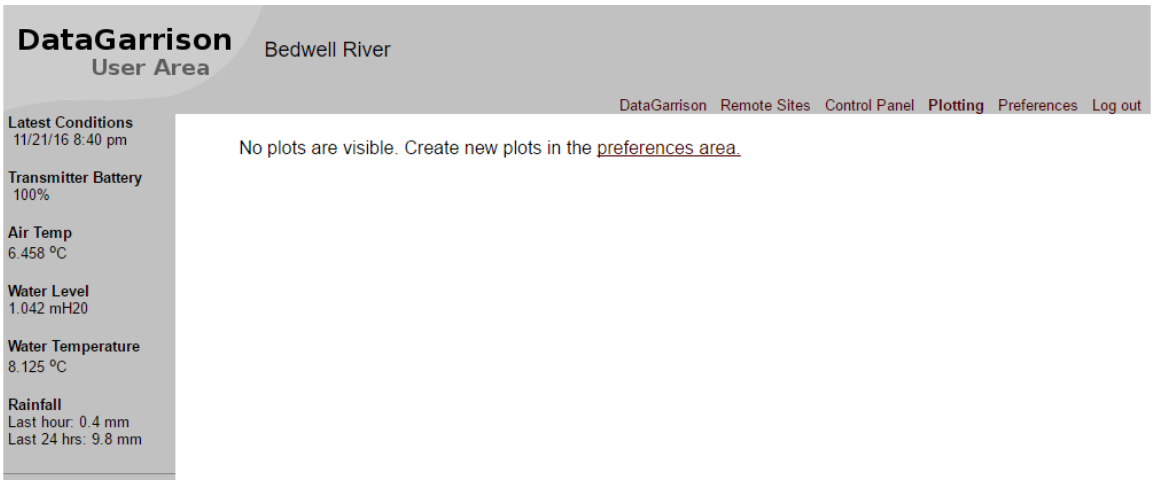
Plotting: Displays data plots.

Preferences: Where you may change account preferences, such as sensor units, and public access.

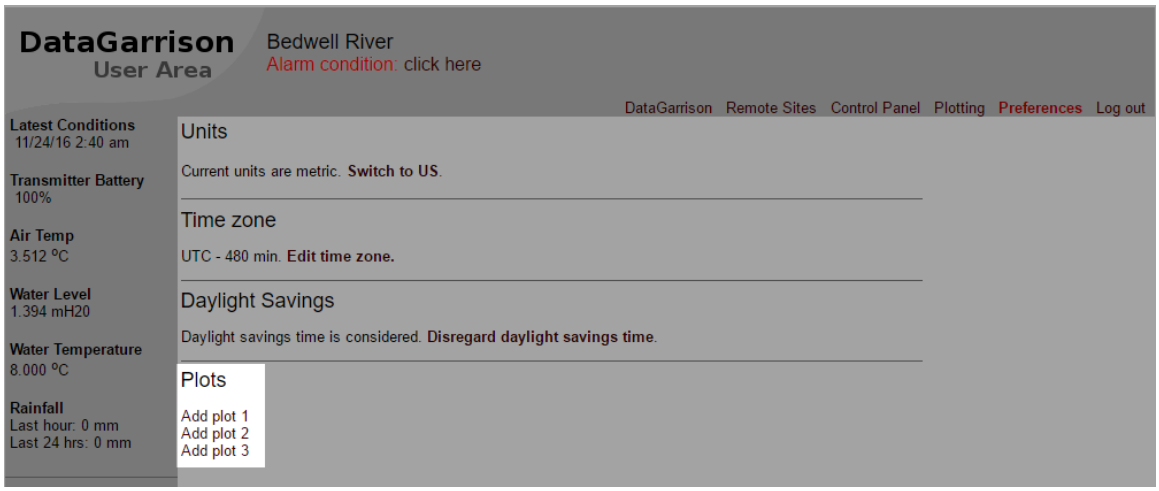
Log out: Closes your online session.

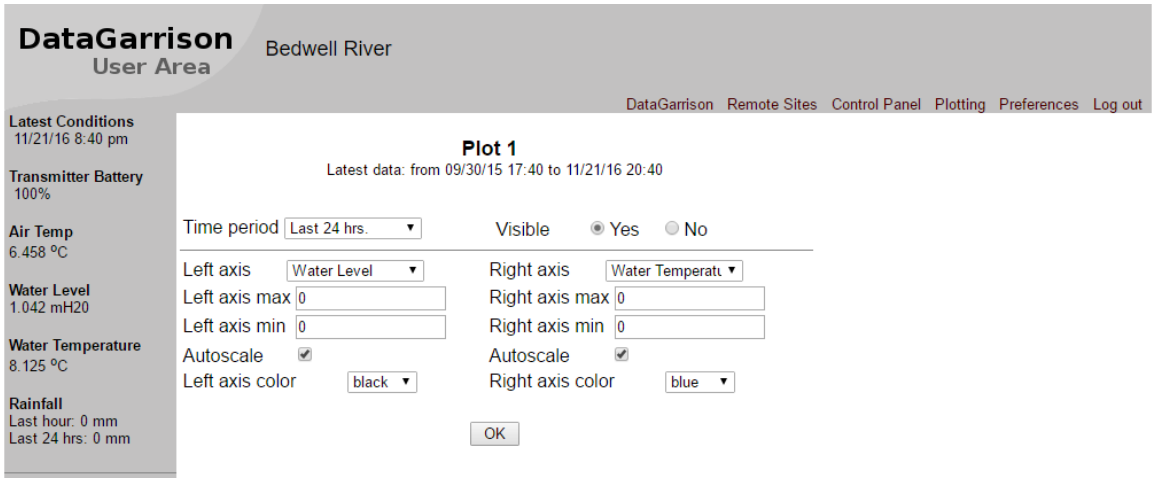
Plotting

Creating your first plot



When logging into your account for the first time, no plots will exist. To create a plot, click on 'Preferences', then click on 'Add Plot 1'.





Clicking on 'Add plot 1' brings up several options to choose from.

Time period: The amount of time up until the present, that you would like to display.
Visible: Whether or not the graph will be visible.

Left axis: The sensor to associate with left axis scaling.
Left axis max: The maximum value to show on the graph for that sensor's data.
Left axis min: The minimum value to show on the graph for that sensor's data.
Autoscale: If this is checked, max and min values will be ignored and replaced with the maximum and minimum values within the selected time period.
Left axis color: The color of the line associated with left axis scaling.

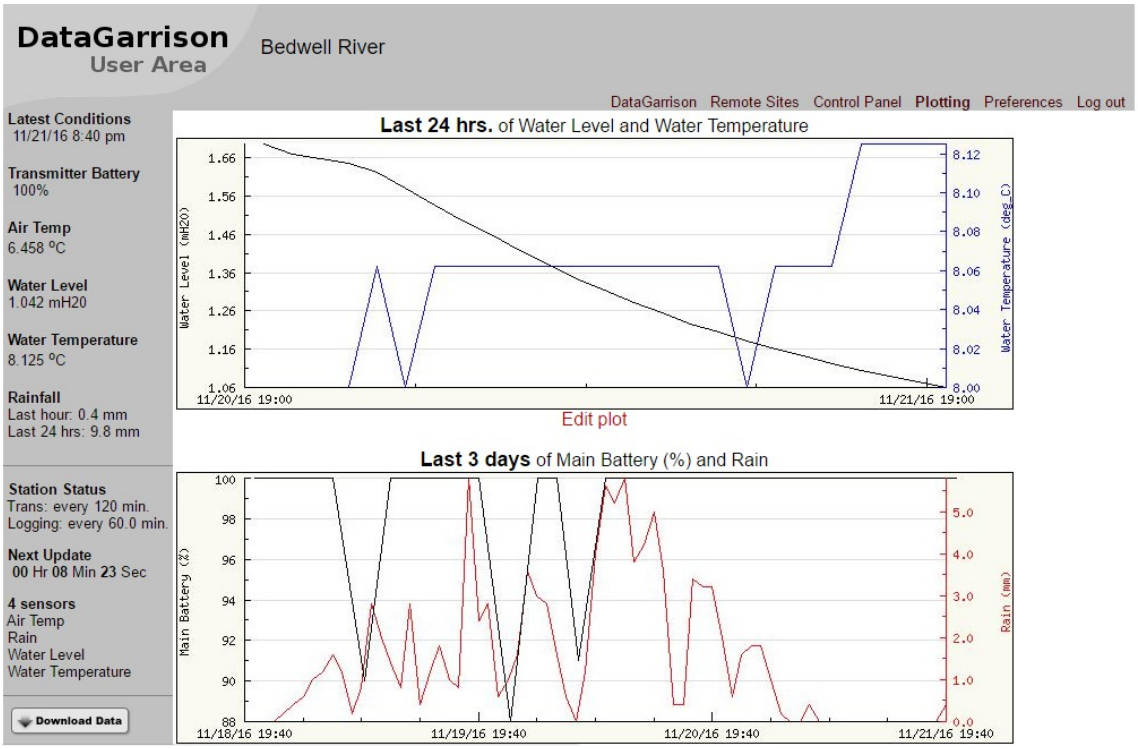
Right axis: The sensor to associate with right axis scaling.
Right axis max: The maximum value to show on the graph for that sensor's data.
Right axis min: The minimum value to show on the graph for that sensor's data.

Autoscale: If this is checked, max and min values will be ignored and replaced with the maximum and minimum values within the selected time period.
Right axis color: The color of the line associated with right axis scaling.

Editing plots

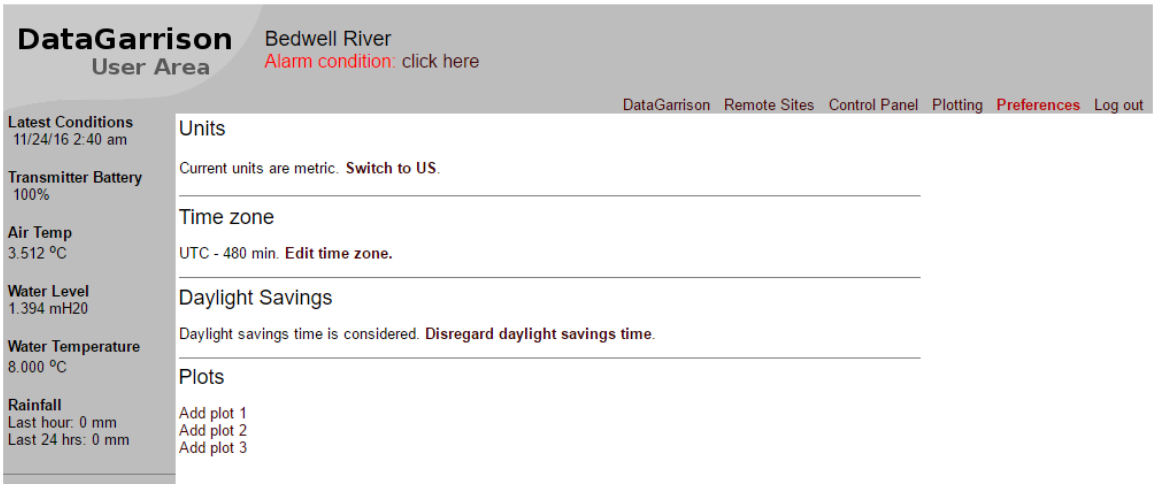
After you have added one or more plots to your plotting page, you can edit them by clicking on a plot or on the 'Edit plot' link under it. This will bring you back to the respective plot's options page.

Clicking 'OK' will display all available plots, with your latest edits.



Preferences

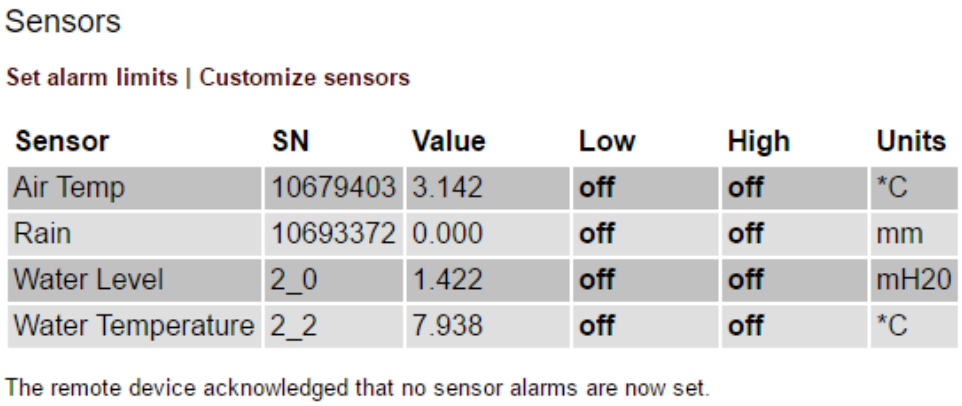
Beyond adding new plots in the 'Preferences' area, you can toggle between US and metric units, activate Daylight Savings time, and specify a time zone.



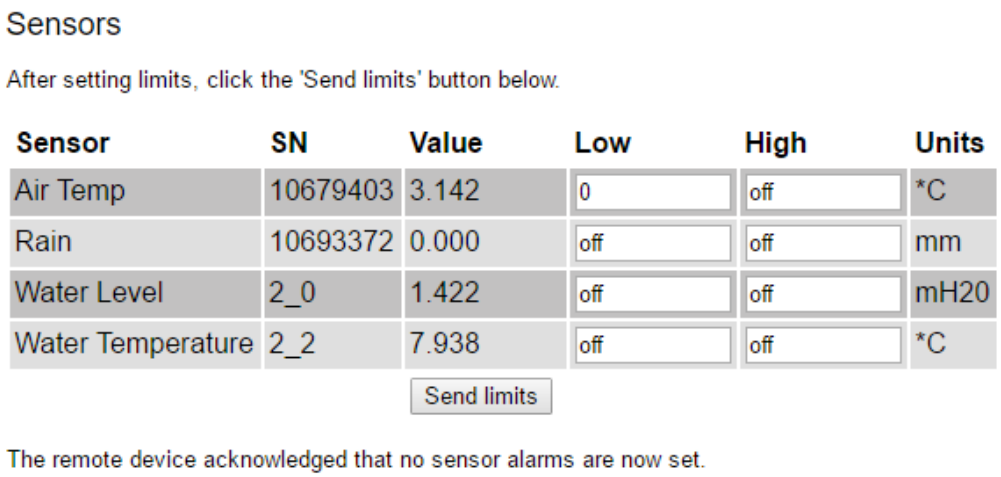
And you can also set high and low sensor alarm limits for HOBO smart sensors.

Setting sensor alarms

To set alarms for any smart sensors attached to your station, click on 'Set alarm limits'.



That will change the sensors' low and high limit cells into text input boxes. Enter one or more limits, and then click the 'Send limits' button.



Sensors

After setting limits, click the 'Send limits' button below.

Sensor	SN	Value	Low	High	Units
Air Temp	10679403	3.142	0	off	*C
Rain	10693372	0.000	off	off	mm
Water Level	2_0	1.422	off	off	mH20
Water Temperature	2_2	7.938	off	off	*C

Send limits

The remote device acknowledged that no sensor alarms are now set.

The alarm limits will then be transmitted to the DataGarrison Station at the next transmission interval. When you believe that interval has passed, check the Preferences page for an acknowledgment at the bottom of the Sensors area.

During typical network conditions, you will receive an alarm within one minute of the extreme value being logged. At that logging interval, the station will transmit the alarm, regardless of any user-defined transmission interval. For example, if a station is syncing its data with DataGarrison.com only once per day, but logging data every 15 minutes, the maximum alarm latency will be 16 minutes during typical network conditions. The additional minute of latency accounts for the time a device must power on and connect to the network.

Customizing sensors

Sensors can similarly be customized when they are being displayed in metric units. Once in metric, you will see the 'Customize sensors' link. Clicking on it will allow you to edit sensor names and units, as well as add factors and offsets to raw sensor values from the station.

Sensors

After customizing sensors, click the 'Submit' button below.

Factors and offsets are applied to the raw sensor value as follows:
New value = offset + factor*raw value.

Sensor	SN	Value	Factor	Offset	Formula	Units
Air Temp	10679403	3.142	1	0		*C
Rain	10693372	0.000	1	0		mm
Water Level	2_0	1.422	0.70308	0		mH20
Water Temperature	2_2	7.938	1	0		*C

Submit Restore Add virtual sensor

*Clicking 'Restore' will restore all sensors to their factory defaults and remove any virtual sensors.

Formula Tips
1) Formulas must be valid PHP code snippets, without syntax errors.
2) Formulas must begin with "$val = " and end with a semicolon.
3) For example, y = x + 3.4 must be written as $val = $s[0] + 3.4; , where x was assumed to be the first sensor.
4) Sensor 1 is $s[0] , sensor 2 is $s[1] , etc...
5) When working with roots, like $y = x^3 + 2.6$, just put in this form: $val = $s[0]*$s[0]*$s[0] + 2.6;

The remote device acknowledged that no sensor alarms are now set.

Adding virtual sensors

Sometimes it is desirable to apply complex formulas to raw sensor values or to combine raw values from more than one sensor together to calculate other values. Calculating wind chill requires this, since its calculation is non-linear and requires both temperature and wind speed. Clicking the 'Add virtual sensor' button will add a 'New Sensor' for you to name and otherwise customize. Follow the instructions in the 'Forumla Tips' area when customizing this type of virtual sensors.

Connectivity alarm

A connectivity alarm alerts a customer when a station fails to sync with DataGarrison.com at three sequential transmissions. It is inactive by default, but a user can activate it by entering a non-zero value into its text box after clicking

'Enter connectivity alarm period'. This alarm period must be at least twice the transmission interval and represents how often the alarm will repeat when there is a lack of connectivity.

Messaging emails

Customers can specify any number of messaging emails in the preferences page. The owners of these email addresses will be notified of any alarms or alerts. Simply click on the Add/Edit email address(es) link and enter in the emails, separated by commas.

Setting site coordinates

Set the station's geographical coordinates by clicking the 'Edit coordinates' link and typing in the location of the device using its longitude and latitude.

Changing your password

You may change the password that was originally assigned to you in the preferences page. Type in your current and new password in the text fields and then click submit.

Adding and removing user accounts

Customers can add user accounts in the 'User Accounts' section of the Preferences page. Enter in a unique username/password combination to add a new user.

Your user ID will be listed as an Administrator, which means you can access your data, change settings at the remote site, and edit your account's preferences. The other type of user, the Guest user, can only view your data, and not edit how it is displayed or send commands to the remote station.

Allowing and restricting public access

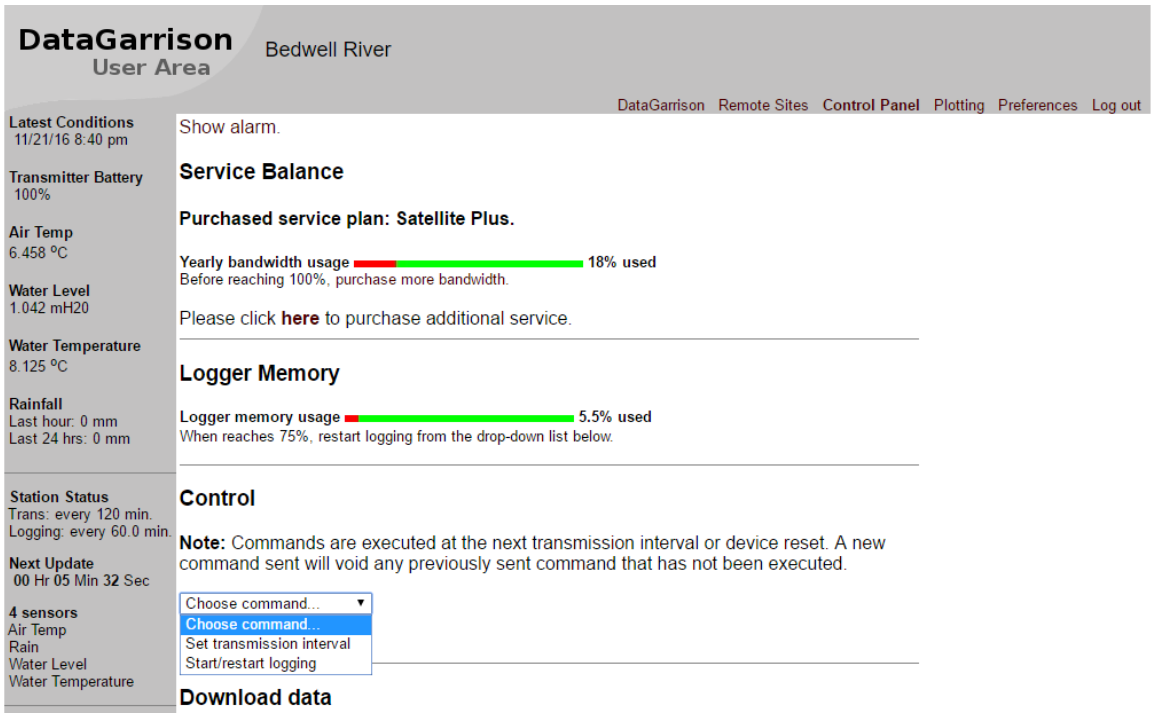
If you would like your data to be accessible to the general public or anyone who has a link to your site's plotting page URL, you can grant public access by clicking 'Allow limited* public access'. Granting such access would provide anyone with a URL link to your plotting page, the ability to visit your account without having to log into DataGarrison.com. However, once viewing your site, they would have the restricted privileges of a 'Guest' user (see above). The default setting is to restrict public access.

Control Panel

Sending commands to your station

IMPORTANT: Only send one command per transmission interval. Commands sent from DataGarrison.com will not be received or executed by the remote station until the station's next transmission interval or after its reset button is physically pressed.

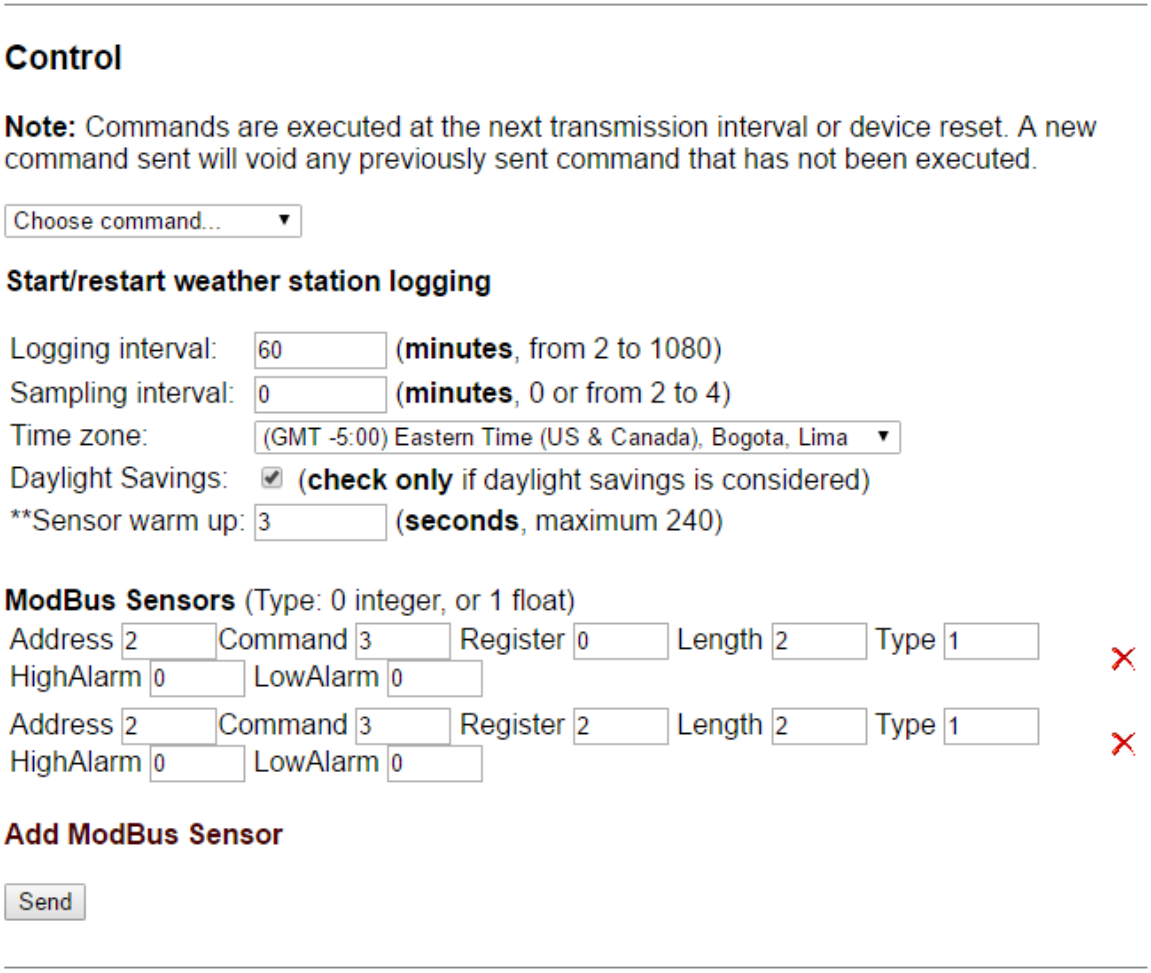
Select a command from the drop-down list in the 'Control' section of the Control Panel page to remotely change settings of the DataGarrison Station. You can change the transmission and logging intervals, or enable Bluetooth communications at the remote site.



Start/restart logging command

This command must be sent to a station within 24 hours before a DataGarrison Station is tested or installed. (See the DataGarrison Station Users Guide for more detailed instructions on how to first set up the station). The command can also be sent while a station is already running to change its logging interval. It will remain in a queue until the station syncs with the DataGarrison.com server after it is powered on, reset, or the transmission interval is reached.

After selecting 'start/restart' logging, the following input boxes will appear.



There are four independent and user-defined time spans: *transmission interval*; *logging interval*; *sampling interval*; and *warm up time*. The *transmission* interval is set with its own command, and this is the interval at which the station will sync its data with its online account at DataGarrison.com. The *logging interval, sampling interval,* and *warm up time* are set with the 'start/restart logging' command.

The *logging* interval is the interval at which data points are recorded in the log file. When the station receives its first (or a new) logging interval, it will begin logging data only after all sensor and station settings are transmitted to the server.[1]

1 Since this initial upload of station settings can sometimes take twenty minutes over a satellite connection, the first data point logged may be delayed. For example, if a start/restart command with a 60 minute logging interval was received by the station at 9:51 AM, the first data points will not be logged (and thus will not show up at DataGarrison.com) until 11:00 AM.

The *sampling* interval only applies to certain HOBO smart sensors, which have the ability to maintain a running average of sensor values within the sensor itself. Refer to your HOBO smart sensor documentation to see if a given sensor supports data sampling. Sensors that sample maintain a running average between logging intervals, which is refined at each sampling interval. The resultant average value is stored in the log file at the specified logging interval. A sampling interval of zero will turn off sampling for any capable sensor.

The sensor *warm up* time applies to ModBus or analog sensors that are powered by the DataGarrison Station. The station powers these sensors for the specified amount of *warm up* time before values are extracted and logged. The default *warm up* time of three seconds is safe for most configurations. Certain sensors may require a longer *warm up* time, which will be listed in the respective sensor's user's guide. Some SDI-12 sensors require *warm up* times, but they need not be specified since those times are automatically elicited from SDI-12 sensors, as detailed in the SDI-12 protocol documentation.

The two *ModBus* sensors listed above were pre-configured based on this guide's *ModBus and SDI-12 Web-based Configuration* section. That section of can be disregarded for stations that only have smart sensors attached, in which case no *ModBus* sensors will be listed when selecting 'start/restart logging'.

Downloading data

Customers download a raw data files from the list of files in the 'Download data' section of the 'Control Panel' page. Whenever you 'start/restart logging' from the website or the Android App (see the DataGarrison Station Users Guide), a new data file will appear at the end of the list within two transmission intervals. New data is appended to this last file whenever your station syncs with DataGarrison.com. All other files are archival and static.

Automated downloads

Third party applications can automatically download data from the current data file at a protected and static URL (web address) which is based on the station's unique IMEI number. See how to determine what this URL is for your specific site below. If you want to use this file, you must contact DataGarrison.com at the number above and request that this file be accessible to the world. Please note that once visible, it is possible (though difficult) for others to guess this URL and access your current data file.

This URL is based on the following two numbers, which may be the same: the original IMEI user ID for logging into DataGarrison.com; and the IMEI number for

the station in question. If we call your IMEI user ID the [parent-ID] and the station's IMEI number the [child-id], the following is your station's static URL:

https://DataGarrison.com/users/[parent-id]/[child-id]/temp/[child-id]_live.txt

With such a URL, developers can import raw, tab-delimited data from your station's current log file into independent websites or Apps.

Station status

A DataGarrison Station transmits and logs data, and since it can both transmit and receive information, the technical term for its transmitter is 'transceiver'. The transceiver, logger, and sensor details are available under the 'Station status' heading.

Transceiver
ID: Unique ID.
Power level: The battery capacity at the last update.
Update rate: The interval over which data is synced with the server.
Mode: The station's power mode.
Low power alarm: The minimum battery level allowed before a low battery alarm is sent.
Sensor alarms: Whether or not sensors will trigger alarms during user-specified conditions.

Logger
Serial number: The unique serial ID of the logger.
Logging start: The start date of the current log file.
Logging interval: How often the station logs data points.
Sampling interval: The interval at which a running average is refined between logging intervals. The final average value will be logged at the logging interval.
Launch description: A user-defined name stored at the start of each log file.
Part number: A company-defined part number.
Logging power: Whether battery voltage is logged along side sensor values.

Sensors
Units: The unit of measurement of a given sensor.
Resolution: The amount of data used for each measurement.
Range: The measurement range for a given sensor.
Serial number: A sensor's unique serial number.

ModBus and SDI-12 Web-based Configuration

If attaching ModBus or SDI-12 devices to the station, download and use as a template, the following example configuration spreadsheet:
http://DataGarrison.com/users/ModBus-SDI-12-Example.xls

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Unused Column	Unused Column	ACTIVE SENSORS		HOBO, ModBus, and SDI-12 Sensor Configuration								
2			Unique ID	Unused	Modbus addr	Unused	Command	Registers	Multiplier	Offset	Units (optional)	Sensor Name (optional)	Format
3													
4													
5													
6			Active 1		255		H	na	1	0	°C	Outside Temperature	na
7			Active 2		255		H	na	1	0	%	Outside Humidity	na
8			Active 3		255		H	na	1	0	°C	Inside Temperature	na
9			Active 4		1		3	1-2	1	0	W/m^2	Solar Irradiance	Unsigned integer
10			Active 5		1		3	3-4	1	0	°C	Cell Temperature	Float
11					0		S	2	1	0	V	DC Voltage	Integer
12			Active 7		0		S	3	1	0	kW	AC Power Output	Integer
13													
14													

Configuration spreadsheet

The active portions of the spreadsheet begin on column C and row 6, and the format of this sheet must be strictly adhered to for the proper logging and transmission of attached sensors. You can insert and delete rows in this area as needed, but do not attempt to add information outside of this area.

You can add notes to unused cells in your spreadsheet file, but these notes should be added below the required information and ***never*** in column C. Anything in a column C cell triggers DataGarrison.com to parse all data from the respective row, and if unexpected or invalid information exists there, a station's log file can be corrupted.

Every sensor being logged and transmitted must have a unique value in the 'Unique ID' column (C). If the respective cell is left blank for any sensor, that sensor will be ignored. Note that cell C11 is blank in the above example, which means the sensor listed in row 11 will be ignored.

If HOBO smart sensors (symbolized by an 'H' in the command column) are not used, delete the content in the respective cells in column C. If HOBO sensors are used, each one must be listed before any ModBus or SDI-12 sensors, and in the order in which they appear in the station, from left to right. The sensor that is connected to the left-most port on the DataGarrison Station must be listed first, and the sensor connected to the right-most port must be listed last. Then ModBus and SDI-12 sensors can follow.

While optional, the 'Units' and 'Sensor Name' columns (K and L) are useful for identifying the sensors and their units within your user account at DataGarrison.com. In these columns, avoid special characters and use * as the degrees symbol for temperature.

Some sensors require multipliers and/or offsets to convert a raw sensor value into the appropriate units. If so, enter these in columns I and J respectively, where the multiplier would be 'm' and the offset 'b' in the formula y = m*[raw_value] + b. 'y' would become the converted value in the desired units, which will be logged and transmitted.

ModBus sensors

ModBus devices have a unique ModBus address, which must be listed in the 'ModBus Addr' column (E).

ModBus sensor values are stored in 'registers' or 'coils', and must be extracted using either the ModBus command 3 or 4 respectively[2]. In the above example file, two ModBus sensors are evident by '3' commands appearing in cells G9 and G10. Consult your sensors manual to determine which command is required. If you are unsure, use the '3' command as it is the most commonly used command.

The registers 1-2 are listed in H9, which means that those two 16-bit registers (totaling 32 bits) are required for that sensor value. Register 3 listed in H10 means that this other ModBus value is 16-bits wide, and no other register is required. Consult with the manufacturer's ModBus Register Map to determine which registers are required.

The Format column (M) must be filled in correctly for all ModBus sensors, or they will not be displayed or stored properly. Valid values for ModBus sensors include float, integer, and unsigned integer.

SDI-12 sensors

SDI-12 devices have a unique address, which must be listed in the 'ModBus Addr' column (E).

SDI-12 sensors values are extracted from delimited string(s), and the custom command 'S' tells the DataGarrison Station that the given spreadsheet row represents an SDI-12 sensor. See cells G11 and G12.

SDI-12 devices do not require registers, so the register column represents a sensor's sequence in the delimited string(s). If the sensor required is the second value listed in that string, then a value of '2' should be in the register column. H11 and H12 list 2 and 3 respectively, meaning that these rows represent the second and third sensor listed in the SDI-12 return string(s).

2 ModBus is an open protocol, with various online documents describing it. While DataGarrison Stations automatically translate your spreadsheet into valid ModBus packets and you do not need to understand the underlying details, you can learn about the protocol by Googling "ModBus protocol'.

The Format column (M) must be filled in correctly for all SDI-12 sensors with ***only*** the following value: integer.

Upload and Activate the Spreadsheet

Once properly formatted, upload your spreadsheet to the DataGarrison Station's online account by visiting its 'Preferences' page. Scroll down and click on *Upload ModBus Configuration File*, browse to the file on your computer and then click *Upload.* Then click on the following link: Click here to import ModBus and sensor information from the file into the database.

Values from your spreadsheet will be displayed across the web browser, signifying successful insertions into your account's database, and you should click the 'Back' button twice, then click on the 'Control Panel'. At this point, you may notice a change in the sensor names on the left side of the page, consistent with your spreadsheet, but these settings have not yet reached your remote device. To send them to your device for activation, select 'start/restart logging' from the drop down list on the 'Control Panel' page.

Enter the appropriate intervals and time zone, then click 'Send'. Your station will then receive the settings the next time it transmits a data or status message. If you are near your station, you can hit the 'reset' button to force a status transmission. Sensor information should then be available online within about twenty minutes and sensor data should arrive within a logging interval afterwards.