Axiom H2

Smart Datalogger for Extreme Environments

User Manual

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1.1 General

The FTS Axiom H2 datalogger is a robust weatherproof datalogger with a built-in power management system, support for a variety of sensors and telemetry devices, an industrial grade colour touchscreen display, and standard USB ports.

The Axiom H2 employs the FTS Quick Touch System™ which combines a graphical user interface (GUI) with a colour touchscreen display and USB ports for easy operation. On-site data retrieval, datalogger parameter optimization, and performance information are simple and intuitive.

The datalogger can store multiple datalogger configurations as well as several years of typical fire weather data. Data in the Axiom H2 is stored in a circular buffer in non-volatile memory with time tags on each record. The time tags have a resolution of one second and correctly account for leap years. Non-volatile memory ensures that data is preserved through power cycles and the circular buffer ensures that the oldest data is overwritten by the newest data when the memory fills.

The datalogger is watertight, even without connectors attached. Device connectors (sensors and telemetry) are circular metal shell, bayonet, military style connectors which are uniquely keyed and colour coded to minimize erroneous connections. The datalogger supports SDI-12 sensors as well as a broad range of meteorological sensors.

The built-in power management system integrates a **SOLAR PANEL** input with a **BATTERY** input to provide a method of regulating and maintaining the optimal battery charge condition.

Support for two independent telemetry devices is standard with each datalogger. The Axiom H2 datalogger can be ordered with two external telemetry ports (model Axiom H2-TLM-2) or with an internal G5 GOES transmitter with one external telemetry port (model Axiom H2-G5-TLM). The Axiom H2 automatically synchronizes with UTC time if a G5 GOES transmitter is connected either externally or internally to the datalogger.

Figure 1-1 identifies the components of the Axiom H2 datalogger front panel. The front panel is divided into four functional blocks:

Power Connections	**SOLAR PANEL** and **BATTERY** inputs
Sensor Inputs	colour coded sensor inputs
Telemetry Panel	dual **TELEMETRY** or internal GOES with single **TELEMETRY**
User Interface	touchscreen, stylus, and USB ports

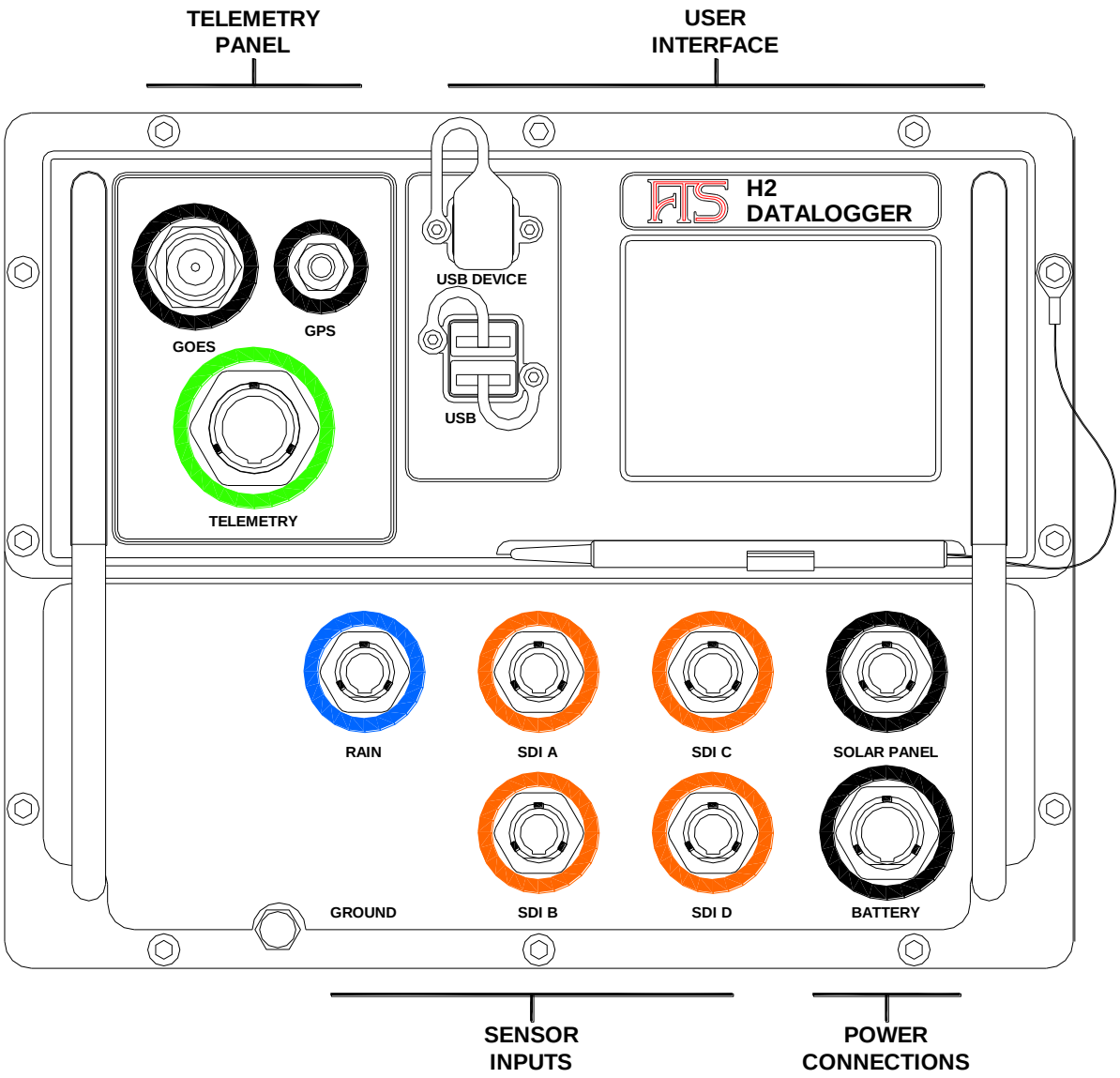


Figure 1-1: Axiom H2 Datalogger Front Panel

1.2 *Power connections*

Power connections for the Axiom H2 datalogger comprise the **SOLAR PANEL** input and the **BATTERY** input. The **BATTERY** input is the power source for the datalogger while the **SOLAR PANEL** input is used by the internal power management system to charge the 12-volt battery.

1.2.1 Solar panel

The **SOLAR PANEL** input is colour coded on the datalogger front panel with a black ring around the connector. The connector is a three terminal, pin (male), bayonet, military style connector which can accept a solar panel array up to a maximum of 100 Watts. The **SOLAR PANEL** input has an internal blocking diode to prevent battery voltage from running back through the power management system and discharging through the solar panel at night.

Normally solar panels are provided by FTS with the appropriate mating connector; however, if required, details for the solar panel connection can be found in the Specifications section of this manual.

1.2.1.1 *Solar charge operation*

The **SOLAR PANEL** input provides power directly to the battery charge control circuits. This allows the internal power management system to begin to charge the battery attached to the **BATTERY** input even when there is not enough battery capacity to run the datalogger (i.e. a completely discharged battery). In addition, once the datalogger is powered, battery charging is temperature compensated for optimal battery charging.

1.2.2 Battery

The **BATTERY** connector is colour coded on the datalogger front panel with a black ring around the connector. The connector is a seven terminal, pin (male), bayonet, military style connector which is designed to connect to a 12 V, absorbed glass mat, deep cycle battery. The cable connection to the battery includes the main battery connection as well as voltage sensing leads and a temperature sensing element. This set of connections enables the datalogger's power management system to optimize battery charging as it is able to accurately measure the battery voltage and to temperature compensate the battery charging algorithm.

Details of the battery connection can be found in the Specifications section of this manual.

1.3 Sensor inputs

The Axiom H2 datalogger has several dedicated sensor inputs specifically chosen for Fire Weather data collection, two independent SDI-12[1] connection ports, as well as several internal sensors. Sensors used on FWS-12S, FWS-12 and FWS-11 dataloggers are compatible with the Axiom H2 datalogger.

1.3.1 Dedicated rain sensor

The **RAIN** input is colour coded on the datalogger front panel with a blue ring around the connector. The connector is a three terminal, socket (female), bayonet, military style connector which is compatible with tipping bucket rain gauge sensors.

Normally Rain Gauges are provided by FTS with the appropriate mating connector; however, if required, details for the **RAIN** input connection can be found in the Specifications section of this manual.

Rain sensing on the Axiom H2 datalogger is accomplished by counting the number of tips of a calibrated tipper bucket and then converting the number of tips to a specific rainfall amount.

1.3.2 SDI ports

The Axiom H2 datalogger has four fully independent front panel SDI-12 ports (**SDI A**, **SDI B**, **SDI C**, and **SDI D**). The SDI ports are special dedicated sensor connectors as the SDI-12 is a multi-drop interface (more than one sensor can be connected to a single SDI bus). Four independent SDI ports allow "slow" sensors (sensors which require a long time to return data) to be placed on a separate bus from quicker SDI sensors. Multiple ports also offer protection against a damaged sensor disrupting communications to all SDI sensors as the sensors can be split between two buses.

[1] SDI-12 is a serial digital interface standard for microprocessor based sensors (for more information, see http://www.sdi-12.org.

The Axiom H2 is the master on both SDI ports and fully supports the SDI protocol (currently version 1.3).

SDI-12 ports are colour coded on the datalogger front panel with an orange ring around the connector. The connector is a three terminal, socket (female), bayonet, military style connector which is compatible with all SDI sensors.

Normally SDI sensors are provided by FTS with the appropriate mating connector; however, if required, details for the SDI port connections can be found in the Specifications section of this manual.

1.3.2.1 Optional SDI-AM analog expansion module

An optional SDI-AM expansion module for general purpose analog inputs is available for use with the Axiom H2 datalogger. The SDI-AM is an SDI-12 module designed to provide easy connection to legacy analog sensors through spring clamp terminal strips. The SDI-AM connects to the Axiom H2 on either of the datalogger's SDI ports. The module provides four configurable analog input channels; two switched 12 V power supply outputs; two excitation voltage outputs; and a general purpose counter input.

Refer to the SDI-AM Operating Manual (FTS Document Number: 700-SDI-AM) for details on the analog expansion module.

1.3.3 Internal sensors

Internal sensors are sensors which are inside the datalogger case (internal to the datalogger). The purpose of these sensors is to provide the user additional station operating information.

1.3.3.1 Battery

The internal battery sensor measures parameters of the datalogger's front panel **BATTERY** input. The battery sensor can be configured to measure battery voltage, current, and temperature.

1.3.3.1.1 Battery voltage

Battery voltage is measured in Volts.

1.3.3.1.2 Battery current

Battery current is measured in Amps. A negative reading indicates current is being pulled from the battery (i.e. the battery is being discharged). A positive reading indicates current is being supplied to the battery (i.e. the battery is being charged from the solar panel).

1.3.3.1.3 Battery temperature

Battery temperature can be measured in Celsius or Fahrenheit.

1.3.3.2 Solar panel

The internal solar panel sensor measures parameters of the datalogger's front panel **SOLAR PANEL** input. This sensor can be configured to measure solar panel voltage and current.

1.3.3.2.1 Solar panel voltage

Solar panel voltage is measured in Volts.

1.3.3.2.2 Solar panel current

Solar panel current, the current supplied by the solar panel to charge the battery, is measured in Amps.

1.3.3.3 Case temperature

The case temperature sensor measures the temperature internal to the Axiom H2 datalogger. Case temperature can be reported in Celsius or Fahrenheit.

1.3.3.4 Location

Three internal location measurements are available in the datalogger. Elevation, latitude, longitude are automatically populated if there is a G5 GOES transmitter connected to the datalogger (obtained from the GPS connected to the G5). If the datalogger is using telemetry other than a G5 transmitter, these three values can be manually entered through the user interface (on the **Site** tab of the **Station** screen).

1.3.3.4.1 Elevation

Elevation is the distance above sea level. Elevation can be reported in metres, feet, or inches.

1.3.3.4.2 Latitude and longitude

Latitude and Longitude are reported in degrees-minutes-seconds (dms) format on the datalogger touchscreen; however; when these parameters are logged, they are stored in decimal format.

1.3.3.5 Telemetry specific

Additional internal sensors may be available to the user depending on the telemetry device attached to the datalogger (e.g., Forward Power if a G5 GOES transmitter is used as a telemetry device). Refer to the Telemetry Reference section of this manual appropriate to your Telemetry device.

1.4 Telemetry panel

The telemetry panel on the Axiom H2 datalogger allows for factory configuration for the telemetry device connections. The Axiom H2 supports the connection of two telemetry devices. The devices can both be external to the datalogger (dual external telemetry panel, Axiom datalogger model number: H2-TLM-2) or one device can be externally connected and a GOES transmitter can be internal to the Axiom H2 (single external telemetry panel with built-in GOES, Axiom datalogger model number: H2-G5-TLM).

External **TELEMETRY** connectors on the Axiom H2 datalogger are colour coded on the telemetry panel with a green ring around the connector. The connector is an eight terminal, pin (male), bayonet, military style connector which is compatible with existing FTS telemetry devices.

Normally telemetry devices are provided by FTS with the appropriate mating connector; however, if required, details for the **TELEMETRY** connector can be found in the Specifications section of this manual.

Telemetry options
Figure 1-2 and Figure 1-3 illustrate the two telemetry panel options which can be selected at the time of order.

1.4.1.1 Dual external telemetry

The top connector on the dual external telemetry panel is defined as Telemetry Port A. The lower connector is defined as Telemetry Port B. Both connections are functionally identical.

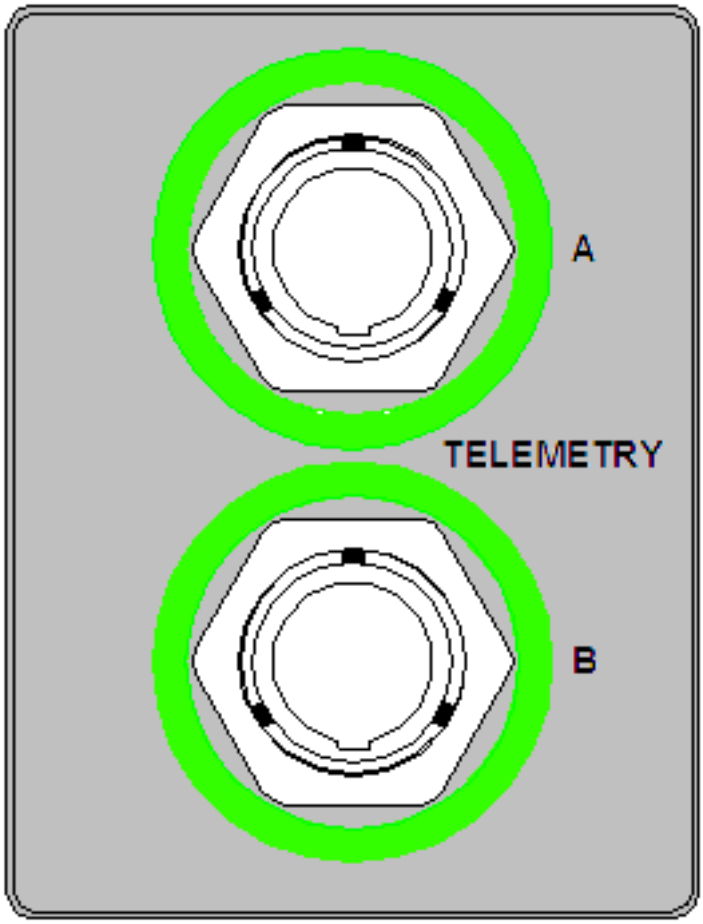


Figure 1-2: Dual External Telemetry Panel

1.4.1.2 Internal G5 GOES transmitter with external telemetry

This telemetry panel option has the upper telemetry port replaced with two RF connectors: an N-type connector and an SMA connector. The N-type connector is used for the internal G5 transmit antenna connection while the SMA connector is the G5 transmitter's GPS connection. The internal G5 transmitter is defined as Telemetry Port A while the lower telemetry connector remains defined as Telemetry Port B.

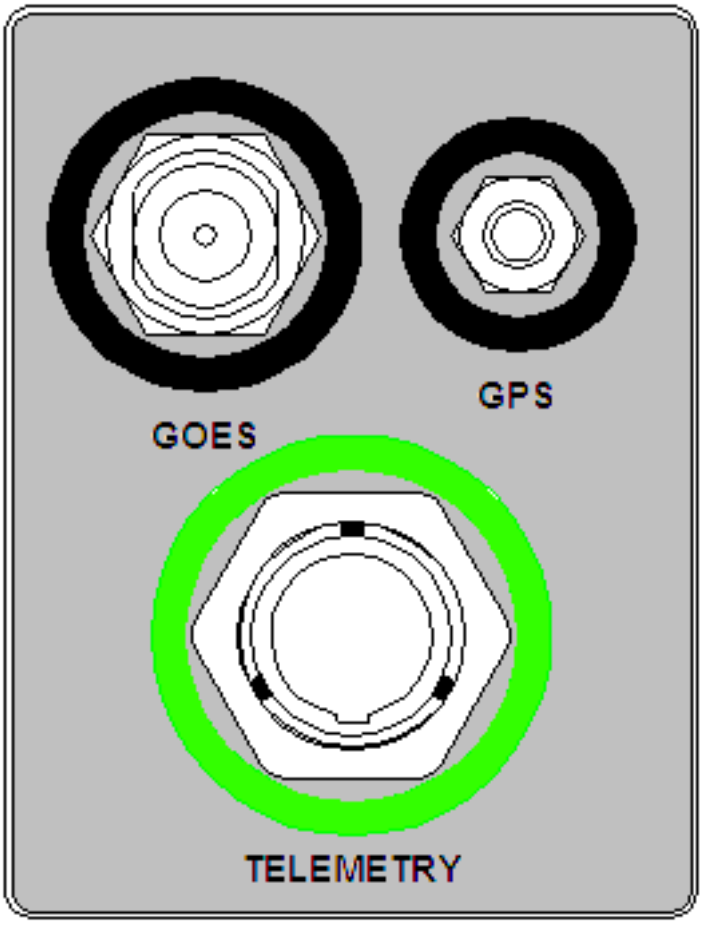


Figure 1-3: Internal G5 GOES Transmitter with Single External Telemetry Panel

1.4.1.2.1 GPS connection

The GPS connector on the telemetry panel shown in Figure 1-3 is used by the internal G5 GOES transmitter. The G5 uses the GPS signal to synchronize its clock to UTC time. The Axiom H2 datalogger is in turn synchronized with UTC time from the G5 transmitter. The Axiom H2 datalogger also obtains position information (latitude, longitude, and elevation) from the G5.

1.5 User interface

The datalogger's user interface incorporates an industrial grade colour touchscreen with a GUI (graphical user interface) application, and standard USB connectors. This virtually eliminates the need for a personal computer during site visits or when configuring the datalogger.

1.5.1 Touchscreen

The display used in the Axiom H2 datalogger is a high visibility, industrial grade, 3.5" colour LCD module with quarter VGA resolution and a built-in touch panel. The display is backlit and is bright and clear even in direct sunlight. A tethered stylus is supplied with each datalogger for use with the touchscreen although most icons are large enough to be operated with a bare finger.

1.5.1.1 *Backlight*

The touchscreen's backlight turns on when the touchscreen is touched and automatically turns off after 60 seconds of non-use (no touches on the touchscreen).

1.5.2 USB ports

Two styles of USB ports are present on the datalogger. The **USB DEVICE** port is used to connect the datalogger to a PC while the dual **USB HOST** port is used to connect USB accessories (mouse, keyboard, memory stick, etc.) to the datalogger. Both USB port types (**USB HOST** and **USB DEVICE**) support USB Basic-Speed data transfer (low speed of 1.5 Mb/s, and full speed of 12 Mb/s).

1.5.3 GUI Home screen

The **Home** screen (Figure 1-4) is the top-most screen in the graphical user interface (GUI), and is the screen which appears when the datalogger has completed powering up. Information on the current state of the datalogger is provided through the Home screen status indicators. From the **Home** screen the user can navigate to the desired location or perform the desired action by pressing the appropriate icon.

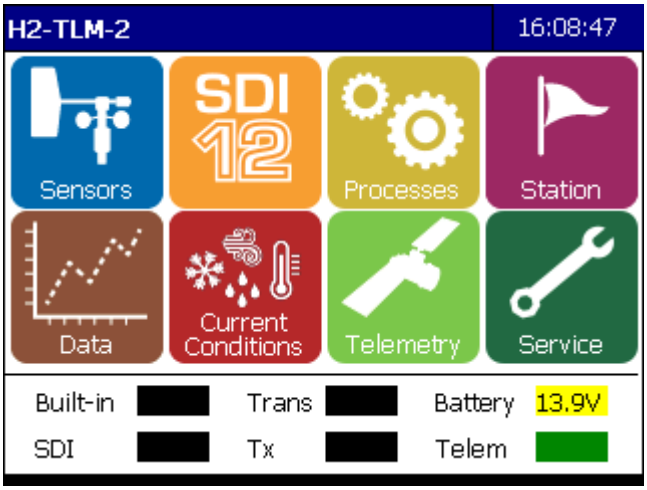


Figure 1-4: Home screen

1.5.3.1 *Status indicators*

The status indicators provide cursory information such as sensor activity, transmitter status, battery voltage, and battery state to allow the user to make a quick assessment as to how the datalogger is operating.

Refer to the Operation section of this manual for specifics on the **Home** screen status indicators.

1.5.3.2 *Station*

The **Station** icon accesses screens that provide the user with datalogger specifics such as software version, serial number, manufacture date, etc. The user can also enter a station name and description as well as save and load datalogger configuration files.

Refer to the Configuration section of this manual for details on the **Station** screen.

1.5.3.3 Sensors icon

The **Sensors** icon accesses screens that provide the user access to sensor definitions. The **Sensors** screen allows the user to define new sensors (Internal, Dedicated, or SDI) as well as individually examine existing sensor operation and configuration.

Refer to the Configuration and Operation sections of this manual for details on sensor set-up and sensor monitoring respectively.

1.5.3.4 SDI-12 icon

The **SDI-12** icon accesses screens that provide the user access to the datalogger's SDI ports and specifically to SDI sensor definitions. The **SDI Sensor Mapping** screen allows the user to define new SDI sensors and examine their operation, to automatically detect SDI sensors that are connected to the datalogger, and to manually issue commands over the SDI ports.

Refer to the Configuration and Operation sections of this manual for details on SDI sensor set-up and operation.

1.5.3.5 Processes icon

The **Processes** icon accesses screens that enable the user to define mathematical calculations and custom scripts to manipulate sensor measurements or other processes. A process output is treated the same as a sensor reading – both are valid datapoints as the datalogger is not concerned about the source of the data. Any datapoint can be logged, transmitted, displayed, or used in another calculation.

Refer to the Processing section of this manual for details on the various process options.

1.5.3.6 Current Conditions icon

The **Current Conditions** icon accesses screens that display and configure a set of user selected datapoints to facilitate easy monitoring of a specific set of data. The user can manually refresh the current condition readings at any time or have the datalogger automatically update the display (on a one minute interval) with a series of current condition readings.

Refer to the Operation section of this manual for details on viewing the current conditions.

1.5.3.7 Telemetry icon

The **Telemetry** icon accesses screens that allow the user to configure the telemetry port for a specific telemetry device and to retrieve status information from the device. The options are: **G5** (FTS G5 GOES satellite transmitter); **RVT** (FTS Radio Voice Transmitter); **AirTalk** (FTS AirTalk); **DB9** (simple serial communications); **FTS** (all other telemetry types); and **None** (disabled). Although all options appear in the selector list, only the following telemetry options are enabled in the Axiom H2: **G5**, **RVT**, **AirTalk**, **None**.

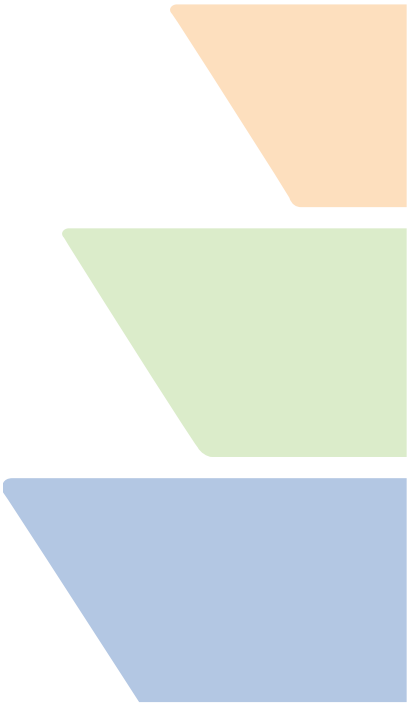
Refer to the Configuration and Operation sections of this manual for details on telemetry device configuration and status monitoring.

1.5.3.8 Service icon

The **Service** icon accesses screens that provide access to datalogger maintenance related items. Through **Service**, the user can set the datalogger's data and time, review and manage the datalogger's audit log, record serial numbers of the sensors used by the datalogger, and issue site visit service reports.

Refer to the Configuration and Maintenance sections of this manual for service function details.

Chapter 2 Quick start guide



FTS normally configures the datalogger to meet the user's requirements; however, should it be necessary, the user can set-up or modify the datalogger's configuration.

There are three ways to configure a datalogger:

1. Load and modify an existing Configuration File,
2. Load and modify an existing Template File, or
3. Configure the datalogger from start to finish using the touchscreen and GUI.

A basic guide to configure the datalogger is outlined in the steps below. Details on configuration specifics can be found in the Configuration Reference section of this manual.

4. Power the datalogger
    a. Attach the battery to the power cable.
    b. Plug the power connector into the datalogger.
5. Set the datalogger's date, time, and time zone:
    a. Press **Service**.
    b. Press **Set Date/Time.**
    c. Enter date, time, and time zone values.
    d. Press **OK** and then **Home** when you are finished.
6. Set the station name and description:
    a. Press **Station** and select the **Site** tab.
    b. Press **Edit**.
    c. Enter your station name and description
    d. Press **OK** when you are done.
7. To configure the datalogger from an existing template or configuration file:
    a. On the **Home** screen, press **Station.**
    b. Select the **Setup** tab on the **Station Set-up** screen.
    c. Press **Load Configuration**.
    d. Select the template or configuration file.
    e. After the datalogger has loaded the desired configuration go to Step 9 to configure/confirm the telemetry settings. Otherwise press **Home** and continue with the steps below.
8. To configure the dedicated and internal sensors:
    a. On the **Home** screen, press **Sensors**.
    b. Press **Add** to create the desired sensor and then enter the appropriate parameters.
    c. Press **OK**.
    d. Press **Home**.
9. To configure the SDI sensors:

a. On the **Home** screen, press **SDI-12**.

b. SDI sensors connected to the datalogger can be automatically detected by pressing **Detect**. This will return each sensor's SDI address as well as information about the sensor (manufacturer, model, serial number).

c. Press **New** in the Defined Name column to configure each SDI sensor.

d. Return to the **Home** screen when you are finished.

10. To configure mathematical calculations and program scripts (e.g., averages, minimum or maximum values, custom calculations etc.):

    a. On the **Home** screen, press **Processes**.

    b. Use **Add** to create the desired process and then enter the appropriate parameters.

    c. Press **Home** when you are finished.

11. To log data from each sensor:

    a. On the **Home** screen, press **Data** and then the **Setup Cog**.

    b. If the logger was programmed at our factory there will be ready-defined **Logging Interval** configuration. To view configuration details, press the icon.

    c. If a new logging interval is required:

        i. Press **Add** and then press **Edit**.

        ii. Select a variable name or sensor name and add this to the Logged Variables list on the right-hand side.

        iii. Continue adding to the list until all the variables you want logged appear on the right-hand side.

        iv. Choose a logging interval time

        v. Press **OK** to save.

    d. Return to the **Home** screen when you are finished.

12. To display or configure the current telemetry port settings:

    a. On the **Home** screen, press **Telemetry**.

    b. Setup is required only for G5 GOES transmitter. If the datalogger is connected to a G5 GOES transmitter (internally or externally):

        i. Press the port's **Status** button to display a summary status screen for the G5 transmitter.

        ii. Press the **Setup Cog** and then **Edit** to configure your station's NESID and relevant GOES parameters.

        iii. Navigate to the Self-Timed Tab to set the desired message format.

        iv. Press **OK** after you are done to return to the setup screen.

        v. Next, select the desired message format and then press **Set Message** to configure the data transmitted on each GOES transmission.

vi. Return to the **Home** screen when you are finished.

13. Confirm proper station operation:
    a. On the **Home** screen, press **Current Conditions**
    b. Press the **Setup Cog** and choose which datalogger parameters to monitor. Press **OK** when finished.
    c. Press **Refresh** on the **Current Conditions** screen to update the display with the latest sensor readings.
    d. Return to the **Home** screen when you are finished.
14. For your records, save the datalogger's configuration to your USB memory stick:
    a. Plug your memory stick into one of the datalogger's **USB HOST** ports.
    b. On the **Home** screen, press **Station** and then select the **Set-up** tab.
    c. Press **Save Configuration** and then press **OK** to save the datalogger's configuration to the USB memory stick.

    If desired you can also save a template of the datalogger's configuration to the USB memory stick (refer the Operation section of this manual for the difference between templates and configurations).
15. To graph data:
    a. On the **Home** screen, press **Data.**
    b. Press **Graph**.
    c. Press the **Setup Cog** to configure the graph.
16. To view data:
    a. On the **Home** screen, press **Data.**
    b. Press **Table**.
17. To export data to your USB memory stick:
    a. Plug your memory stick into one of the datalogger's **USB HOST** ports.
    b. On the **Home** screen, press **Data.**
    c. Press **Download**.
    d. Select the desired date range and then press **Download** to download the data.
    e. Note that the export process can require some time if a large data range is selected.

Chapter 3 Operation

Chapter contents

3.1 General

Datalogging is a simple, straightforward process – data is sampled and stored on predefined intervals. Operation of the datalogger is also quite simple as the datalogger GUI has several facilities (which can be password protected) to configure the datalogger and to monitor the status of the datalogger and datalogging system. The user has several options when interfacing with the datalogger. The simplest option is to use the datalogger's touchscreen GUI together with a USB memory stick. Alternately, the datalogger can be connected to a PC as a USB device. Third, the datalogger telemetry port can be connected to a PC through an RS-232 serial port. As well, several telemetry choices exist for remote data collection from the datalogger.

3.1.1 Mouse and keyboard connection

For convenience, a USB mouse and/or keyboard can be connected to the datalogger's **USB HOST** ports. The datalogger's touchscreen continues to function while the mouse and keyboard are connected.

3.1.2 Password protection

Two levels of password protection can be utilized on the datalogger. A User Level password grants touchscreen read-only access to the datalogger while a Tech Level password enables the operator to modify the datalogger configuration. It is the choice of the station operator whether or not to enable password protection on the datalogger as passwords are not set when the datalogger is shipped from FTS.

3.1.2.1 User level

A User Level password allows the operator read-only access to the datalogger. The operator is able to examine datalogger status (i.e. view data, read sensors, view telemetry configuration etc.) but cannot change the configuration of the logger if a Tech Level password is set.

3.1.2.2 Tech level

The purpose of the Tech (technician) Level password is to prevent unauthorized modifications to the datalogger. A Tech Level password allows the operator full access to the datalogger. The operator is able to modify datalogger operation (i.e. load new configurations, create and change datalogging intervals, create and change sensor definitions etc.). There are no restrictions placed on a Tech Level user. If a Tech Level password is not set then the User Level has access to Tech Level functionality.

3.1.2.3 Logout

Automatic logout from User Level or Tech Level occurs after 20 minutes of touchscreen inactivity. In addition, a station operator can force a logout by pressing **Logout** on the **Service** screen.

3.1.3 Datalogger time

The user can set the datalogger to report the time in whatever time zone they desire. The datalogger continually displays the time (as per the time zone setting) in the upper right corner of the display. All datalogging and all audit log entries are recorded with the time of the time zone setting.

3.1.3.1 Setting the time

On the **Service** screen, press **Set Date/Time** to set the datalogger date, time and time zone. Check the Enable Daylight Savings box if you want the datalogger to track daylight savings time.

3.1.3.2 Operation with a G5 GOES transmitter

When the datalogger is connected to a G5 GOES transmitter, the datalogger's time automatically synchronizes with the high-accuracy, GPS-synchronized clock in the G5 transmitter. Clock synchronization occurs the first time the G5's time is synchronized. Clock synchronization also occurs before each test or self-timed G5 transmission and every 24 hours after power on but only if there is a time difference greater than one second between the datalogger and G5 transmitter. Although the datalogger is synchronized with the G5's time, the time zone setting of the datalogger is unaffected. If you want the datalogger time to match the G5 transmitter time, set the datalogger's time zone to the UTC setting and do not select the **Enable Daylight Savings** checkbox.

3.1.4 Using template and configuration files

Configuration and template files are powerful tools for maintaining a network of dataloggers. Configuration files allow unique datalogger configurations to be saved or loaded while template files are used to store or distribute specific data collection algorithms for use in any number of dataloggers.

3.1.4.1 Configuration files

A configuration file encompasses all datalogger details – this includes datalogger specific information such as site and telemetry parameters as well as general data collection and processing algorithms. Saving the datalogger's configuration is useful as it becomes a record which can be used to restore or duplicate a specific datalogger set-up.

3.1.4.2 Template files

Unlike configuration files, template files do not include datalogger specific information. Template files only contain the data collection and processing algorithms. This allows a template file to be loaded into several dataloggers to ensure consistent data sampling on all sites while retaining the specifics of each datalogger. The datalogger can be preloaded with multiple template files (prior to deployment) so that field selection of the data collection algorithm can be done through the datalogger's GUI (no other tools required). Template files can also be loaded from a USB memory stick or PC.

3.1.5 USB connection to a PC

The datalogger can be connected as a slave device through the datalogger's **USB DEVICE** port. This section describes how this feature appears (differently) under Windows XP and Windows 7.

3.1.5.1 Windows XP

The PC automatically senses the datalogger when the connection is made. (A 'Found New Hardware' message appears the first time the datalogger is connected to the PC.)

3.1.5.1.1 Activesync

On a PC running Windows XP, when a datalogger is plugged in, the PC automatically starts an application called Microsoft ActiveSync. This synchronization program enables the datalogger to function as a USB device connected to the PC.

The Microsoft ActiveSync™ window on the PC should indicate a Guest connection when the datalogger has been connected to the PC. Choose 'No' to partnership on the dialogs which appear shortly after the USB cable is connected (do not set-up a partnership). If desired, the user can minimize or close the PC's ActiveSync

window. Once the ActiveSync connection is in place, the datalogger appears as 'Mobile Device' in Windows Explorer.

> **WARNING:** FTS strongly recommends against modifying any files in the datalogger accessed through the ActiveSync connection. Doing so may cause severe problems in the datalogger.

3.1.5.1.2 Remote Display

Once an ActiveSync connection is established with the datalogger, you can use Microsoft's Remote Display program to interact with the datalogger GUI through the PC instead of using the datalogger's touchscreen. This is an ideal tool to use if the datalogger's touchscreen has been damaged or if the ambient temperature is below -20 C and the display is not readable (see the Touchscreen Considerations section of this manual). The drawback to this tool is that it is slower than using the built-in datalogger touchscreen.

Remote Display requires certain settings for best performance with the datalogger. A customized Remote Desktop application is available from FTS which has settings preconfigured for optimal use – please contact FTS for a free copy of the Remote Display application.

3.1.5.2 Windows 7

The PC automatically senses the datalogger when the connection is made. (A 'Found New Hardware' message appears the first time the datalogger is connected to the PC.)

3.1.5.2.1 Windows Mobile Device Center

On a PC running Windows 7, an application called Windows Mobile Device Center is available. It does not start automatically when a datalogger (or other mobile device) is plugged in. It must be started manually, and it is usually best to start it before plugging in the datalogger.

When Windows Mobile Device Center is running and the datalogger is plugged in, Windows Mobile Device Center usually (but not always, for reasons not understood) detects it and notifies the user. When it does so, the datalogger appears as a "WindowsCE" device in Windows Explorer.

> **WARNING:** FTS strongly recommends against modifying any files in the datalogger accessed through the Windows Mobile Device Center connection. Doing so may cause severe problems in the datalogger.

3.1.5.2.2 No Windows 7 equivalent of Remote Display

Even though Windows Mobile Center is described as a replacement for Microsoft ActiveSync, it does not provide exactly the same features and Microsoft Remote Display does not work with it (nor is Remote Display provided with Windows 7). There is currently no program that provides the same functionality of Remote Display on Windows 7.

3.1.6 Touchscreen considerations

3.1.6.1 Temperature

When the datalogger is operated at low temperatures (lower than -20 Celsius), the display responds more slowly than it does at room temperature. Also, the display becomes faint or has low contrast. This is normal for the display. Although the official specification for low temperature operation of the display is -20 Celsius, we have

found that typically the display remains readable until approximately -30 Celsius. When performing a site visit at temperatures colder than -20 Celsius, the user should bring along a laptop computer so that they can remotely connect to the datalogger. Note that although the display becomes unreadable at cold temperatures, this does not affect the datalogger's operation. The datalogger continues to log the required data and as the temperature rises, the datalogger display once again becomes readable.

3.1.6.2 Touch

The datalogger's touchscreen is a sensitive membrane – only the attached stylus or a bare finger should be used to touch the screen (i.e. do not use a screwdriver, pen, pliers, pocket knife, etc. in place of a stylus).

3.1.6.3 Screen calibration

The datalogger's touchscreen is factory calibrated; however, if you notice that the presses on the touchscreen do not register in the correct location, then the touchscreen may need to be recalibrated. To recalibrate the touchscreen, go to the **Service** screen and press **Screen Calibration**.

3.1.7 Telemetry connection to a PC

The datalogger can be connected to a PC's RS-232 port using a CBL-F6H2-TLM-CP cable (available from FTS) to establish a serial connection (9600 baud, no parity, 8 data bits, 1 stop bit) to the datalogger's **TELEMETRY** port. The serial connection can be used by FTS software (i.e. AutoCaller, StreamTrac, etc.) or by terminal software (i.e. HyperTerminal) to retrieve data from the datalogger. The **TELEMETRY** port connection is not intended for datalogger maintenance (i.e. uploading of datalogger configurations or application software). The primary purpose of the **TELEMETRY** port is for telemetry device connections.

3.1.7.1 ASCII data download

Data can be retrieved from the datalogger over using a command line, text based interface. The getdatarange command can be used to retrieve all data or a range of data stored in the datalogger. Password protection over the command line interface mirrors password protection in the datalogger. That is, if password protection has been set in the datalogger then the user is required to enter the appropriate password over the command line in order to gain access to the logger's data. The date format specified in the getdatarange command determines the format of the date field in the returned data (see examples below).

Example 1 – mm/dd/yyyy format

C/R	String
Cmd	`getdatarange 10/02/2009 10/04/2009`

Resp	`Data From: H1 at FTS Date: 10/02/2009,00:00:00 to: 10/04/2009,00:00:00`
	`Date,Time,HG`
	`MM/DD/YYYY,HH:MM:SS,m`
	`10/02/2009,18:08:03,1.432`
	`10/02/2009,18:09:04,1.433`
	`10/02/2009,18:10:05,1.43`
	…

Example 2 – yyyy/mm/dd format

C/R	String
Cmd	`getdatarange 2009/10/02`

Resp	`Data From: H1 at FTS Date: 2009/10/02,00:00:00 to: 9999/12/31,23:59:59`
	`Date,Time,HG`
	`YYYY/MM/DD,HH:MM:SS,m`
	`2009/10/02,18:08:03,1.432`
	`2009/10/02,18:09:04,1.433`
	`2009/10/02,18:10:05,1.435`
	…

Notes

- the getdatarange command does not require that an end date be specified
- pressing Ctrl+C on the keyboard during data retrieval will terminate the download

3.1.8 HDL1 datalogger emulation

It is possible for the user to connect to an Axiom H2 datalogger using AutoCaller, StreamTrac, Fire Weather Plus, Terra Plus, or Toolbox software with the datalogger type set to an HDL1 as the Axiom H2 emulates certain functions of the HDL1 .

HDL1 calls supported by the Axiom H2 are:

logger information request
current conditions request
data request
set date/time request
get date/time request
physical info request
stored data info request
sensor set information request
program information request
get data by tag name
get audit log info
get all audit log messages
get all audit log messages since
get list of user variables
get list of SDI variables
get list of built-in variables
get list of used built-in variables

Note: The Axiom H2 does not use an HDL1 style DLP (Data Logger Program). For this reason it is not possible to download or upload datalogger configurations to the Axiom H2 datalogger while emulating an FWS-12 datalogger.

3.2 *USB memory stick information*

The datalogger has two **USB HOST** ports which are both capable of interfacing to a USB memory stick (or keyboard or mouse). A memory stick can be used to save datalogger information as well as provide the datalogger with application software upgrades.

3.2.1 Requirements

Although data and configuration files are quite small, a minimum 2 GB USB memory stick is recommended for use with the datalogger as the large capacity ensures ample room for data from many station visits. Any USB memory stick is compatible with the datalogger's **USB HOST** port.

3.2.2 File structure

The Axiom H2 datalogger uses a defined file structure on the memory stick to help with file housekeeping. The memory stick file structure used by the Axiom H2 datalogger is shown in Figure 3-1.

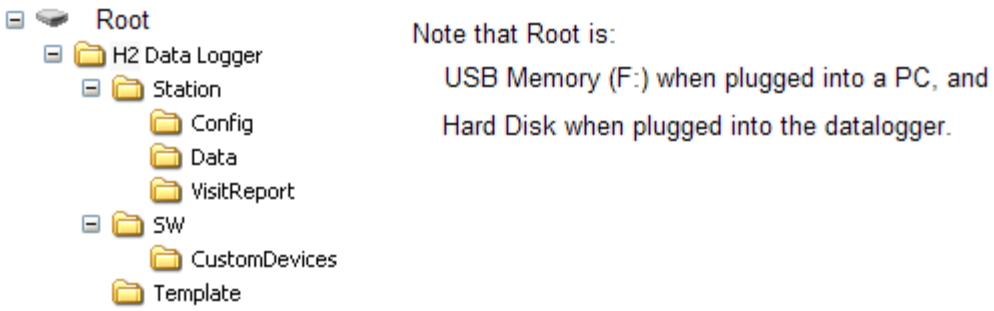


Figure 3-1: Memory Stick File Structure

3.2.2.1 H2 Data Logger folder

The H2 Data Logger folder in the root of the USB memory is the folder in which all Axiom H2 datalogger information is stored.

3.2.2.2 SW folder

The SW (software) folder is the folder the datalogger examines when the user updates the datalogger's application software. A typical application update file would be named F6H2_v229.CAB.

3.2.2.2.1 Custom devices

The Custom Devices subfolder is the folder the datalogger examines when the user updates the datalogger's sensor extensions. The sensor extension file for the SDI-AM module is named AmModDll.dll.

3.2.2.3 Template folder

The Template folder is the directory used by the Axiom H2 datalogger when saving or loading template files from a USB memory stick. A typical default name for a template file is Template-2009-4-9-15-28.xml (format Template-YYYY-MM-DD-hh-mm); however, the user can specify a filename during the save template process.

3.2.2.4 Station folder

The station folder is the default folder used by the Axiom H2 datalogger if the datalogger's Station name has not been specified (i.e. the Station field on the **Site** tab on the **Station Set-up** screen is blank). This means that the default station folder could contain data from several stations (i.e. data from every datalogger whose Station name has been left blank). If the datalogger has been assigned a Station name, then the datalogger creates a folder on the memory stick with the same name as the datalogger's Station name. This way every named datalogger site has its own station folder in the main Axiom H2 Data Logger folder.

3.2.2.4.1 Config folder

The Config (configuration) subfolder is the directory used by the Axiom H2 datalogger when saving or loading configuration files from a USB memory stick. A typical default name for a configuration file is Configuration-2009-4-9-15-28.xml (format Configuration-YYYY-MM-DD-hh-mm); however, the user can specify a filename during the save configuration process.

3.2.2.4.2 Data folder

The Data subfolder is the directory used by the Axiom H2 datalogger when exporting data, audit logs, and G5 transmission history files to a USB memory stick. Default file names are as follows:

Audit Logs:	AuditLog-YYYY-MM-DD-hh-mm.txt
G5 Tx History	TelemA- YYYY-MM-DD-hh-mm.txt
Exported Data	<Station Name>-YYYY-MM-DD-hh-mm.csv

3.2.2.4.3 Visit Report folder

The Visit Report subfolder is the directory used by the Axiom H2 datalogger for storing site visit reports and configuration summary reports to a USB memory stick. Typical file names are as follows:

Start Visit:	StartVisitReport_2009-4-9-13-28.txt
End Visit:	EndVisitReport_2009-4-9-13-57.txt
Configuration Summary:	ConfigSummary_2010-8-19-14-47.csv

Note: timestamp format is YYYY-MM-DD-hh-mm format. E.g., 2009-4-9-13-28 denotes April 9, 2009 at 13:28

3.3 Datalogger status

The Axiom H2 datalogger's Quick Touch System™ allows the user to quickly assess the datalogger. Status indicators on the **Home** screen provide a snapshot of datalogger's current operating state. The **Home** screen also provides easy access to more detailed datalogger status information such as datapoint values (sensor readings and processing calculations), as well as an audit log file. Additionally, the datalogger time is always displayed in the upper right corner of the touchscreen to show that the datalogger is functioning.

3.3.1 Home screen status indicators

Home screen status indicators provide information such as sensor activity, transmitter status, battery voltage, and battery state to allow the user to make a quick assessment as to how the datalogger is operating. The six status indicators at the bottom of the **Home** screen are: **Built-in**, **SDI**, **Trans**, **Tx**, **Battery**, and **Telem** (see Figure 1-4).

3.3.1.1 Built-in

Colour	Meaning
Green	dedicated front panel sensors or internal sensors are being read by the datalogger
Black	no sensor reading activity

3.3.1.2 SDI

SDI is actually two indicators in one, split left and right, for **SDI A** and **SDI B** sensor inputs respectively.

Colour	Meaning
Green	SDI A (left) or SDI B (right) sensors are being read by the datalogger
Black	no sensor reading activity

Detailed information on a specific SDI sensor is available through that SDI sensor's definition screen.

3.3.1.3 Trans

Trans indicates G5 GOES transmitter status. This indicator refers to the status of an internal or an externally connected G5 transmitter.

Colour	Meaning
Black	no status available
Yellow	the G5's GPS receiver is on and looking for a GPS fix
Green	G5 is operational
Red	G5 has an error (refer to the Telemetry status screen for more details)

Detailed information on the G5 transmitter is available through the **Telemetry G5 Status** screen (**Home > Telemetry > Status**).

3.3.1.4 Tx

Tx indicatesthe transmission status of the (internally or externally) connected G5 GOES transmitter.

Colour	Meaning
Black	no G5 transmitter attached or G5 status not available
Red	no G5 transmissions have occurred
Green	data loaded into G5 transmit buffer (black text on green background indicates the combined number of bytes loaded for self-timed and random transmissions)

Detailed information on the G5 transmitter is available through the **G5 Status** button in the **Telemetry G5 Status** screen (**Home > Telemetry > Status**).

3.3.1.5 Battery

The Battery status indicator has black text which displays the voltage of the battery connected to the datalogger's **BATTERY** input while the background colour displays the charging status of the battery. Background colours for the Battery indicator are:

Colour	Meaning
Black	no status available
Yellow	the battery is being discharged
Green	the battery is being charged

Detailed information on the **BATTERY** and **SOLAR PANEL** inputs are available through their respective definition screens.

3.3.1.6 Telem

Telem is actually two indicators in one, split left and right, for the Telemetry A and Telemetry B ports respectively.

Colour	Meaning
Green	datalogger is supplying power to the telemetry port
Red	port power is turned off
Black	power to the port is disabled

3.3.2 Datapoint values

Datapoint values are another source for confirming proper datalogger operation. Datapoints encompass all sensor readings, Built-in and SDI, as well as all process calculations. Individual datapoints are viewed by selecting the desired sensor or process from the screens accessed from the **Home** screen through **Sensors**, **SDI-12**, or **Processes**, as appropriate .

3.3.2.1 Current Condition

Screens accessed from the **Home** screen **Current Conditions** icon allow the user to define a custom set of datapoints which can be simultaneously displayed. The datapoints selected for the Current Conditions display can be manually refreshed or be automatically refreshed every minute (for up to 60 minutes). Built-in sensors are read every time a manual or automatic refresh event occurs whereas SDI sensors displays the last value read from the sensor. A process returns the current value of the process at the time the refresh was selected.

3.3.3 Audit log

A chronological summary of significant datalogger events is captured in the datalogger's audit log text file. The Audit log is a circular file in which the newest message overwrites the oldest message once the file has reached its maximum size (20 kB). The audit log file is viewed by pressing **Audit Log** on the **Service** screen. The user can clear the audit log file or save the file to a USB memory stick.

3.4 Data status

To access the **Data Status** screen (Figure 3-2), press **Data** on the **Home** screen.

Data Status shows a summary of the data which has been recorded in the datalogger and allows examination of that data. ("Data Status" does not refer to the quality of the data collected.) The **Data Status** screen also provides the user options to configure datalogging or examine recorded data.

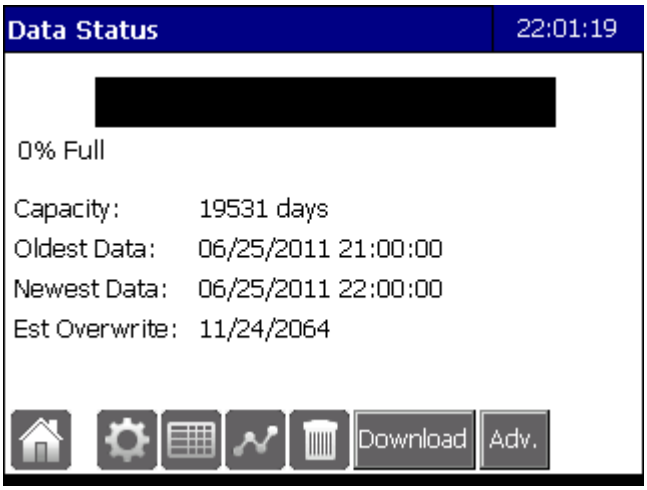


Figure 3-2: Data Status screen

3.4.1 Data storage information

The datalogger stores data in a non-volatile circular 14 MB file. Once the data file is full, the datalogger begins to overwrite the oldest stored data.

3.4.1.1 Percentage full

A bar graph showing the percentage of the file already used for data storage full is displayed. The percentage full is a calculation of the actual number of bytes used out of the available for data storage. This bar is typically green but turns yellow when the datalogger starts to overwrite the oldest data.

3.4.1.2 Capacity

The reported capacity is the estimated number of days of data the datalogger can stored before the datalogger begins to overwrite the oldest stored data. The capacity estimate is based on the record size stored during each log event and datalogger's currently defined Log Intervals.

3.4.1.3 Oldest data

Oldest Data is the date and time of the oldest data currently stored in the datalogger. Oldest Data date and time is updated when the data file reaches its size limit and the datalogger starts to overwrite the oldest data.

3.4.1.4 Newest data

Newest Data is the date and time of the newest data currently stored in the datalogger. Newest Data date and time is updated as new data is recorded.

3.4.1.5 Estimated overwrite date

The Est (estimated) Overwrite Date is the date on which the datalogger starts to overwrite data stored in its circular data file. The estimated overwrite date is based on the capacity estimation and the current date.

3.4.2 Data viewing

The user can examine logged data in tabular or graphical format.

To view and to customize a graph of the available data, use the **Data Graph** screen (**Home > Data > Graph**).

To view all logged data in a tabular format, use the **Data Table** screen (**Home > Data > Table**).

3.4.2.1 Graph view

Graph View (the **Data Graph** screen; **Home > Data > Graph Data**) is useful for examining a data trend over a short period of time. While it is possible to graph a large time period, the user should be aware that it may take the datalogger an extended time to format the graph depending on the number of readings in the selected range.

To configure the graph (set the date and time range, select the datapoints to display, set the y-axis minimum and maximum), use the **Graph Setup** screen (**Home > Data > Graph Data > Setup Cog**).

3.4.2.2 Table view

Table View (the **Data Table** screen; **Home > Data > Display Table**)is useful for examining specific data values, presented in a tabular format. The user is able to resize the data columns as well as reposition the data columns, by drag and drop, so that they can easily compare datapoint values.

The **Jump** button on the **Data Table** screen allows the user to go to a specific time in the logged data.

3.4.3 Data operations

To export selected logged data to a USB memory stick, or to delete the datalogger's logged data file, use the **Download Data** screen (**Home > Data > Download Data**).

3.4.3.1 Downloading stored data

To download data, use the **Download Data** screen (**Home > Data > Download Data**). Specify the date range and file format (either CSV or binary) to save to a USB memory stick. The requested data is downloaded (saved) to the memory stick inserted in the **USB HOST** port when **Download** is pressed.

The download process does not delete the original data from the datalogger.

3.4.3.2 Deleting stored data

To delete the datalogger's stored data, press **Delete** on the **Data Status** screen (**Home > Data**). The user is prompted to confirm the data deletion after **Delete** is pressed.

> **WARNING !** Deleting the data **PERMANENTLY** removes the data from the datalogger.

3.4.4 Remote datalogger communication

Data and datalogger information can also be remotely retrieved from the datalogger using a variety of telemetry devices. Please contact FTS for assistance in choosing the telemetry option appropriate for your application.

3.5 Telemetry status

The datalogger has two Telemetry ports (A and B) which support simultaneous connection of two telemetry devices. To view a summary of device status for both telemetry ports (Figure 3-3) use the **Telemetry** screen (**Home > Telemetry**). The displayed status depends on the telemetry port's Device Type setting.

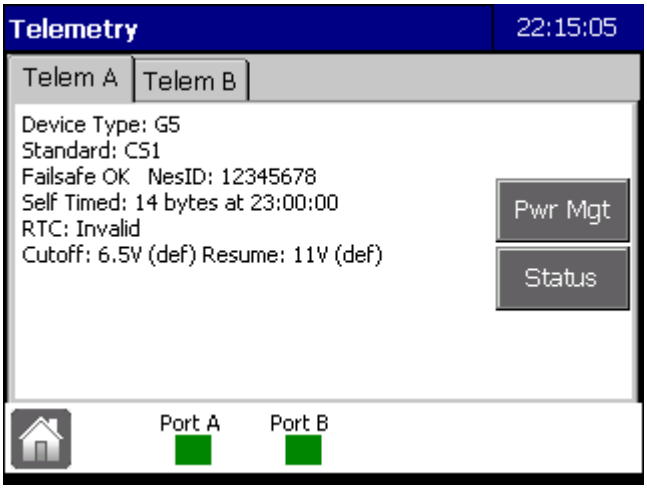


Figure 3-3: Telemetry screen

There are several telemetry devices that are supported: a generic device type named **FTS**; a specific device type for the G5 GOES Transmitter named **G5**, a specific device type for AirTalk named **RVT2**, and a specific device type for the Radio Voice Transmitter named **RVT**. The option of **None** is also available in the Device Type

selection list. Selecting **None** as the port's telemetry device type disables the telemetry port by turning off port power as well as disabling all port communications.

To view detailed information for the attached telemetry device, press the port's **Status** button on the **Telemetry** screen.

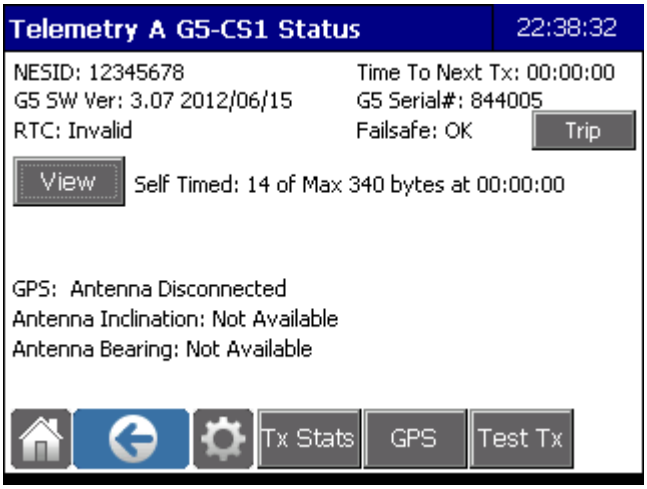


Figure 3-4: Example Telemetry Status screen

3.5.1 FTS telemetry

The **FTS** device type is the default selection for all telemetry devices other than the G5 GOES Transmitter or RVT Radio Voice Transmitter. The **FTS** device type selection configures the telemetry port for serial communications at 9600 baud with 8 data bits, 1 stop bit, no parity, and no flow control. The status of the attached telemetry device is not displayed when this device type is selected.

Refer to the Specifications section of this manual for details on the **TELEMETRY** connector.

3.5.2 G5 GOES transmitter

The **G5** device type is specific to the G5 GOES Transmitter. Basic status of the attached G5 transmitter is displayed when this device type is selected (see Figure 3-4). The same status information is displayed whether the G5 is internally or externally connected to the datalogger. For an internally connected G5, telemetry port A is automatically set to the G5 device type. For an externally connected G5, the device type on the port to which the G5 is connected must be properly set.

Press **Status** for more detailed information from the G5 transmitter. Refer to the G5 Telemetry Reference section for a detailed description of the G5 interface.

3.5.3 AirTalk

The AirTalk device type is specific to and should only be used with the FTS AirTalk Radio Voice Transmitter.

Refer to Chapter 9 for detailed AirTalk configuration instructions and for status information provided by **Status**.

3.5.4 Radio voice transmitter (RVT)

The RVT device type is specific to and should only be used with the FTS RVT Radio Voice Transmitter.

Refer to Chapter 9 for detailed RVT configuration and status information provided by **Status**.

Chapter 4 Installation

Chapter contents

4.1 Preparation

Preparation is the best way to ensure a smooth field installation. Time spent in the confines of a clean, dry, warm office preparing for your installation trip ensures that you are familiar with your datalogger configuration and that you have all of the necessary cables and equipment. Not only is proper preparation more desirable than performing last minute on-site changes, proper preparation should eliminate the need for a second site visit to repair or install something that was overlooked.

Before you go

There are several steps that should be performed prior to deploying the datalogger to an existing site or installing the datalogger as part of a new station.

1. Develop a pre-trip checklist and a toolkit checklist and update the lists as necessary.
2. Develop an on-site activity checklist to ensure all tasks are completed. It is always easy to feel pressure to complete on-site work as quickly as possible (i.e. a helicopter is waiting, light is fading, weather is coming, etc.), an on-site checklist will help ensure that, in the rush, nothing was forgotten.
3. Record the site's magnetic declination as this information is required for antenna and sensor orientation.
4. If you are installing a datalogger with a GOES transmitter (internal or external), ensure you have the required GOES parameters for your assignment (NESID, channel number, East or West satellite, transmit interval, and transmit offset).
5. Unpack and inspect the equipment for obvious mechanical damage (i.e. was it damaged during shipping).
6. Power the datalogger and confirm the datalogger's configuration and operation. When possible, attach a full suite of sensors and telemetry devices and then call/monitor the datalogger through the attached telemetry (i.e. monitor a few GOES transmissions to confirm operation). This will help you ensure that all the required cables and equipment has been identified and that the datalogger, sensors, and telemetry are configured and are operational and are working to your expectations.
7. Record the model and serial numbers of your datalogger and other equipment that will be field deployed and enter the serial numbers of the equipment into the datalogger's serial number table. Also record the software version in each device. Contact FTS if you suspect or are unsure if a software upgrade is required for a particular device.
8. If deploying the datalogger to an existing site, check the condition of the site's battery. Check the battery install date to see if the battery is due for replacement and examine existing battery data to check the condition of the unit.
9. After your office testing is complete, pack the datalogger and other equipment appropriately for transport to the field site.
10. Check forecasted weather for the site.
11. Arrange for standby personnel to check/verify telemetry transmissions while you are on-site.
12. Update your checklists with any of your findings

4.2 *At the site*

Once at the site, ensure the site is safe – check the site for obvious hazards and deal with them appropriately. If this is an existing site, survey the equipment for any malfunctions or incorrect sensor or antenna orientations – record your findings.

4.2.1 Unpacking

Check for transport damage when unpacking the datalogger. Though the datalogger's display is waterproof, care should be taken to avoid contact with sharp objects which could damage the touchscreen. Also, do not leave the display exposed in full sun for long periods of time as this may damage the display. A good practice is to keep the datalogger in its shipping package until you are ready to install the datalogger in the enclosure.

4.2.2 FTS enclosure mounting

A mounting plate for the datalogger is fastened to the back of most FTS enclosures. Decide the positioning of the datalogger and the other equipment being installed, then just place the datalogger over the appropriate keyhole slots and slide it down into place (see Figure 4-1).

Connect one of the green grounding wires from the mounting plate to the datalogger ground stud.

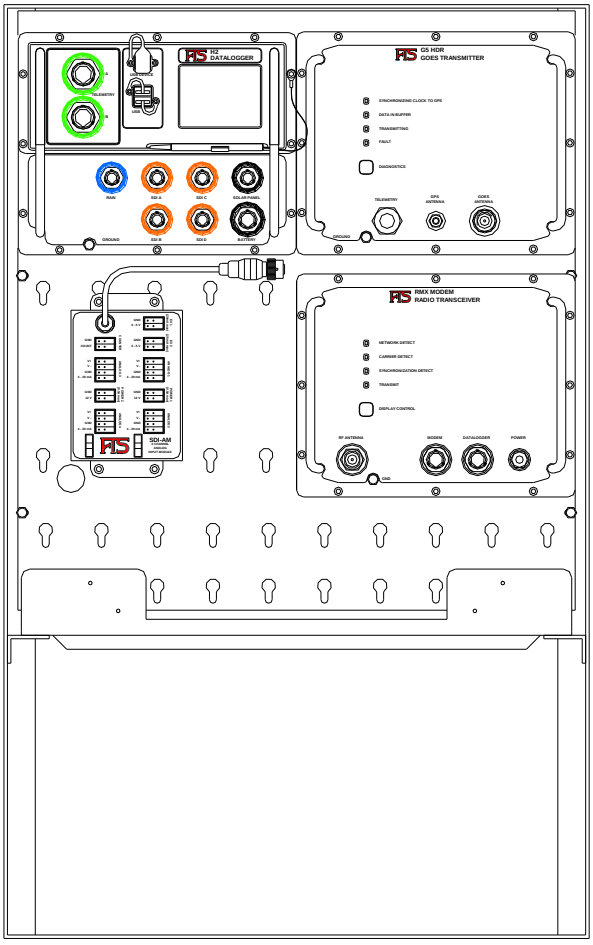


Figure 4-1: Keyway Enclosure

4.2.2.1 Other enclosures

Depending on the nature of the enclosure, the datalogger can be mounted to either a keyhole mounting panel which is fastened to one wall of the enclosure or the datalogger can be directly mounted to the enclosure wall.

Contact FTS to determine which option, keyway panel (FTS part number 993-UCMT-PNL-x) or mounting adapter (FTS part number 993-UCASE-BKT) would best suit your needs.

4.2.2.2 Grounding

The Axiom H2 datalogger has built-in lightning protection circuitry. This protection can be aided by the connection from the datalogger chassis to a single point ground. There is a ground stud on the datalogger that accepts one of the one of the green grounding wires from the mounting plate. The enclosure's ground lug (located on the outside at the back of the enclosure) should be connected to the nearest ground or radial connection. The enclosure's ground cable should always be run as low as possible and be free of any kinks or sharp bends (refer to your local code requirements).

All FTS Forest Technology Systems sensors used shielded cable. If the datalogger chassis is well grounded, the sensor cables is shielded as well.

4.2.3 Sensor and telemetry connections

The datalogger is watertight, even without connectors attached. Device connectors (sensors and telemetry) are circular metal shell, bayonet, military style connectors which are uniquely keyed and colour coded to minimize erroneous connections. When connecting the various devices to the datalogger, ensure that the connectors are dry and free of debris so that no water or dirt gets trapped between the connectors. Connector pin-outs and sensor input specifications are defined in Specification section of this manual.

4.2.3.1 Connecting the dedicated rain sensor

The Axiom H2 datalogger has a dedicated rain gauge input on the datalogger front panel (colour coded with a blue ring around the connector). Normally rain gauges are provided by FTS with the appropriate mating connector; however, if required, details for the RAIN input connection can be found in the Specifications section of this manual.

4.2.3.2 Connecting SDI sensors

SDI sensors from a variety of manufacturers are supported. If the sensor was supplied by FTS with a datalogger then it will be programmed with its final parameters and system address. Otherwise you must remember to program the sensor to its final address and set up any programmable characteristics that you need. The procedure to do this varies from manufacturer to manufacturer. Alternately, you can arrange to send your sensor to FTS for programming and connector installation.

Remember, to avoid incorrect or missing sensor readings, set the sensor address, command, and reading field information in the datalogger's SDI sensor configuration for the desired sensor reading.

SDI sensors supplied by FTS have a colour coded, three pin, waterproof, military style connector attached, so all that is necessary is to connect the sensor to the datalogger and set the sensor's configuration in the datalogger.

If you have a sensor with bare wires, it is necessary to solder the correct connector to the cable. See the Specifications section for the correct connector and pin-out.

If you are using junction blocks for signal and power distribution, it is very important that any junctions be in a dry, condensation free environment. If the junction is in a damp location, then there is accelerated corrosion of the wires and connections, and the communications with the sensors becomes unreliable or fail.

4.2.3.3 Connecting telemetry

The Axiom H2 datalogger has a built-in power management system which provides power to the telemetry device connected to either front panel **TELEMETRY** port. Connector pin-out and signal definitions are defined in Specification section of this manual.

4.2.3.3.1 Existing telemetry devices

When upgrading a site to an Axiom H2 datalogger, telemetry devices existing at the site might be powered from the battery. These telemetry devices can have their military connector connected to an Axiom H2 front panel **TELEMETRY** port. Directly powering the telemetry device from the battery and then connecting it to the Axiom H2 will not cause any damage as the Axiom H2 has blocking diodes on both ports to isolate telemetry port power.

4.2.4 Power connections

As previously mentioned, power connections for the Axiom H2 datalogger are the **SOLAR PANEL** input and the **BATTERY** input. The **BATTERY** input is the power source for the datalogger while the **SOLAR PANEL** input is used by the internal power management system to charge the connected 12V battery.

4.2.4.1 Battery connection

The system's 12V battery is connected to the datalogger's front panel **BATTERY** connector by a custom battery cable available from FTS. The **BATTERY** connector is the power source for the datalogger. The battery cable's ring terminals should always be connected to the battery before the battery cable is connected to the datalogger. Also, to ensure proper power-up, the battery should always be connected to the datalogger before connecting the solar panel. The battery connection procedure is outlined below.

> **WARNING !** The battery cable fuse will blow if the battery connections are reversed.

The correct procedure for connecting the battery power is as follows:

1. Connect the battery cable to the battery by bolting each of the cable ring terminals to the appropriate battery terminal. The ring terminal with the red wire and the fuse holder goes to the positive (+) side of the battery. The other ring terminal with the black and white wires goes to the (-) side of the battery. Contact FTS to discuss cabling considerations for the parallel connection of batteries if dual batteries are required at the site.
2. Mount the temperature sensor to the battery by taping it to the top of the battery using foam tape or duct seal putty. The sensor is mounted between the two battery posts.
3. Route the cable around behind the shelf above the battery, and plug the cable's military connector into the datalogger's **BATTERY** input. The datalogger backlight should illuminate and the datalogger will start-up (note that the datalogger requires about 90 seconds to start). Verify that the battery is connected properly by observing the battery voltage reading on the datalogger GUI. If the backlight does not come on and the datalogger does not start, then disconnect the battery power connector from the datalogger front panel and check the battery cable fuse and connections.

4. Once the battery is connected properly, connect the solar panel to the solar panel input. Use the datalogger GUI to verify proper solar panel operation by reading the battery and solar panel voltage and current. Also, the battery voltage is displayed on the home screen battery status indicator.

4.2.4.2 Solar panel connection

The system's solar panel is connected to the datalogger's front panel **SOLAR PANEL** connector. The solar panel connector is the power source for recharging the battery connected to the datalogger. To ensure proper datalogger power-up, the solar panel should always be connected to the datalogger after the datalogger's battery connection has been made.

Normally solar panels are provided by FTS with the appropriate mating connector. If required, details for the solar panel connection can be found in the Specifications section of this manual.

4.2.4.3 Datalogger power cycling sequence

The power source for the datalogger is the battery that is connected to the datalogger's front panel **BATTERY** input. That being said, it is possible to power the datalogger from the datalogger's front panel **SOLAR PANEL** input; however, this practice is not advisable as power from the solar panel is intermittent. Because the datalogger has two inputs which can power the datalogger, there is a proper procedure for power cycling the datalogger to ensure proper start-up and shutdown.

4.2.4.3.1 Start-up Power Sequence

The correct power on sequence for the datalogger is:

1. Ensure the battery cable is properly connected to the battery.
2. Connect the battery cable to the datalogger's **BATTERY** input.
3. Connect the solar panel cable to the datalogger's **SOLAR PANEL** input.

4.2.4.3.2 Shutdown power sequence

The correct power off sequence for the datalogger is:

1. Disconnect the solar panel cable from the datalogger's **SOLAR PANEL** input.
2. Disconnect the battery cable from the datalogger's **BATTERY** input.
3. If power cycling the datalogger, wait a minimum of 5 seconds before reconnecting the datalogger's **BATTERY** input.

4.2.5 Operational check

Perform an operational check of the equipment once the datalogger and ancillary equipment has been installed. The operational check should include:

1. Check to confirm that the datalogger's date and time is correct.
2. Read each of the sensors by observing their displayed sensor reading.
3. Check to ensure data is being logged by observing logged data in the data table.
4. Perform a telemetry test to ensure each telemetry device is functional.

5. Save a visit report to your USB memory stick so that you have a record of the serial numbers of the equipment currently installed at the site (assuming you have populated the serial number table in the datalogger).

Chapter 5 Maintenance

Chapter contents

5.1 General

Very little maintenance is required for the Axiom H2 datalogger. Do not remove the front panel as there are no user serviceable parts inside the datalogger. All software upgrades can be performed externally using the datalogger's **USB HOST** ports. The user should ensure that the battery is in good condition and that the touchscreen is free of debris.

Please contact FTS Technical Support if the datalogger fails to operate properly.

5.1.1 Battery type

A 12 V, absorbed glass mat, deep cycle battery rated at 90 to 105 Amp Hours capacity is recommended for use with the datalogger. Deep-cycle batteries are designed to be deeply discharged and then recharged without damage. Automotive type batteries are not suitable for remote environmental monitoring. Battery life cycle management (we recommend that you replace the battery every 5 years) helps your station provide years of reliable operation.

5.1.2 Touchscreen care

Do not use any solvents on the touchscreen. To clean the touchscreen, wipe the touchscreen with a soft, dry cloth. Only the stylus attached to the datalogger or your bare finger should be used to touch the screen.

5.1.3 Touchscreen recalibration

The datalogger's touchscreen is factory calibrated; however, if you notice that the presses on the touchscreen do not register in the correct location, then the touchscreen may need to be recalibrated. To recalibrate the touchscreen press **Screen Calibration** on the **Service** screen.

5.1.4 Datalogger shipping

In the event the datalogger needs to be returned to FTS, take precautions to protect the datalogger's display during shipping. Whenever possible, return the datalogger using the original factory packaging.

5.2 Datalogger update

To update software in the datalogger from a USB memory stick, press **Home > Service > Datalogger Update**. Application software, used to run the datalogger, and Sensor Extensions, which provide advanced sensor set-up functionality, can be independently updated from the **Datalogger Update** screen.

5.2.1 Application

The Application is the program which runs the datalogger and provides the GUI and the functionality for the user to configure the datalogger to their requirements. The version of the application currently running the datalogger is displayed in the **Version** tab of the **Station Set-up** screen (**Home > Station**).

Refer to the Datalogger Update portion of the Configuration Reference section for details on upgrading the datalogger's Application Software.

5.2.2 Sensor extensions

Each Sensor Extension provides advanced set-up functionality for a specific sensor. For example, the sensor extension for Forest Technology System's SDI-AM 4 channel analog module provides a convenient set-up

GUI which allows the user to configure the sensor without needing to learn the module's low level SDI-12 commands. Sensor extensions are automatically installed on the datalogger during an application update; sensor extensions can also be added incrementally as they are developed.

To update, remove, or add sensor extensions, use the **Sensor Extensions** screen (**Home > Service > Datalogger Update > Sensor Extensions**).

Refer to the Datalogger Update portion of the Configuration Reference section for Sensor Extension details.

5.3 Site visit

Facilities exist to help ensure information gathered from the station during a site visit is complete. The datalogger has an internal serial number table which can be used to record serial numbers of the equipment used at the site. Also a visit report feature allows the user to download a log of relevant datalogger information at the start and end of the site visit.

5.3.1 Site visit procedure

The following procedure is recommended when visiting the site:

1. Survey the site to ensure the site is safe - check the site for obvious hazards and deal with them appropriately.
2. Survey the equipment for any malfunctions or incorrect sensor or antenna orientations and record your findings.
3. Insert your memory stick into one of the datalogger's **USB HOST** ports.
4. Go to the **Visit Report** screen (**Home > Service > Visit Report**), enter your name in the technician box and press the **Start Visit** button. This will record the station's current operating state.
5. Perform the required service work and have a colleague at the office ensure telemetry transmissions are functional.
6. Update the Serial Number Table in the datalogger (**Home > Service >Serial # Table**) to accurately reflect the equipment installed on the site.
7. Go to the **Visit Report** screen (**Home > Service > Visit Report**) and press the **End Visit** button. This will record station's operating state at the end of your visit.

5.3.2 Serial number table

The Serial Number Table (**Home > Service >Serial # Table**), allows the user to enter serial numbers of the sensors, telemetry, and other equipment associated with the site. The serial number table is a convenient way of tracking equipment used at the site as it is automatically included in visit reports.

The datalogger can automatically load the serial number from devices which are capable of reporting their serial number (i.e., some SDI sensors and telemetry equipment). Serial numbers of devices which are not capable of automatic reporting can be entered manually.

To remove a sensor from the serial number table, press the delete button then select the desired device in the list. Confirm that this is the serial number you wish to remove.

Refer to the Serial Number Table portion of the Configuration Reference section for details.

5.3.3 Visit report

The **Visit Report** screen (**Home > Service > Visit Report**) allows the user to save the station's current operating state to an automatically chosen station folder on the connected USB memory stick.

The information saved in the station's folder on the memory stick includes:

- A time-stamped text report of the datalogger's current operating state.
- A time-stamped datalogger configuration file.
- A time-stamped download of the datalogger's audit log file.
- A time-stamped configuration summary report in CSV format.
- If applicable, a time-stamped download of the transmission history (Tx Log) of the attached G5 transmitter.

In addition, the current operating state text report is displayed for the user each time the **Start/End Visit** button is pressed. The text report includes the following:

- Visit details (i.e. technician, trip number, and date)
- Datalogger details (i.e. station name, model, version information, etc.)
- Power supply information (i.e. battery voltage, battery current, solar panel voltage etc.)
- Serial number table
- Telemetry information
- Current conditions

5.3.3.1 Start/end visit

The **Start / End Visit** button on the **Service Report** screen toggles between **Start Visit** and **End Visit** as a reminder to the user of where they are in the site visit process. The same information is saved for both reports (the exception is that the length of the visit is included in the End Visit text report).

5.3.3.2 Technician

The **Technician** box allows the user to enter their name or initials as a record of who performed the site visit.

5.3.3.3 Trip number

The trip number automatically increments from the last visit. If this number is not correct, the user can manually enter a trip number before pressing the **Start Visit** button.

Chapter 6 Configuration structure

Chapter contents

6.1 General

The three basic building blocks used to configure the datalogger are sensors, processes, and outputs (see Figure 6-1).

Sensors (dedicated, internal, or SDI) are configured to provide datapoints which then can be processed or output as required.

A process performs an operation on select datapoints and then creates a new datapoint or set of datapoints which then can then be processed again or output as required.

An output either displays, logs, or transmits datapoints as specified by the user.

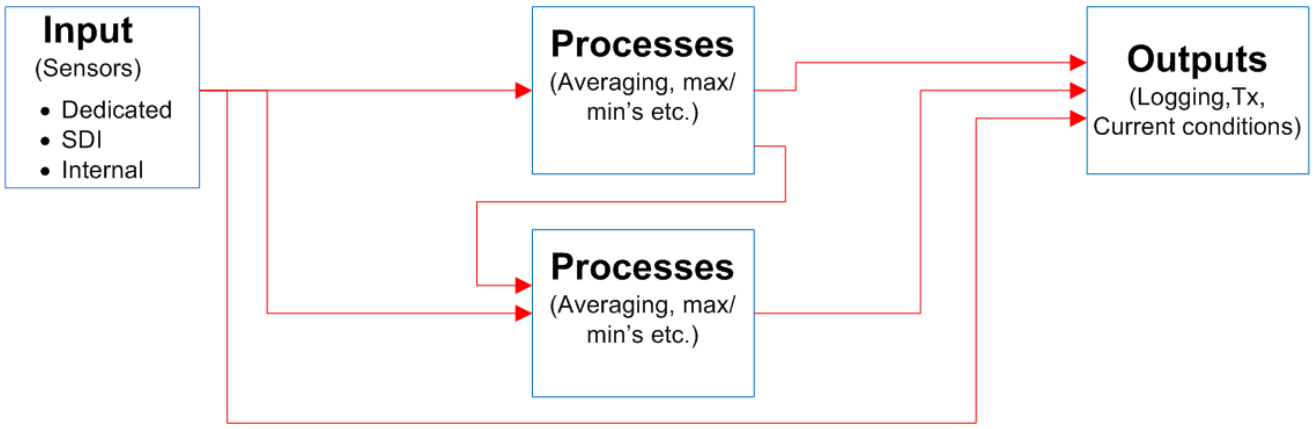


Figure 6-1: Datalogger Configuration Structure

When configuring the datalogger sensors should always be configured first as sensors provide the primary data. The next step is to configure the desired processes (i.e. averaging, max/min, user variables, functions and scripts) to manipulate the sensor data. The last step is to configure the datalogging (i.e. define what data is to be stored and when) and telemetry parameters (i.e. for a G5 GOES transmitter, set-up the transmission parameters and the data to be transmitted).

> **IMPORTANT !** When configuring the datalogger, sensors should always be configured first, followed by processes, and lastly outputs.

6.2 Operating algorithms

There are five separate algorithms running in the datalogger (see Figure 6-2). Each algorithm runs independently and with its own timing. The algorithms determine when data is collected and how the data is handled within the datalogger.

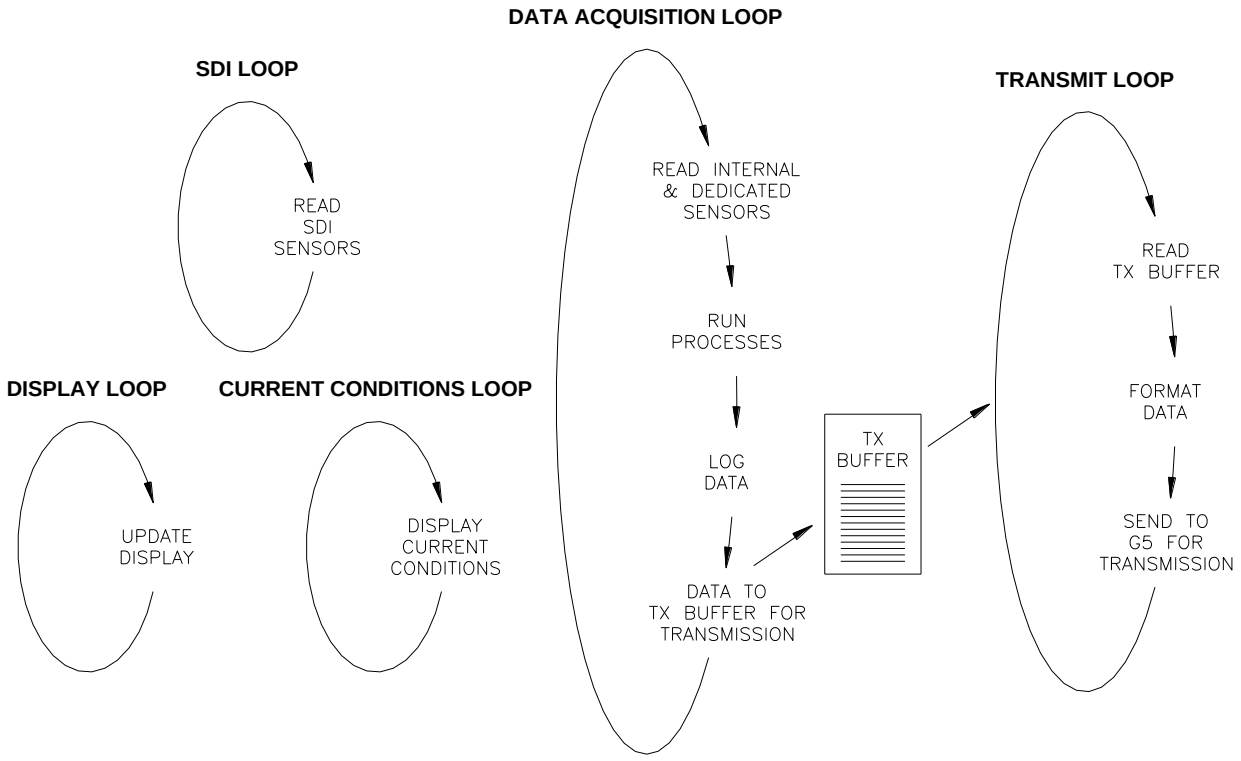


Figure 6-2: Datalogger Operating Algorithms

The Data Acquisition Loop performs the following tasks in the order they are listed:

1. Read the datalogger's Internal and Dedicated sensors
2. Run the datalogger's processes
3. Log the data
4. Write data to the Transmit buffer

The timing of the Data Acquisition Loop is set by the most frequent process, log interval, or transmit message interval.

The SDI Sensor Loop reads the defined SDI sensors. The timing of the SDI Sensor Loop is set by the SDI sensor which is read most often.

The Transmit Loop is responsible for G5 GOES data transmission. The Transmit Loop sends the contents of the transmit buffer to the G5 transmitter 90 seconds prior to the G5 transmit time. The timing of the Transmit Loop is set by the G5 transmission frequency. In order to meet timing requirements for transmission, data should be sent to the transmitted buffer at least two minutes prior to the G5 transmit time.

The Display Loop is updates the displayed sensor values approximately every 5 seconds.

The Current Conditions Loop is run as needed. The loop is run when **Refresh** on the **Current Conditions** screen is pressed or when a Current Conditions telemetry request is received.

Chapter 7 Configuration reference

Chapter contents

7.1 General

Eight menu icons are present on the **Home** screen (Figure 7-1). Each icon accesses screens to configure or view information related to a particular subarea of the datalogger's functionality.

This reference section provides a detailed explanation of options for each subarea.

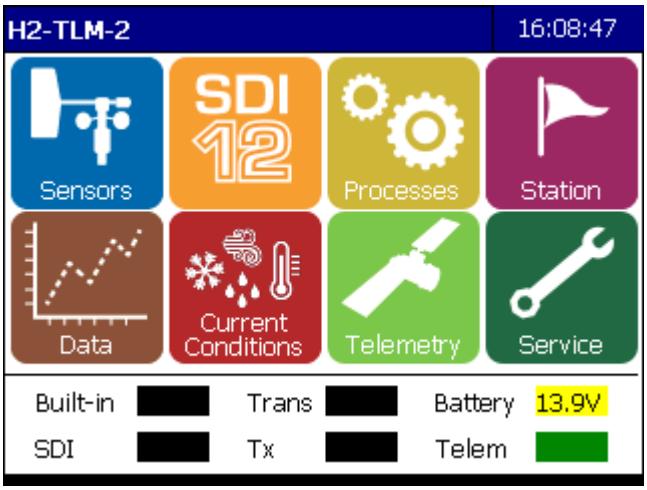


Figure 7-1: Home screen

7.2 Station set-up

Station information encompasses all of the aspects which are unique to a particular datalogger. The **Station** icon on the touchscreen allows the user to view and edit datalogger site information, to view datalogger version information, and also allows the user to load and save datalogger configuration and template files.

7.2.1 Site tab

The **Station Set-up** screen **Site** tab (see Figure 7-2) identifies the datalogger's name, description and location.

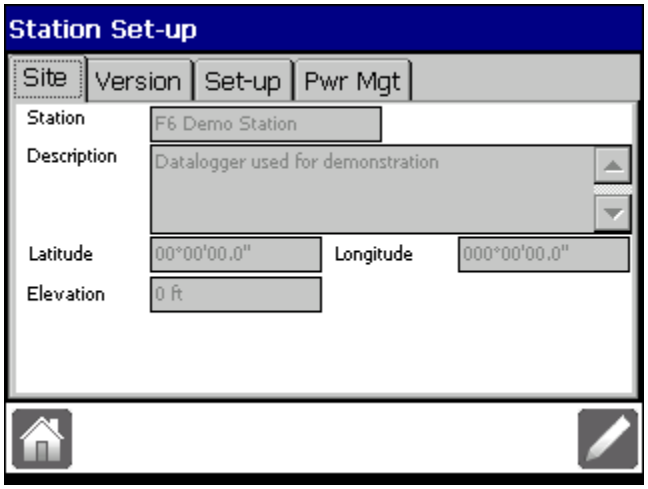


Figure 7-2: Station Set-up screen – Site Tab

7.2.1.1 Station

Although every datalogger is identified by its serial number, the operator can enter a station name and a description specific to the site or type of station deployment. Virtually any alpha-numeric text string can be a station name. The datalogger displays a single line of 15 to 22 characters (depending on which characters are used) for the station name.

7.2.1.2 Description

Like the station name, station description is also a text field. The datalogger displays three lines of characters in a scrollable textbox for the station description.

7.2.1.3 Location

Station location fields include latitude, longitude, elevation and declination. If the datalogger is attached to an FTS G5 GOES transmitter then the station location fields are read-only fields as this information is provided by the G5 transmitter. If the datalogger is not connected to a G5 transmitter, the user can manually enter the appropriate information.

7.2.1.3.1 Latitude and longitude

Station latitude and longitude are entered and reported in degrees-minutes-seconds (dms) format of dd° mm" ss.s' D where D is either N or S for latitude or E or W for longitude.

7.2.1.3.2 Elevation

Station elevation is entered and reported in metres, feet, or inches (the units are user selectable).

7.2.2 Version tab

The **Station Set-up** screen **Version** tab (see Figure 7-3) displays read-only details such as the datalogger's model and serial number as well as software versions. These fields are populated automatically by the datalogger.

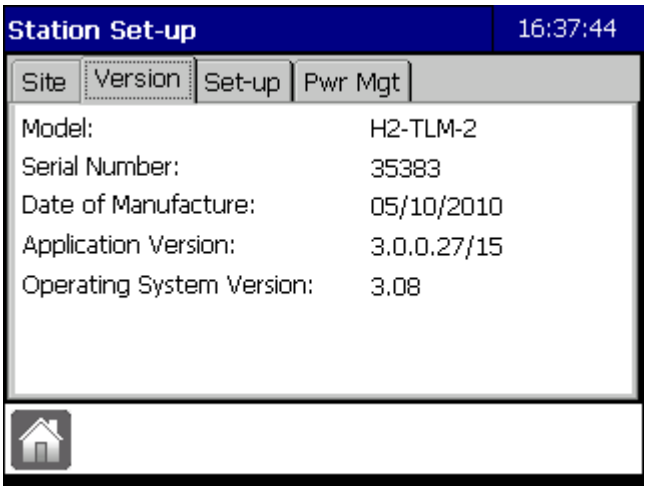


Figure 7-3: Station Set-up screen – Version Tab

7.2.2.1 Model

This is the model assigned to the datalogger during the manufacturing process.

7.2.2.2 Serial number

This is the serial number assigned to the datalogger during the manufacturing process.

7.2.2.3 Date of manufacture

The manufacturer date identifies when the datalogger was produced at FTS. The Date of Manufacture is reported in MM / DD / YYYY format.

7.2.2.4 Application version

The Application Version identifies the datalogger's application software – it does not identify how the datalogger is configured (i.e. which sensors are attached, what data is logged, or what telemetry is attached, etc.). Application software can be field updated via a USB memory stick (refer to the Maintenance section of this manual for details).

7.2.2.5 Operating system version

The datalogger uses Microsoft Windows CE as its operating system (OS). The OS version identifies which of the Windows CE components were put together for the operating system running on the datalogger. The user is not able to update the datalogger's OS; however, OS upgrades can be done at the factory or by FTS field service personnel.

7.2.3 Set-up Tab

The **Station Set-up** screen **Set-up** tab (see Figure 7-4) enables the user to save and load a datalogger set-up. There are two types of set-up files: configurations and templates. The difference between a configuration and a template is that a configuration contains datalogger site specific information (i.e. a station name and position as well as telemetry specific parameters) along with the general set-up information (i.e. sensor and processing definitions, datalogging intervals, transmit message, etc.) while a template only contains the general set-up information. Both file types contain all the information required for data collection but only the Configuration file contains the extra information required to uniquely identify the datalogger and enable GOES transmissions. The **Set-up** tab also provides the ability to view a summary of the datalogger's configuration and the ability to clear a configuration.

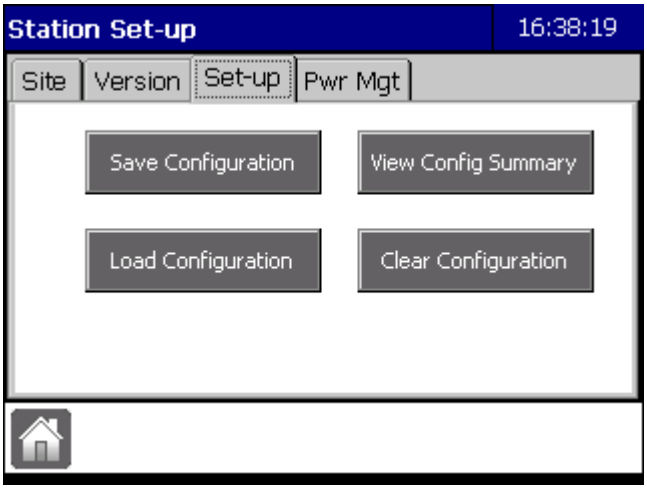


Figure 7-4: Station Set-up screen – Set-up Tab

7.2.3.1 Save configuration

To save the datalogger's active configuration or to save the active configuration as a template, use the **Save Configuration File** screen (Figure 7-5; **Home > Station > Set-up tab > Save Configuration**).

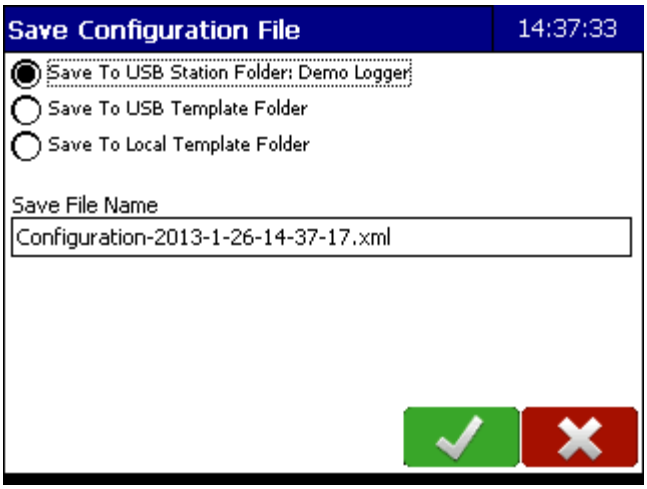


Figure 7-5: Save Configuration File screen

7.2.3.1.1 Save file name

The **Save File Name** box specifies a name for the file to be saved. Configuration files is given a default name of Configuration-YYYY-MM-DD-hh-mm-ss.xml. Template files are given a default name of Template-YYYY-MM-DD-hh-mm-ss.xml. The file name changes to the default name each time a different save option is selected. The default name automatically populated in the **Save File Name** box can be overridden by the user.

7.2.3.1.2 Save to USB station folder

The **Save to USB Station Folder** option (default selection) automatically saves the configuration file in the Station's Config folder on the USB memory stick. The station folder on the memory stick has the same name as the datalogger. If the datalogger does not have a station name (i.e. the station name is blank), then the name 'station' is used as the folder name. The file that is saved has the file name entered in the **Save File Name** box.

7.2.3.1.3 Save to USB template folder

The **Save to USB Template Folder** option automatically saves a template file in the Template folder on the USB memory stick. The file that is saved has the file name entered in the **Save File Name** box.

7.2.3.1.4 Save to local template folder

The **Save to Local Template Folder** option automatically saves a template file in the datalogger's internal template folder. The file that is saved has the file name entered in the **Save File Name** box.

7.2.3.2 Load configuration

To load a template that is stored on the datalogger or load a configuration or template from a USB memory stick, use the **Load Configuration File** screen (Figure 7-6; **Home > Station > Set-up tab > Load Configuration**).

The screen automatically displays the contents of folder appropriate to the **Load From …** option selected. To search for and select any file in the datalogger or on USB, press **Browse** .

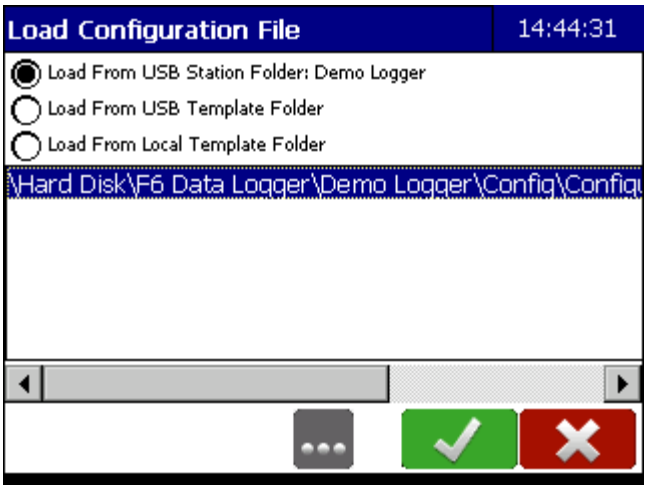


Figure 7-6: Load Configuration File screen

7.2.3.2.1 Load from USB station folder

The **Load from USB Station Folder** option (default selection) automatically examines the station's Config folder on the USB memory stick. If the datalogger does not have a station name (i.e. the station name is blank), then the name 'station' is used as a default station name. The file selection box lists the configuration files available. Typically the station's Config folder on the USB device contains configuration files previously saved from this datalogger. Select the configuration to load and press **OK**.

7.2.3.2.2 Load from USB template folder

The **Load from USB Template Folder** option automatically looks in the Template folder on the USB memory stick. The file selection box lists the template files available. Select the template to load and press **OK**. Typically the template folder on the USB device contains templates for different datalogger configurations.

Remember templates do not contain site specific datalogger information. Loading a template does not affect site specific information already in the datalogger but, if configuring the datalogger for the first time, the user must enter the required site specific information.

7.2.3.2.3 Load from local template folder

The **Load from Local Template Folder** option works the same as the **Load from USB Template Folder** option except that the file selection box automatically points to the datalogger's internal Template folder.

7.2.3.2.4 Browse

When loading a file, **Browse** allows the user to select a specific file located outside of the preselected folder.

7.2.3.3 View configuration summary

The **Configuration Summary** screen (**Home > Station > Set-up tab > View Config Summary**) provides the user with a basic configuration summary of the sensors and processes defined in the datalogger (see Figure 7-7, Figure 7-8, and Figure 7-9).

Note that when the user performs a site visit, the information displayed on the configuration summary screens is written to a time-stamped csv file in the station's folder on the USB memory stick along with the other site visit files.

7.2.3.3.1 Sensors

The **Configuration Summary** screen – **Sensors** tab provides information on the datalogger's dedicated and internal sensors. Sensors and their datapoint names and values as well as if the datapoint is being logged or transmitted are shown (see Figure 7-8).

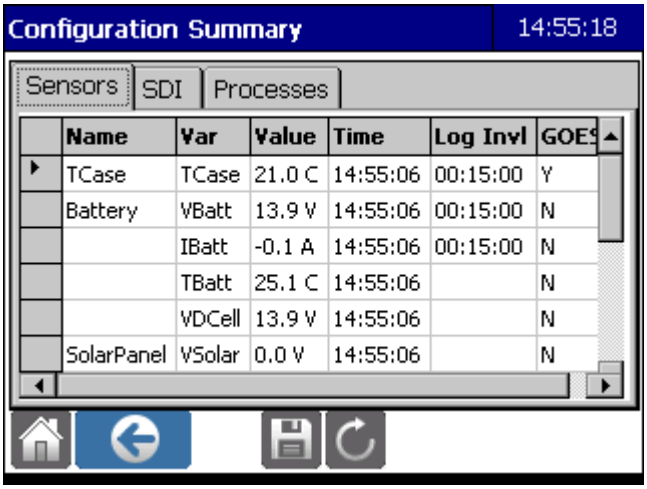


Figure 7-7: Configuration Summary screen – Sensors tab

Column heading	Contents
Name	Sensor Name - an X preceding the sensor name indicates the sensor is Inactive
Var	Sensor Datapoint (variable) Name
Value	Sensor Datapoint Reading
Time	Time of the Sensor Datapoint Reading
Log Invl	Datalogging Time Interval - a C preceding the log interval time indicates a conditional datalog - a D preceding the log interval time indicates a disabled datalog
GOES	: Indicates if the Datapoint is defined as part of a GOES transmission - a Y indicates the datapoint is to be transmitted in the GOES message - an N indicates the datapoint is not transmitted

7.2.3.3.2 SDI sensors

The **Configuration Summary** screen – **SDI** tab provides information on the datalogger's SDI sensors (see Figure 7-8). SDI command details are shown in addition to the headings displayed on the Sensor tab.

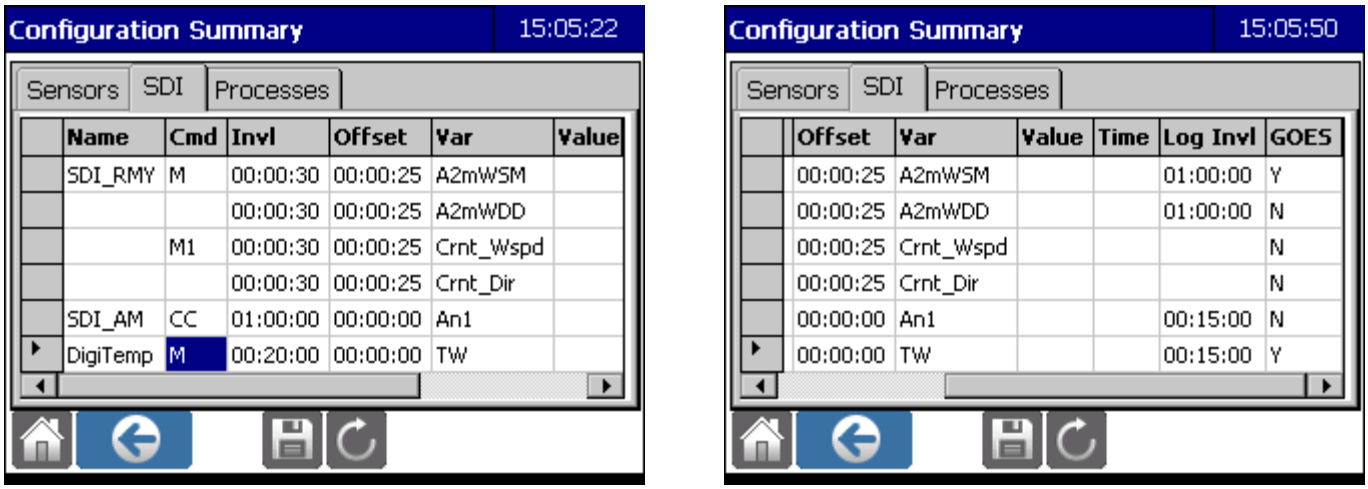


Figure 7-8: Configuration Summary screen – SDI tab

Configuration Summary – SDI tab – columns

Column heading	Contents
Cmd	the SDI command sent to the sensor
Invl	SDI Command Time Interval
Offset	SDI Command Time Offset

Example

An **Interval** of 01:00:00 and an **Offset** of 00:05:00 indicated that the datalogger sends the shown SDI command to the sensor every hour at five minutes past the hour (00:05:00, 01:05:00, 02:05:00, 03:05:00 ...).

7.2.3.3.3 Processes

The **Configuration Summary** screen – **Process** tab provides information on the various processes defined in the datalogger (see Figure 7-9). Process details are shown in addition to the headings displayed on the **Sensor** tab.

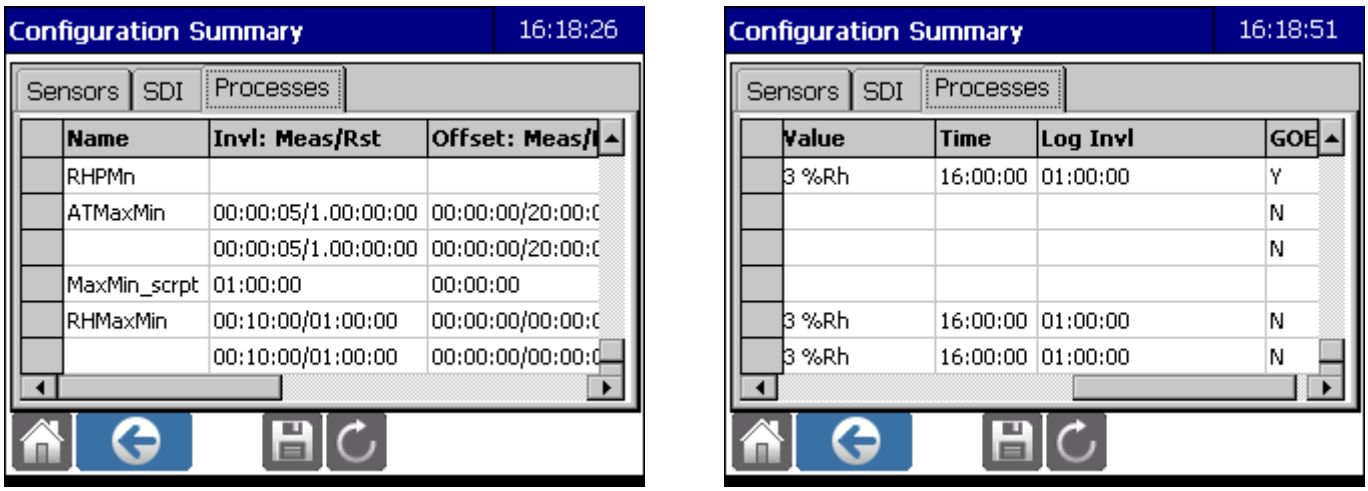


Figure 7-9: Configuration Summary screen – Processes tab

Configuration Summary – Processes tab – columns

Invl: Meas/Rst	Process Measurement and Reset Interval Times
Offset: Meas/Rst	Process Measurement and Reset Interval Offset Times

Example

The RhMaxMin process shown in Figure 7-9 has a Measurement Interval of 10 minutes (00:10:00) and a Reset Interval of 1 hour (01:00:00). Also both the Measurement Offset and the Reset Offset are zero. This indicates that the RhMaxMin process is run every 10 minutes (xx:00:00, xx:10:00, xx:20:00, etc.) and the process outputs are reset every hour at the top of the hour.

7.2.3.4 Clear Configuration

Clears all user settings and loads a blank factory default configuration

7.2.4 Power management tab

The **Station Set-up** screen – **Pwr Mgt** tab (Figure 7-10; **Home > Station > Pwr Mgt tab**) allows the user to specify when the datalogger enters and recovers from low power standby mode.

When the battery voltage drops below the specified **Datalogger V Cut-off** voltage level, the datalogger turns off SDI bus power, turn off power to the telemetry devices, stop all datalogging, turn off power to the touchscreen, and enter a low power standby mode. The datalogger remains in the low power standby mode until the battery voltage rises above the specified **Datalogger V Resume** voltage level.

When the datalogger is in low power standby mode and the user presses the touchscreen, the touchscreen briefly flashes and then returns to low power mode.

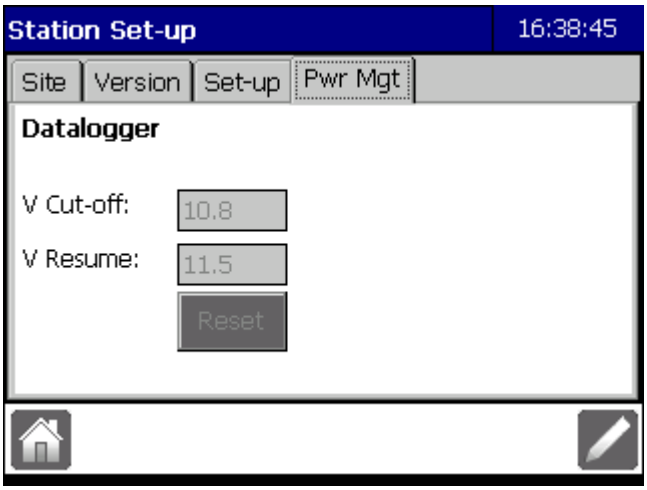


Figure 7-10: Station Set-up screen – Power Management Tab

The **Reset** button restores the Telemetry factory default settings, which are shown in Figure 7-10.

7.3 Service

The **Home** screen **Service** icon is used to access maintenance and service utilities available in the datalogger. The **Service** screen (Figure 7-11) allows the user to set the datalogger's date and time, enable password protection, update the datalogger software, view the datalogger's audit log, record serial numbers of site equipment, as well as create service reports.

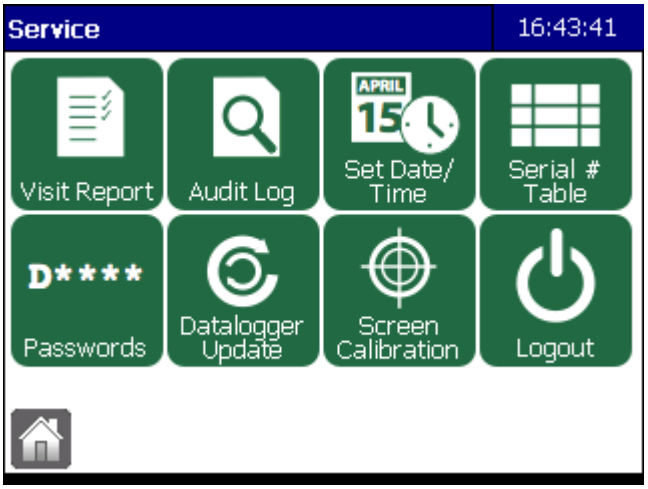


Figure 7-11: Service screen

7.3.1 Screen calibration

The datalogger's touchscreen is factory calibrated; however, if you notice that the presses on the touchscreen do not register in the correct location, then the touchscreen may need to be recalibrated.

To recalibrate the touchscreen, press **Home > Service > Screen Calibration** and follow the instructions . Use only the stylus attached to the datalogger or your bare finger to touch the screen. Follow the displayed instructions to touch the cursor (+ sign) at the center and four corners of the screen, conclude by tapping anywhere on the screen. This ensures the touchscreen is properly calibrated. Be careful to accurately touch each location as this ensures optimum touchscreen operation. The touchscreen calibration routine monitors the accuracy of the calibration attempt and requests you try again if you inadvertently miscalibrate a point.

7.3.2 Set date / time

To set the datalogger's local date and time, open the **Set Date Time** screen (see Figure 7-12; **Home > Service > Set Date Time**). This sets the time the datalogger uses to timestamp its logged data and audit log entries.

To leave the datalogger's Date/Time settings unchanged, press the **Cancel** .

To set the Date, Time, and Time zone to the currently entered values on the **Set Date Time** screen, press **OK** . To set time precisely, enter a time that is slightly ahead of the current time, then press **OK** at the precise moment corresponding to the entered time.

If the datalogger is connected to a G5 GOES transmitter, the datalogger has its time synchronized with the G5's high accuracy, GPS based clock; however, the datalogger's time zone setting remains unaffected and the datalogger continues to operate based on its local time.

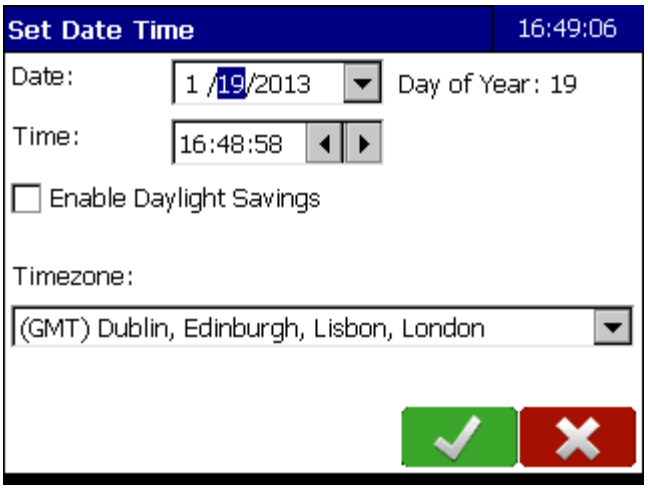


Figure 7-12: Set Date Time screen

7.3.2.1 Date

Set the desired date by using the drop-down menu (the down arrow on the right side of the Date box). The left/right arrows in the drop down menu step backwards and forwards through the months. To step through the years, click on the year and then use the up/down arrows which appear to select the desired year. (See Figure 7-13.)

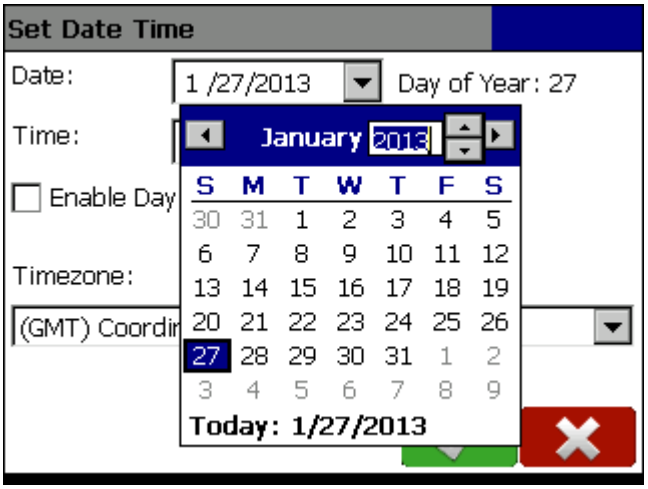


Figure 7-13: Set Date Selection

7.3.2.2 Time

Set the desired time by using the left/right arrows in the **Time** box to select the desired hours, minutes, and seconds.

7.3.2.3 Time zone

Select the desired time zone from the list provided by the time zone drop-down menu (the arrow on the right side of the **Timezone** box). When changing the datalogger's time zone, ensure that the **Date** and **Time** fields are also correct as the datalogger's Date, Time, and Time zone information are all updated when **OK** is pressed.

7.3.2.4 Enable daylight savings

Check the **Enable Daylight Savings** box if you want the datalogger to track daylight savings time.

7.3.2.5 G5 GOES transmitter time synchronization

If the datalogger is connected to a G5 GOES transmitter, then datalogger time synchronization with the GOES transmitter occurs in the following cases:

1. When the datalogger is first powered on and the GOES transmitter obtains a GPS fix.
2. After the operator manually sets the datalogger date, time, or time zone.
3. Prior to each GOES transmission.

The datalogger's clock is adjusted if the time difference between the datalogger and the G5 GOES transmitter is more than 1 second. If the time difference is greater than 20 seconds, then, in addition to the datalogger's clock being resynchronized, the contents of the datalogger's transmit buffer is cleared to ensure incorrect data is not transmitted.

7.3.3 Passwords

Two levels of password protection are available in the datalogger – User Level and Tech Level. Each level can be individually enabled. User Level password provides protection against unauthorized access of the datalogger whereas the Tech Level password provides protection against unauthorized changes to the operation of the datalogger.

7.3.3.1 User level

A User Level password allows the operator read-only access to the datalogger. The operator is able to examine datalogger status (i.e. view data, read sensors, view telemetry configuration etc.) but cannot change the configuration of the logger if a Tech Level password is set.

7.3.3.2 Tech level

The purpose of the Tech Level password is to prevent unauthorized modifications to the datalogger. A Tech Level password allows the operator full access to the datalogger. The operator is able to modify datalogger operation (i.e. load new configurations, create and change datalogging intervals, create and change sensor definitions etc.). There are no restrictions placed on a Tech Level user. If a Tech Level password is not set then the User Level has access to Tech Level functionality.

7.3.4 Logout

Automatic logout from User Level or Tech Level occurs after 20 minutes of touchscreen inactivity. In addition, a station operator can use the **Logout** icon to force a logout.

7.3.5 Datalogger update

The **Datalogger Update** icon, found on the **Service** screen, enables the user to update software in the datalogger from a USB memory stick. Application software, which is used to run the datalogger, and Sensor Extensions, which provides advanced sensor set-up functionality, both can be independently updated from the **Datalogger Update** screen (see Figure 7-14).

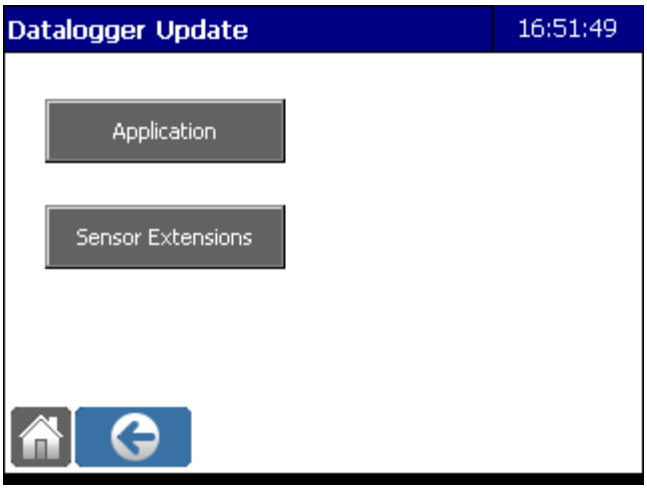


Figure 7-14: Datalogger Update screen

7.3.5.1 Application

The Application is the program which runs the datalogger and provides the GUI and the functionality for the user to configure the datalogger to their requirements. The version of the Application currently running the datalogger is displayed in the **Version** tab of the **Station Set-up** screen (**Home > Station**). The **Application** button on the **Datalogger Update** screen begins the Application update process.

7.3.5.1.1 Update procedure

Follow the steps below to update the datalogger's Application software:

1. Obtain the latest application software release from FTS. The file will have a .CAB extension (i.e. F6H2_v230.CAB for datalogger application software version 2.30).
2. Place the CAB file on a memory stick in the default folder H2 Data Logger\SW (create this folder structure if it does not exist – refer to Figure 3-1). Alternately, you can place the file in any folder you wish but then you will need to browse to the file when updating the datalogger's application software.
3. Insert the memory stick into either of the datalogger's **USB HOST** ports.
4. Press **Home > Service > Datalogger Update > Application**.
5. The datalogger displays the **Application Update** screen (Figure 7-15). The Current Version of the application currently running on the datalogger as well as the Latest Version Available (as found in the Axiom H2 Data Logger\SW folder on the memory stick) is shown.

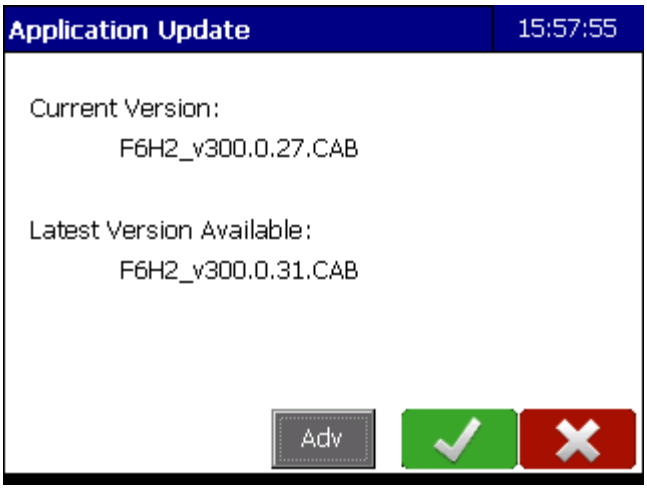


Figure 7-15: Application Update screen

6. Press **OK** to accept the Latest Version Available file selection to proceed with the application software update or press **Cancel** to abort the operation. Alternately, the **Adv** (advanced) button can be used to browse to and choose a specific file outside of the default folder location
7. If **OK** was pressed, the following steps occur (this process takes about a minute):
    a. The datalogger displays a Please Wait message.
    b. The current application automatically stops.
    c. The datalogger displays an Update Successful message.
    d. Remove the memory stick from the **USB HOST** port and then press **OK**
    e. The updated application software automatically starts.
8. The datalogger will begin operating with its previous configuration – no user action is required
9. Datalogger application software update is complete. Confirm by checking the Application Version number shown on **Home > Station > Version tab**.

7.3.5.2 Sensor extensions

A Sensor Extension provides advanced set-up functionality for a specific sensor.

Error! Reference source not found. shows the datalogger's **Sensor Extensions** screen

Error! Reference source not found. shows, in the bottom listbox, that there is a Sensor Extension named mModDll.dll already installed on the datalogger (installed on the datalogger in the datalogger's Program Files\CustomDevices folder).

Error! Reference source not found. also shows, in the top listbox, that there is a USB memory stick plugged nto the datalogger and that the memory stick has two sensor extensions which can be installed to the datalogger.

The **Add** and **Delete** buttons on the left side of the **Sensor Extensions** screen are used to install and remove extensions from the datalogger.

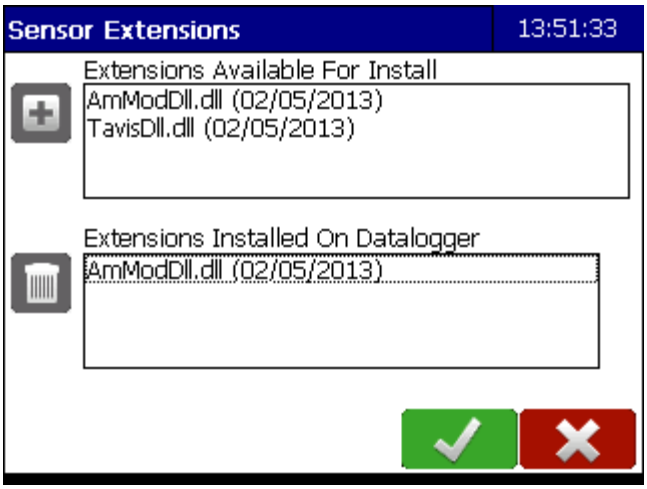


Figure 7-16: Sensor Extensions screens

7.3.5.2.1 Adding or updating a sensor extension

The **Add** button is used to install or update datalogger Sensor Extensions. A new extension can be directly added to the datalogger; however, when updating an extension, the datalogger's application software needs to be restarted. Restarting the application software cycles the power to the telemetry devices attached to the datalogger. For instance, if you have a G5 transmitter attached to the datalogger and the datalogger's application is restarted, then the G5 transmitter is power cycled and the G5 needs to reacquire the GPS almanac in order to validate its real time clock before any GOES transmissions can occur (note to acquire the GPS almanac can take up to 20 minutes). The process is the same for adding or updating a sensor extension. When updating an extension, the existing extension on the datalogger is overwritten.

To **add or update** Sensor Extensions on the datalogger:

1. Obtain the latest sensor extensions from FTS. Sensor Extension filenames have a .dll suffix (i.e. AmModDll.dll for the SDI-AM module extension).
2. The sensor extension dll file must be placed on the memory stick's Axiom H2 Data Logger\SW\CustomDevices folder (you must create this folder structure if it does not exist or else the datalogger will not be able to find the new dll files).
3. Insert the memory stick into either of the datalogger's **USB HOST** ports.
4. Press **Home > Service > Datalogger Update > Sensor Extension**.
5. The datalogger displays the sensor extensions currently installed on the datalogger in the lower listbox and the sensor extensions available to be installed from the USB memory stick in the upper listbox.
6. Select the sensor extension you wish to install in the upper listbox
7. Press **Add**.
8. The datalogger moves the selected file to the lower listbox. If there was already a sensor extension with the same name installed on the datalogger, then the extension in the lower listbox will be moved to the upper listbox (note that the two extensions have different file paths).
9. Press **OK** to complete the sensor extension add/update process or press **Cancel** to abort the operation.

IMPORTANT ! The datalogger's application software needs to be restarted after updating a sensor extension from the datalogger. Restarting the application software cycles the power to the telemetry devices attached to the datalogger.

7.3.5.2.2 Removing a sensor extension

The **Delete** button is used to uninstall Sensor Extensions from the datalogger. It is important to note that when removing Sensor Extensions, the datalogger's application software needs to be restarted. Restarting the application software cycles the power to the telemetry devices attached to the datalogger. For instance, if you have a G5 transmitter attached to the datalogger and the datalogger's application is restarted, then the G5 transmitter is power cycled and the G5 needs to reacquire the GPS almanac in order to validate its real time clock before any GOES transmissions can occur (note to acquire the GPS almanac can take up to 20 minutes).

To **remove** a Sensor Extension from the datalogger:

1. Ensure that there is no memory stick connected to either **USB HOST** port.
2. Press **Home > Service > Datalogger Update > Sensor Extension**.
3. The datalogger will display the sensor extensions currently installed on the datalogger in the lower listbox.
4. Select the sensor extension you wish to remove in the lower listbox
5. Press **Delete**.
6. The datalogger moves the selected file to the upper listbox.
7. Press **OK** to complete the sensor extension removal process. The datalogger will prompt you for confirmation and then the datalogger application will automatically restart.

   Press **Cancel** to abort the operation.

IMPORTANT ! The datalogger's application software needs to be restarted when removing a Sensor Extension from the datalogger. Restarting the application software cycles the power tothe telemetry devices attached to the datalogger.

7.3.6 Audit log

To view the datalogger's Audit Log, use the **Audit Log** screen (Figure 7-17; **Home > Service > Audit Log**). The Audit Log is a circular text file (maximum size 20 kB) in which the datalogger stores time-stamped entries of anomalous events or events of importance. On the **Audit Log** screen, the user can scroll through the log entries as well as clear the file or save the Audit Log file to a USB memory stick.

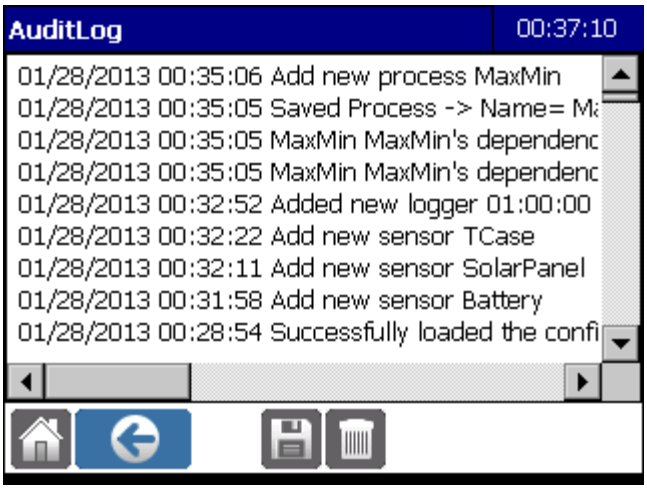


Figure 7-17: Audit Log screen

7.3.6.1 Save

The **Save** button allows the user to write the datalogger's Audit Log file to the USB memory stick.

The audit log is automatically saved in the station folder on the memory stick memory stick. The full folder and file name is: Axiom H2 Data Logger\<station name>\Data\AuditLog-YYYY-MM-DD-hh-mm-ss.txt (where <station name> is the datalogger's station name and YYYY-MM-DD-hh-mm-ss is year-month-day-hour-minute-second). The datalogger's Audit Log file is not altered by writing the file to a memory stick.

7.3.6.2 Delete

The **Delete** button allows the user to erase the datalogger's Audit Log file. The user is prompted to confirm the deletion of the log entries as the log entries cannot be recovered once they have been deleted.

7.3.7 Serial number table

The **Serial Number** screen (Figure 7-18; **Home > Service > Serial # Table**) allows the user to enter serial numbers of the sensors, telemetry, and other equipment associated with the site. A device whose serial number needs to be manually entered is shown with a beige background (e.g., Rain in Figure 7-18). A device capable of reporting its serial number is identified with a yellow background (e.g., G5 Port A in Figure 7-18). Devices whose serial numbers have not been entered or detected are shown with a red background. The Last Update column is automatically populated with the time the serial number of the device was entered.

To auto-detect or to manually enter a serial number, touch the name of the device in the serial number table. The **Serial Number Update** screen opens (see Figure 7-19). If the device is not capable of reporting its serial number then the **Auto Detect** button is absent. The user can manually edit a serial number which was auto detected.

When a sensor or telemetry is added to the datalogger, it is automatically added to the serial number table; however, the user can also add a device to the serial number table by selecting the **Add** button. The user can then give the device a name and manually enter its serial number.

To remove a sensor from the serial number table select the **Delete** button, a new screen will appear where you can select which device in the serial number table you would like to remove from the list.

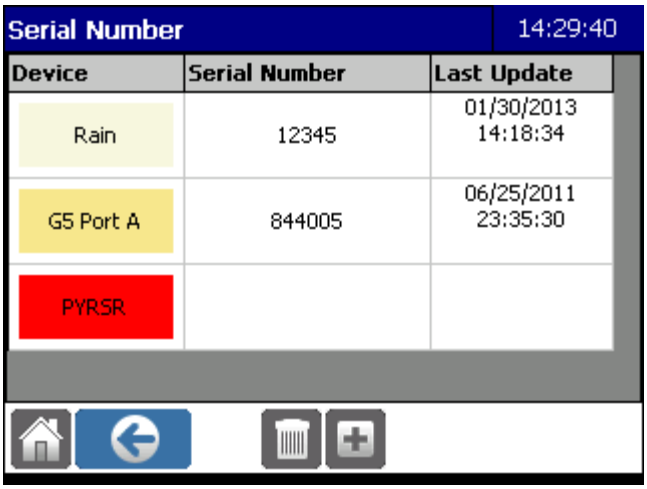


Figure 7-18: Serial Number Table screen

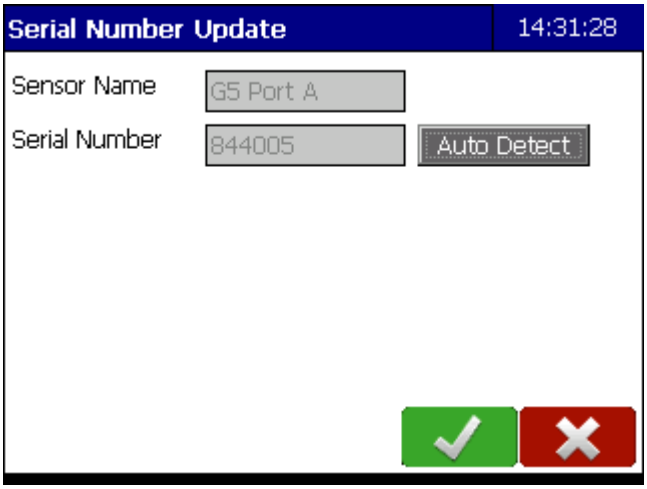


Figure 7-19: Serial Number Update screen

7.3.8 Visit report

The Visit Report provides the user with a convenient tool which saves the station's current operating state at the start and end of each site visit. The Visit Report also ensures consistency in the data that is saved for every site visit. Visit report information is always saved to the station's folder on a USB memory stick inserted into one of the datalogger's **USB HOST** ports. Information saved for each visit report (start and end of visit) includes:

- A time-stamped text report of the datalogger's current operating state.
- A time-stamped datalogger configuration file.
- A time-stamped download of the datalogger's audit log file.
- A time-stamped configuration summary report in csv format.
- if applicable, a time-stamped download of the transmission history (Tx Log) of the attached G5 transmitter.

The **Visit Report** screen (Figure 7-20; **Home > Service > Visit Report**) has two textboxes which should be correctly set prior to pressing the **Start Visit** button .

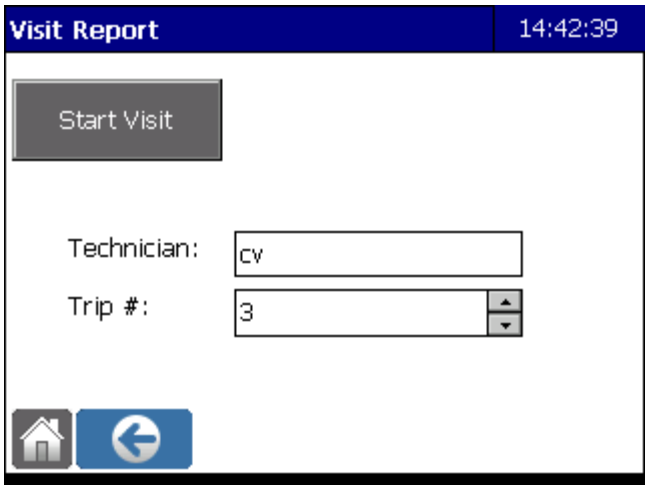


Figure 7-20: Start Visit Report screen

7.3.8.1 Technician

The **Technician** box allows the user to enter their name or initials as a record of who performed the site visit.

7.3.8.2 Trip

The trip number automatically increments from the last visit; alternatively, the user can manually enter a trip number before pressing the **Start Visit** button.

7.3.8.3 Start / end visit

The **Start / End Visit** button toggles between the labels (and functions) **Start Visit** and **End Visit**. After the **Start Visit** button is pressed, a text report of the datalogger's current operating state is displayed for the user to view in the **Save Report** screen (see Figure 7-21).

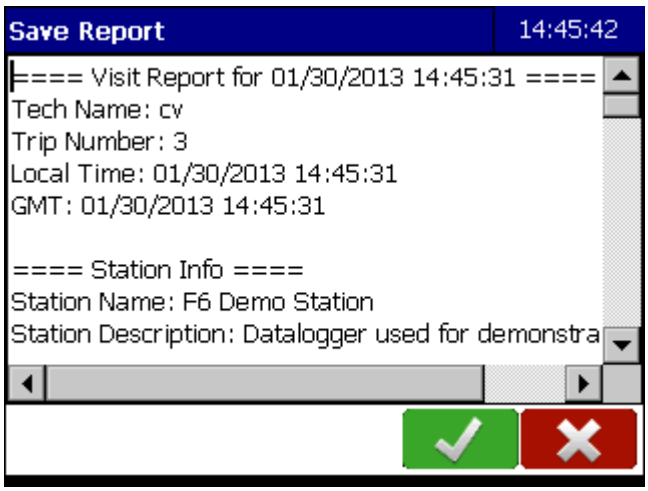


Figure 7-21: Save Report - Start

Once the user presses **OK**, the entire Visit Report information is written to the memory stick. The **Visit Report** screen now displays an **End Visit** button in place of the **Start Visit** button (see Figure 7-22).

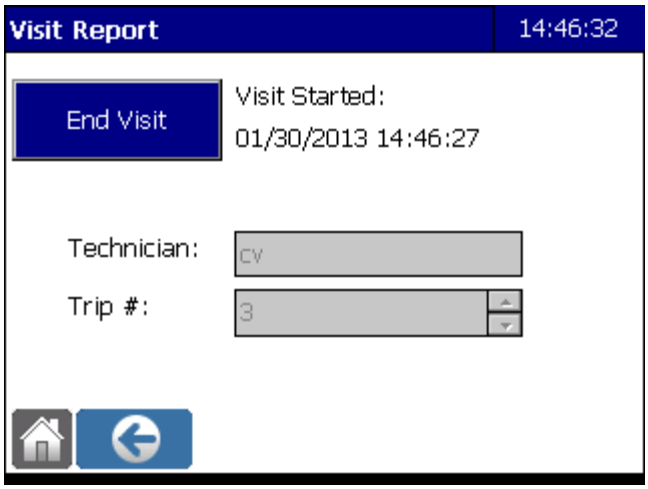


Figure 7-22: End Visit Report screen

The user can now navigate away from the **Visit Report** screen to do the required maintenance work. The **Visit Report** Screen continues to display the **End Visit** button until the button is pressed again. Once the **End Visit** button is pressed, an End Visit text report of the datalogger's current operating state is displayed for the user to view in the **Save Report** screen (see Figure 7-23). The End Visit Report includes Length of Visit information.

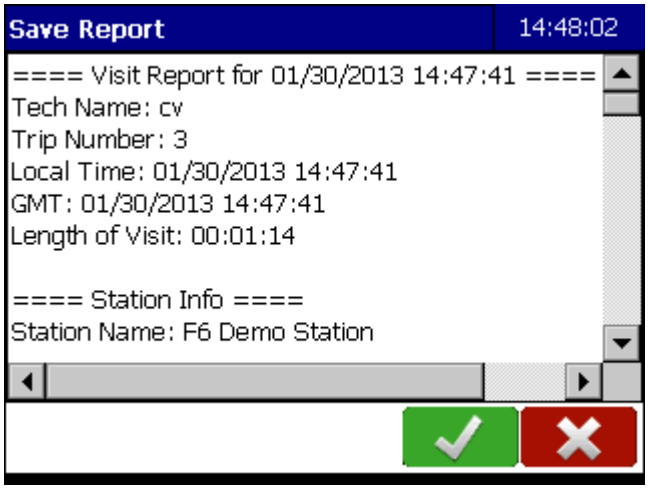
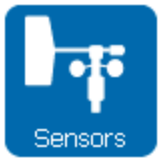


Figure 7-23: Save Report - End

This alternating **Start Visit / End Visit** functionality allows the user to capture the station's current operating conditions (start visit) and then capture the stations operating conditions after completion of any maintenance work (end visit) so that a full record of site maintenance is retained.

7.4 Sensors



The **Sensors** icon opens the **Sensors** screen, which enables the user to configure sensors for the Axiom H2 datalogger. Figure 7-24 shows the **Sensors** screen for a blank datalogger (no sensors configured) – the only option for the user is to add a new sensor. Normally the datalogger would be preconfigured by FTS and several sensors would be visible on the **Sensor** screen (see Figures 28, 29, and 30).

Figure 7-24: Sensors screen

Pressing the **Add** button allows the user to configure a new sensor for the datalogger. The new sensor can be one of the datalogger's internal sensors (see Figure 7-25) or an external sensor connected to a dedicated or SDI input (see Figure 7-26) or a Sensor Extension (see Figure 7-27).

Figure 7-25: Internal Sensor Icons

Figure 7-26: SDI and Dedicated Sensor Icons

Figure 7-27: Sensor Extension Icons

When configuring sensors, the user can override the default parameter name. If a parameter name is left blank, then that parameter is not monitored and is not available as a datapoint in the datalogger.

After a sensor has been configured, its icon appears on the **Sensors** screen (Figure 7-24). The sensor displays its parameters when the sensor's icon is pressed as well as its Time To Next Acquisition. Time To Next Acquisition is a countdown timer to the next time that the sensor is logged, processed, or transmitted.

All sensor set-up screens have a checkbox titled **Active**. If the **Active** checkbox is unchecked (left blank), then the sensor is not read by the datalogger and any calculations or processes that use the sensor reading will report an error.

7.4.1 Restrictions on sensor datapoint names

Each sensor defines one or more named datapoints. These names must conform to the following rules:

- The name must contain only upper- or lower-case letters, digits, or the underscore character ("_").
- The name must start with a letter.
- The name cannot be any of the following reserved names:
    - ABS
    - ACOS
    - ASIN
    - AT
    - ATAN
    - CMD
    - COS
    - ELSE
    - ERR
    - EXP
    - FRAC
    - IF
    - INT
    - LN
    - MAX
    - MIN
    - MOD
    - PI
    - POW
    - SIN
    - SQRT
    - SteinhC
    - t_DySince
    - t_DySYr
    - t_HrSince
    - t_HrSYr
    - t_IsLeap
    - t_MnSince
    - t_MnSYr
    - t_SeSince
    - TAN

7.4.2 Internal sensors

There are three physical sensors internal to the Axiom H2 datalogger used to measure solar panel parameters, battery parameters, and datalogger temperature. The **Battery**, **Solar**, and **Case Temp** icons access screens to configure these measurements.

7.4.2.1 Battery

Figure 7-28 shows the **Battery Sensor Setup** screen. Measurable parameters for the battery are the battery voltage, current, and temperature as well as the voltage of the optional battery back-up D-cell pack. The default sensor name is Battery while the default parameter names are VBatt for battery voltage (Volts), IBatt for battery current (Amps), TBatt for battery temperature (either °C or °F), and VDCell for the optional battery back-up D-cell pack voltage. A negative value for battery current indicates that current is being drawn from the battery (the battery is being discharged) while a positive value indicates that the battery is being charged. The value reported in battery voltage and battery current is an average value from the last 10 seconds.

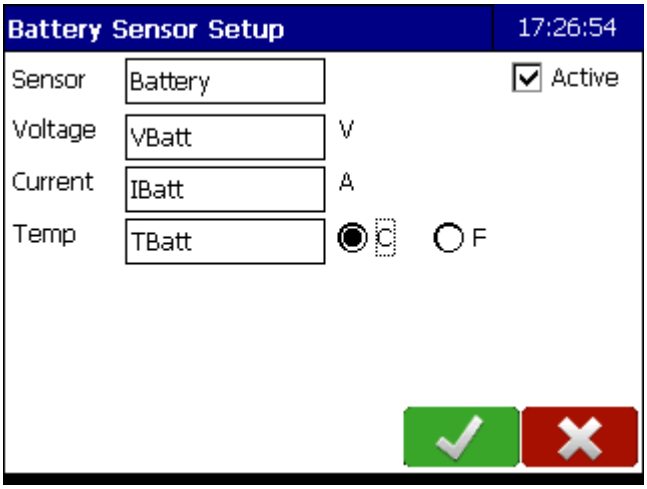


Figure 7-28: Battery Sensor Setup screen

7.4.2.2 Solar

Figure 7-29 shows the **Solar Sensor Setup** screen. Measurable parameters for the solar panel are the solar panel voltage and current. The default sensor name is Solar Panel while the default parameter names are VSolar for solar panel voltage (Volts) and ISolar for solar panel current (Amps). The value reported in solar panel voltage and solar panel current is an average value from the last 10 seconds.

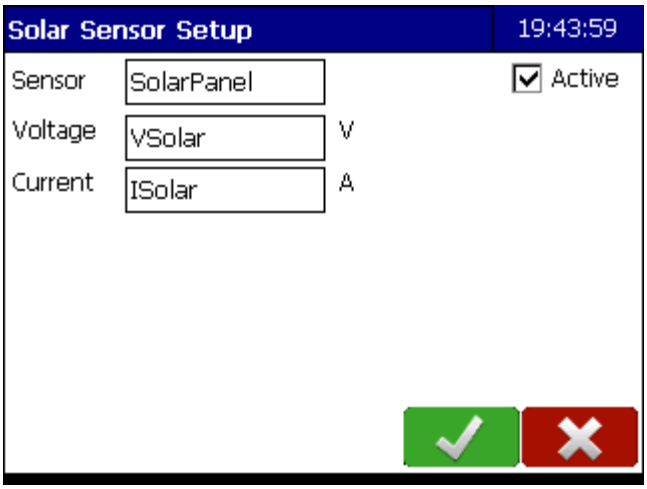


Figure 7-29: Solar Panel Sensor Setup screen

7.4.2.3 *Case temperature*

Figure 7-30 shows the **Case Temp Sensor Setup** screen (for the datalogger's internal case temperature sensor). The default parameter name for this sensor is TCase and the user can select units of Celsius or Fahrenheit.

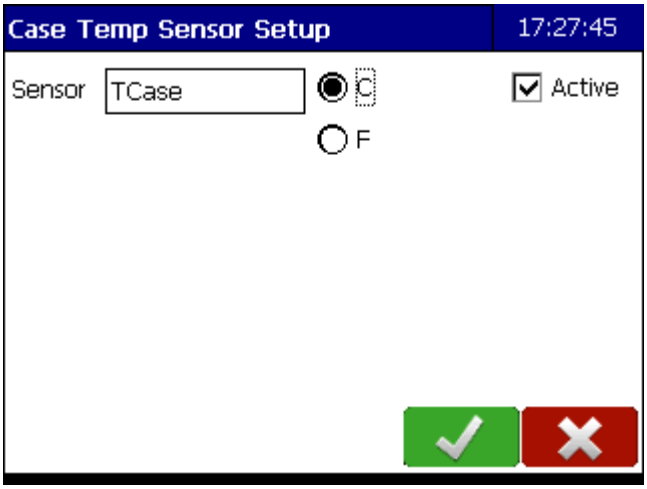


Figure 7-30: Case Temp Sensor Setup screen

7.4.3 Dedicated sensors

Dedicated sensors are sensors which have a specifically labeled (i.e., not SDI) datalogger front panel connector.

7.4.3.1 *Rain*

Figure 7-31 shows the **Rain Sensor Setup** screen. The default parameter name for this sensor is RNIN and the user can specify any units they desire (typically inches, mm, or counts – default of inches). The tip increment defaults to 0.01 but this value can be overridden by the user. The tip increment is the amount of rain measured by one rain gauge contact closure.

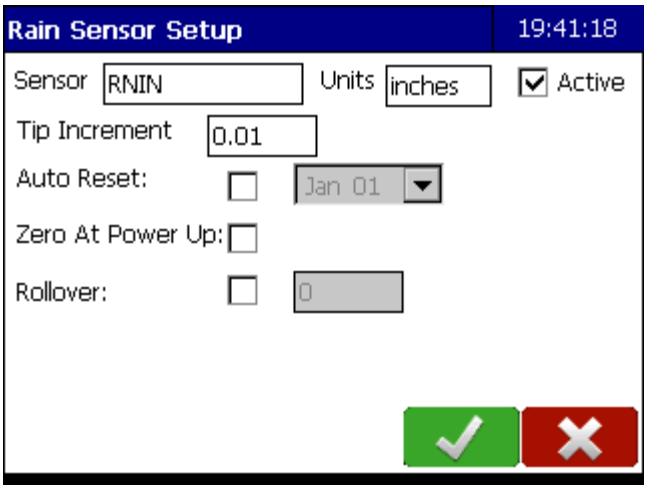


Figure 7-31: Rain Sensor Set-up screen

The **Auto Reset** checkbox, if checked, allows the user to specify a rain counter reset date. The rain counter is reset at the beginning of the day specified.

The **Zero At Power Up** checkbox, if checked, causes the datalogger to set the rain counter to zero every time the datalogger is powered on.

The **Rollover** checkbox, if checked, causes the datalogger to reset the rain counter to zero once the rollover value is surpassed.

Figure 7-32 shows the **Rain Sensor** screen after the sensor has been configured. The rain counter is currently at 4.12 inches. The **Set** and **Zero** boxes allow the user to set a specific value or to zero the rain count.

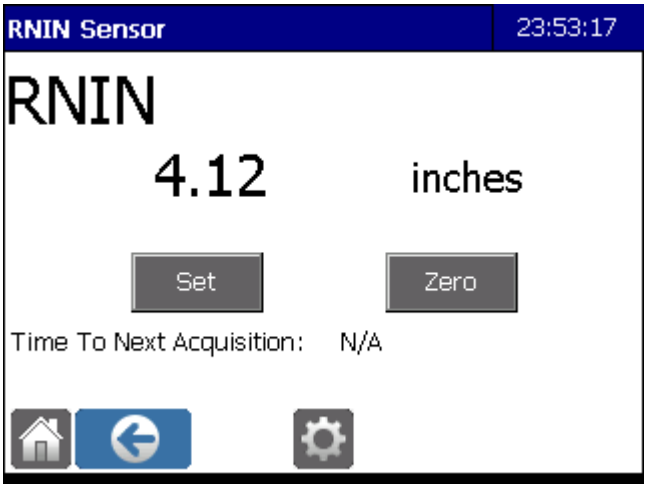


Figure 7-32: Rain Sensor Display screen

7.4.4 SDI sensors

Figure 7-33 shows the **SDI Sensor Set-up** screen, which is the main set-up screen for any SDI sensor. The configuration of an SDI sensor is more involved than a dedicated or internal sensor because each SDI sensor must have a unique address and also because each type of SDI sensor returns a unique set of values for each supported command. Refer to your SDI sensor's operating manual when configuring the datalogger for your SDI sensor.

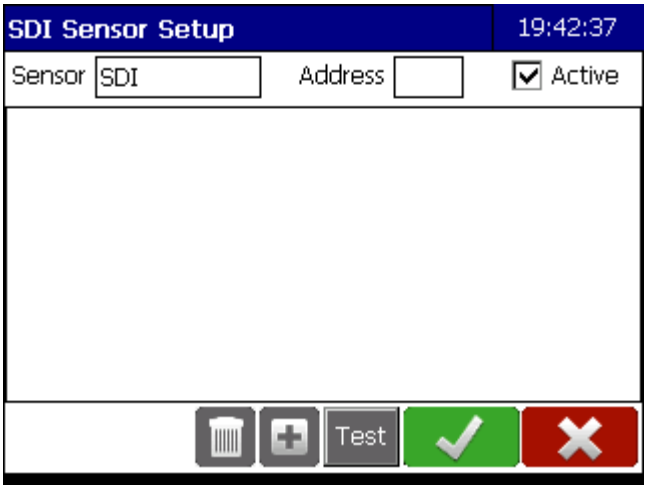


Figure 7-33: SDI Sensor Set-up screen

Note that entering or changing the Address field does not change the address of an attached SDI sensor. The Address field defines the expected address of the sensor in the datalogger's configuration. The actual address of the sensor is dependent on the sensor connected to the datalogger.

The **SDI Sensor Set-up** screen (Figure 7-33) requires the user to specify a unique sensor name and address. The **Test** button allows the user to confirm the address entered for the sensor is correct. The **Add** button opens the **SDI Command Setup** screen (Figure 7-34), which enables the user to define a command for the SDI sensor. Multiple commands can be defined for a single sensor.

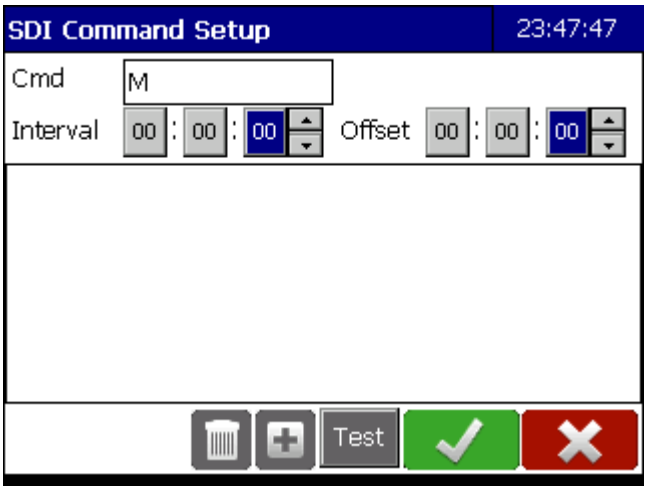


Figure 7-34: SDI Sensor Command Set-up screen

The **SDI Command Set-up** screen (Figure 7-34) allows the user to specify the sensor command (default is the **M** command) and requires the user to set a command interval and offset. The **M**, **MC**, **C**, **CC**, **R**, **RC** and **V**

commands are supported as per the SDI-12 specification (version 1.3). The datalogger automatically sends **D** commands if needed to retrieve the measured values.

The **Interval** is in hour:minute:second format and specifies how often the specified command is sent to the sensor. The **Offset** is also in hour:minute:second format and specifies how long after midnight the first command is sent to the sensor. The specified **Offset** must be less than the specified **Interval**.

> **IMPORTANT !** **Interval** and **Offset** specify the time the command to the SDI sensor is initiated. When configuring the sensor, the user must consider the sensor's measurement response time so that the data returned from the sensor is available to the datalogger prior to the desired log, process, or transmission time.

Example

An **Interval** of 01:00:00 and an **Offset** of 00:59:30 configures the datalogger to send the specified command to the sensor every hour at fifty nine minutes and thirty seconds past the hour (00:59:30, 01:59:30, 02:59:30, 03:59:30, etc.). Assuming that this SDI sensor only requires a few seconds to return its data, then the data from this command is available to the datalogger for logging, processing, or transmission at the top of the hour.

The **Test** button sends the specified command to the sensor and displays the returned fields (values).

The **Add** button on the SDI Command Setup Screen (Figure 7-34) launches the SDI Field Setup Screen which enables the user to define datapoints for the values returned by the command.. Multiple fields can be defined for each command as a single SDI command can return several values. Figure 7-35 shows the **SDI Field Setup** screen for defining an SDI field.

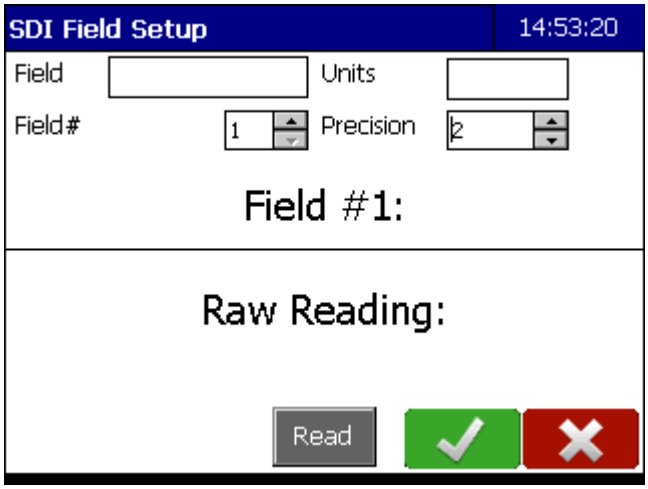


Figure 7-35: SDI Sensor Field Set-up screen

The **SDI Field Set-up** screen (Figure 7-35) allows the user to specify a unique field name for the selected field number. The user can also specify the units and precision (number of decimal places) for this field. Not all fields returned by an SDI command need to be defined. Only those fields which have been defined in an **SDI Field Set-up** screen appear as datapoints in the datalogger.

The **Read** button generates a sensor measurement and then display the formatted field value, as specified by Field Number and Precision, next to the Readout text.

7.4.5 Sensor extensions

Sensor extensions are designed to ease the set-up of certain SDI sensors by minimizing or eliminating the need for the user to know the sensor's specific SDI protocols. Currently the following sensor extensions are available for use on the datalogger.

Stage	a generic set-up useful for configuring a variety of stage sensors
SDI-PT	specifically designed for pressure sensor stage sensors
Shaft	specifically designed for shaft encoder stage sensors
Tavis	specifically designed for the Tavis DISI-1200 Water Stage sensor
SDI-AM	specifically designed for the FTS SDI-AM 4 channel analog module
SDI-RMY	specifically designed for the FTS SDI-WS-RMY-1/2/3 wind sensor with smart SDI-12 interface

Note that sensor extensions write configuration parameters to the attached sensor and that any previously configured sensor parameters are overwritten.

7.4.5.1 Stage

Figure 7-36 shows the **Stage Sensor Set-up** screen (**Stage** tab), with default settings, that is provided by the Stage sensor extension. The Stage extension is special in that it is always present in the datalogger. This extension predefines a stage datapoint of HG and an auxiliary water temperature datapoint of TW. The Stage extension is generic so knowledge of the specific attached stage sensor's SDI commands may be required to appropriately configure it. Refer to the sensor's operating manual for sensor command and data details.

7.4.5.1.1 Set-up screen

7.4.5.1.1.1 Sensor tab

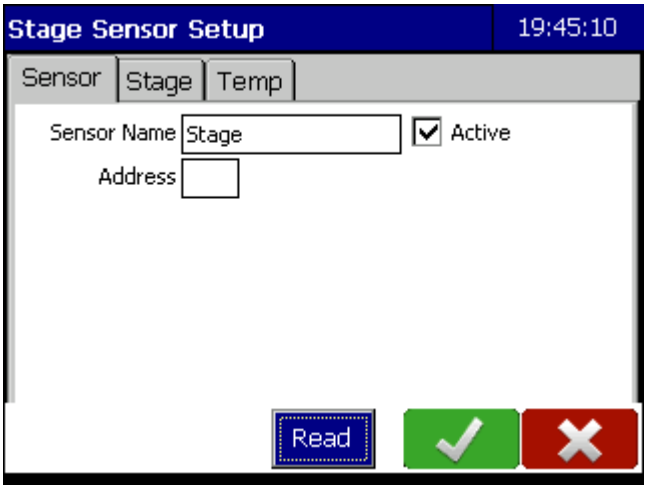


Figure 7-36: Stage Sensor Set-up screen – Sensor tab

The Sensor tab contains basic information about the sensor: Enter **Sensor Name** and **Address** (address on the SDI bus), and select whether it is currently **Active**.

7.4.5.1.1.2 Stage tab

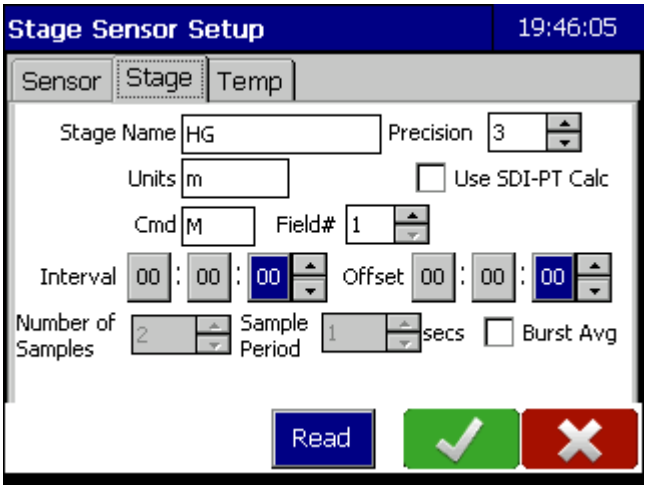


Figure 7-37: Stage Sensor Set-up screen – Stage tab

The **Stage** tab controls the stage (water depth) function of the sensor.

Stage Name specifies the datapoint name for the stage value returned by the sensor.

Precision specifies the precision (number of decimal places) in the stage value to be used in computations and displays.

Units specifies the units label used in displays of stage values.

Use SDI-PT Calc specifies whether or not to enable the SDI-PT calculation which converts stage value from PSI to the units specified.

Cmd specifies the sensor's stage SDI command. (You may need to consult the sensor manual to determine the correct command.)

Field # specifies which field the stage value is returned in the sensor's data response to **Cmd**. (You may need to consult the sensor manual to determine the correct field.)

Interval and **Offset** specify the schedule of stage readings on this sensor.

Burst Avg activates the burst averaging feature for stage values. A burst average is formed at each measurement event by collecting **Number of Samples** samples at intervals specified by **Sample Period**, and taking the average.

Number of Samples and **Sample Period** control burst averaging. They are enabled only when **Burst Avg** is selected.

7.4.5.1.1.3 Temp tab

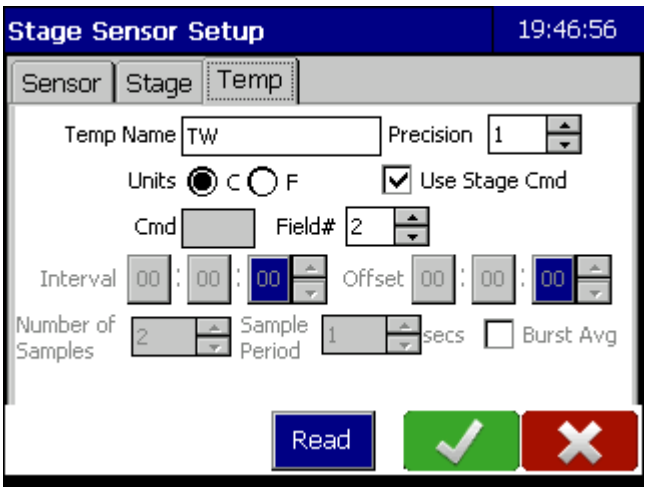


Figure 7-38: Stage Sensor Extension Set-up screen – Temp tab

The **Temp** tab (Figure 7-38) allows the user to specify an auxiliary water temperature measurement.

Temp Name specifies the datapoint name for the temperature value returned by the sensor. If no temperature measurement is desired, **Temp Name** should be blank.

Precision specifies the precision (number of decimal places) in the temperature value to be used in computations and displays.

Units (radio buttons) specifies the units in which the sensor returns temperature values.

If **Use Stage Cmd** is selected, the water temperature measurement uses the same SDI command and command timing as is used for the stage measurement – the user only needs to specify the field number of the returned water temperature data in **Field #**. In this case, burst averaging for temperatures is also determined by the settings on the **Stage** tab.

If **Use Stage Cmd** is deselected, a separate SDI command, command timing, and burst averaging (see **Stage** tab, above) for the water temperature measurement can be specified.

7.4.5.1.2 Display screen

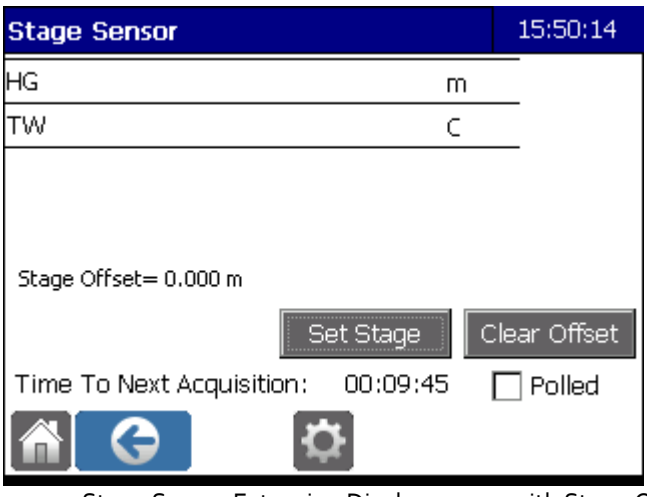


Figure 7-39: Stage Sensor Extension Display screen with Stage Offset

This screen displays the current readings from the stage sensor.

Set Stage and **Clear Offset** enable the user to set the stage offset value. They are present when a Stage datapoint is configured on the **Stage** tab. For information on setting the stage offset, see section 7.4.5.5.

7.4.5.2 SDI-PT (Pressure Transducer)

Figure 7-40 shows the **Pressure Transducer Sensor Set-up** screen (**Sensor** tab), with default settings, that is provided by the SDI-PT (pressure transducer) sensor extension. The SDI-PT extension is always present in the datalogger. This extension predefines a stage datapoint of HG and an auxiliary water temperature datapoint of TW. The SDI-PT extension is generic so knowledge of the specific attached pressure transducer sensor's SDI commands may be required to appropriately configure it. Refer to the sensor's operating manual for sensor command and data details.

7.4.5.2.1 Set-up screen

7.4.5.2.1.1 Sensor tab

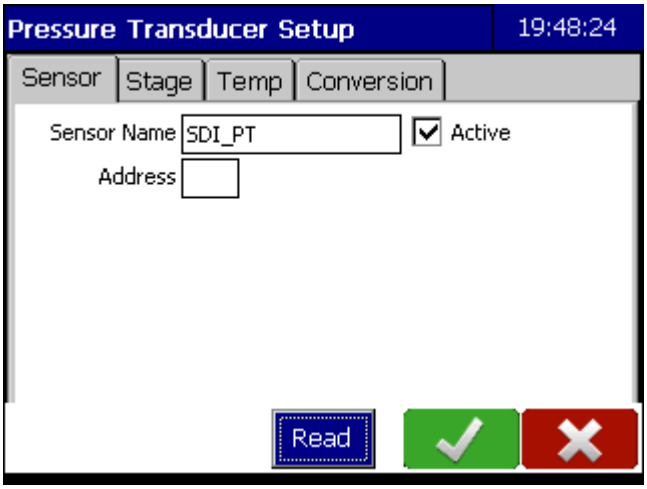


Figure 7-40: Pressure Transducer Set-up screen – Sensor tab

This tab is identical to the **Stage Sensor Set-up** screen – **Sensor** tab.

7.4.5.2.1.2 Stage tab

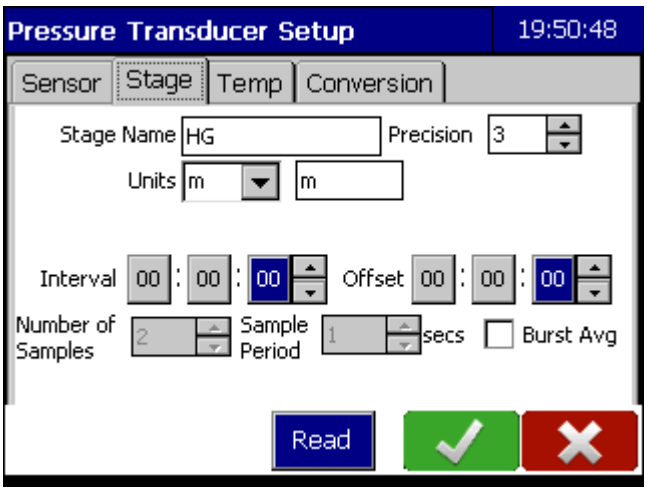


Figure 7-41: Pressure Transducer Set-up screen – Stage tab

This tab is identical to the **Stage Sensor Set-up** screen – **Stage** tab except that there are now two different selections for **Units**.

Units (dropdown) specifies the units in which the sensor returns the stage values

Units (textbox) specifies the units label used in displays of the stage values

7.4.5.2.1.3 Temp tab

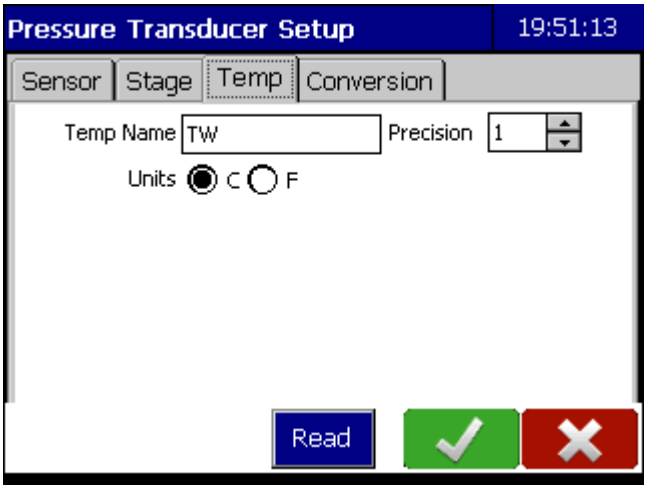


Figure 7-42: Pressure Transducer Set-up screen – Temp tab

The **Temp** tab (Figure 7-42) allows the user to specify an auxiliary water temperature measurement.

Temp Name specifies the datapoint name for the temperature value returned by the sensor. If no temperature measurement is desired, **Temp Name** should be blank.

Precision specifies the precision (number of decimal places) in the temperature value to be used in computations and displays.

Units (radio buttons) specifies the units in which the sensor returns temperature values.

7.4.5.2.1.4 Conversion tab

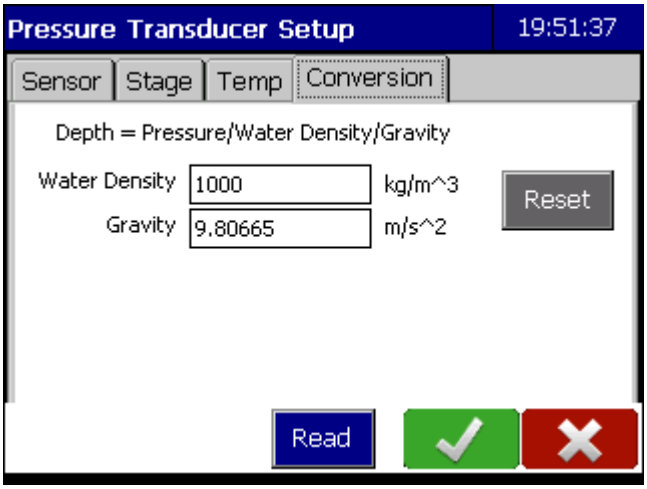


Figure 7-43: Pressure Transducer Set-up screen – Conversion tab

The **Pressure Transducer Set-up** screen – **Conversion** tab (Figure 7-43) sets up the equation used to convert measured water pressure to estimated water depth. This is the value given to the datapoint defined on the **Stage** tab.

The equation used is:

$$d = \frac{p}{\rho g}$$

where

d is estimated water depth,

p is measured water pressure,

ρ is water density (**Water**; default 1000 kg/m^3),

g is the local acceleration of gravity (**Gravity**; default 9.80665 m/s^2),

Reset resets the parameters on this screen to their default values.

7.4.5.2.2 Display screen

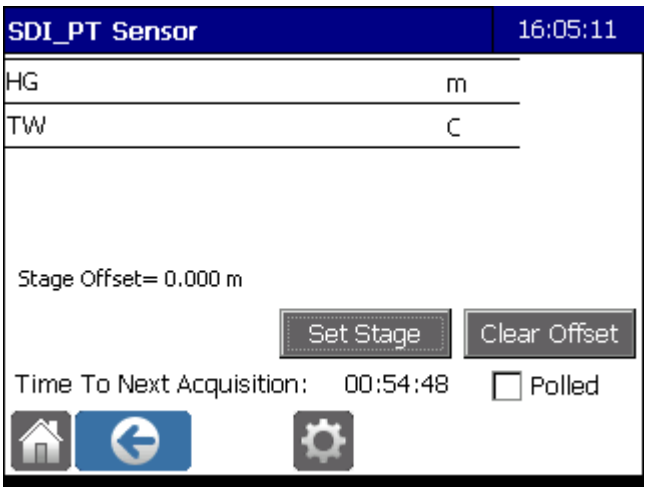


Figure 7-44: Pressure Transducer display screen

This screen displays the current readings from the stage sensor.

Set Stage and **Clear Offset** enable the user to set the stage offset value. They are present when a Stage datapoint is configured on the **Stage** tab. For information on setting the stage offset, see section 7.4.5.5.

7.4.5.3 Shaft Encoder

Figure 7-45 shows the **Shaft Encoder Set-up** screen (**Sensor** tab), with default settings, that is provided by the Shaft (shaft encoder) sensor extension. The Shaft extension is always present in the datalogger. This extension predefines a stage datapoint of HG. The Shaft extension is generic so knowledge of the specific attached shaft encoder sensor's SDI commands may be required to appropriately configure it. Refer to the sensor's operating manual for sensor command and data details.

7.4.5.3.1 Set-up screen

7.4.5.3.1.1 Sensor tab

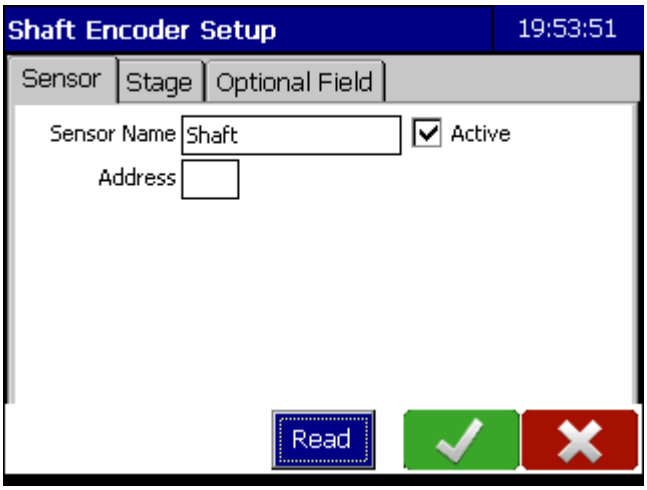


Figure 7-45: Shaft Encoder Set-up screen – Sensor tab

This tab is identical to the **Stage Sensor Set-up** screen – **Sensor** tab.

7.4.5.3.1.2 Stage tab

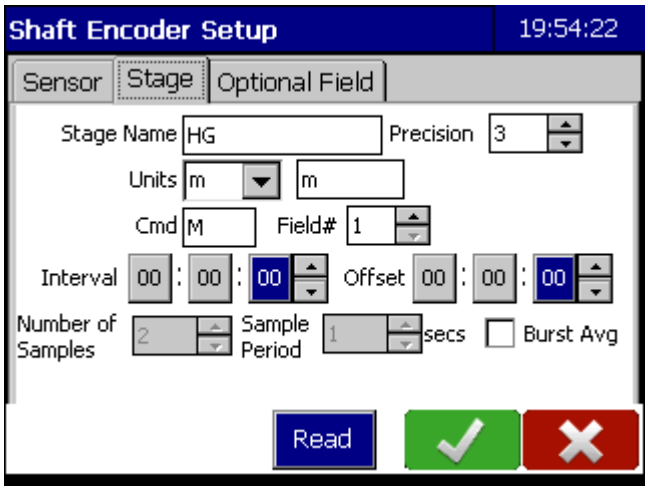


Figure 7-46: Shaft Encoder Set-up screen – Stage tab

This tab is identical to the **Stage Sensor Set-up** screen – **Stage** tab except that there are now two different selections for **Units**.

Units (dropdown) specifies the units in which the sensor returns the stage values

Units (textbox) specifies the units label used in displays of the stage values

7.4.5.3.1.3 Optional Field tab

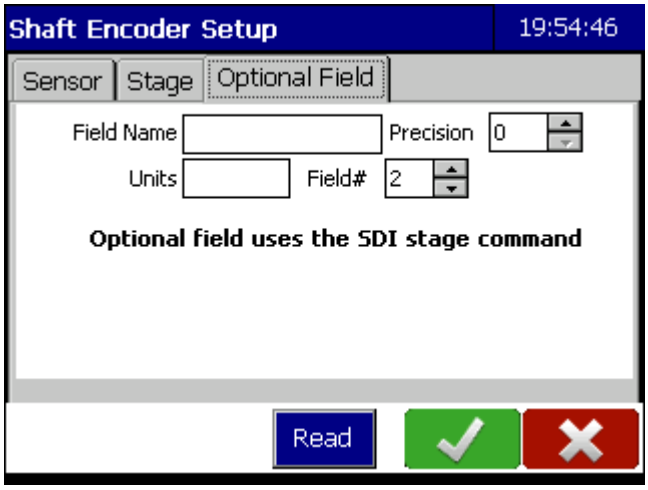


Figure 7-47: Shaft Encoder Set-up screen – Optional Field tab

The **Optional Field** tab enables the user to define a datalogger datapoint for any field returned by the shaft encoder. A typical use is to collect the error code (field #5) from measurement responses.

Field Name specifies the datapoint name.

Precision specifies the precision (number of decimal places) in the field value to be used in computations and displays.

Units specifies the units in which the sensor returns the field value.

Field # specifies field number to extract from the data returned by the sensor.

7.4.5.3.2 Display screen

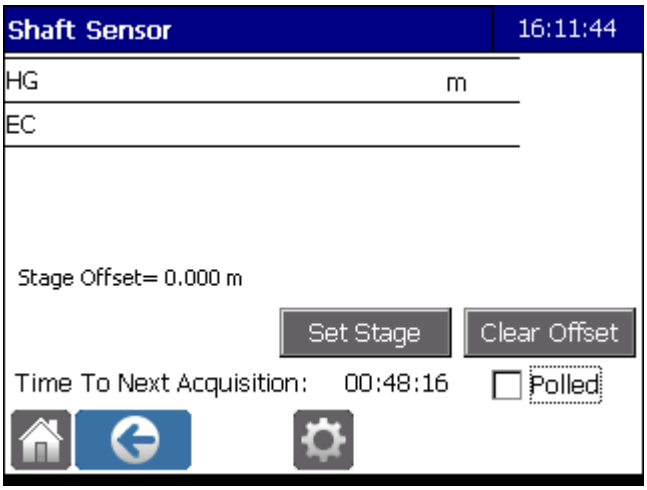


Figure 7-48: Shaft Encoder Sensor display screen

This screen displays the current readings from the stage sensor.

Set Stage and **Clear Offset** enable the user to set the stage offset value. They are present when a Stage datapoint is configured on the **Stage** tab. For information on setting the stage offset, see section 7.4.5.5.

7.4.5.4 Tavis

Figure 7-49 shows the **Tavis Sensor Setup** screen, with default values, provided by the Tavis sensor extension for the Tavis DISI-1200 Water Stage sensor. To configure the Tavis sensor, the user only needs to set the module's **SDI Address** and when the sensor is read (**Interval** and **Offset** times). If desired, the user can change the default names and units.

Once the sensor has been configured and is operating, the **Set Stage** and **Clear Offset** buttons (see Figure 7-52) can be used to match the current sensor reading to the site's staff gauge and to clear a previously set water level offset.

7.4.5.4.1 Set-up screen

7.4.5.4.1.1 Sensor tab

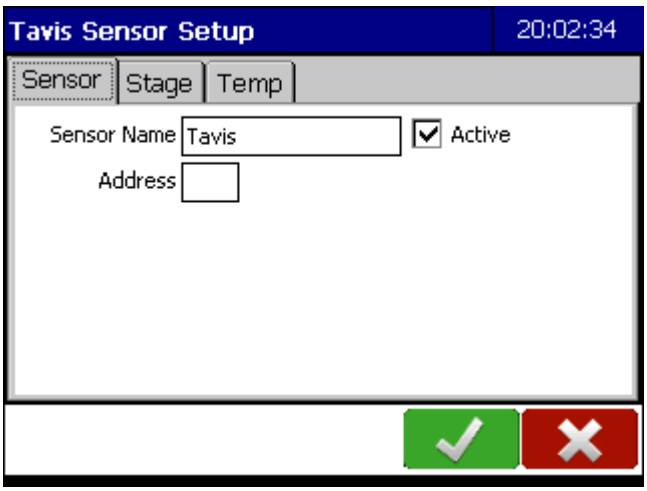


Figure 7-49: Tavis Sensor Setup screen - Sensor tab

This tab is identical to the **Stage Sensor Set-up** screen – **Sensor** tab.

7.4.5.4.1.2 Stage tab

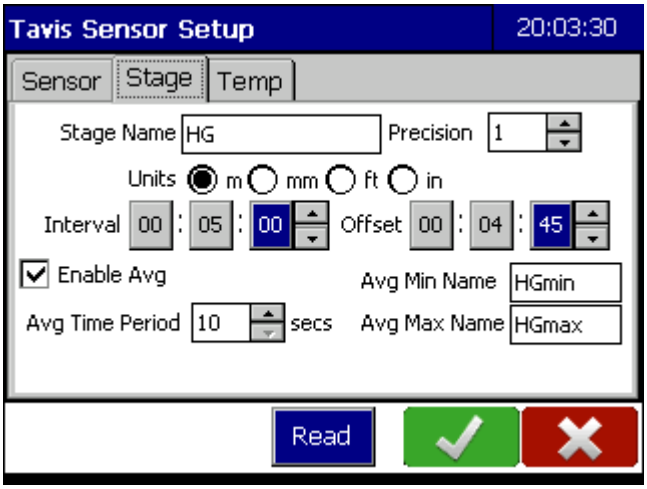


Figure 7-50: Tavis Sensor Setup screen - Stage tab

The **Stage** tab controls the stage (water depth) function of the sensor.

Stage Name specifies the datapoint name for the stage value returned by the sensor.

Precision specifies the precision (number of decimal places) in the stage value to be used in computations and displays.

Units (radio buttons) specifies the units in which the sensor returns stage values.

Interval and **Offset** specify the schedule of stage readings on this sensor.

Enable Avg activates the averaging feature for stage values. Averaging causes average, minimum, and maximum values over a specified time period (beginning at the time of measurement) to be returned. Averaging does not

apply to temperature values. When **Enable Avg** is checked, stage values are averaged according the following parameters.

Avg Time Period specifies the time period over which the stage (depth) average, minimum and maximum are computed.

Avg Min Name specifies the name for the minimum value datapoint.

Avg Max Name specifies the name for the maximum value datapoint.

7.4.5.4.1.3 Temp tab

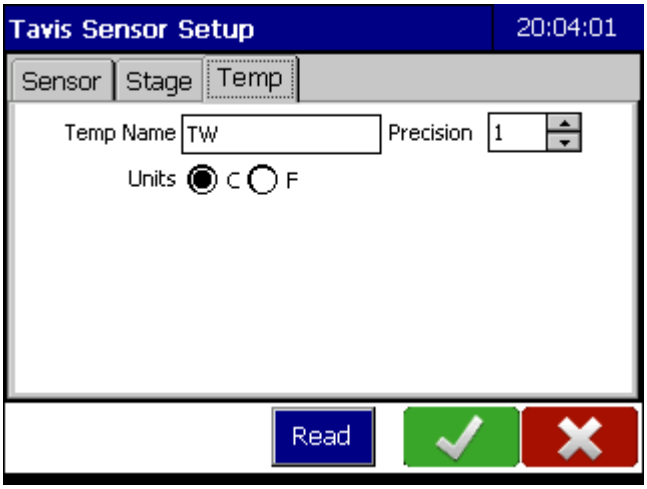


Figure 7-51: Tavis Sensor Setup screen - Temp tab

The **Temp** tab controls the temperature measurement function of the Tavis sensor.

Temp Name specifies the name of the datapoint for temperature values from the sensor.

Precision specifies the number of decimal places that temperature values are displayed and processed with.

Units specifies the units that temperature values are measured in.

7.4.5.4.2 Display screen

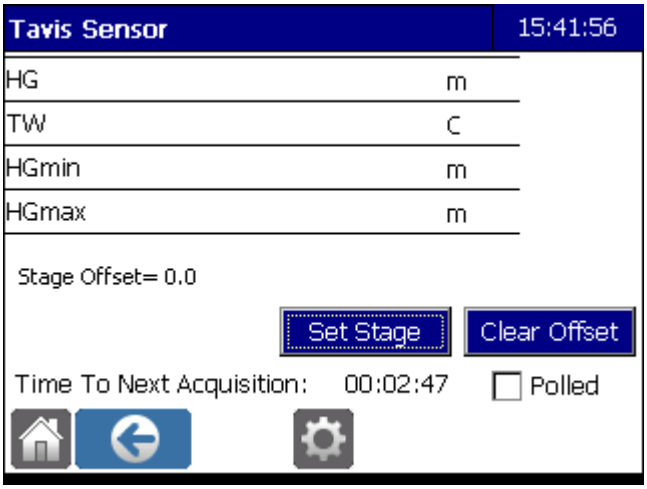


Figure 7-52: Tavis Sensor Extension Display screen

This screen displays the current readings from the stage sensor.

Set Stage and **Clear Offset** enable the user to set the stage offset value. They are present when a Stage datapoint is configured on the **Stage** tab. For information on setting the stage offset, see section 7.4.5.5.

Refer to the Tavis sensor's operating manual for sensor details.

7.4.5.5 Setting and clearing the stage offset in stage sensors

Once the sensor has been configured and is operating, the **Set Stage** and **Clear Offset** buttons (see Figure 7-53) can be used. They are present only if a stage datapoint has been configured on the **Stage** tab.

Use **Set Stage** to match the current sensor reading to the site's staff gauge. Use **Clear Offset** to clear a previously set water level offset. These functions are available in the Stage, SDI-PT, Shaft Encoder, and Tavis sensor extensions.

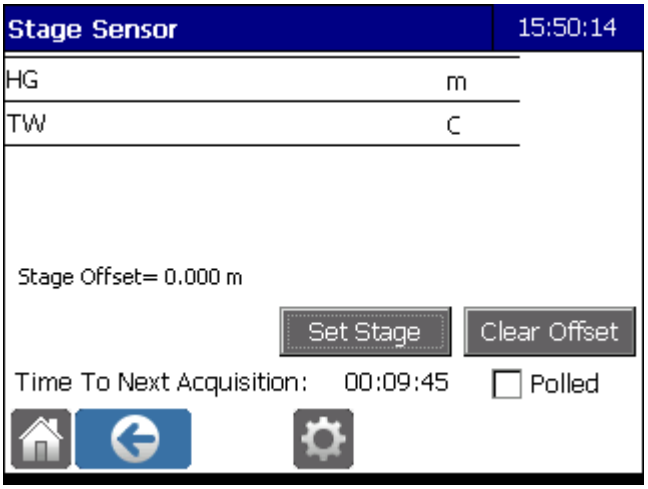


Figure 7-53: Stage Sensor Display screen

There are two methods available for setting the stage offset in the datalogger.

If the staff gauge reading is known the user can press **Set Stage**, enter the staff gauge value, and then the datalogger calculates and appropriate stage offset from the current stage sensor reading.

If the staff gauge reading is unknown, the user can select the **Polled** checkbox and then press **Set Stage** to begin a series of stage sensor readings while the user checks the staff gauge reading. After checking the staff gauge reading and returning to the datalogger, the user can select the appropriate time stamped stage sensor reading and then enter the staff gauge value so that the datalogger can calculate the appropriate stage offset.

A Polled mode stage offset sequence follows:

1. Select the **Polled** checkbox and then press **Set**. The **Stage Polled Values** screen opens (Figure 7-54).

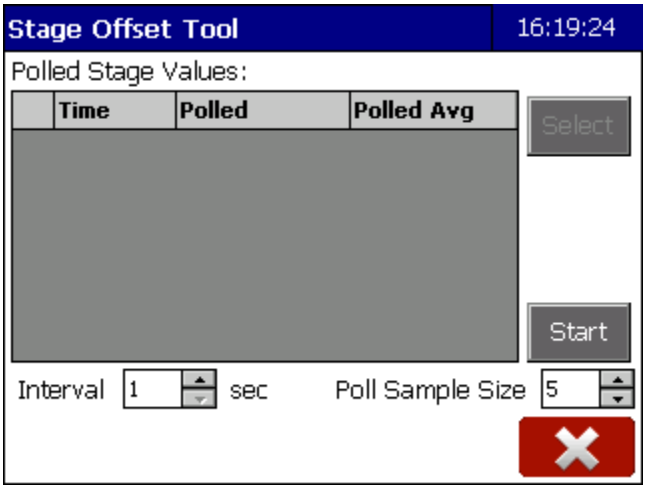


Figure 7-54: Stage Offset Tool screen (empty)

2. Set the stage sensor poll interval and sample size (for averaging) and then press **Start**. The datalogger starts to record stage sensor values, and the **Start** button is replaced by the **Stop** button.
3. Synchronize your watch to the datalogger time and go read the staff gauge. Note the time and the staff gauge reading.

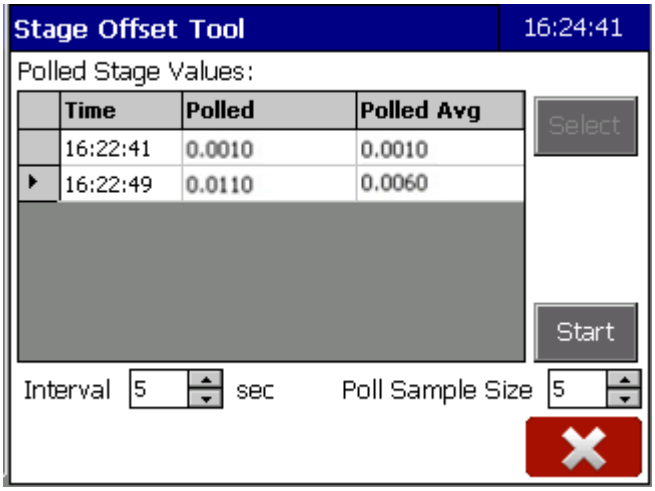


Figure 7-55: Stage Offset Tool screen (example data)

4. Press **Stop** after reading the staff gauge (Figure 7-55).

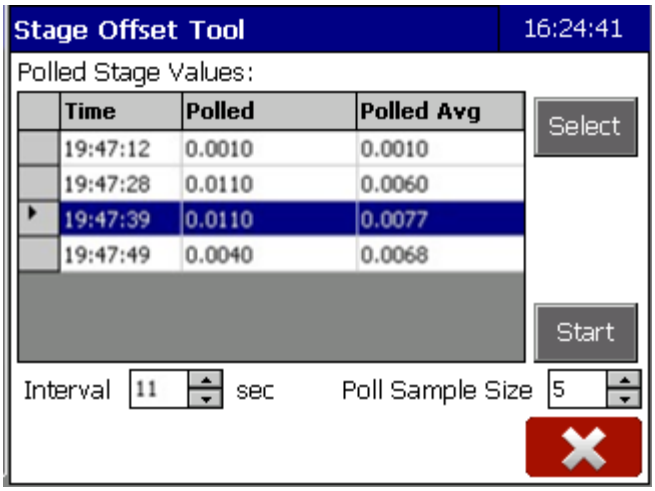


Figure 7-56: Stage Offset Tool screen (more example data)

5. Scroll through the stage sensor readings, highlight the reading which corresponds with the time of the staff gauge reading, and then press **Select** (Figure 7-56).

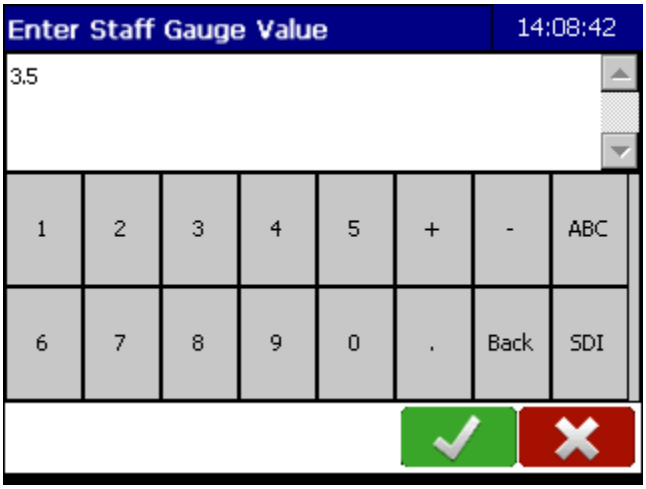


Figure 7-57: Stage Sensor Extension Staff Gauge Entry screen

6. Enter the staff gauge reading (Figure 7-57).

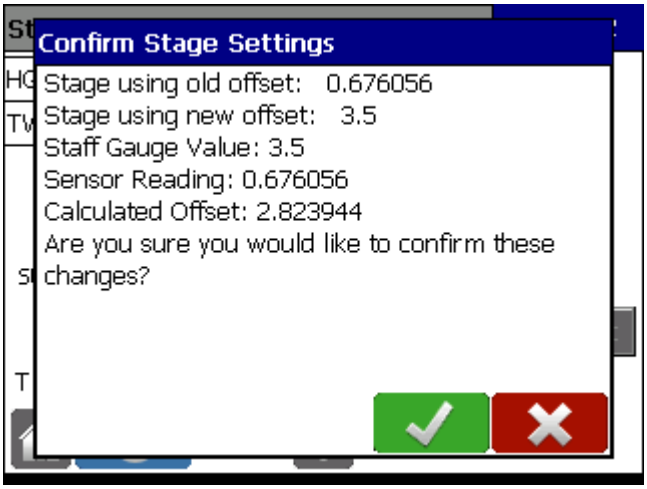


Figure 7-58: Stage Sensor Extension Stage Settings Confirmation screen

7. After entering the staff gauge reading the datalogger display the offset data and requests confirmation of the new stage offset calculation (Figure 7-58). Press **Yes** to accept the calculation. Press **No** to decline it and abort polled mode.
8. After accepting the stage settings, the stage sensor displays the adjusted stage value as well as the calculated stage offset (Figure 7-39).

Press **Clear** (Figure 7-39) to return the stage offset to zero.

7.4.5.6 SDI-AM

Figure 7-59 shows the **Analog Module Set-up** screen (**Sensor** tab), which is the top level set-up screen provided by the SDI-AM sensor extension for the FTS SDI-AM 4 channel analog module. The default name for this sensor is SDI_AM. Knowledge of the module's specific SDI commands is not required as all of the module's settings are encompassed in the SDI-AM sensor extension. The user needs to set the module's SDI address, to specify when the module is read (**Interval** and **Offset** times), and to provide names for the measured fields. Refer to the SDI-AM module operating manual, FTS number 700-SDI-AM, for SDI-AM operating details.

7.4.5.6.1 Set-up screen

7.4.5.6.1.1 Sensor tab

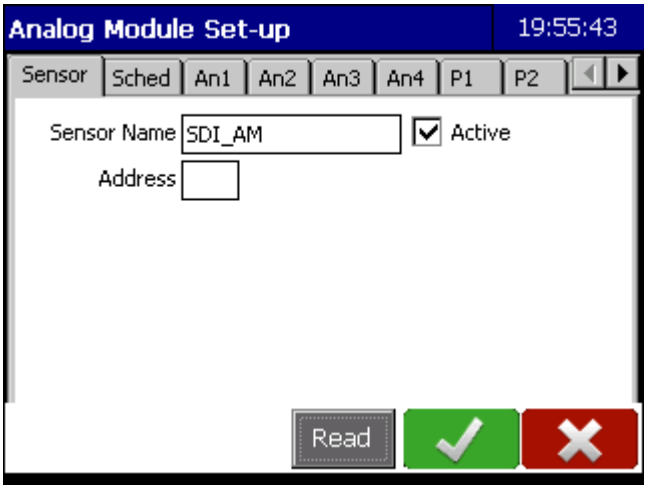


Figure 7-59: SDI-AM Analog Module Set-up screen -- Sensor tab

The **Sensor** tab contains basic information about the sensor: Enter **Sensor Name** and **Address** (address on the SDI bus), and select whether it is currently **Active**.

7.4.5.6.1.2 Sched tab

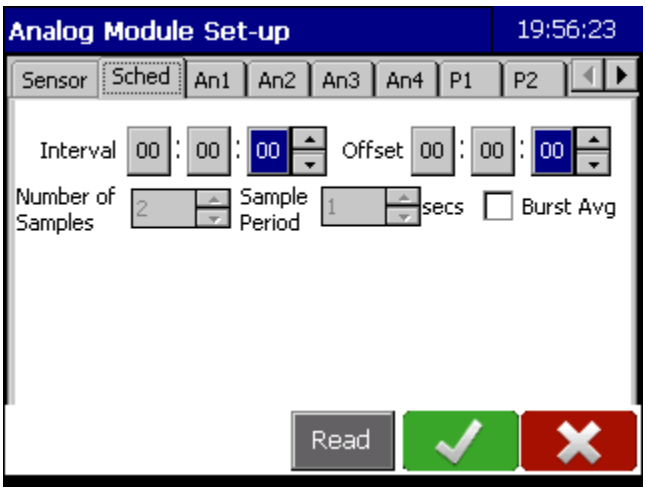


Figure 7-60: SDI-AM Analog Module Set-up screen -- Sched tab

Interval and **Offset** specify the schedule of stage readings on this sensor.

Burst Avg activates the burst averaging feature for stage values. A burst average is formed at each measurement event by collecting **Number of Samples** samples at intervals specified by **Sample Period**, and taking the average.

Number of Samples and **Sample Period** control burst averaging. They are enabled only when **Burst Avg** is selected.

7.4.5.6.1.3 Analog input settings

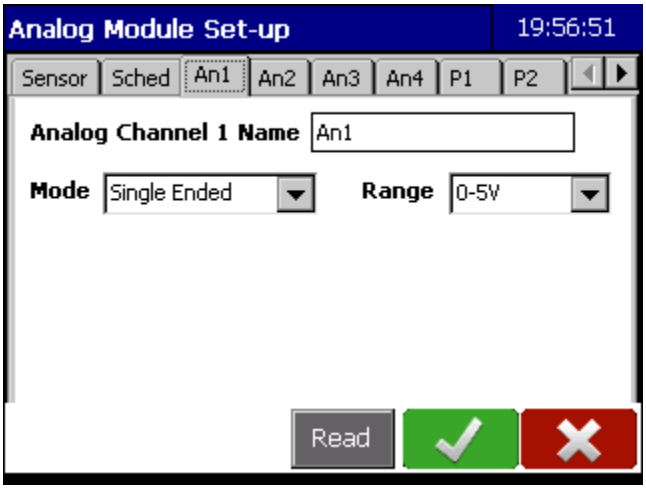


Figure 7-61: SDI-AM Analog Module Set-up screen - Analog Channel tab

On the **Analog Module Set-up** screen, four tabs – **An1, An2, An3,** and **An4** – are used to configure the module's four analog input channels (Figure 7-61). The name, operating mode, and input voltage range are independently set for each of the four channels. Analog channel values are reported in millivolts (mV) or milliamps (mA) depending on the channel's **Mode** setting. The text entered in the **Analog Channel Name** textbox is used as a datapoint in the datalogger.

7.4.5.6.1.4 Power output settings

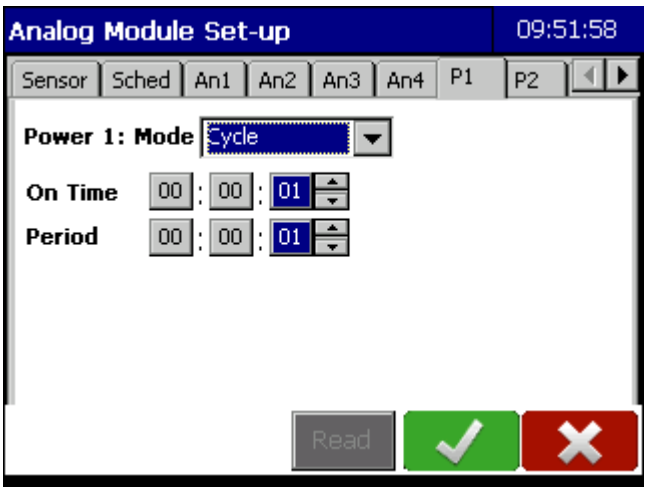


Figure 7-62: SDI-AM Analog Module Set-up screen - Power Output tab

On the **Analog Module Set-up** screen, two tabs – **P1** and **P2** – are used to configure the module's two power outputs (see Figure 7-62). The two tabs are only used to configure the SDI-AM module power outputs – the power outputs do not appear as datapoints in the datalogger. The power outputs can be configured as:

Disabled	always off
Enabled	always on
Warm-up	only on for the specified time at the start of any analog channel measurement
Cycle	continually power cycle with the specified **On Time** and **Period**

7.4.5.6.1.5 Excitation output settings

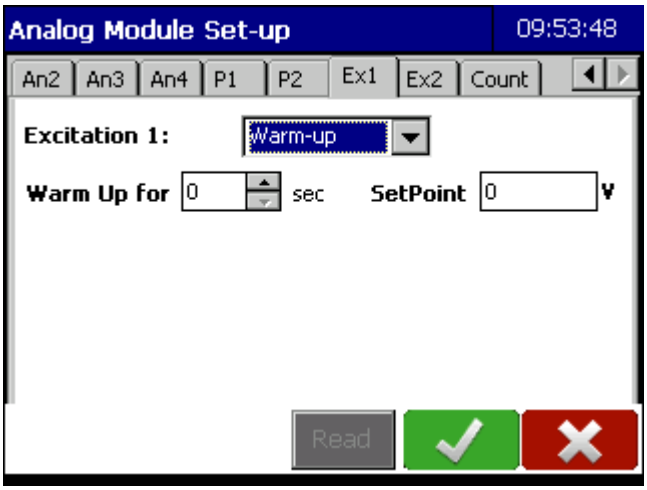


Figure 7-63: SDI-AM Analog Module Set-up screen - Excitation Output tab

On the **Analog Module Set-up** screen, two tabs – **Ex1** and **Ex2** – are used to configure the module's two excitation outputs (see Figure 7-63). The two tabs are only used to control the SDI-AM module excitation outputs – the excitation outputs do not appear as datapoints in the datalogger. The voltage of each excitation output is independently set and each output can be configured as:

Disabled	always turned-off,
Enabled	always turned-on,
Warm-up	turned-on the specified time (in seconds) at the start of any analog channel measurement and then turned-off after the measurement is complete

The **SetPoint** textbox specifies the excitation output voltage (range of 0.000 to 5.000 Volts).

7.4.5.6.1.6 Counter settings

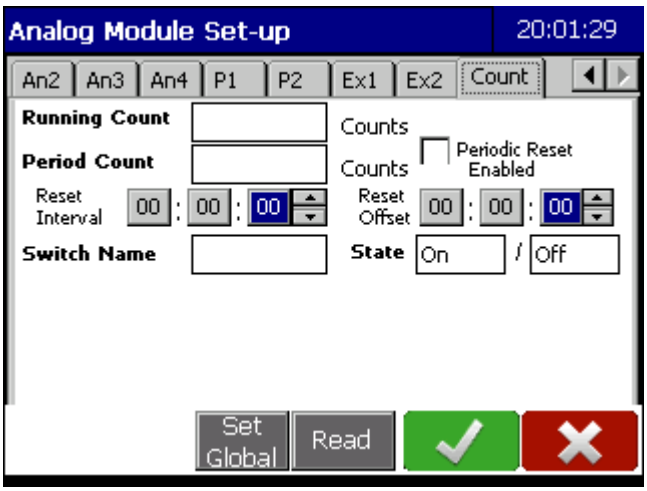


Figure 7-64: SDI-AM Analog Module Set-up screen - Counter tab

On the **Analog Module Set-up** screen, the **Count** tab is used to configure the module's counter input (see Figure 7-64). The SDI-AM counter input can report a running count, a period count, and a counter input state (Switch Name). The **Set Global** button is used to set the running counter to an absolute value.

The running counter is enabled as a datapoint in the datalogger by entering a unique name in the **Running Count** textbox.

The period counter is enabled as a datapoint in the datalogger by entering a unique name in the **Periodic Count** textbox. Additionally the period counter can be configured to be periodically set to zero by ticking the **Periodic Reset Enabled** checkbox and specifying the **Reset Interval** and **Offset**. Resetting the period counter does not affect the running counter.

The counter input state is enabled as a datapoint in the datalogger by entering a unique name in the **Switch Name** textbox. The units for the switch name can be specified by the user. In the Figure, **Switch Name** default units are "On" for a high level of '1' (3 V) and "Off" for a low level of '0' (0 V).

7.4.5.6.2 Display screen

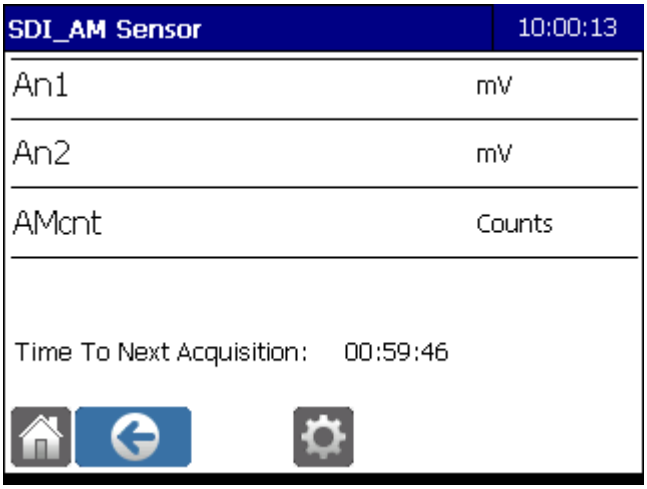


Figure 7-65: SDI-AM Sensor display screen

This screen displays the current readings from the SDI-AM sensor. Note that only configured analog input and count datapoints are displayed; also, the power and excitation configurations do not define datapoints and so are not shown in any way here.

7.4.5.7 SDI-RMY

Figure 7-66 shows the **RM Young Set-up** screen (**Sensor** tab), the SDI-RMY sensor extension for the FTS SDI-WS-RMY wind sensor with smart SDI-12 interface. Knowledge of the module's specific SDI commands is not required as all of the module's settings are encompassed in the SDI-RMY sensor extension.

The following subsections describe how to configure the various features of the SDI-RMY sensor. For SDI-RMY operating details, refer to the SDI-RMY module operating manual, FTS number 700-SDI-RMY.

7.4.5.7.1 Set-up screen

7.4.5.7.1.1 Sensor tab

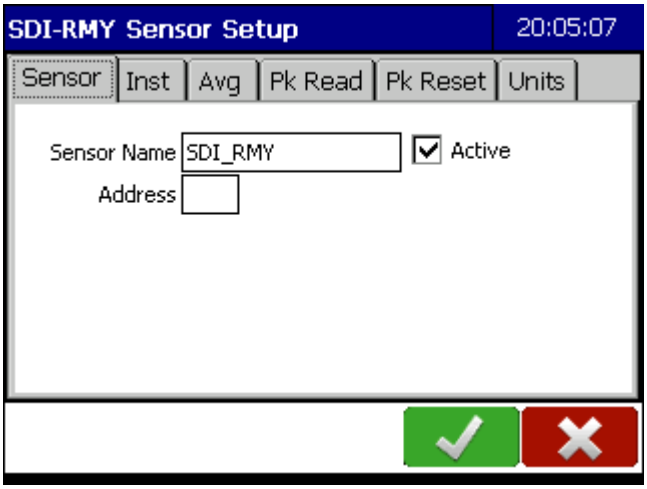


Figure 7-66: RM Young Setup **screen –** Sensor tab

Ensure the **Active** box is checked.

Default settings are as shown.

7.4.5.7.1.2 Inst tab - Instantaneous wind speed and direction

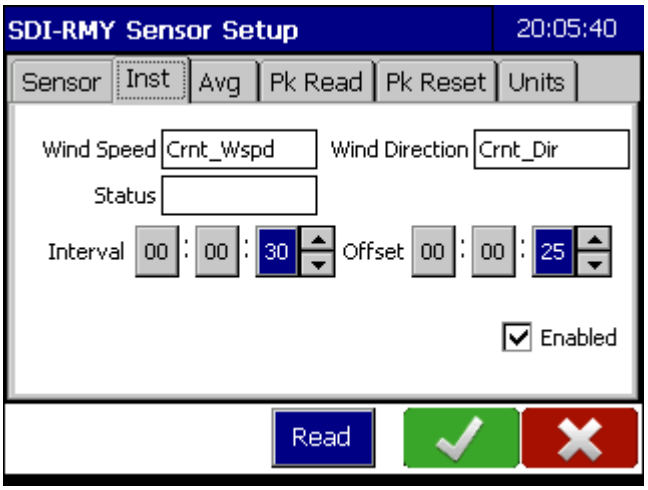


Figure 7-67: **RM Young Setup** screen – **Inst** tab

The SDI-RMY sensor can measure instantaneous wind speed and direction.

Specify if instantaneous readings are enabled (**Enabled**).

Provide datapoint names for the measured instantaneous fields (**Wind Speed**, **Wind Direction** and **Status**).

Specify when the module is read (**Interval** and **Offset** times) for these fields.

Default settings are as shown.

7.4.5.7.1.3 Avg tab - Scalar and/or vector averaging settings

The sensor can compute scalar and vector average wind speeds. (For details, see SDI-RMY module operating manual, FTS number 700-SDI-RMY.)

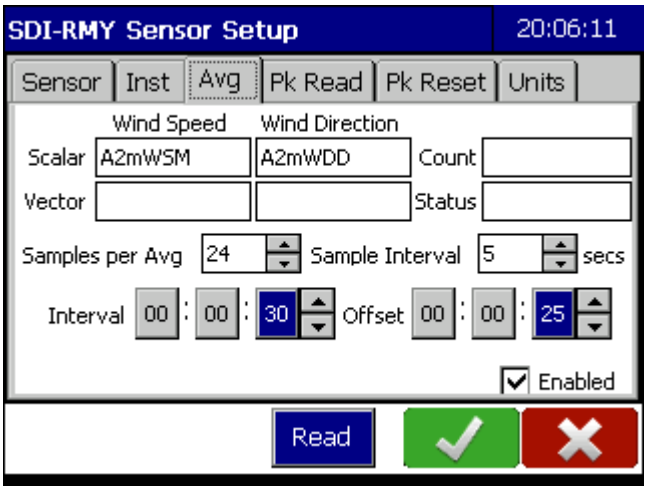


Figure 7-68: **RM Young Setup** screen – **Avg** tab

Specify if average readings are enabled (**Enabled**)

Provide datapoint names for the measured scalar and vector averaging fields (**Scalar** and **Vector Wind Speed** and **Wind Direction**, **Count**, and **Status**). Set values for the controlling scalar and vector averaging: number of samples per average (**Samples per Avg**) and the interval between averaged samples(**Sample Interval**).

Specify when the module is read (**Interval** and **Offset** times) for these fields.

Default settings are as shown

7.4.5.7.1.4 Pk Read tab - Peak readings settings

The sensor can calculate and return two different values for peak wind speed, with direction. These two values differ only depending on when they are reset to zero. (A peak is the highest wind speed detected since the last peak reset, together the corresponding direction. For details, see SDI-RMY module operating manual, FTS number 700-SDI-RMY.)

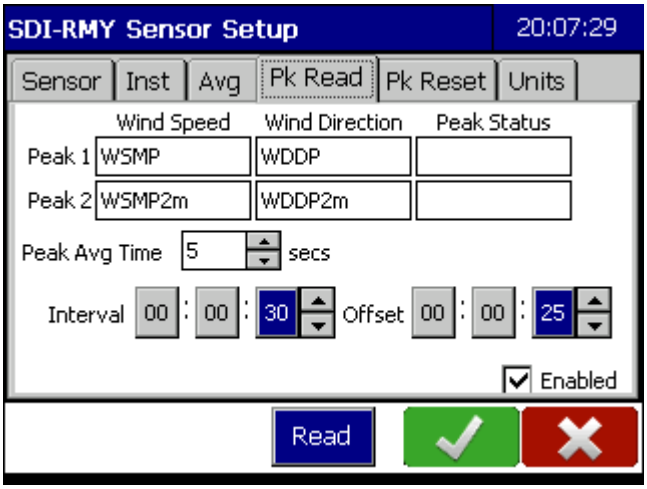


Figure 7-69: **RM Young Setup** screen – **Pk Read** tab

Specify if peak readings are enabled (**Enabled**).

Provide names for the measured peak readings fields (**Peak 1** and **Peak 2 Wind Speed**, **Wind Direction** and **Peak Status**). Set the time over which peaks are averaged (**Peak Avg Time**).

Specify when the module is read (**Interval** and **Offset** times) for these fields.

7.4.5.7.1.5 Pk Reset tab - Peak reset intervals settings

Computations for the two peak values can be reset to zero on independent schedules.(For details, see SDI-RMY module operating manual, FTS number 700-SDI-RMY.)

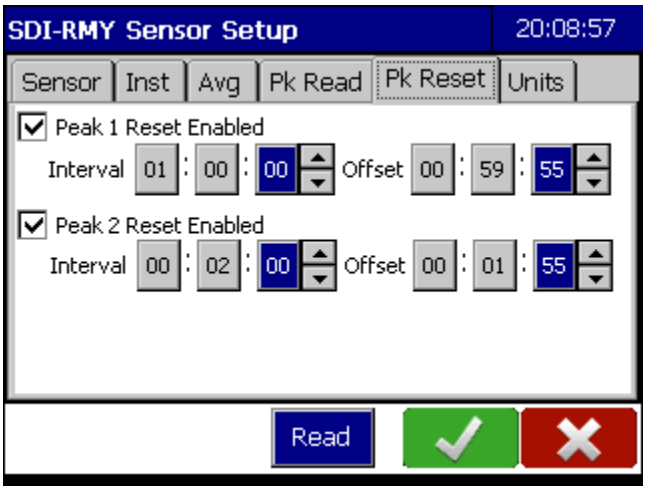


Figure 7-70: **RM Young Setup** screen – **Pk Reset** tab

Specify whether each peak is to be reset periodically (**Peak 1 Reset Enabled**, **Peak 2 Reset Enabled**), and if yes, provide its reset schedule (**Interval** and **Offset** times).

7.4.5.7.1.6 Units tab

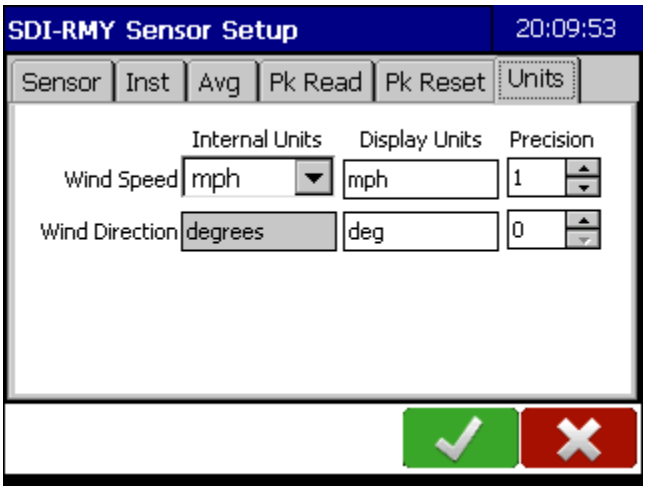


Figure 7-71: **RM Young Setup** screen – **Units** tab

Select the internal sensor wind speed units (**Internal Units**).

Define the unit labels (**Wind Speed Units** and **Wind Direction Units**). You can choose to use the factory wind speed units (m/s, kph, mph, knots) or define your own. Only the **Internal Units** have any effect on the actual measurements. The **Display Units** text is used only to label displays of measurement values.

Define the precision of the measurements (**Wind Speed Precision** and **Wind Direction Precision**).

7.4.5.7.2 SDI-RMY sensor display screen

Once the SDI-RMY sensor extension has been installed, the **RM Young Sensor** display screen is available from the **Sensors** screen.

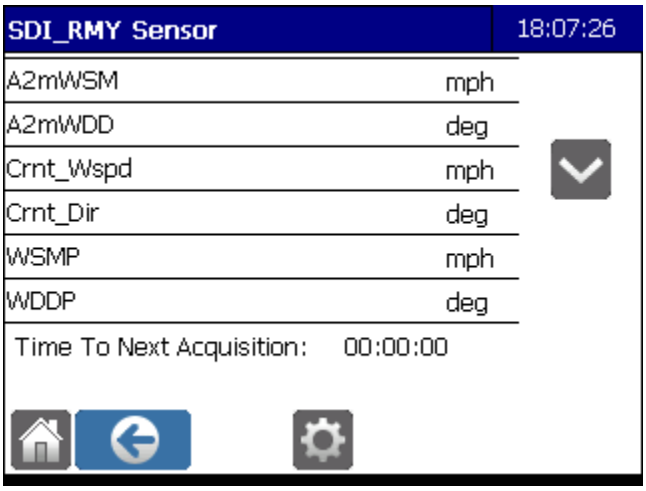


Figure 7-72: **RM Young Sensor** display screen

The **Setup** button opens the **RM Young Setup** screen (described above). **PgUp** and **PgDwn** buttons scroll the display of SDI-RMY variables with their current values and defined label units, which often can run to more than a single screen can hold.

7.4.6 Deleting sensors

To delete a sensor from the datalogger, go to the **Sensors** screen and then press the **Delete** button. A list of available sensors appears (as shown in Figure 7-73). Select the sensor to delete. The user is prompted to confirm the deletion of the sensor.

Figure 7-73: Delete Sensor screen

7.5 SDI sensors

The **SDI-12** icon displays a mapping of the SDI sensors currently configured in the datalogger to the SDI sensors actually connected to the datalogger. In Figure 7-74, the **Defined** table is a list of sensors configured in the datalogger while the **Detected** table is a list of sensors that the datalogger found connected to one of its SDI ports.

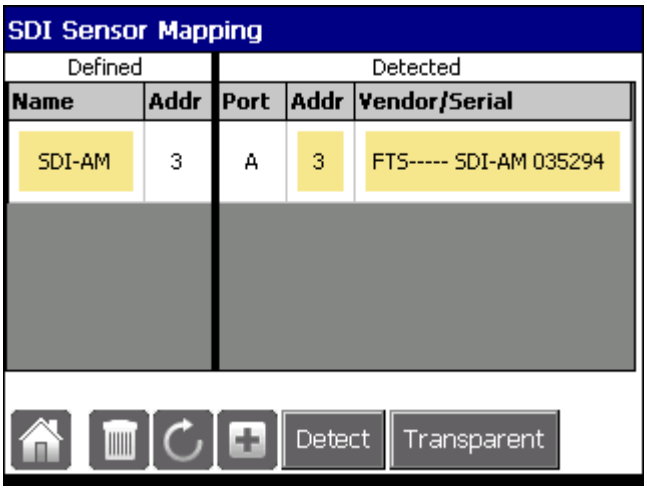


Figure 7-74: SDI Sensor Mapping screen

7.5.1 Detecting SDI sensors

The user can connect SDI sensors to either of the datalogger SDI ports and then press **Detect** on the **SDI Sensor Mapping** screen (**Home > SDI Sensors**) to begin the sensor definition process. Detection automatically determines whether SDI sensors are connected. For each detected SDI sensor, the datalogger displays on which SDI port the sensor was detected (**SDI A**, **SDI B**, **SDI C**, or **SDI D**), the sensor's address, and the information string returned from the sensor (see Figure 7-76).

When **Detect** is pressed, the **SDI Detect** dialog box appears (Figure 7-75).

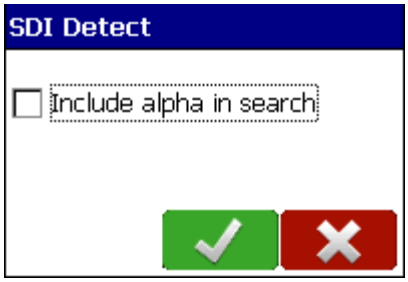


Figure 7-75: SDI Detect dialog

The **Include alpha in search** check box should only be checked if you suspect you have an SDI sensor with a non-numeric address (i.e. an address that isn't 0 to 9). The detection process takes longer if the check box is enabled since the datalogger must now also search for sensors at the non-numeric addresses (addresses a to z and A to Z).

Figure 7-76 shows that an SDI-AM module has been defined in the datalogger at address 7 and the datalogger has detected two SDI sensors (one sensor on **SDI A** and one sensor on **SDI B**); furthermore, both detected sensors have the same SDI address (address = 3)! The Axiom H2 datalogger can resolve SDI sensors with the

same address as long as these sensors are not connected on the same SDI port; however, it is good practice to give each SDI sensor a unique address.

> **IMPORTANT!** To avoid potential problems, each SDI sensor connected to the datalogger must have a unique SDI address.

The red background on several of the fields in Figure 7-76 indicates that there are problems which need to be resolved. The problems in Figure 7-76 are:

1. Two detected sensors both have the same SDI address (3).
2. An SDI-AM module was detected at address 3 but the sensor configuration is not defined.
3. A Gill Ultrasonic wind sensor was detected at address 3 but a configuration is not defined.
4. The SDI-AM module defined at address 7 could not be found.

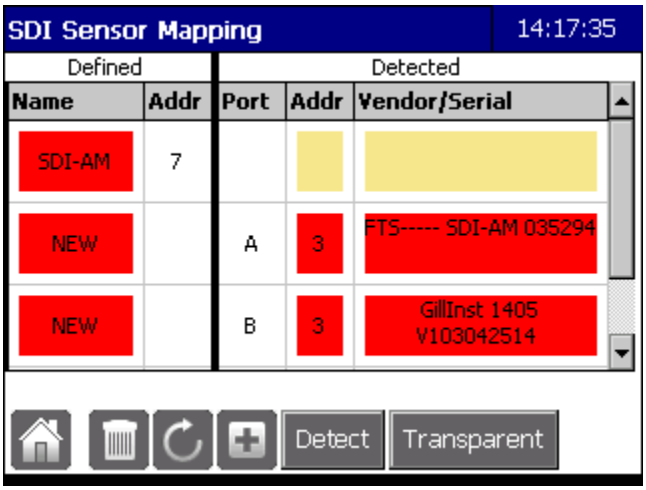


Figure 7-76: Detected SDI Sensors

7.5.2 SDI sensor problem resolution

The main problem in Figure 7-76 is that there are two sensors with the same SDI address. The address of one sensor **must** be changed. Secondary is mapping the defined SDI-AM module (address 7) to the detected SDI-AM module (address 3). Lastly, is creating a new sensor configuration for the detected Gill sensor.

7.5.2.1 Changing a detected SDI sensor's address

Press the **Detected Addr** field of the Gill sensor to change the address of the Gill sensor detected at address 3. The **Change Sensor Address** dialog box appears (see Figure 7-77), which allows the user to select a new address for the sensor. Press **OK** to write the new address to the sensor. The datalogger uses the SDI change address command to write the new address to the sensor. The datalogger displays an error message if the sensors address cannot be changed. Figure 7-78 shows the Gill sensor with the newly selected address of 4.

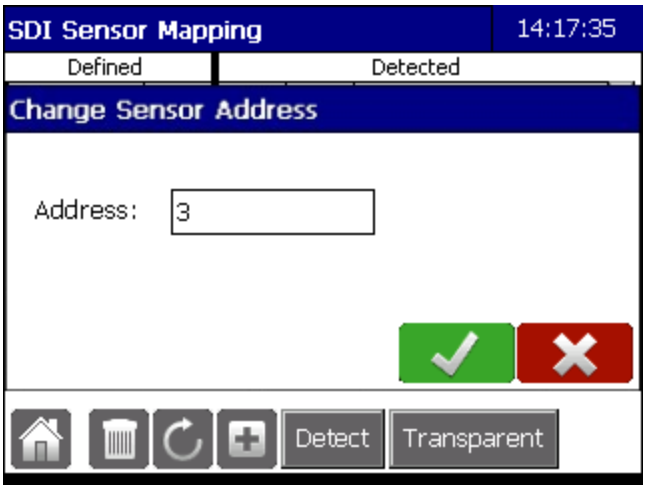


Figure 7-77: Change SDI Sensor Address

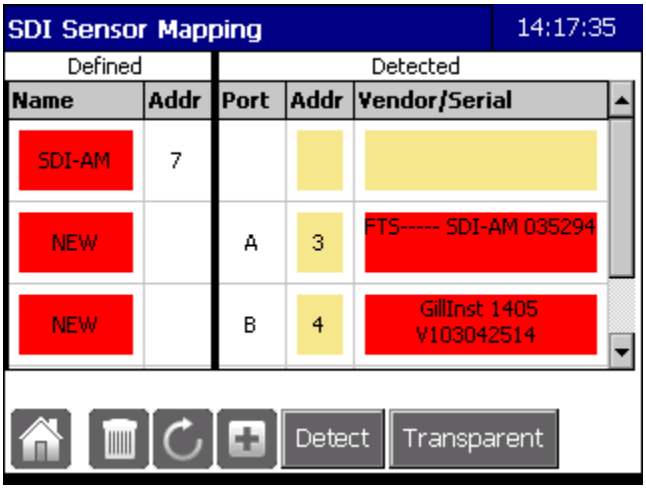


Figure 7-78: Resolved SDI Address Conflict

The sensors detected by the datalogger no longer have an address conflict so the **Detected Addr** fields now appear with a yellow background signifying no more address conflict problems.

7.5.2.2 Mapping SDI sensors

Touch the **Vendor/Serial** field of the detected SDI-AM module ("FTS ------ SDI-AM 035294") to match the defined and detected SDI-AM module. The **Sensor Mapping** dialog box appears (see Figure 7-79), which allows the user to select which defined sensor is mapped to the detected sensor. Choose the SDI-AM sensor from the drop down menu and then press **OK** to complete the mapping (see Figure 7-80).

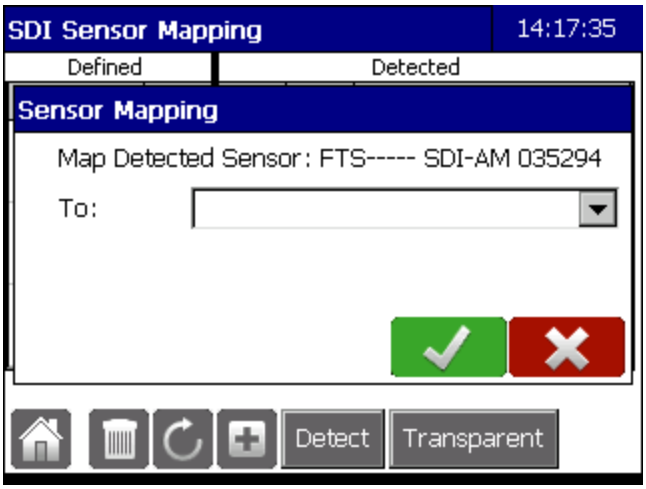


Figure 7-79: SDI Sensor Mapping

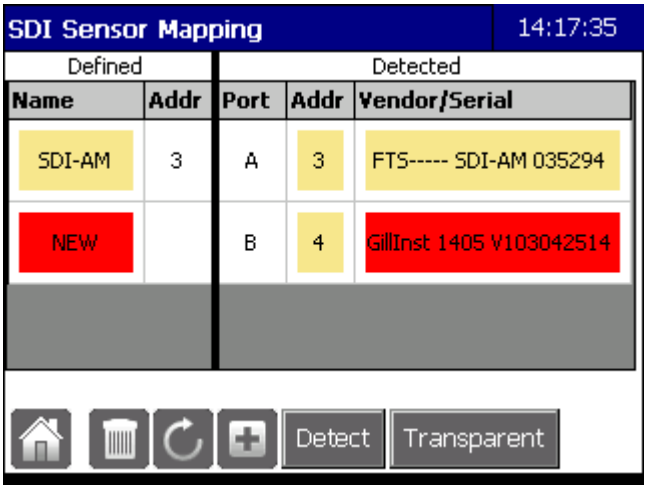


Figure 7-80: Mapped SDI Sensor

Alternately, the user could have edited the address of the defined SDI-AM module (originally at address 7) to match that of the detected module (address 3) and then pressed **Refresh** to achieve the same result. Another option is to create a new sensor configuration for the SDI-AM module detected at address 3 and then either delete the SDI-AM defined at address 7 or connect a second SDI-AM module whose address is 7.

7.5.2.3 Configuring a new SDI sensor

The **NEW** field in the **Defined** list's **Name** column or the **Add** button allows the user to create a new SDI sensor configuration. **New** will appear if there is an associated detected sensor. Pressing **NEW** causes different responses depending on whether the sensor is 'recognized' (see Recognized SDI Sensor section) by the datalogger. Press **Add** if there is no associated detected sensor. The user can then define a new sensor based on the standard SDI sensor or one of the datalogger's built-in sensor extensions.

If **NEW** has a red background (meaning there is an associated detected sensor), and the sensor is not 'recognized' by the datalogger, the user can define a new sensor based on the standard SDI sensor or one of the datalogger's built-in sensor extensions. In this case the sensor's SDI address is populated in whichever SDI style sensor was selected.

If **NEW** has a red background (meaning there is an associated detected sensor), and the sensor is 'recognized' by the datalogger, then the datalogger automaticallys select the appropriate sensor definition and populate the detected sensors SDI address.

7.5.3 Recognized SDI sensors

Several sensors can be automatically recognized by the datalogger. The Axiom H2 has built-in support for SDI sensors manufactured by FTS as well as several sensors from other manufacturers. To have a sensor recognized, the user must first use **Detect** on the **SDI Sensor** screen (see Figure 7-74) to detect the sensor and then press the corresponding **NEW** field for the detected sensor (see Figure 7-80) to configure the sensor.

7.5.3.1 FTS manufactured sensors

There are two sensors manufactured by FTS which can be recognized by the datalogger.

7.5.3.1.1 SDI-AM 4 channel analog input module

When the datalogger recognizes an SDI-AM module, the datalogger uses the SDI-AM sensor extension (see Figure 7-61) to configure the module.

Refer to the SDI-AM sensor extension section for SDI-AM module configuration details.

7.5.3.1.2 DTS-12 turbidity sensor

When the datalogger recognizes a DTS-12 turbidity sensor, the datalogger uses the following configuration for the DTS-12.

Sensor Name: DTS-12

Command: M1 (sensor does not wipe its window prior to the measurement)

Field name	Field #	Precision	Units
TurbMeanNw	1	1	NTU
TurbVarNw	2	2	
TurbMedNw	3	1	NTU
TurbBesNw	4	1	NTU
TurbMinNw	5	1	NTU
TurbMaxNw	6	1	NTU
WatTempNw	7	1	C

Command: M2 (sensor does a wipe of the its window prior to the measurement)

Field name	Field #	Precision	Units
TurbMeanWw	1	1	NTU
TurbVarWw	2	2	
TurbMedWw	3	1	NTU
TurbBesWw	4	1	NTU
TurbMinWw	5	1	NTU
TurbMaxWw	6	1	NTU
WatTempWw	7	1	C

The user needs to specify measurement **Interval** and **Offset** values for the M1 and M2 commands.

Refer to the sensor's operating manual (FTS document 700-DTS-12) for configuration details.

7.5.3.2 Other sensors

The following sensors, made by manufacturers other than FTS, can also be recognized by the datalogger.

7.5.3.2.1 Gill instruments windsonic

The datalogger uses the following configuration when a Gill Windsonic Wind Speed and Direction Sensor is recognized.

Sensor Name: Gill

Command: M

Field name	Field #	Precision	Units
UWD	1	0	deg
UWS	2	1	m/s
UWStatus1	3	0	

Command: M1

Field name	Field #	Precision	Units
UWNS	1	1	m/s
UWEW	2	1	m/s
UWStatus2	3	0	

The user needs to specify a measurement **Interval** and an **Offset** value for the M and M1 commands.

Refer to the sensor's operating manual for configuration details.

7.5.3.2.2 Tavis corporation DISI-1200 water stage sensor

When the datalogger recognizes a Tavis DISI-1200 stage sensor, the datalogger uses the Tavis sensor extension (see section 0) to configure the sensor.

Refer to the sensor's operating manual for configuration details.

7.5.3.2.3 GEMS sensor

When the datalogger recognizes a GEMS 9500 series pressure transducer, the datalogger uses its built-in Stage sensor extension (see section 7.4.5.1) to configure the sensor.

Refer to the sensor's operating manual for configuration details.

7.5.3.2.4 Sutron barometric pressure sensor

The datalogger uses the following configuration when a `Sutron ACCUBAR® Barometric Pressure` Sensor is recognized.

Sensor Name: Sutron

Command: M

Field name	Field #	Precision	Units
BP	1	1	

The user needs to specify a measurement **Interval** and **Offset** value for the M command.

Refer to the sensor's operating manual for configuration details.

7.5.4 SDI transparent mode

The **Transparent** button at the bottom of the **SDI Sensors Screen** allows the user to send SDI commands on the datalogger's SDI ports (see Figure 7-81). The user must select from the **Port** drop down menu the datalogger port on which they wish to communicate. Also, to use this feature, the user must have knowledge of the sensor's SDI commands as well as the SDI command syntax.

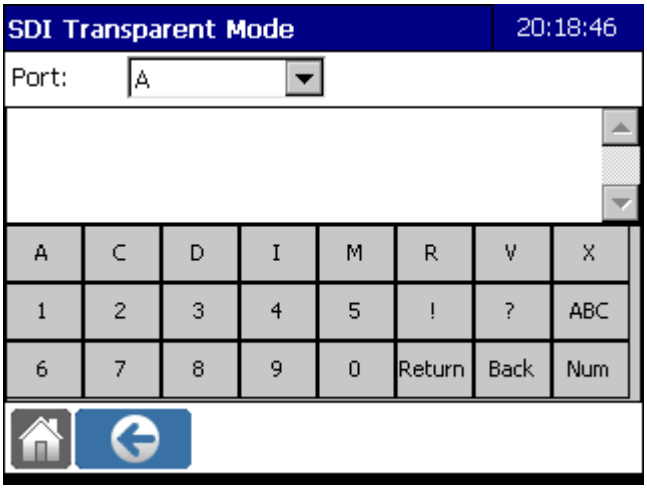


Figure 7-81: SDI Transparent Mode screen

Commands are sent to the specified port when the '!' character is entered. **ABC** and **NUM** can be used to display alternate keypads for entering command characters not shown on the SDI keypad.

WARNING: When you send an SDI command which configures a device, you are circumventing the datalogger's user interface and the datalogger does not know about the changed configuration. The new configuration is not reflected in the UI and the datalogger continues to function as if the previous configuration is still in force.

FTS strongly recommends against reconfiguring devices using SDI transparent mode. This mode is intended only for diagnostic purposes and its use should be limited to checking that a device is functioning and to retrieving information from it.

Several common SDI-12 version 1.3 commands follow.

7.5.4.1 *Notation for SDI commands*

In the end, SDI commands are just strings of characters sent to the SDI device. The format of those strings is important, of course, and to specify the format of SDI commands we use different typefaces. All commands (and the replies from the device) are represented in a monospaced font, thus. Different parts of a command are represented with variants on this text format.

Item	Meaning	Text representation
Command literal	Part of a command that must be reproduced literally as it appears;	**x**
Command parameter	Part of a command that must be filled in with an appropriate value	*data*

7.5.4.2 *Common SDI commands*

7.5.4.2.1 Address Query

This command requests the address of the SDI sensor.

C/R	String	Note
Cmd	**? !**	request the (single) device on this bus to report its address
Resp	**0**	the sensor is configured for address 0 **Note:** only one SDI device can be connected to the bus when using this command

7.5.4.2.2 Acknowledge Active

This command queries whether a sensor is present on the SDI bus at the specified address.

C/R	String	Note
Cmd	**0 !**	request the device at address 0 to confirm it is active
Resp	**0**	a device is active at address 0

7.5.4.2.3 Change Address

This command changes a sensor's SDI address.

C/R	String	Note
Cmd	**0A3!**	change the address of the device at SDI address 0 to 3
Resp	**3**	device address (response confirms change)

7.5.4.2.4 Send Identification

This command requests detailed identification information from the addressed sensor.

C/R	String		
Cmd	**3I!**		
Resp	**313FTS-----WTMP-v134567**	**3**	device SDI address
		13	compatible with SDI-12 version 1.3
		FTS	manufacturer's identifier
		WTMP	sensor model
		-v1	version 1 of sensor firmware
		34567	sensor serial number

7.5.4.2.5 Measurement command

Measurement, or "M," commands (**M**, **M1**, **M2**, …, **M9**) are used trigger a measurement on the addressed sensor. The sensor nots return data, instead the sensor returns the duration of the measurement (in seconds) as well as the number of data points returned by the measurement. The data is read using a subsequent Send Data ("D") command. Refer to the sensor's operating manual for specifics of each M command.

Command format	Explanation	
*a***M***b***!**	*a*	device SDI address
	M	command code (literal)
	b	command number (omitted, or digit 0 – 9)
	!	command terminator (literal)

Example

C/R	String		
Cmd	**3M!**	start a measurement on sensor at address 3	
Resp	**30038**	**3**	device SDI address
		003	measurement delay (until data is ready; seconds)
		8	number of data points returned

7.5.4.2.6 Send data command

Send Data, or "D," commands (**D0**, **D1**, **D2**, …, **D9**) request data generated by the preceding measurement command. A **D0** command is always the first command sent to request the data regardless of which measurement command was sent. If all of the data points are not retrieved by the **D0** command then a **D1** command must be sent followed by a **D2** command etc. etc., up to a **D9** command (see the example below).

Command format	Explanation	
*a***D***b***!**	*a*	device SDI address
	D	command code (literal)
	b	command number (digit 0 – 9)
	!	command terminator (literal)

Example

Following the measurement command example above (which indicated we are expecting 8 data points to be returned):

C/R	String	Note	
Cmd	**3D0!**	request first block of data points from sensor at address 3	
Resp	**3+709.315+0+459.4809+0+684.4509+0**	**3**	sensor SDI address is 3
		+709.315	data point 1
		+0	data point 2
		+459.4809	data point 3
		+0	data point 4
		+684.4509	data point 5
		+0	data point 6
Cmd	**3D1!**	request second block of data points from sensor at address 3	
Resp	**3+459.9899+2**	**3**	sensor SDI address is 3
		+459.9899	data point 7
		+2	data point 8

7.6 Processing

The **Processing** icon accesses screens that enable the user to define mathematical calculations and custom scripts to manipulate sensor measurements or other processes. . Figure 7-82 shows the **Processes** screen for a datalogger with no configured processes – the only option for the user is to add a new process. Normally the datalogger would be preconfigured by FTS and several processes may be visible on the **Processes** screen (see Figure 7-83).

Figure 7-82: Processes screen

Pressing the **Add** button allows the user to configure a new process for the datalogger. A process may have zero, one, or multiple inputs and outputs. In fact, it is possible for a process to have no inputs and no outputs. When configuring a process, the user can override the default output names. If an output name is left blank, then that output will not be available as a datapoint in the datalogger.

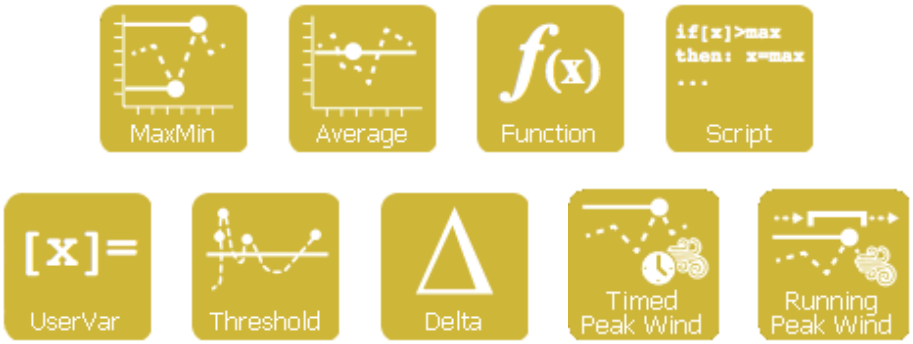


Figure 7-83: Process Icons

After a process has been configured, its icon appears on the **Processes** screen (Figure 7-82). The process displays its outputs when its icon is pressed.

> **IMPORTANT !** When a process is run, the latest available value for a process input is used for the process calculation.

When a process is run, the **latest available value** for a process input is used for the process calculation. Internal and dedicated sensors values are updated every second by the datalogger so that the last value for these sensors is never more than one second old; however, SDI sensors are only read on their programmed interval.

This means that, if an SDI sensor is only read every ten minutes, and if that SDI sensor's output is used as an input to a process, and if the process is calculated every minute, then the process uses the same SDI sensor output value for ten consecutive calculations.

7.6.1 Built-in date and time datapoints

In addition to datapoints defined by configuring sensors and processes, Axiom dataloggers also provide built-in datapoints that give users access to the current date and time. These can be useful when defining processes, particularly functions and scripts. The date and time datapoints are defined as follows:

Datapoint name	Description
TBD	TBD

7.6.2 Restrictions on process (datapoint) names

The same restrictions that apply to sensor datapoint names apply to process datapoint names. See section 7.4.1.

7.6.3 Maximum and minimum

Figure 7-84 shows the **Max Min Process Set-up** screen (**General Settings** tab).

The Max/Min process calculates the maximum and minimum value of the selected input. Datapoints for the maximum and minimum values can be created (default names of Max and Min) and can be time stamped with their respective time of occurrence.

7.6.3.1 Setup screen

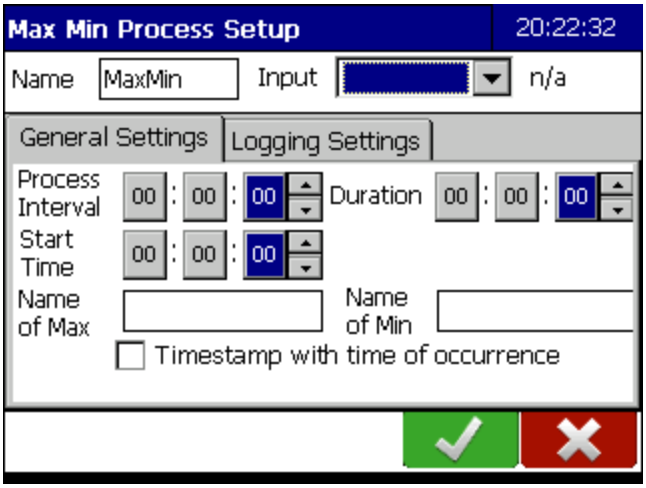


Figure 7-84: Max Min Process Set-up screen – General Settings tab

7.6.3.1.1 General Settings tab

Name specifies a name for the process, which must be unique amongst processes.

Input selects which of the available datapoints is to be the subject of the max-min computation in this process.

Name of Max and **Name of Min**, when non-blank, specify the names of datapoints that are created in the datalogger to hold the latest computed maximum and minimum values respectively. These datapoints are available just like any other datapoint in the datalogger, and can be used for logging, telemetry, further process computations, and other purposes.

Process Interval, **Start Time**, and **Duration** determine when and how the minimum and maximum values are computed.

Duration specifies the length of time that the maximum and minimum are calculated over. For example, if **Duration** is 60 minutes, then the process calculates the maximum and minimum of the **Input** value over 60-minute blocks of time.

Process Interval specifies how often the **Input** value is examined (sampled) to compute the maximum and minimum. Shorter intervals (more frequent samples) give more accurate results. **Process Interval** must be less than **Duration**, and should be chosen to result in enough samples to yield reliable maximum and minimum values over the **Duration** period. For example, with a **Duration** of 60 minutes, a reasonable **Process Interval** might be between 10 seconds and 5 minutes, causing the process to examine **Input** between 360 and 12 times (respectively) during each 60-minute computation block.

Start Time specifies the offset of the **Duration** cycles from midnight (00:00). The first cycle starts at midnight + **Start Time** each day, regardless of whether **Duration** is a whole fraction of 24 hours or not. However, note that the first sample (in the first set) is taken at midnight + **Start Time** + **Interval** (see explanation below).

The following diagram shows how these three parameters determine the sample sets over which minimum and maximum values are computed.

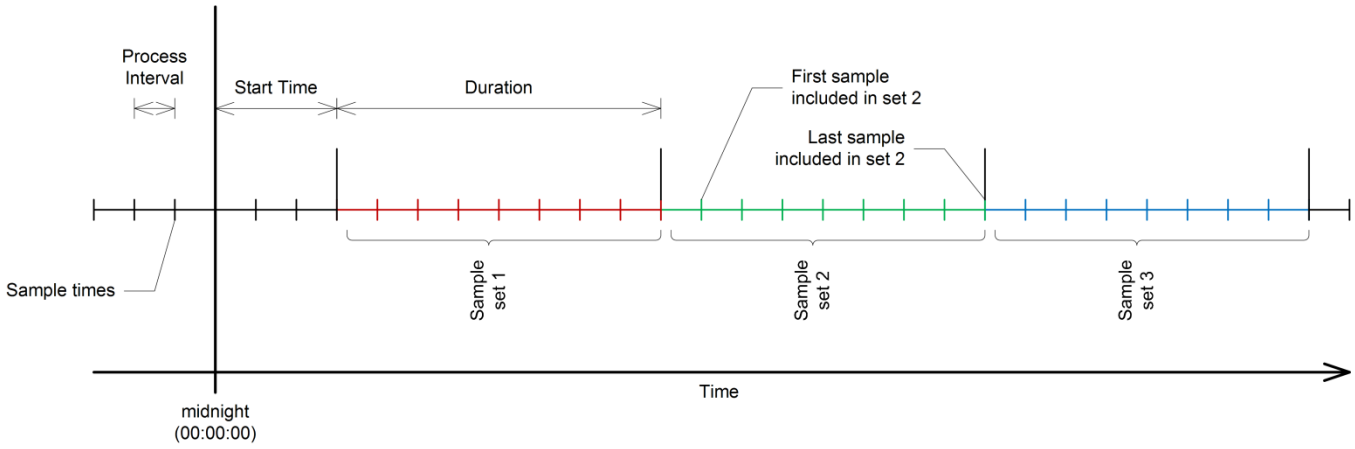


Figure 7-85: Max Min process sample set timings

In the above diagram:

- A "sample set" is a set of values over which one maximum and/or minimum is calculated.
- Sample set k contains samples occurring at times

$$t_{kj} = S + (k-1)D + jI$$

where

S is the value of **Start Time**,

D is the value of **Duration**,

I is the value of **Process Interval**,

$k = 1, \ldots, \frac{24\ \text{hr}}{D}$,

$j = 1, \ldots, \frac{D}{I}$

- Note that the first sample in each set does *not* occur on a **Duration** boundary, but is the first one *following* that boundary. If you wish the first sample to occur on a **Duration** boundary, then you must set **Start Time** to **Duration** – **Interval**.

Timestamp with time of occurrence determines how logged maximum and minimum datapoints are timestamped (see next section).

7.6.3.1.2 Logging Settings tab

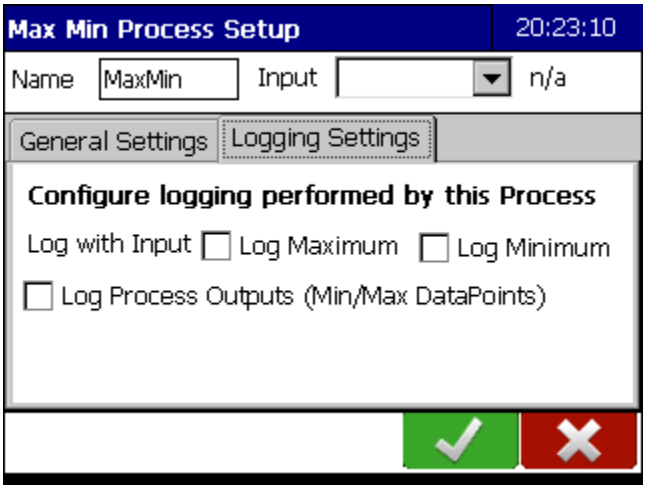


Figure 7-86: Max Min Logging Set-up screen – Logging Settings tab

The **Logging Settings** tab allows you to establish logging (in the same sense as other data logging established in separate logs) within the process configuration. Aside from convenience, this allows some special features to be incorporated that cannot be provided through ordinary logs.

Log Process Outputs determines whether the maximum and minimum datapoints specified on the General Settings tab are logged. If checked, these max/min datapoints (if given non-blank names) are written to the log at the end of each **Duration** period.

The **Log with Input** checkboxes specify whether maximum and/or minimum values are to be logged under the **Input** name. If checked, the **Input** value is logged with the computed maximum and/or minimum value. **Timestamp with time of occurrence** determines the timestamp of these logged values. When checked, the calculated minimum and maximum **Input** values are stamped with the time the minimum or maximum occurred. If the checkbox is not selected, then the minimums and maximums are be logged with the time of the end of the process interval.

7.6.3.2 Example

The following example (see Figure 7-87) shows a Max/Min process named **CaseMax** that calculates five minute maximum and minimum values for case temperature (**TCase**). Case temperature is sampled every 30 seconds and the maximum and minimum values are stored inline with the **TCase** values. Also, a maximum case temperature datapoint (**TCmax**) is created and logged at the time of occurrence during the process interval. **TCase** is logged every minute for the sample output data shown.

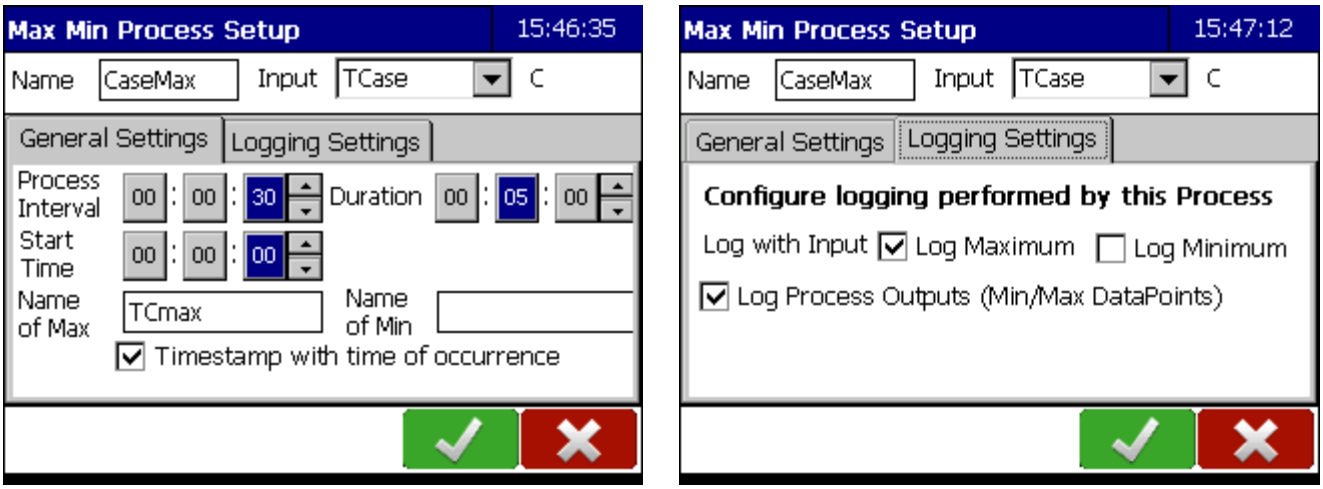


Figure 7-87: Max Min Process Example

Time	TCase	TCmax	
10:05:00	22.4		
10:04:30	22.6	22.6	← inline logged max & logged at time of occurrence
10:04:00	22.5		
10:03:00	22.4		
10:02:30	22.2		← inline logged min
10:02:00	22.3		
10:01:00	22.4		

7.6.4 Peak wind

The Peak Wind processes calculate the maximum wind speed and capture the corresponding wind direction.

There are two types of Peak Wind processes: **Timed Peak Wind** and **Running Peak Wind**. The difference between these two is that the Timed Peak Wind process is reset at the end of every period whereas the Running Peak Wind process uses a running "window" which discards old values to make room for new, but is never reset.

An example is as follows:

WS is the current wind speed read from the sensor, TPeak is the Timed Peak Process results and RPeak is the Running Peak Process results. TPeak resets every 20 seconds. RPeak has a window size of five samples. Both processes run every five seconds.

Time	WS	TPeak	RPeak	
10:00:00	0.7	0.7	0.7	
10:00:05	0.6	0.7	0.7	
10:00:10	0.74	0.74	0.74	← First Peak
10:00:15	0.5	0.74	0.74	
10:00:20	0.63	0.74	0.74	← TPeak Reset occurs (after sample is taken)
10:00:25	0.4	0.4	0.74	← TPeak is calculated only using 10:00:25; RPeak is now calculated on 10:00:05 to :25
10:00:30	0.44	0.44	0.74	← RPeak is now calculated on :10 to :30
10:00:35	0.35	0.44	0.63	← RPeak is now calculated on :15 to :35, so :20 is the new Peak.

NOTE: The Average process is a running average (is never reset), so it is recommended that the Running Peak Wind process be used in conjunction with the Average of Wind Speed.

7.6.4.1 Timed Peak Wind

Figure 7-88 shows the **Timed Peak Process Setup** screen, which is the set-up screen for the Timed Peak Wind process. The Timed Peak Wind process calculates the maximum wind speed direction *over a fixed duration of time* and captures the corresponding wind. If desired, datapoints for the **Peak Speed** and **Peak Direction** can be created (default names of tPeakSpeed and tPeakDirection). The **Log with Input** checkbox enables the peak values to be logged as entries with the selected input's data (similar to the Max/Min process).

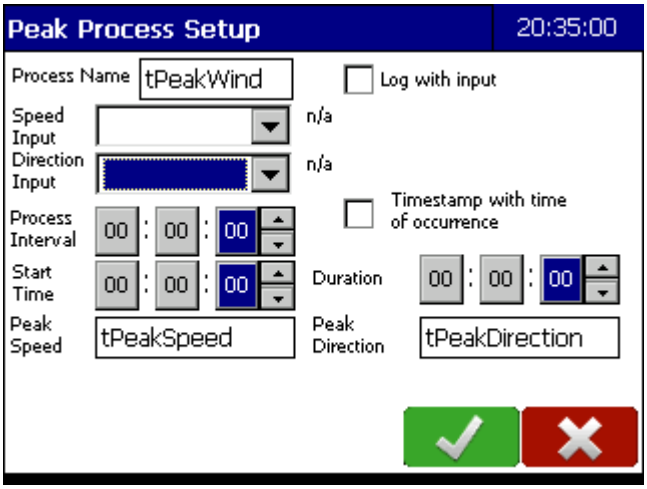


Figure 7-88: Timed Peak Process Setup screen

The user must select the desired input and specify the input's **Process Interval** (i.e., how often is the input read). The user must also specify the **Start Time** and **Duration** for the process. The process repeats continuously based on the **Start Time** and **Duration**.

7.6.4.2 Running Peak Wind

Figure 7-89 shows the **Running Peak Process Setup** screen, which is the set-up screen for the Running Peak Wind process. The Running Peak Wind process calculates the maximum wind speed *over a fixed number of samples* and captures the corresponding wind direction. If desired,

datapoints for the **Peak Speed** and **Peak Direction** can be created (default names of rPeakSpeed and rPeakDirection).

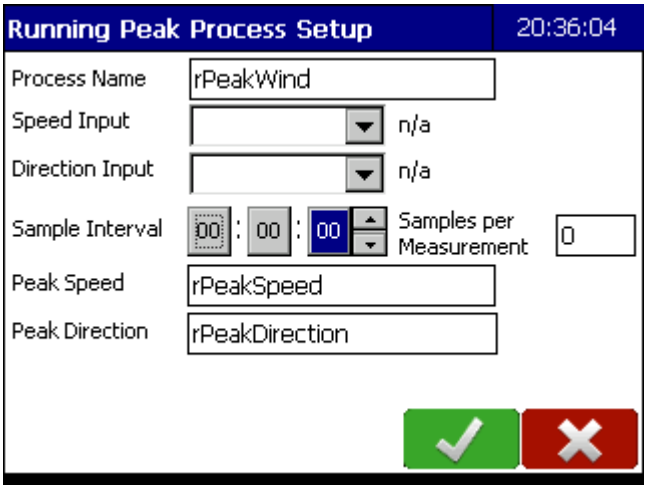


Figure 7-89: Peak Process Setup screen

The user must select the desired input and specify the input's **Sample Interval** (i.e., how often is the input read). The user must also specify the **Samples per Measurement** (i.e., the number of samples to keep in the window) for the process.

7.6.5 Delta

Figure 7-90 shows the **Delta Process Setup** screen. The Delta process calculates the difference of the selected Input's value over a time period. The user selects the desired input and specifies the input's **Process Interval** (how often is the input read). The user must also specify the **Start Time** and **Duration** for the process. The process repeats continuously based on the **Start Time** and **Duration**.

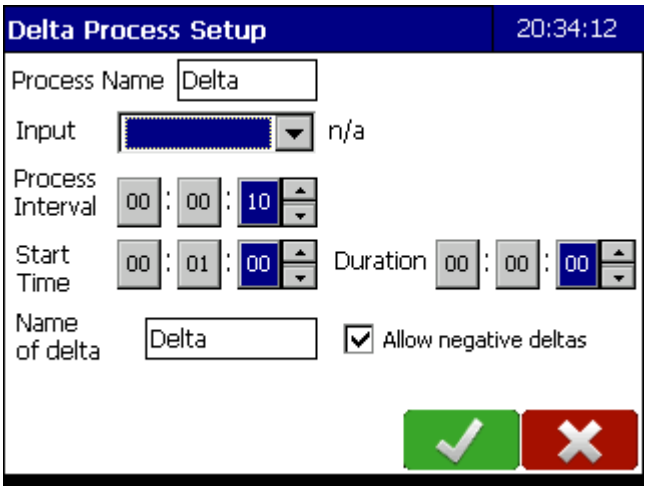


Figure 7-90: Delta Process Setup screen

7.6.6 Average

Figure 7-91 shows the **Average Process Setup** screen. The Average process calculates the mean, standard deviation, median, running maximum, and running minimum value of the selected input. The user selects the desired input and specifies the input's **Process Interval** (how

often is the input read) and the desired number of samples, **Samples per Measurement**, for the calculation.

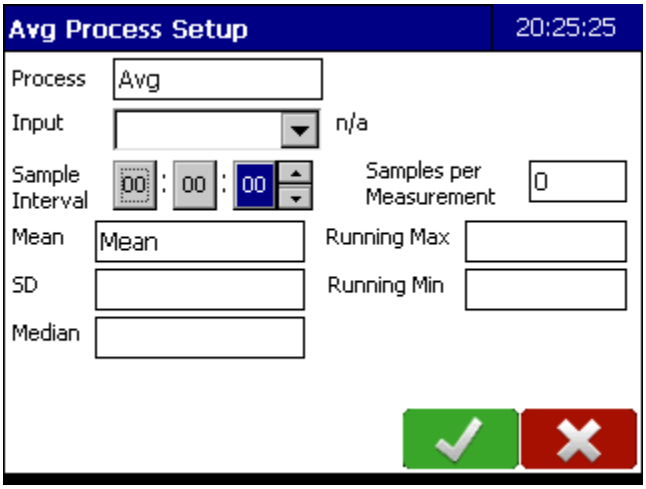


Figure 7-91: Average Process Setup screen

Figure 7-92 shows the Average process (named CaseAvg) set-up for a five minute case temperature (TCase) average (TCavg).

TCase is sampled every 10 sec. for 30 samples so: 10 sec. * 30 samples = 300 sec. = 5 min.

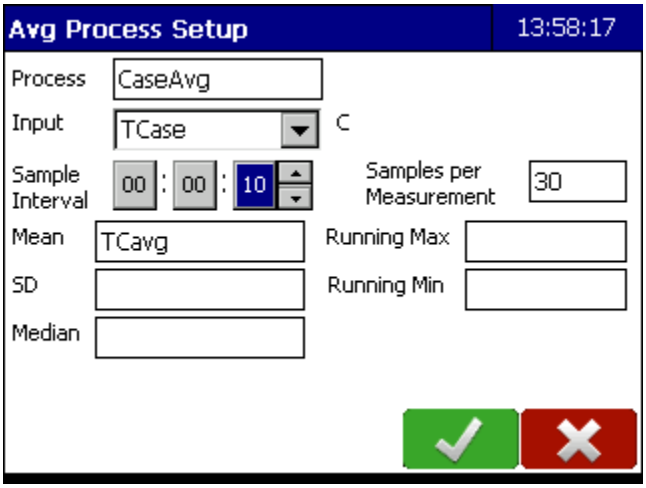


Figure 7-92: Average Process Example

Depending on the units of the specified input for the average calculation, the Average process can be used to calculate a normalized vector average. If the units of the specified input are "deg", "degree", "degrees" or "degs" (in upper or lower case), the calculated average is calculated as a normalized vector average, as defined below.

$$x_i = \cos(\text{Input}_i), \qquad y_i = \sin(\text{Input}_i), \qquad i = 1, \ldots, N$$

$$\hat{x} = \frac{1}{N}\sum_1^N x_i, \qquad \hat{y} = \frac{1}{N}\sum_1^N y_i$$

$$\text{normalized vector average} = \tan^{-1}\frac{\hat{y}}{\hat{x}}$$

This calculation takes the 'north' rollover account if calculating a wind direction average; however, wind speed at the individual wind direction measurements is not accounted for in the average calculation.

To account for wind speed in the vector average, the following definition would be used:

$$x_i = \mathrm{WS}_i \cos(\mathrm{WD}_i), \qquad y_i = \mathrm{WS}_i \sin(\mathrm{WD}_i), \qquad i = 1, \ldots, N$$

$$\hat{x} = \frac{1}{N}\sum_1^N x_i, \qquad \hat{y} = \frac{1}{N}\sum_1^N y_i$$

$$\text{average WS} = \sqrt{\hat{x}^2 + \hat{y}^2}, \quad \text{average WD} = \tan^{-1}\frac{\hat{y}}{\hat{x}}$$

7.6.7 User variable

Figure 7-93 shows the **User Variable Setup** screen. User variables are datapoints which can be assigned values (either manually or by the script process). The user variable can be assigned units and precision as well as a power-on default value. A User Variable must be created before it can be referenced in another process (i.e. a script) or output.

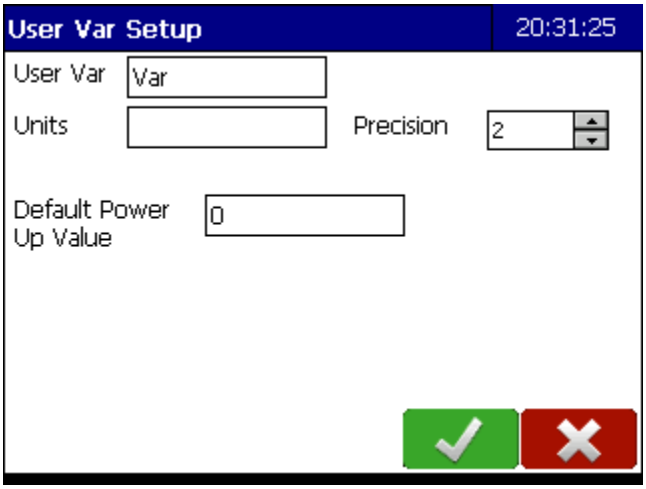


Figure 7-93: User Variable Setup screen

Figure 7-94 shows the display screen (**UserVar Process** screen) for a user variable named Test_Var (units of ft were assigned). The screen displays the current value of Test_Var (-4.2) and also allows the user to clear (**Zero** button) or set (**Set** button) Test_Var to a specific value.

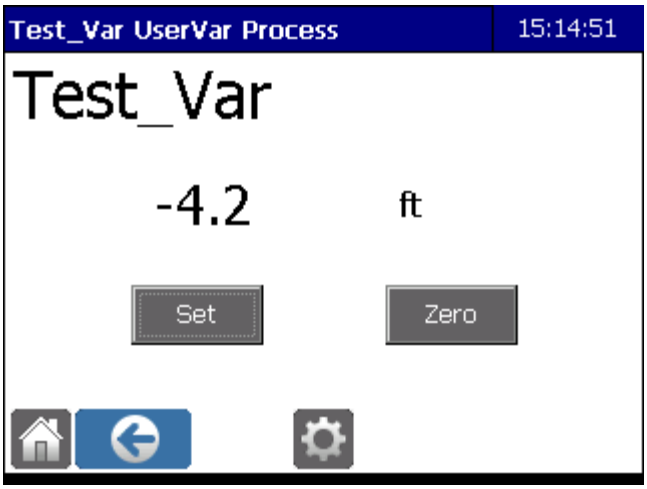


Figure 7-94: User Variable Process Display screen

7.6.8 Function

Figure 7-95 shows the **Function Setup** screen. A Function process evaluates a single-valued function expression. The function name (default of Func) is also used as a datapoint name for the values of the function's output. The user must enter a single equation for the function which evaluates to a floating point number and can specify the function's units and precision. A list of mathematical operators supported by the Function process is given below (nested operations are supported).

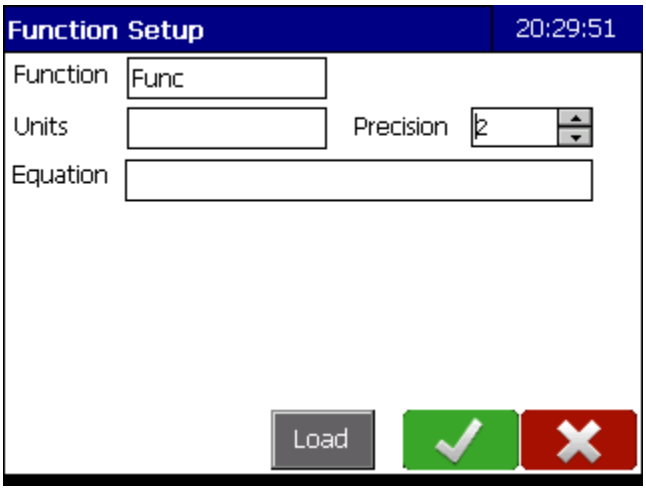


Figure 7-95: Function Setup screen

7.6.8.1 Built-in mathematical operators

Mathematical operators supported by the Function process are:

Operator	Meaning
+	addition
-	subtraction
*	multiplication
/	division
=	equal to
MAX(A,B)	maximum of A or B
MIN(A,B)	minimum of A or B
SQRT(x)	square root
LN(x)	natural logarithm
EXP(x)	natural antilog
POW(A,B)	A raised to power of B, A^B
PI	pi
ABS(x)	absolute value
FRAC(x)	fractional part of x
INT(x)	integer part of x
MOD(A,B)	modulus of A / B
SIN(x)	sine (in radians)
COS(x)	cosine (in radians)
TAN(x)	tangent (in radians)
ASIN(x)	arcsine (in radians)
ACOS(x)	arcos (in radians)
ATAN(x)	arctan (in radians)
ATAN2(y,x)	arctan (in radians), this operator preserves the quadrant of the result.
SteinhC(x)	calculates the temperature of a thermistor (in Celsius) from its resistance using the simplified Steinhart - Hart equation (see below).

Simplified Steinhart - Hart equation

$$T = \frac{1}{A + B\ln R + C(\ln R)^3} - 273.15$$

Symbol	Meaning/Value	Note
T	temperature (C)	
R	thermistor resistance (Ω)	
A	1.0295 x 10^{-3}	coefficient for YSI 44006 thermistor
B	2.3910 x 10^{-4}	coefficient for YSI 44006 thermistor
C	1.5680 x 10^{-7}	coefficient for YSI 44006 thermistor

7.6.8.2 Loading from a file

The **Load** button allows the user to load a function from an XML file. The file can be loaded from the datalogger's internal memory or from a USB memory stick. All datapoints used in the function must be defined in the datalogger prior to loading the function.

In the following example file, the function Temp_F is defined. Temp_F is a formula to convert temperature from Celsius to Fahrenheit. The Temp_C datapoint must already be defined in the datalogger in order for the function load to be successful.

```
<?xml version="1.0" encoding="UTF-8"?>
<XMLRoot>
  <Processes>
    <Temp_F ProcessType="FuncProcess" Units="F" Equation="32+Temp_C*9/5"
Precision="1" />
  </Processes>
</XMLRoot>
```

7.6.9 Script

Figure 7-96 shows the **Script Setup** screen. The Script process executes a script (short computer program written in a simple programming language). The **Script Name** (default of Script) is only used to name the script. The script does not create any new datapoints – all datapoints used in a script must already exist in the datalogger. The user may enter a multi-line program for the script which can read several inputs and have several outputs. In fact, it is possible for a Script not to have any input or outputs. The script is run in accordance with the specified **Interval** and **Offset** (note that the minimum script **Interval** is one minute).

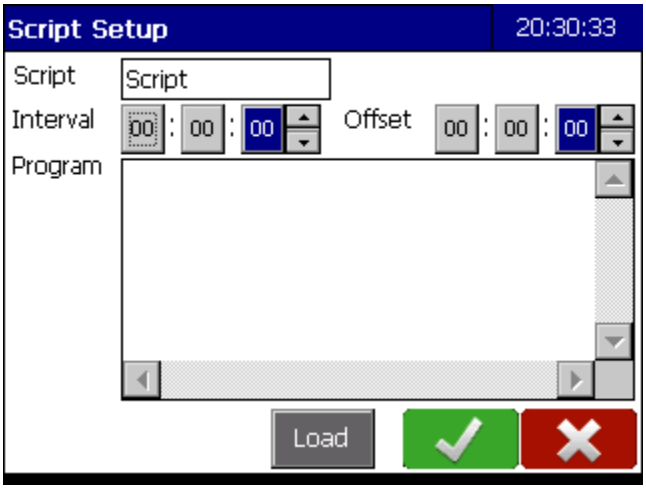


Figure 7-96: Script Setup screen

The Script process supports all of the Function's mathematical operators as well as the logical operators given below (nested operations are supported).

7.6.9.1 Built-in logical operators

The following are the logical operators supported by the Script process.

Operator	Meaning
IF()	
ELSE IF()	
ELSE	
||	logical or
&&	logical and
==	equal
!=	not equal
<	less than
>	greater than
<=	less than or equal
>=	greater than or equal

In addition to the logical operators above, the following command is supported by the script process.

CMD()	send a command to the SDI ports (the command is sent on all ports).

As well, **Load** allows the user to load a script from the datalogger's internal memory or from a USB memory stick.

Figure 7-97 shows a Script process (named IncCount). The script is run hourly at 15 minutes past the hour. The script increments a user variable named Count and then clears Count if Count is greater than or equal to five.

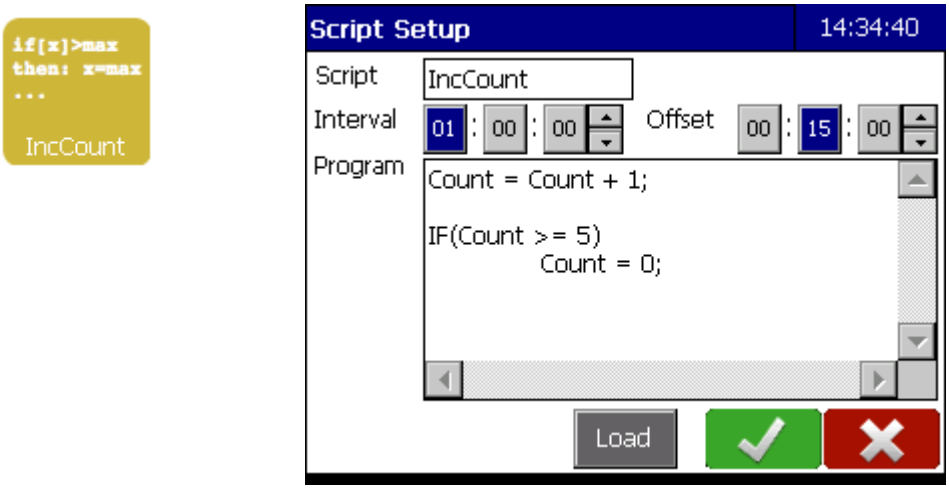


Figure 7-97: Script Process Example (IncCount)

Figure 7-98 shows a slightly more complicated script (named RNIN123). The script is run every minute and sets a user variable named Result to one, two, or three depending on the value of sensor RNIN.

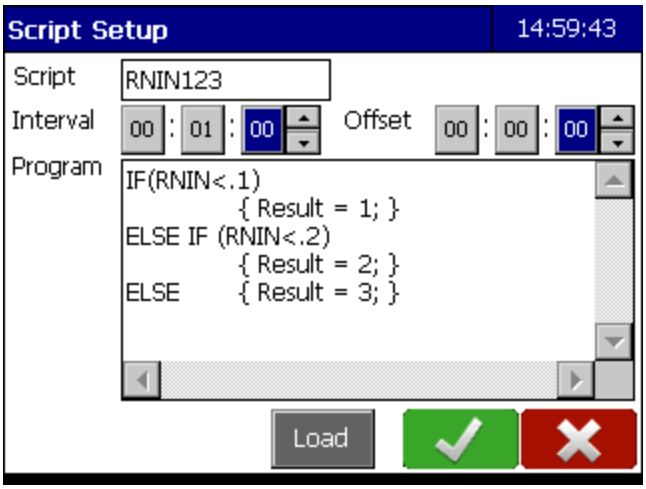


Figure 7-98: Script Process Example (RNIN)

7.6.10 Threshold sampling

Figure 7-99 shows the **TSampler** (threshold sampling process setup) screen. Threshold sampling is a process for the automatic collection of water samples. Water samples are taken as certain conditions of the specified Trigger are met. The user must enter the **Sample Interval** and **Offset** which control how often the threshold process is run as well as the **Trigger** input (usually a DTS-12 turbidity sensor) and the appropriate sensors to measure stage and water temperature. **Sampler 1** and **Sampler 2** specify the water samplers (usually an ISCO 6712 series).

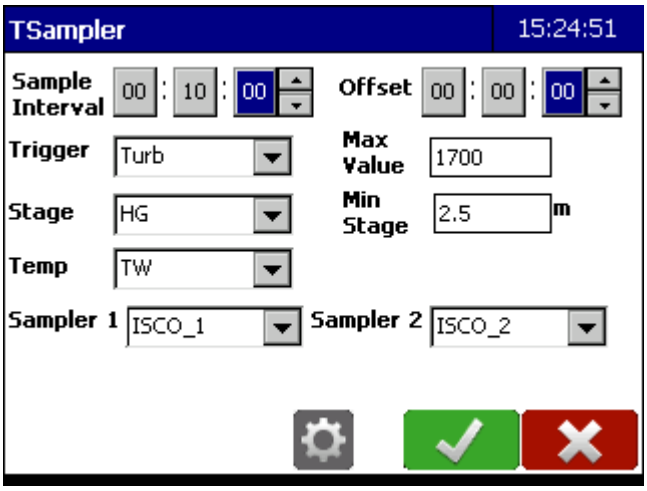


Figure 7-99: TSampler (threshold sampling process setup) screen

Figure 7-100 displays the default threshold settings (**Setup Cog –** Thresholds Tab) used for the trigger sensor. Samples can be triggered by rising or falling values.

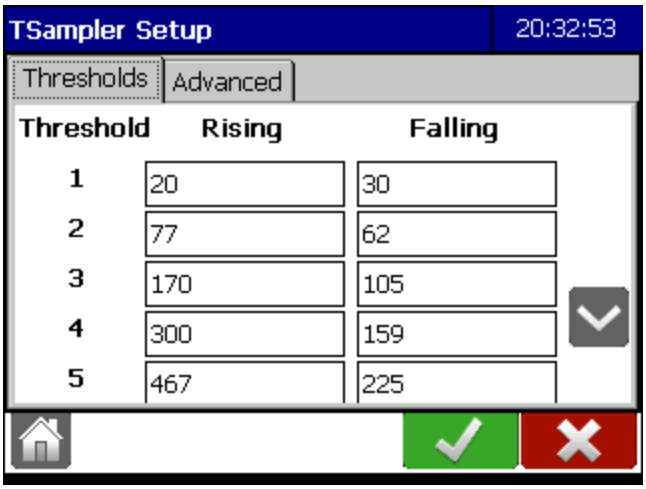


Figure 7-100: Threshold Sampling Process Threshold Set-up screen

Figure 7-101 displays the advanced settings (**Setup Cog -** Advanced Tab) used for the **Trigger** sensor. These settings outline the hysteresis for the thresholds as well minimum interval settings.

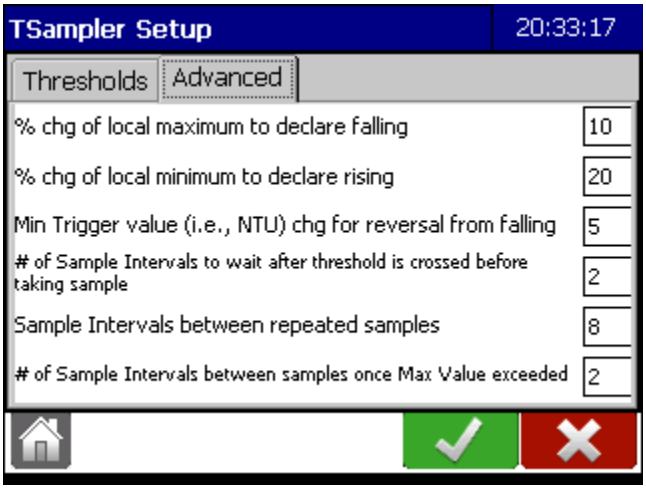


Figure 7-101: Threshold Sampling Process Advanced Set-up screen

Figure 7-102 shows the Threshold Sampling (**TSampler**) screen. This screen displays current readings for the process and allows the user to suspend sampling (**Disable** button) or manually trigger a water sample.

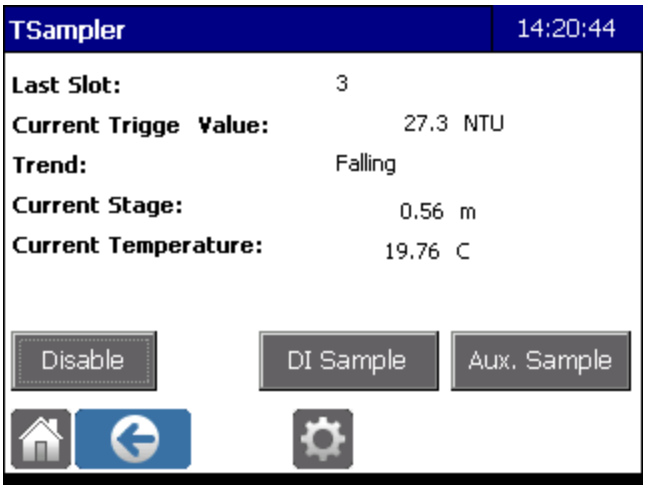


Figure 7-102: Threshold Sampling Process Display screen

Two types of water samples can be triggered; a Depth Integrated Sample or an Auxiliary Sample. In both cases a water sample is taken but the samples are tagged differently in the smp_code variable. Smp_code is a user variable automatically created by the Threshold Sampling process. A DI Sample is normally used to correlate depth integrated sediment samples taken manually on site with data and physical samples recorded by the datalogger. Similarly an Aux. Sample is used to manually trigger an auxiliary sample as a test or if the operator wants an additional sample for some other reason.

7.6.10.1 Threshold sampling user variables

The following is a list of user variables automatically created by the threshold sampling process.

Variable name	Value	Meaning
Threshold code (thr_code)	0	Baseflow
	1	Rising trigger value
	2	Falling trigger value
	3	Unknown trigger value, not yet defined as rising or falling
Sampling code (smp_code)	0	No sample collected
	1	Threshold sample
	2	Depth-integrated sample (DI)
	3	Auxiliary sample (AUX)
	4	Start-up sample
	5	Overflow sample, turbidity above maximum; samples every third interval
Sample bottle number (slot)	-3	Bottle not filled: SDI voltage < 9 V
	-2	Sampler did not return a slot value, OR Bottle not filled: sampler is full or disconnected
	-1	Bottle not filled: something else is wrong
	0	no bottle filled
	1 to 48	slot number where bottle filled

These values are logged along with the trigger value every sample interval and in response to a manually triggered DI Sample or Aux. Sample.

7.7 Data

The **Data Status** screen (see Figure 7-103) displays data storage information and enables the user to configure datalogging (**Setup Cog**) as well as export and delete data (**Download** and **Delete Data** buttons), or examine the datalogger's recorded data (**Graph** or **Table** view).

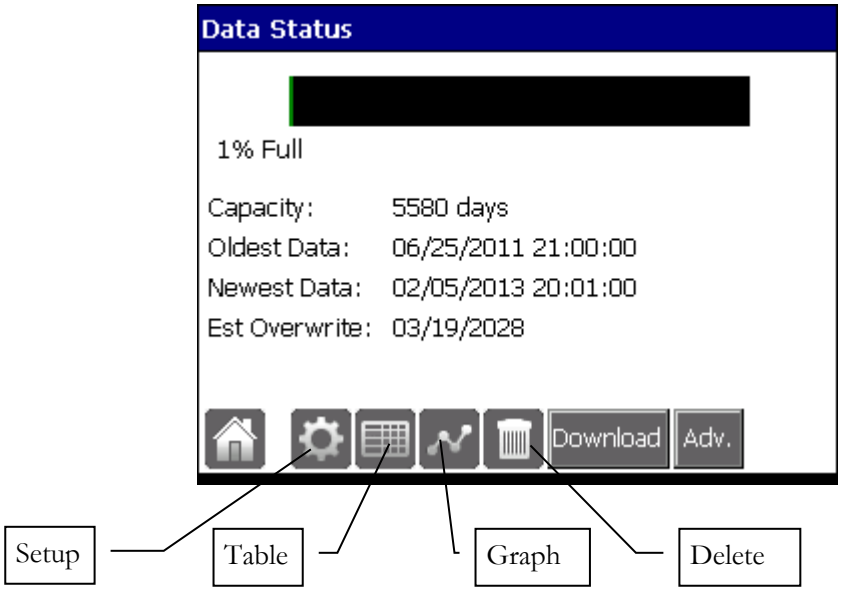


Figure 7-103: Data Status screen

7.7.1 Log set-up

Datalogging is configured through the **Setup Cog** button on the **Data Status** screen. Figure 7-104 shows the **Logging Intervals** screen (currently there are no datalogging intervals configured).

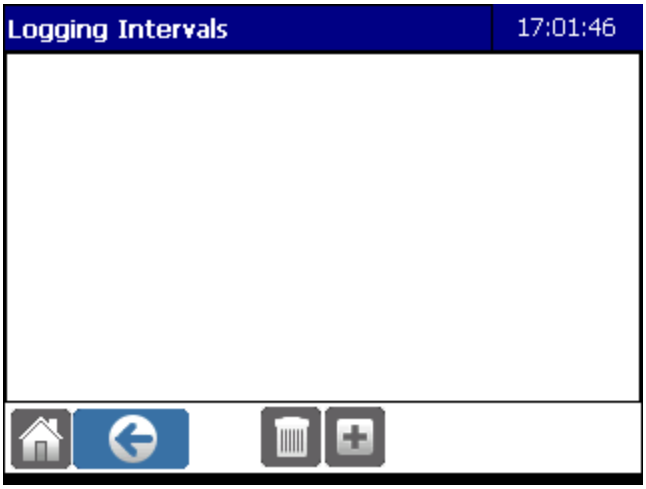
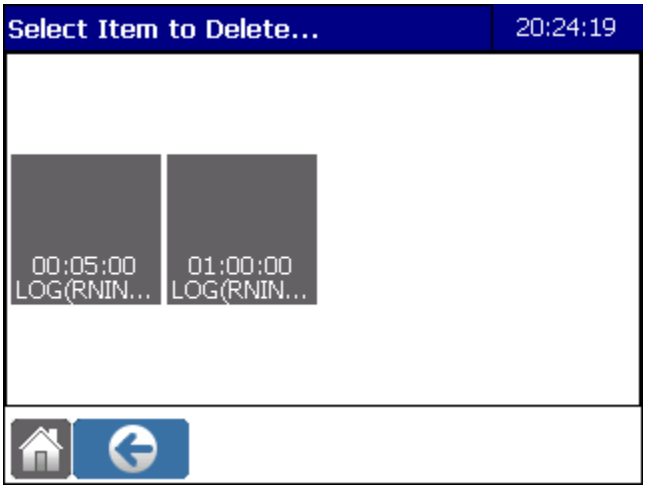


Figure 7-104: Logging Intervals screen

Press **Add** to configure a logging interval (see Figure 7-105). After a Log Interval is configured, it appears on the **Logging Intervals** screen. Multiple Log Intervals can be configured in the datalogger.

To delete a Logging Interval, tap **Delete**. A **Delete Item** screen will appear. Click on the item you wish to delete and then confirm the deletion to remove the log interval from the datalogger. Repeat for each item you wish to delete and then click the Back or Home button to leave the Delete Item screen. Deleting Log Intervals does not delete data stored in the datalogger.



Note: Deleting Log Intervals does not delete data stored in the datalogger.

7.7.1.1 Logging interval

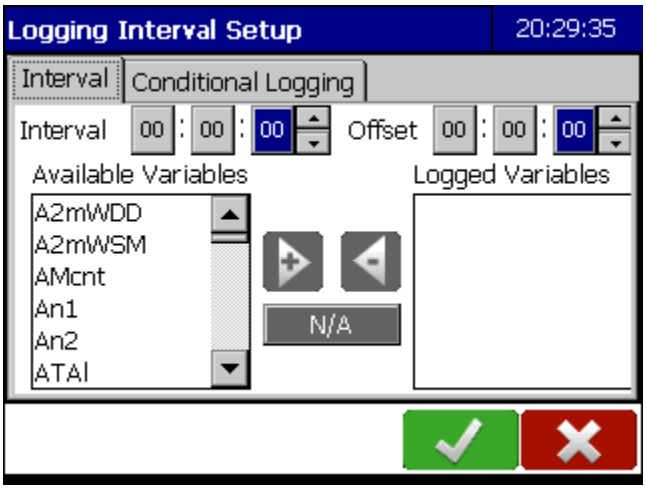


Figure 7-105: Logging Interval Setup screen

To configure a Log Interval, the user must set how often and when the data is logged and specify what data is to be stored. Press **Edit** to enable datapoint selection (labeled Variables in Figure 7-105) and use the **Move Right Arrow** and **Move Left Arrow** to specify which datapoints is logged. **Interval** and **Offset** determine how often and when the data is logged.

Example

An **Interval** of 01:00:00 and an **Offset** of 00:05:00 configures the datalogger to log the specified Variables every hour at five minutes past the hour (00:05:00, 01:05:00, 02:05:00, 03:05:00, etc.).

Once a datapoint has been selected to be logged (e.g., TCase and MBV variables in Figure 7-106), the user can disable logging of individual datapoints. Figure 7-106 shows that TCase logging has been disabled. To disable and re-enable logging of a datapoint, select the datapoint in the **Logged Variables** list and then use the **Disable/Enable** toggle button to select the desired action.

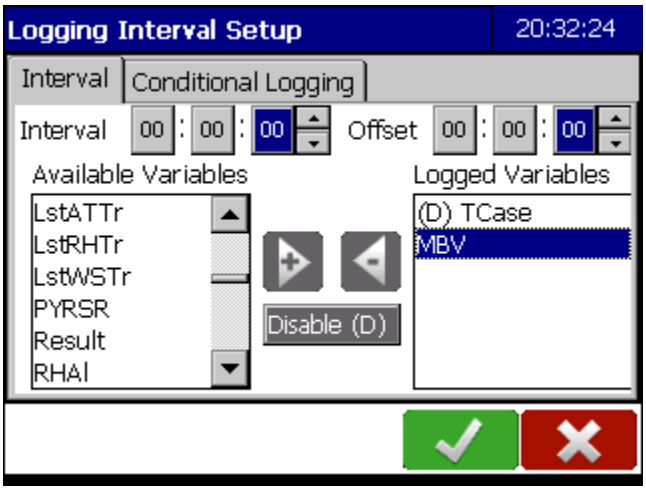


Figure 7-106: Log Interval Set-up screen – Disable Logging

7.7.1.1.1 Conditional logging

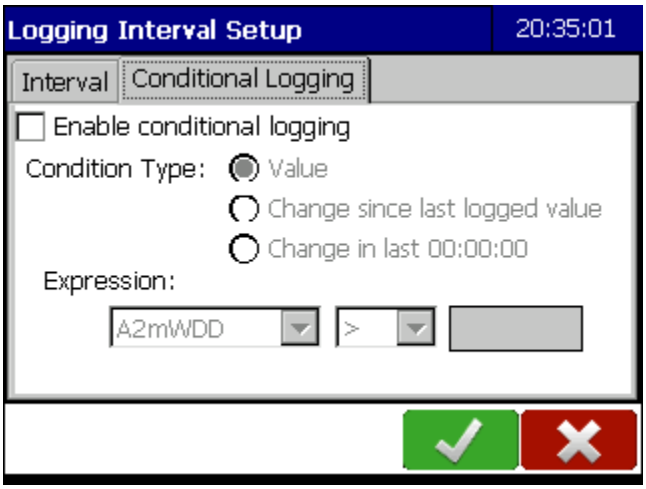


Figure 7-107: Conditional Logging Set-up screen

The **Conditional Logging** tab of the **Logging Intervals** screen is used for conditional datalogging. If the **Enable Conditional Logging** checkbox is selected (see Figure 7-107), then the Variables specified on the **Interval** tab (Figure 7-106) will only be logged if the **Condition Type** and **Expression** on the **Conditional Logging** tab (Figure 7-107) are satisfied.

Condition type	Meaning
Value	Only log if the value of the variable selected in the Expression drop down satisfies the Expression.
Change Since Last Logged Value	Only log if the difference between the value of the variable selected in the Expression drop down and the last logged value of the variable satisfies the Expression.
Change in Last 00:00:00	Only log if the difference of the value of the variable selected in the Expression drop down over the last logging interval satisfies the Expression.

The Expression input selection is limited to one variable. Valid operators for the Expression are:

>	greater than
>=	greater than or equal to
<	less than
<=	less than or equal to
=	equal to

7.7.2 Download

The **Download** button on the **Data Status** screen allows the user to export data to a USB memory stick or erase the data stored in the datalogger.

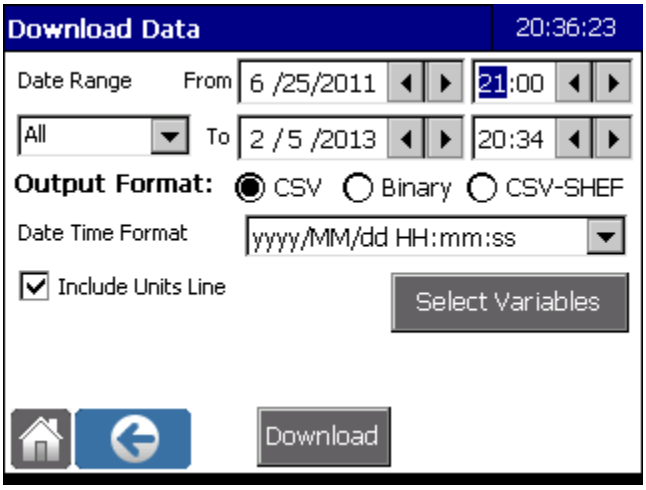


Figure 7-108: Download Data screen

7.7.2.1 *Exporting stored data*

The **Download Data** screen allows the user to export a copy of the logged data to a USB memory stick (see Figure 7-108). The user can select the date and time range of the data to be exported as well as the data format (either CSV or binary) of the export. The downloaded data file is time-stamped and haves the following naming format: station name-yyyy-mm-dd-hh-ss with either a .csv or .bin extension.

IMPORTANT ! Datalogger binary exports are much quicker than CSV exports; however, CSV exports have the advantage of being readable by text or spreadsheet programs

7.7.2.1.1 CSV and CSV-SHEF output formats

Selecting **CSV** output format causes the exported file to be written in standard ASCII text **C**omma-**S**eparated **V**alue format.

Selecting **CSV-SHEF** causes the exported file to be written in a CSV-like format based on the **S**tandard **H**ydrologic **E**xchange **F**ormat.

If **CSV** or **CSV-SHEF** format is selected, the user can specify the **Date and Time Format** used in the export file and also specify whether to include the variables' units under the variable names in the file.

Format codes for date and time components are detailed in the table below.

Format code	Output
yyyy	year
MM	month in numerical format (e.g., 01 for January)
MMM	month in text format (e.g., JAN for January)
dd	day
HH	hour in 24 hour format
hh	hour in 12 hour format
mm	minute
ss	second
tt	am / pm
,	commas inserted in the Date Time Format will result in commas inserted in the output data file

The user can also select which datapoints (variables) to export by enabling the **Only Export Selected Variables** checkbox. The list of variables exported is built using the **Select Variables** screen (Figure 7-109), opened by pressing **Select Variables** on the **Download Data** screen.

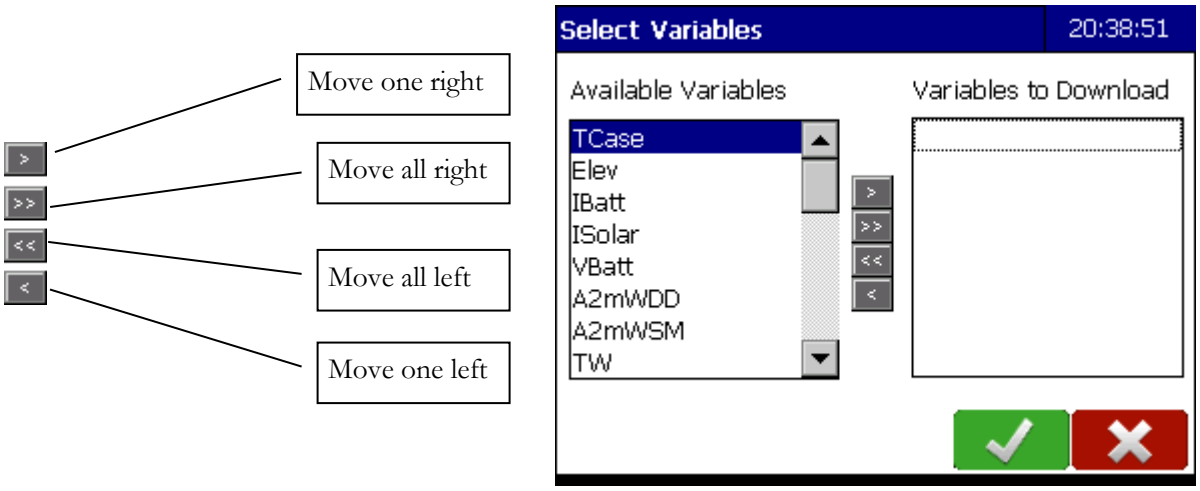


Figure 7-109: Download Data Select Variables screen

7.7.2.1.2 Binary format

Data export in binary format is the quickest way to download data from the datalogger to the USB memory stick. After downloading data in binary format, the FTS Logger Data Conversion Tool can be used to place the data from the binary data file saved on the USB memory stick directly into an FTS database or to convert the data to a CSV file.

7.7.3 Deleting stored data

The **Delete Data** button on the **Data Status** screen permanently deletes all data stored in the datalogger. Once deleted, the data cannot be recovered. After the **Delete Data** button is pressed, the user is prompted to confirm the delete operation (see Figure 7-110).

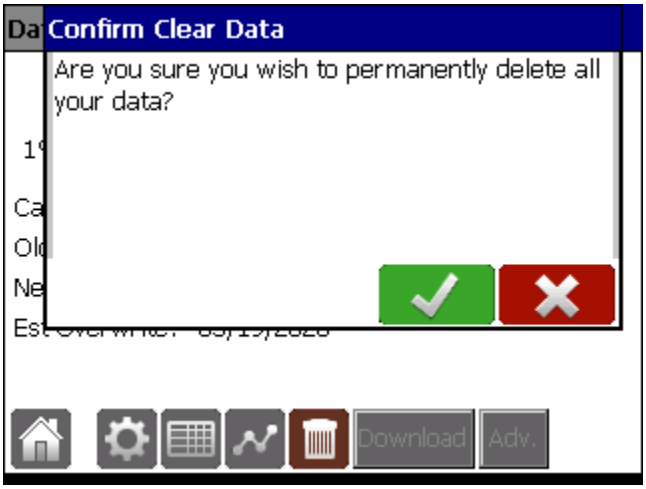


Figure 7-110: Confirm Delete Data screen

IMPORTANT ! Clearing the data permanently deletes the data from the datalogger.

A 'Data Cleared' message is displayed once the data has been deleted from the datalogger (see Figure 7-111). Press **OK** to continue.

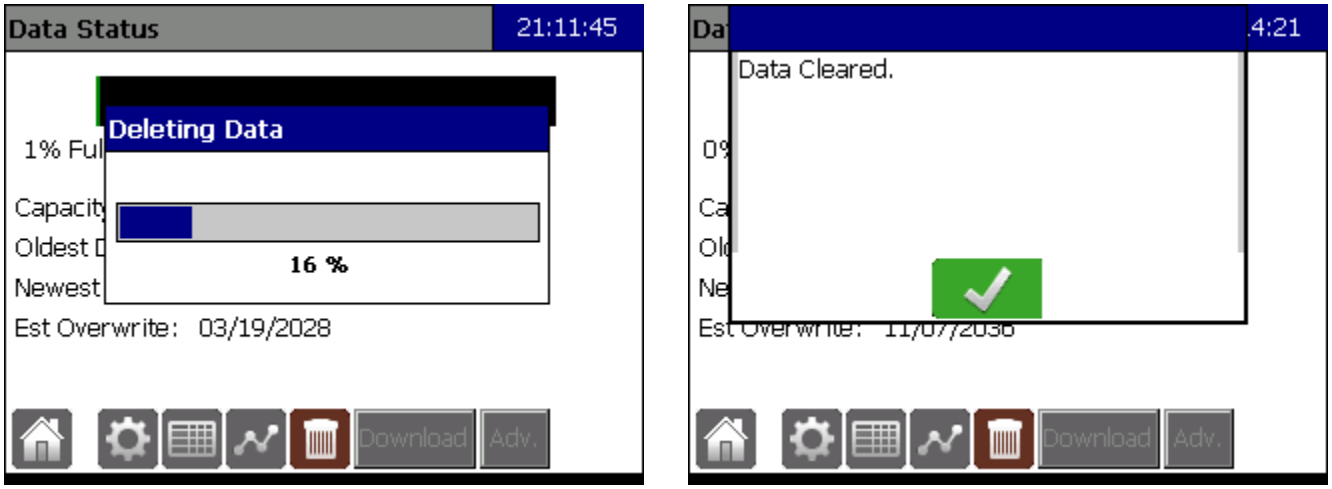


Figure 7-111: Data Deleted screens

7.7.4 Graph

A graph of logged data can be created and viewed through **Graph** on the **Data Status** screen. While it is possible to graph a large date range, the user should be aware that there may be a delay to format the graph depending on the number of readings in the selected range. Graphing capability in the datalogger is intended to show trends over a short time period to help the user determine proper sensor and station operation. Multiple variables can be graphed at the same time. Figure 7-112 shows a graph of the RNIN sensor over a two hour period.

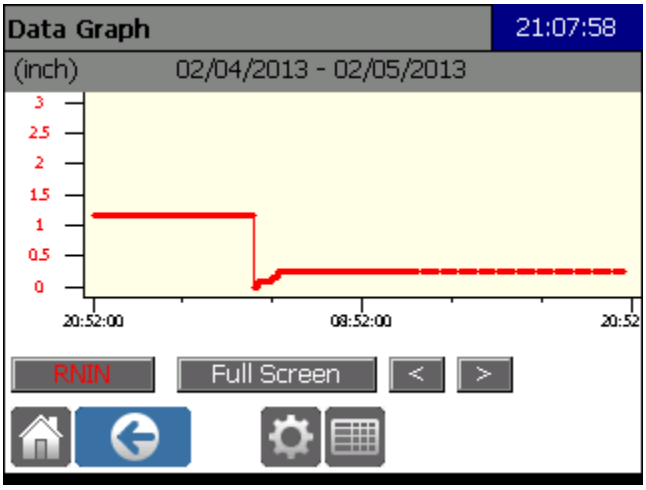


Figure 7-112: Graph Data screen

The **Full Screen** button expands the graph to fill the entire display area.

The **<** and **>** buttons scroll forwards and backwards by half the time scale (in this case one hour) for each time the button is pressed.

Pressing the variable button, in this example labeled **RNIN**, allows the user to toggle through all the variables defined for the graph. The name of the variable currently being displayed (active variable) is shown on the variable button. Data from the active variable is displayed in its selected colour and the y-axis changes to the range defined for the active variable. Data from the non-active variables are displayed in grey.

The **Setup** button provides access to the **Graph Set-up** screen (see Figure 7-113).

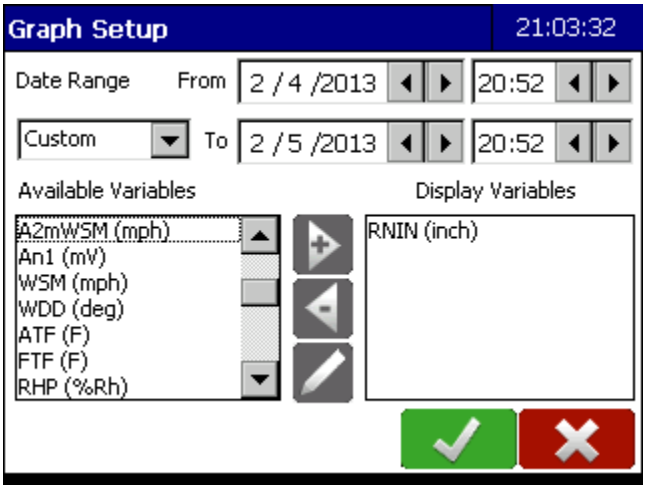


Figure 7-113: Graph Set-up screen

Use the **Move Right Arrow** and **Move Left Arrow** to select which variables to display.

The **Date Range** drop down menu is used to select the graph's time scale (Last Day, Last Week, Last Month, or a Custom range). If Custom is selected, then the user can specify the exact date/time range for the graph to display. Note that the same time scale is used for all variables displayed on the graph.

The **Edit** button allows the user to set the colour and y-axis range for the highlighted Display Variable (see Figure 7-114).

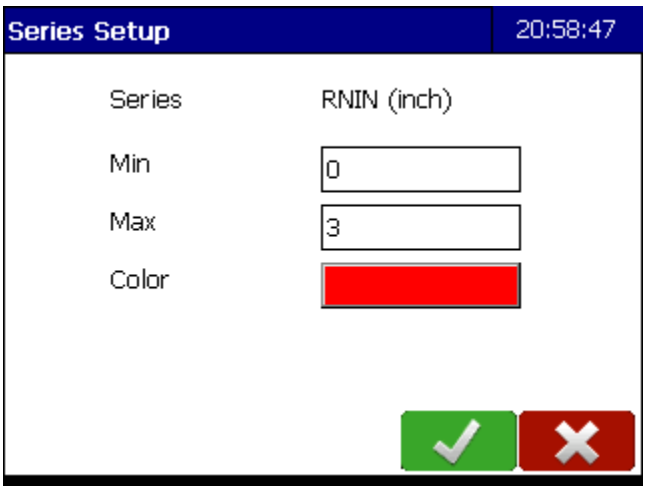


Figure 7-114: Display Variable Set-up screen

7.7.5 Table

A table of logged data can be created and viewed through **Table** on the **Data Status** screen. The **Data Table** (see Figure 7-115) is useful for examining specific data values with respect to each other. Data columns can be resized and repositioned (drag and drop) so that data values can easily be compared. The **Jump** button on the **Data Table** screen allows the user to go to a specific time in the logged data. The **Jump** button also acts like a refresh button if the specified jump time is slightly in the future (this way the most current data is shown in the table).

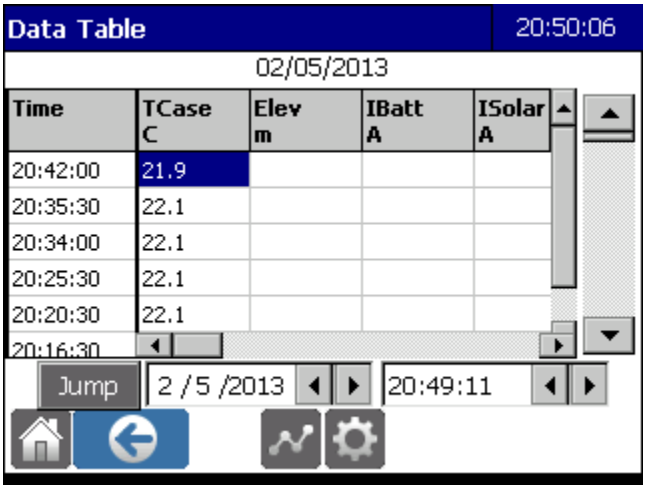


Figure 7-115: Data Table screen

7.7.6 Adv (Advanced)

Advanced logging options are configured through the **Adv** button on the **Data Status** screen. The **Data Advanced Setup** screen allows the user to select the following two options:

- Enable 30 second caching (10 min default): Decrease the size of the cache used between data logging operations and the NandFlash memory. The default cache size stores about 10 minutes worth of data between writes to NandFlash. If this option is selected, the cache stores only about 30 seconds worth of data. The NandFlash is thus written 20 times more often than in the default configuration, which reduces its lifespan by a corresponding factor.
- Enable 8 year Log File (2 year default): Increase the size of file allocated to storing logged data. The default log file is 13.4 MB, enough for 2 years of data under typical usage. If this option is selected, the log file is expanded to 54 MB, enough for about 8 years of data under typical usage. The consequence is that the time required for indexing and deleting data is increased by a factor of at least 10.

To change the advanced data setup, press the **Edit** button on the screen.

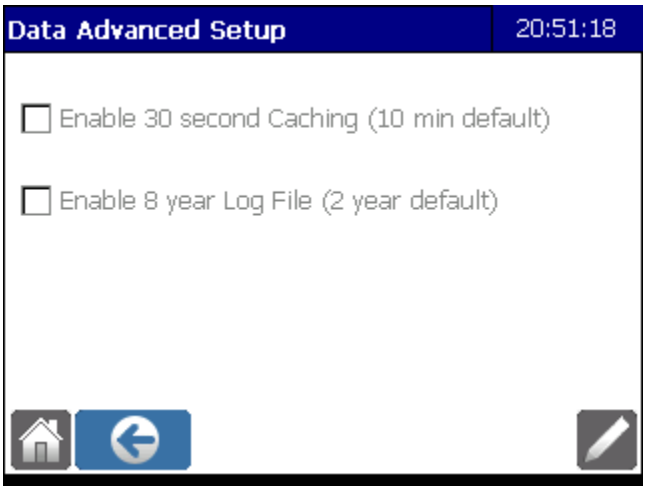


Figure 7-116: Data Advanced Setup screen

7.8 Current Conditions

The **Current Conditions** icon displays a set of user selected datapoints for easy monitoring of a specified set of data. The **Current Condition** screen (see Figure 7-117) is not automatically updated by the datalogger. The **Refresh** button can be used to update the display. It is important to note that **Refresh** does not trigger a new set of readings from SDI sensors or process outputs – **Refresh** only causes the last measured value to be displayed. For example, an SDI sensor that is programmed to be read every 10 minutes displays the same value until the 10 minute rollover occurs and a new SDI measurement is performed. Note that a Current Condition call through a telemetry device or telemetry port connection to a PC operates in a similar manner as the **Current Condition** screen.

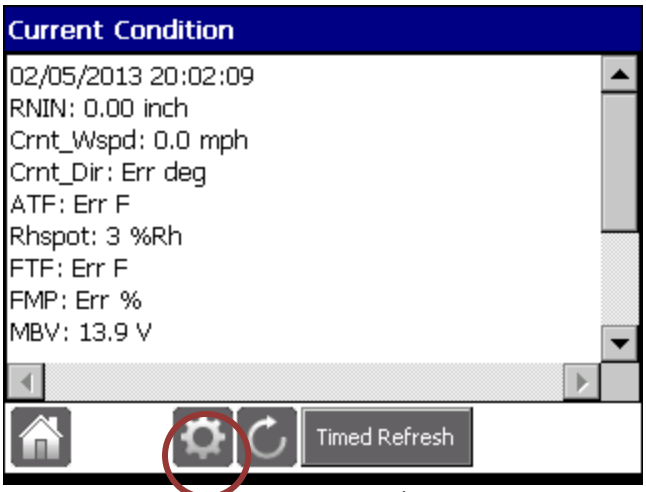


Figure 7-117: Current Condition screen

7.8.1 Set-up

The **Setup** button provides access to configure the data displayed on the **Current Condition** screen. After **Edit** is pressed on the **Current Condition Set-up** screen (see Figure 7-118), the user can use the **Move Right Arrow** and **Move Left Arrow** to select which variables are displayed.

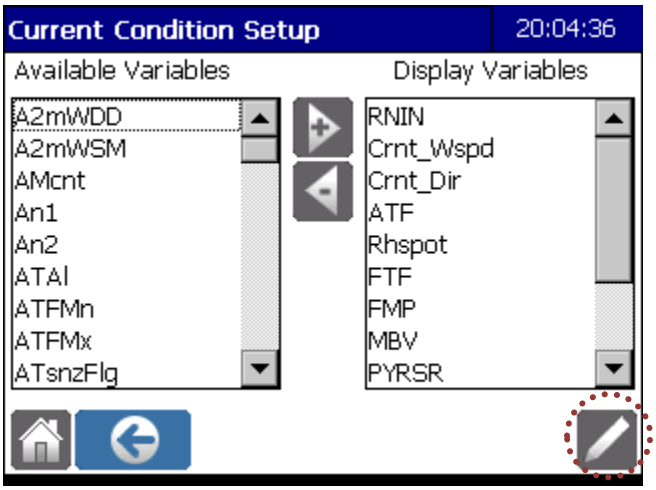


Figure 7-118: Current Condition Set-up screen

7.8.2 Timed refresh

An alternative to manually refreshing the screen is to place the datalogger in Timed Refresh mode (see Figure 7-119). The **Timed Refresh** button updates the **Current Condition** screen every minute (up to a maximum of 60 min) from the time the **Timed Refresh** button was pressed. Using the slider bars, the user is able to scroll back through the list of timed screen updates. Pressing **Exit** terminates Timed Refresh mode and return the user to the manually refreshed **Current Condition** screen.

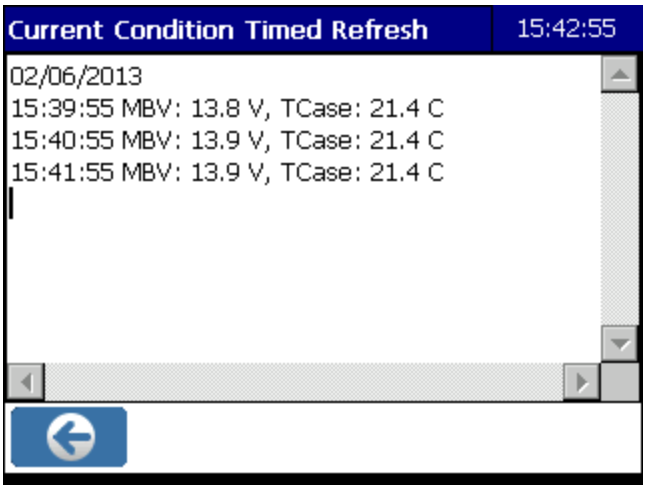


Figure 7-119: Current Condition Timed Refresh screen

7.9 Telemetry

The **Telemetry** screen (see Figure 7-120) displays the configuration of the datalogger's two telemetry ports.

Status information shown on the **Telemetry** screen includes the port's device type and a status summary of the attached telemetry device.

The coloured rectangle beneath the Port (A or B) label indicates the power status of the port:

Green	power on
Black	power off

Figure 7-120 is an Axiom H2-G5-TLM's **Telemetry** screen, showing the tabs for Telem A (port A) and Telem B (port B). Port A is fixed at a Device Type of G5 (the F6-G5-TLM has an integral G5 transmitter). Port A's device type is user selectable for dual external Telemetry port dataloggers (i.e. H2-TLM-2).

The **Status** buttons associated with Port A and Port B provide detailed status information on the connected telemetry device (see the appropriate Telemetry Device in the following Device Type section).

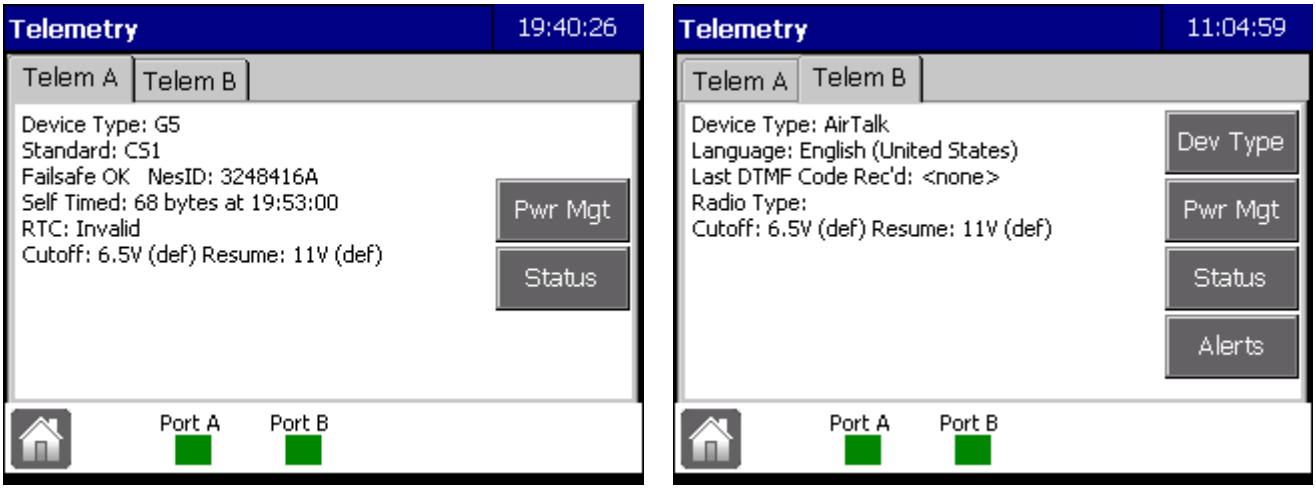


Figure 7-120: Telemetry screen (Telem A and Telem B tabs)

7.9.1 Device type

The **Dev Type** (Device Type) button is used to configure the datalogger for the device attached to the associated telemetry port. See Figure 7-121.

G5	specific for the FTS G5 GOES Transmitter
RVT	specific for the FTS Radio Voice Transmitter (version 1)
AirTalk	specific for AirTalk (FTS Radio Voice Transmitter, version 2)
FTS	generic port setting
None	disables the Telemetry port

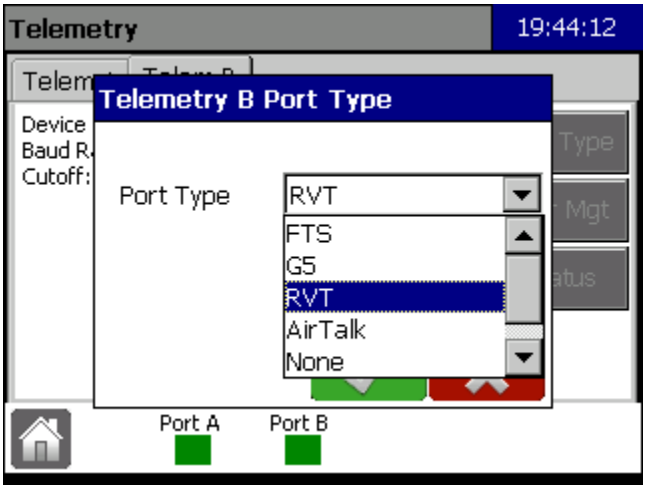


Figure 7-121: Telemetry Device Selection screen

7.9.1.1 FTS telemetry device

The FTS device type sets the telemetry port settings to 9600 baud, no parity, 8 data bits, and, 1 stop bit. Currently, the datalogger's port should be configured to a Port Type of FTS for all telemetry devices other that an FTS G5 GOES Transmitter or an FTS RVT Radio Voice Transmitter.

7.9.1.2 G5 telemetry device

The G5 device type is specific to and should only be used with the FTS G5 GOES Transmitter. G5 status information reported on the **Telemetry** screen includes:

NesID	the G5's current NESDIS identification number
Failsafe	the state of the G5's failsafe circuit
Timed Tx Info	the number of bytes to be sent at the next timed transmission time
RTC	the status of the G5's real time clock
Standard	the standard (CS1 or CS2) that the G5 implements

Refer to the G5 Telemetry Reference section for detailed G5 configuration and status information provided by **Status**.

7.9.1.3 RVT telemetry device

The RVT device type is specific to and should only be used with the FTS RVT Radio Voice Transmitter.

Refer to the RVT Telemetry Reference section for detailed RVT configuration and status information provided by **Status**.

7.9.1.4 AirTalk telemetry device

The AirTalk device type is specific to and should only be used with the FTS AirTalk radio voice transmitter.

Refer to Chapter 9 AirTalk guide for detailed configuration instructions and for status information provided by **Status**.

7.9.1.5 No telemetry device

Selecting **None** as the port's telemetry device type disables the telemetry port by turning off port power as well as disabling all port communications.

7.9.2 Power Management

The **Pwr Mgt** button opens the **Port Setup** screen for setting power management options.

When the battery voltage drops below the specified **Cut-off Voltage**, the datalogger turns off power to the telemetry device The datalogger keeps the power to the telemetry device turned off until the battery voltage rises above the specified **Resume Voltage**.

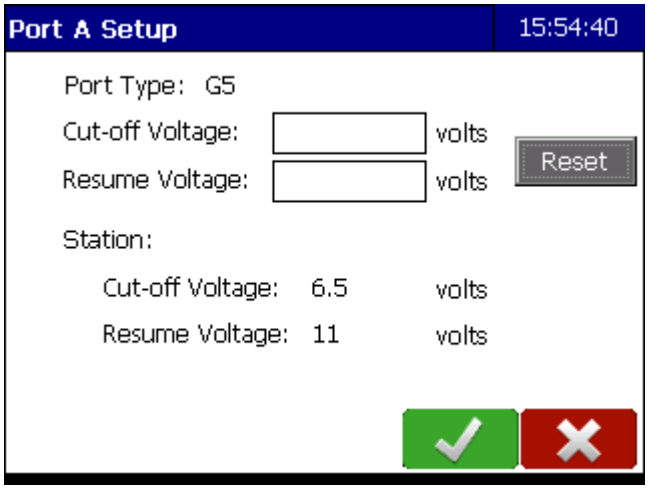


Figure 7-122: Telemetry Device Selection screen

Cut-off Voltage must be at least the station cut-off voltage (shown on the screen).

Resume Voltage must be at least the station resume voltage (shown on the screen). The maximum value is 15 V.

The **Reset** button clears the **Cut-off Voltage** and **Resume Voltage** controls.

Chapter 8 G5 telemetry reference

Chapter contents

8.1 CS1 and CS2 standards

The U.S. National Oceanographic and Atmospheric Administration operates the GOES satellite system, and sets the communications standards for them. The current standard is called CS1. NOAA is in the process of introducing a new standard, CS2, which will eventually replace CS1. Key dates in the replacement process are:

May 2012	Any new GOES transmitters purchased (including products which integrate a GOES transmitter) must be CS2-capable. They will be backwards compatible with the CS1 standard.
May 2013	All NESDIS assignments by NOAA are CS2 only.
Mid-2023	CS1 standard is no longer supported. Any GOES transmitters without CS2 capability will no longer transmit.

Key differences between the CS1 and CS2 standards are:

	CS1	**CS2**
Channel numbers	1-266	1-266, 301-566
Bit rates	100, 300, 1200	300, 1200 (no 100)
Bit rate/channel restrictions	100 bps, channels 1-266	100 bps not permitted
	300 bps, channels 1-266	300 bps, channels 1-266 and 301-566
	1200 bps, channels 1-133	1200 bps, every third channel from 3-264 (i.e., 3,6,9...264) and from 301-565 (i.e., 301,304,...565)
RF power level	fixed	30–40.5 dBm, variable

8.2 Status

The **G5 Status** screen is displayed (see Figure 8-1) when the **Status** button associated with the G5 transmitter on the **Telemetry** screen is pressed. Variant screens are presented depending on the standard (CS1 or CS2) implemented by the installed G5. The **G5 Status** screens provide detailed status information on the G5 and allow the user to configure the G5 transmitter.

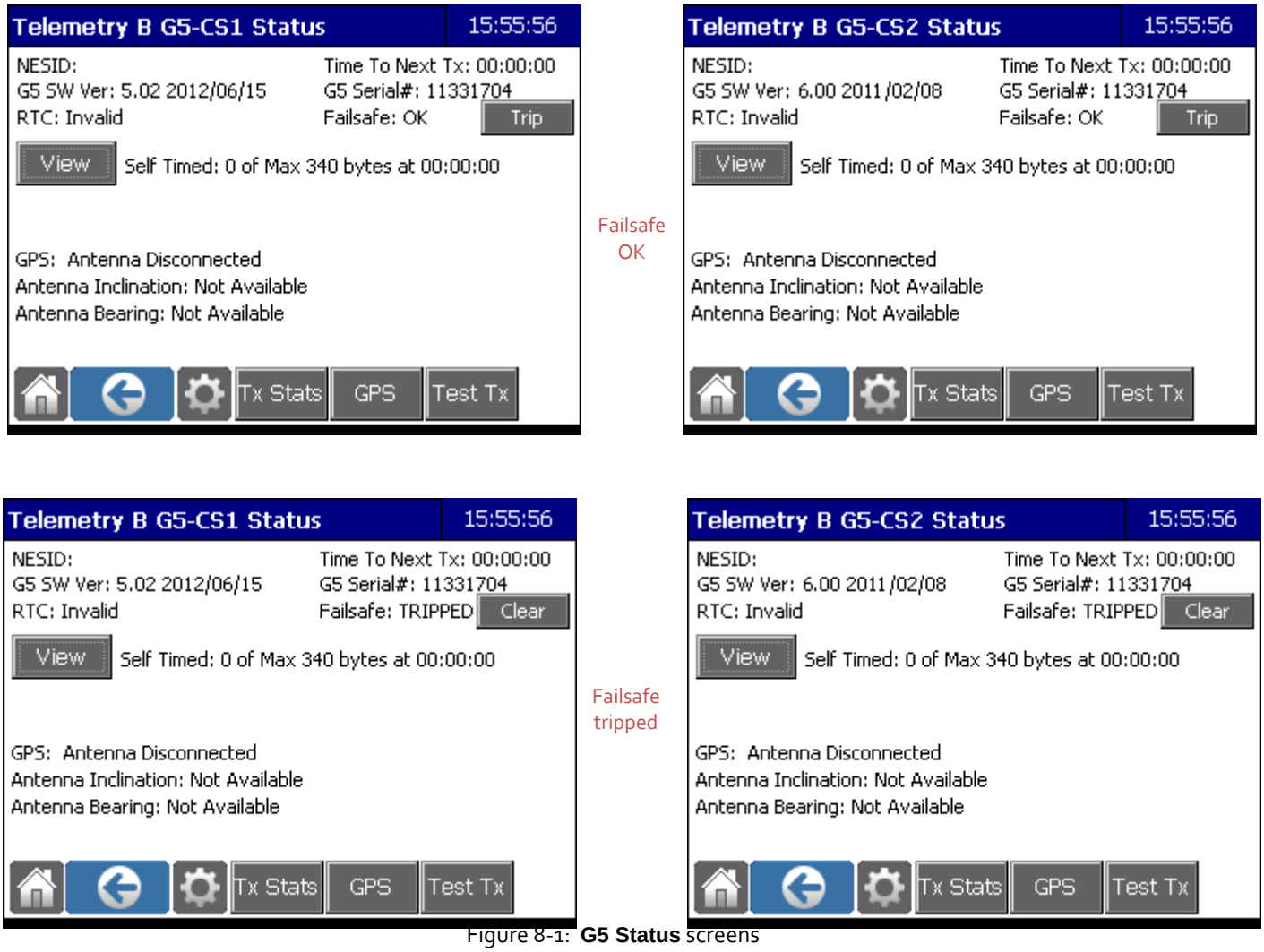


Figure 8-1: **G5 Status** screens

G5 physical parameters, operational status, and deployment information is provided.

Physical Parameters

G5 SW Ver	the G5's firmware version
G5 Serial #	the G5's serial number

Operational Information

NESID	The G5's current NESDIS identifier
Time to Next Tx	Countdown timer to the next G5 transmission
RTC	State of the G5's real time clock
Failsafe	State of the G5's failsafe circuit
Self Timed	The number of bytes queued in the Self Timed Transmit buffer for the next timed transmission. Additionally, **VIEW** displays the contents of the Self Timed Transmit buffer.
Random	The number of bytes queued in the Random Transmit buffer for the next random transmission. Additionally, **VIEW** displays the contents of the Random Transmit buffer. Note that Random transmissions are only enabled when the G5 has been configured for Time Ordered or Pseudo Binary transmission message format.

Deployment Information

GPS	Status of the G5's internal GPS unit
Antenna Inclination	inclination to be used for antenna mounting
Antenna Bearing	true north and compass bearing to be used for antenna mounting

8.2.1 View

The **View** button on the **G5 Status** screen allows the user to examine the current contents of the transmit buffer. The contents of the transmit buffer are delivered to the G5 transmitter approximately 90 seconds prior to the G5 transmit time. In order to meet timing requirements for transmission, data should be sent to the transmitted buffer at least two minutes prior to the G5 transmit time.

8.2.2 Trip / Clear

For CS2 standard G5's, there is a button on the **G5-CS2 Status** screen to the right of the **Failsafe** status. When the failsafe status is **OK**, this button is labeled **Trip**; when it is **TRIPPED** or unknown, the button is labeled **Clear**.

The **Trip** button causes the transmitter failsafe to trip. The **Clear** button causes the failsafe to be cleared (to return to OK status).

8.2.3 Set-up

The **Set-up** button on the **G5 Status** screen displays the **G5 Setup** screen which enables the user to set the appropriate G5 transmitter parameters.

8.2.3.1 Transmitter tab

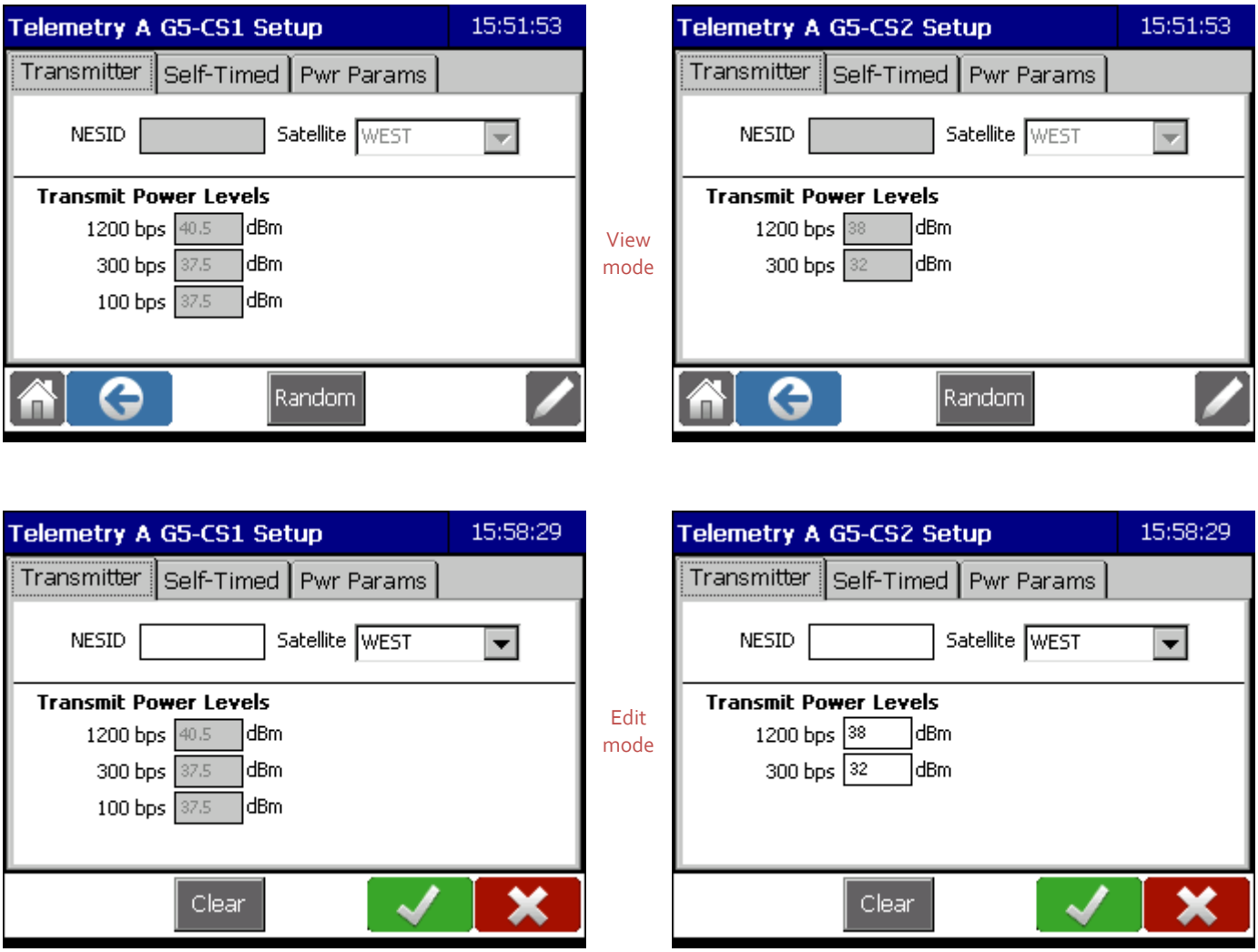


Figure 8-2: G5 Set-up screens -- Transmitter tab

Transmit parameters for the G5 are provided by the United States National Oceanic and Atmospheric Administration (NOAA). These parameters allow the user to retrieve data from their remote site using the GOES Data Collection System (DCS). On this tab you specify the following GOES parameters:

NESID	: The ADDRESS (an eight character identifier) for your assignment.
Satellite	: The GOES satellite used for your assignment (**East** or **West**).

You can also view and, in the case of a CS2 standard G5, set, the **Transmit Power Levels** for each available data rate on the G5.

8.2.3.2 Self-Timed tab

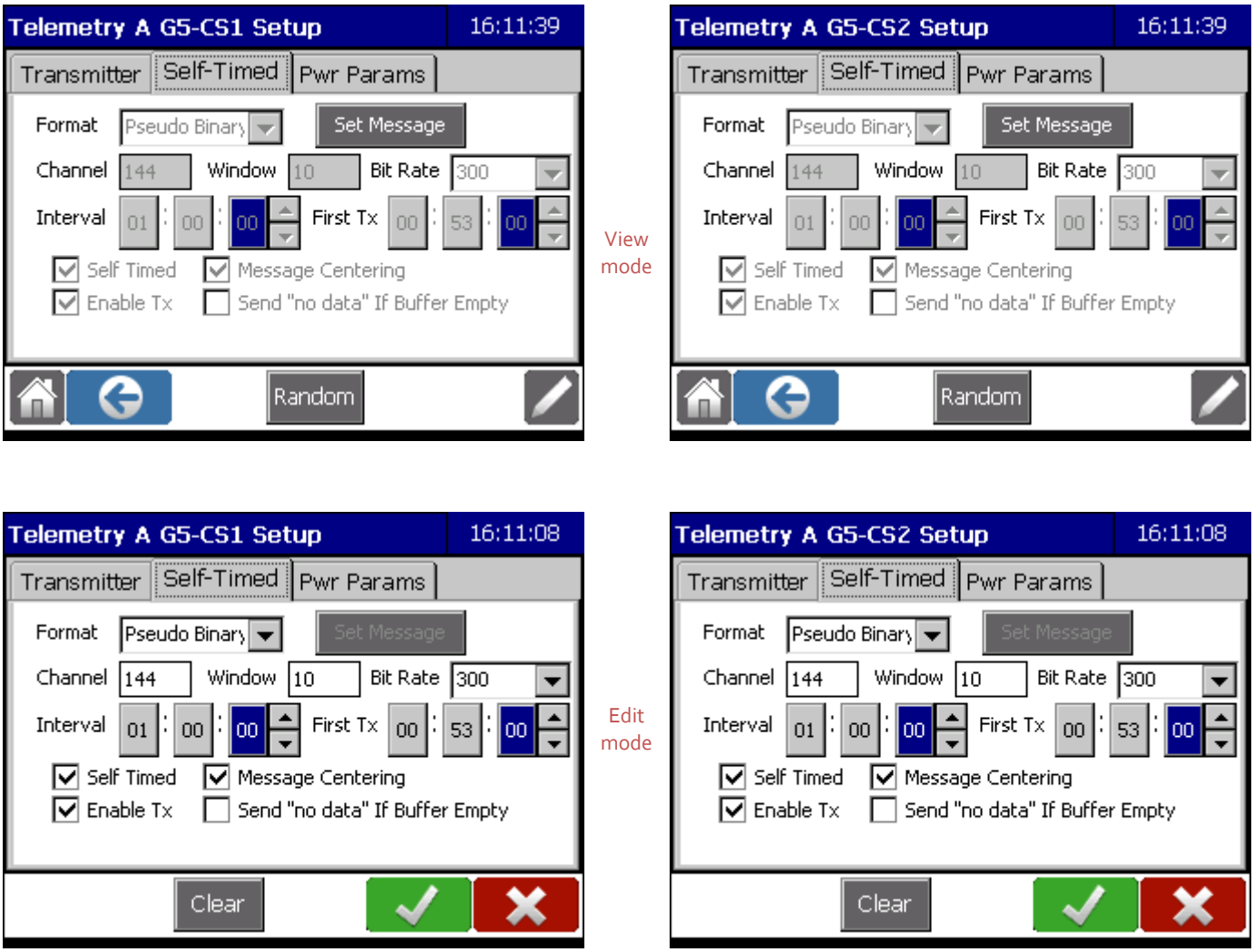


Figure 8-3: G5 Set-up screens -- Self-Timed tab

Transmit parameters for the G5 are provided by the United States' National Oceanic and Atmospheric Administration (NOAA). These parameters allow the user to retrieve data from their remote site using the GOES Data Collection System (DCS). On this tab you specify the following GOES parameters:

Channel	: Your assigned PRIME CHANNEL
Window	: Your assigned XMT (transmit) WINDOW
Bit Rate	: Your assigned platform baud rate
Interval	: Your assigned REPORT RATE
First Tx	: Your assigned FIRST TRANS time

On this tab you also specify the message format and other determiners of how the message is sent:

Format: How the message content is formatted.

Time Ordered	an ASCII format used to transmit time-stamped data; allows for GOES random transmissions
BLM	format specified by the U.S. Bureau of Land Management; an ASCII format commonly used in fire weather applications
WSC	format specified by Water Surveys Canada; a self contained ASCII format with parameter names and timing embedded in the message
Pseudo Binary	a bit packed modified ASCII transmission format; allows for GOES random transmissions

The **Set Message** button is used to configure the contents of the message. This button is disabled in edit mode, but enabled otherwise.

> The Message should always be set after the **Message Type** has changed!!

For details on message formats and how to set them up, see section 8.2.4 Message formats.

If selected, the **Message Centering** checkbox causes the G5 to transmit its data centered in the middle of its transmission window instead of transmitting right at the start of its transmission time.

If selected, the **Send "no data" If Buffer Empty** checkbox causes the G5 to transmit a message of "NO DATA AVAILABLE FOR TRANSMISSION" at its transmission time if the datalogger has not provided the G5 transmitter with data. This feature ensures that a transmission occurs at every transmit interval.

The user can disable GOES transmissions by deselecting the **Enable Transmission** checkbox. If the transmission is disabled, all functions in the datalogger occurs in normal preparation for a GOES transmission; however, no data is transmitted.

Note that the **Self-Timed** checkbox must remain selected when using BLM or WSC message format. If using Time Ordered or Pseudo Binary format then the **Self-Timed** checkbox can be deselected if only Random transmissions are desired.

8.2.3.3 Pwr Params tab

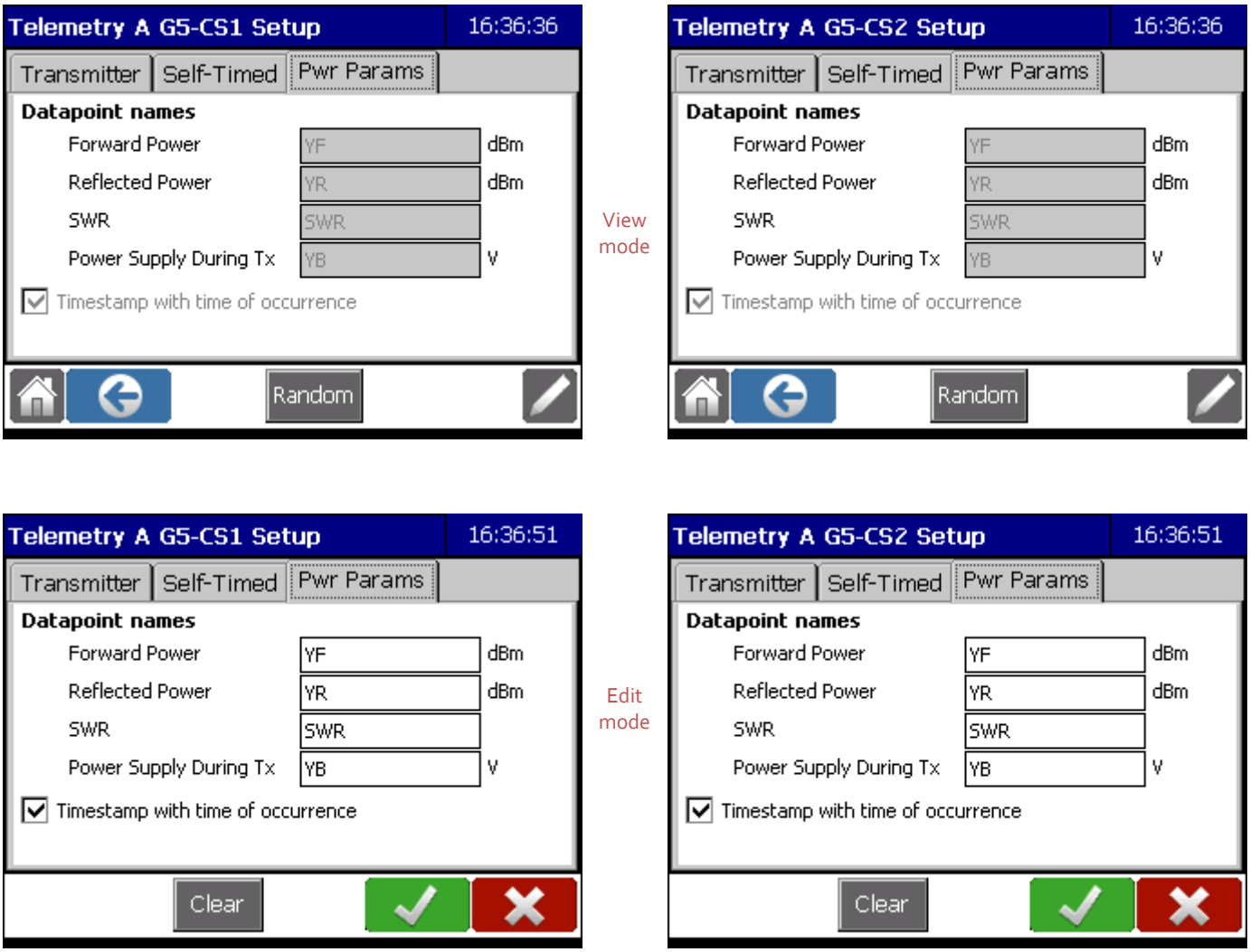


Figure 8-4: G5 Set-up screens -- Pwr Params tab

The datapoints defined on this tab appear as internal sensors in the datalogger. **Forward Power**, **Reflected Power**, **SWR** (Standing Wave Ratio), and **Power Supply During Tx** are parameters updated by the G5 transmitter after each GOES transmission.

The default name for each parameter is shown. They may be changed if desired.

If selected, the **Timestamp with time of occurrence** checkbox records the parameters with the time the GOES transmission occurred. If the checkbox is not selected, then the parameters are not associated with a transmission time.

8.2.3.3.1 Forward power

Forward Power is a measurement (units of dBm) of the G5 GOES transmitter's RF output power during the last transmission.

8.2.3.3.1.1 Reflected power

Reflected Power is a measurement (units of dBm) of the RF power reflected back to the G5 GOES transmitter from the antenna connection during the last transmission.

8.2.3.3.1.2 SWR

Standing Wave Ratio (**SWR**) is a calculation based on the forward and reflected power (see formula below). SWR is a measure of impedance mismatch between the output of the G5 transmitter and the connected antenna. An SWR of 1 indicates an ideal match and signifies that maximum RF power is transferred to the antenna. SWR values greater than 1 indicate an impedance mismatch between the G5 transmitter and the connected antenna. Typically SWR values of less than 1.5 are acceptable. An SWR of 1.5 indicates that 4% of the transmitter power is being reflected from the antenna. SWR is defined as:

$$SWR = \frac{1 + \sqrt{\frac{P_{ref}}{P_{fwd}}}}{1 - \sqrt{\frac{P_{ref}}{P_{fwd}}}}$$

where

P_{ref}	reflected power (W)
P_{fwd}	forward (transmitted) power (W)

8.2.3.3.1.3 Power supply during tx

Power Supply During Tx is a measurement (units of Volts) of the G5's supply voltage made by the G5 during a GOES transmission. Essentially **Power Supply During Tx** is a measurement of battery voltage under load.

Note: **Power Supply During Tx** replaces the **Vload** parameter used in datalogger application versions prior to version 2.32 build 5.

8.2.4 Message formats

The **Format** drop-down menu (see Figure 8-3) is used to select the format of the transmitted GOES message. The **Set Message** button is used to configure the contents of the message.

8.2.4.1 BLM message format

BLM message format is an ASCII format commonly used in fire weather applications. BLM message format is configured by adding variables in the order you want them transmitted (see Figure 8-5).

The **Up** and **Down** buttons can be used to adjust the order of the Transmit Variables. The Format button is used to set the number of characters for each Transmit Variable (see Figure 8-6).

Interval and **Offset** settings are used to specify how often the selected Transmit Variables are written to the transmit buffer. Transmit Variables need to be written to the transmit buffer at least two minutes prior to the G5 transmit time in order for them to be included in the G5's transmission.

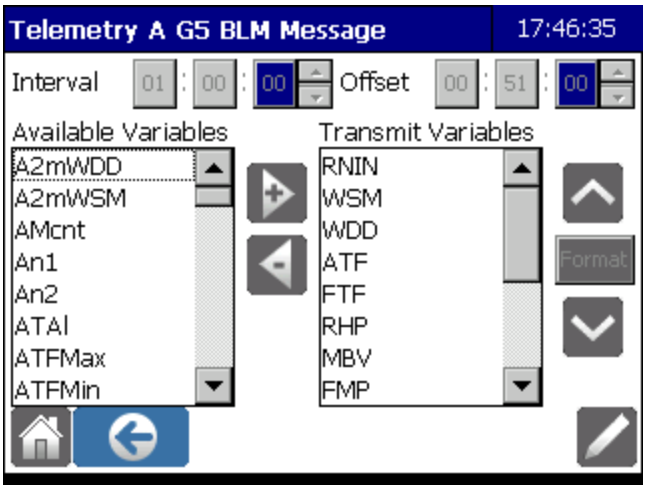


Figure 8-5: G5 BLM Message screen

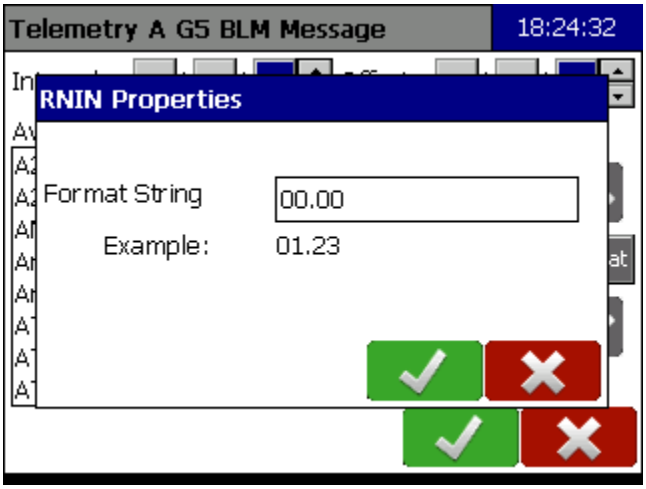


Figure 8-6: G5 BLM Format String screen

8.2.4.1.1 BLM single sample example

An example of a typical hourly BLM message transmission is shown below. In this example the data is sampled two minutes prior to the GOES transmission.

Message timing

Parameter	Value	Meaning
Message Interval	01:00:00	data is sampled every hour …
Message Offset	00:51:00	… at 51 minutes and 0 seconds after the top of the hour(see Figure 85a) note that the message timing is set at two minutes prior to the GOES transmission (see Figure 83)

Datalogger parameter information

Parameter	Meaning	Format
RNIN	Rainfall	00.00
WSM	Wind Speed	000
WDD	Wind Direction	000
ATF	Air Temperature	000
FTF	Fuel Stick Temperature	000
RHP	Relative Humidity	000
MBV	Main Battery Voltage	00.0
FMP	Fuel Stick Moisture	000.0
WDDP	Peak Wind Direction	000
WSMP	Peak Wind Speed	000
SR	Solar Radiation	00000

GOES transmission

Value	Meaning
001044E409131142033G43+0NN195EUB00056	GOES Header
00.41	Rainfall
001	Wind Speed
201	Wind Direction
053	Air Temperature
055	Fuel Stick Temperature
081	Relative Humidity
13.4	Main Battery Voltage
009.9	Fuel Stick Moisture
089	Peak Wind Direction
003	Peak Wind Speed
00153	Solar Radiation

8.2.4.1.2 BLM multiple sample example

An example of an hourly BLM message transmission is shown below. In this example the data is sampled every 15 minutes so four sets of data are transmitted (i.e. at 14:20:33, data from 13:30:00, 13:45:00, 14:00:00, and 14:15:00 is transmitted).

Message Timing

Parameter	Value	Meaning
Message Interval	00:15:00	data is sampled every 15 minutes …
Message Offset	00:00:00	… at hour + 00, 15, 30, and 45 minutes (+ 0)

- .

Datalogger Parameter Information

Parameter	Meaning	Format
RNIN	Rainfall	00.00
WSM	Wind Speed	000
WDD	Wind Direction	000
ATF	Air Temperature	000
FTF	Fuel Stick Temperature	000
RHP	Relative Humidity	000
MBV	Main Battery Voltage	00.0
FMP	Fuel Stick Moisture	000.0
WDDP	Peak Wind Direction	000
WSMP	Peak Wind Speed	000
SR	Solar Radiation	00000

GOES Transmission

Value	Meaning
001044E409132142033G43+0NN195EUB00220	GOES Header
00.41 00.41 00.41 00.41	Rainfall
002 001 002 001	Wind Speed
091 138 221 245	Wind Direction
050 050 049 049	Air Temperature
050 050 050 049	Fuel Stick Temperature
081 083 083 084	Relative Humidity
13.4 13.4 13.4 13.4	Main Battery Voltage
009.9 010.1 010.1 010.1	Fuel Stick Moisture
092 077 100 267	Peak Wind Direction
005 004 005 008	Peak Wind Speed
00153 00087 00063 00030	Solar Radiation

- note that the GOES transmission time is still at 20 minutes and 33 seconds after the top of the hour.

8.2.4.2 Time ordered message format

Time Ordered message format is an ASCII format used to transmit time-stamped data. The **G5 Setup** screen when Time Ordered format is selected allows for GOES random transmissions (see Figure 8-7).

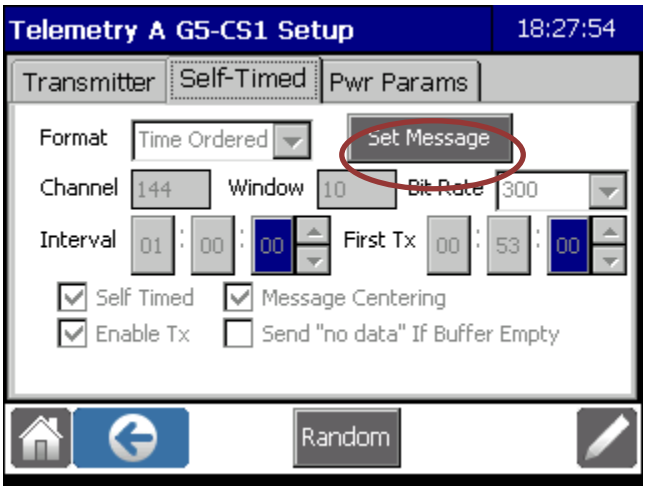


Figure 8-7: G5 Set-up screen for Time Ordered Format

Time Ordered messages are configured by defining sensor sets. A sensor set is a group of datapoints transmitted in a defined ordered. Multiple sensor sets can be defined for Time Ordered transmission (up to 100 unique sensor sets – numbers 0 to 99). Each sensor set transmission includes the Sensor Set's ID number followed by a time-stamp and then the defined data.

Press the **Set Message** button (Figure 8-7) and then press tap **New** (Figure 8-8) to define a new sensor set (Figure 8-9).

Figure 8-8: G5 Time Ordered Message screen

The **Up** and **Down** buttons can be used to adjust the order of the Transmit Variables within a specific sensor set. **Interval** and **Offset** settings are used to specify how often a Sensor Set is written to the transmit buffer. Sensor Sets need to be written to the transmit buffer at least two minutes prior to the G5 transmit time in order for them to be included in the G5's transmission.

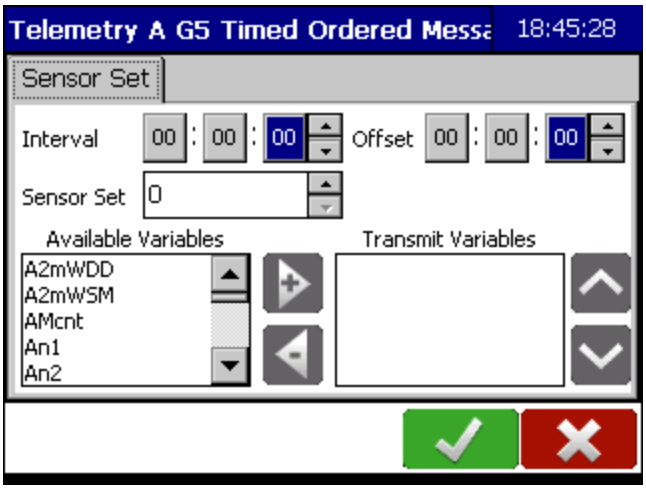


Figure 8-9: G5 Time Ordered Message Set-up screen

8.2.4.2.1 Time ordered example

An example of a Time Ordered message transmission is shown below.

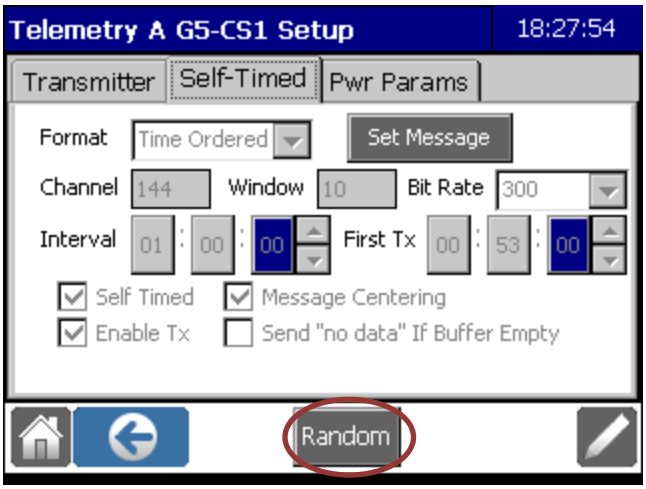
GOES Transmission

Value	Meaning
001044E409130003031G34+1NN196WUB00342	GOES Header
0 16:30:00 0.67,4.7,206.4,78.3,77.0,30,13.3,7.4,199.9,5.5,2	Sensor set 0, 16:30 data
0 16:40:00 0.67,5.1,201.1,78.4,77.1,30,13.4,7.4,199.7,5.4,3	Sensor set 0, 16:40 data
0 16:50:00 0.67,4.5,209.3,78.4,77.1,30,13.4,7.4,202.7,5.8,2	Sensor set 0, 16:50 data
0 17:00:00 0.67,4.9,203.7,78.4,77.2,30,13.3,7.4,198.4,5.4,2	Sensor set 0, 17:00 data
4 17:00:00 13.2,19.4	Sensor set 4, 17:00 data
0 17:10:00 0.67,4.9,203.7,78.4,77.2,30,13.3,7.4,199.9,5.4,2	Sensor set 0, 17:10 data
0 17:20:00 0.67,4.5,205.5,78.4,77.2,30,13.3,7.4,199.9,5.4,2	Sensor set 0, 17:20 data

Note that the transmission time is 00:30:31 UTC (the GOES Header is always in UTC) whereas the transmitted data is in local time as the datalogger is set to PDT. Also note that the datalogger's 17:30 data was not included in this transmission as the data was not available at the required two minutes prior to the transmit time.

8.2.4.2.2 Random transmission set-up

From the **G5 Setup** screen, tap **Random** to display the **G5 Random Setup** screen (see Figure 8-10) which enables the user to configure transmit parameters for GOES random transmissions.



Random channel parameters are provided by the United States' National Oceanic and Atmospheric Administration (NOAA).

Channel	Your assigned random channel
Bit Rate	Your assigned platform baud rate
Repeat Count	The number of times the G5 transmits the random messages

The **Random** checkbox when selected enables random transmissions. The **Setup** button allows the user to configure the Random message (see Figure 8-11).

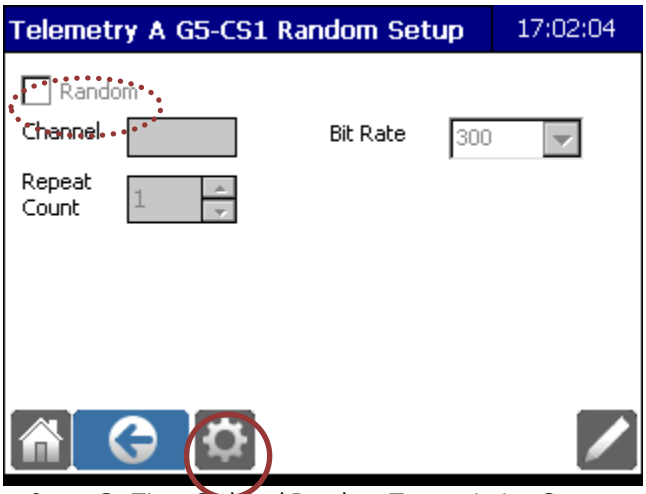


Figure 8-10: G5 Time Ordered Random Transmission Set-up screen

Similar to self timed messages, random messages are also configured by defining sensor sets (multiple sensor sets are also allowed for Random transmissions). A combined total of 100 unique sensor sets can be defined for Time Ordered messages. A random message is prepared for transmission when the defined condition is met.

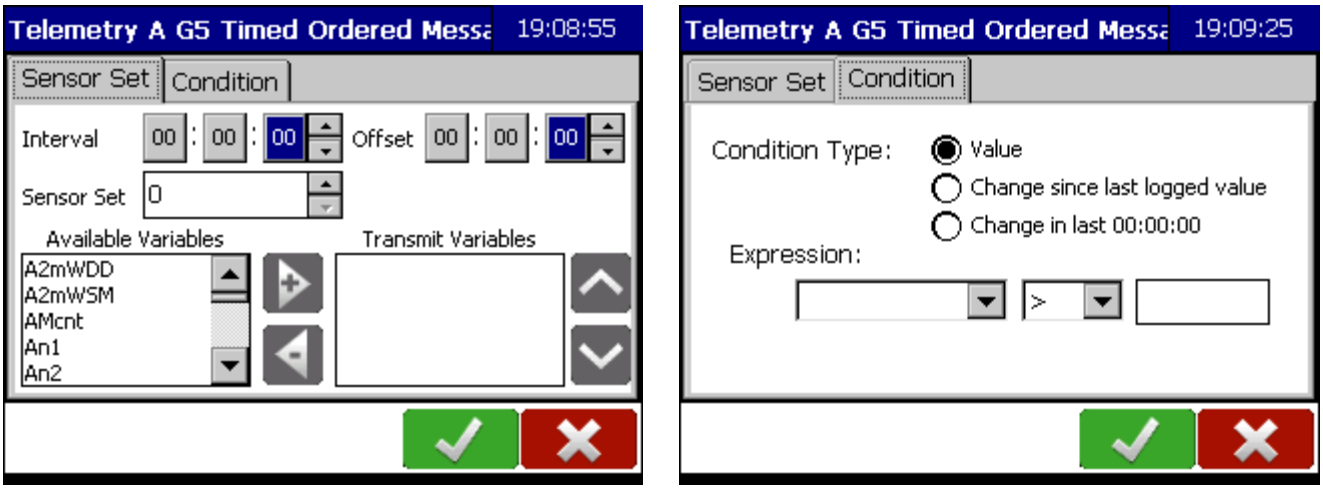


Figure 8-11: G5 Time Ordered Random Transmission Message Definition screens

8.2.4.3 WSC message format

WSC message format is an ASCII format used by the Water Survey of Canada. WSC is a self contained format with parameter names and timing embedded in the message[2].

A WSC message is configured by tapping **New** to add variables for transmission (see Figure 8-12).

Figure 8-12: G5 WSC Message screen

Figure 8-13 shows the setup screen for each WSC variable.

[2] Refer to Environment Canada's Operational Specifications for Environmental Data Acquisition System (EDAS) Logger, Annex A of KM055-045105/B, appendix A, page 15 for more details.

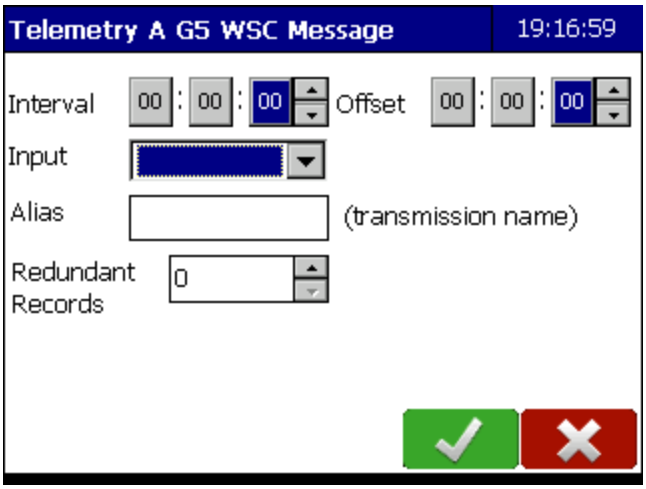


Figure 8-13: G5 WSC Message Set-up screen

The **Input** drop-down selection box allows the user to choose any datapoint already configured in the datalogger as a variable for transmission. Each variable has associated **Interval** and **Offset** settings to specify when and how often the selected datapoint is written to the transmit buffer.

The **Alias** textbox allows the user to enter a name which is used as the transmit variable's name. An example of where an alias would be used is when a user wishes to transmit data maximum and minimums using the same name as the original datapoint (i.e. transmit minimum stage, HGmin, as a stage measurement, HG). Leave the Alias textbox blank if no alias is desired.

The Redundant Records setting allows the user to specify how much of previously transmitted data is to be retransmitted.

The **Order** button on the bottom of the **WSC Message** screen allows the user to specify the order in which the variables are transmitted. The upper image of Figure 8-14 shows that three variables have been set for transmission in WSC format. Pressing **Order** allows the user to rearrange the transmission order (Figure 8-14, lower image) by selecting the variable and then using the **Up** and **Down** icons to move the variable's position in the displayed list. The variable displayed at the top of the list is transmitted first, followed by the next variable, etc., etc.. The variable shown at the bottom of the list is transmitted last

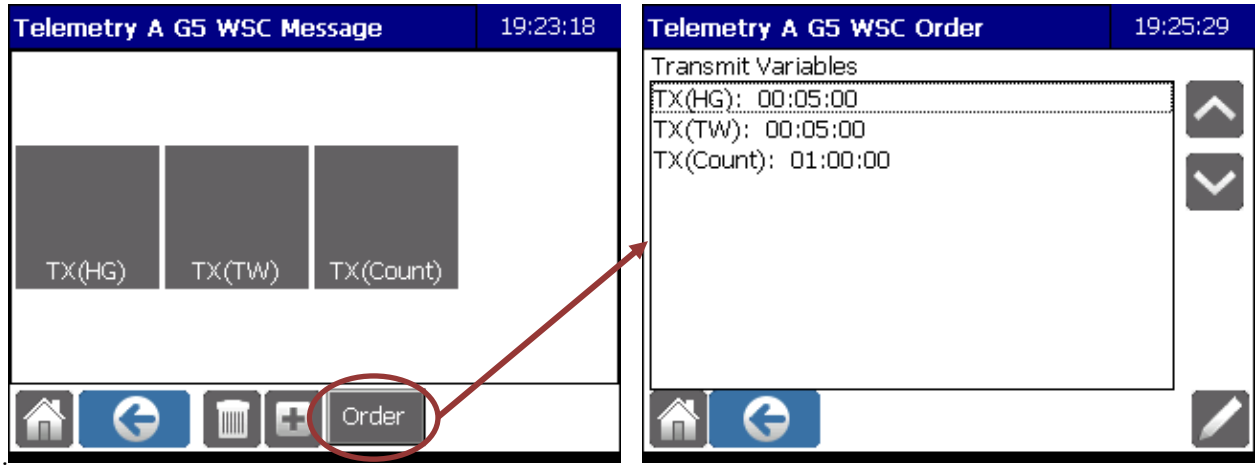


Figure 8-14: G5 WSC Message Order screen

8.2.4.3.1 WSC message example

An example of a WSC message transmission is shown below.

Message Timing

Parameter	Value	Meaning
Message Interval	: 00:30:00	transmission occurs every 30 minutes …
Message Offset	: 00:15:20	… starting at 15 minutes and 20 seconds past the top of the hour

- s

Datalogger parameter information

Parameter	Meaning	Notes
VB	Battery Voltage	sampled every 30 minutes from the top of the hour zero redundant records
HG	Stage	sampled every five minutes from the top of the hour six redundant record

GOES transmission

```
00102172091271845 20G34+0NN195EUB00101  :VB 15 #30 13.2 :HG 05 #05 5.379 5.925 6.472 7.019
7.565 8.112 8.659 9.206 9.753 9.800 9.846 9.994
```

Notes:

1. the transmission time is 18:45:20 UTC (the GOES Header is always in UTC)
2. Battery Voltage parameter (VB) was sampled 15 minutes prior to transmission (15) on a 30 minute interval (#30), so the value of VB at 18:30:00 UTC was 13.2 Volts.
3. Stage parameter (HG) was sampled five minutes prior to transmission (05) on a 5 minute interval (#05), so the values of HG are:

HG value	Time	Note
5.379	18:40:00 UTC	
5.925	18:35:00 UTC	
6.472	18:30:00 UTC	
7.019	18:25:00 UTC	
7.565	18:20:00 UTC	
8.112	18:15:00 UTC	
8.659	18:10:00 UTC	this is redundant record 1
9.206	18:05:00 UTC	this is redundant record 2
9.753	18:00:00 UTC	this is redundant record 3
9.800	17:55:00 UTC	this is redundant record 4
9.846	17:50:00 UTC	this is redundant record 5
9.994	17:45:00 UTC	this is redundant record 6

8.2.4.4 Pseudo binary message format

Pseudo Binary message format is a bit packed modified ASCII transmission format. The **G5 Setup** screen when Pseudo Binary format is selected allows for GOES random transmissions (see Figure 8-15).

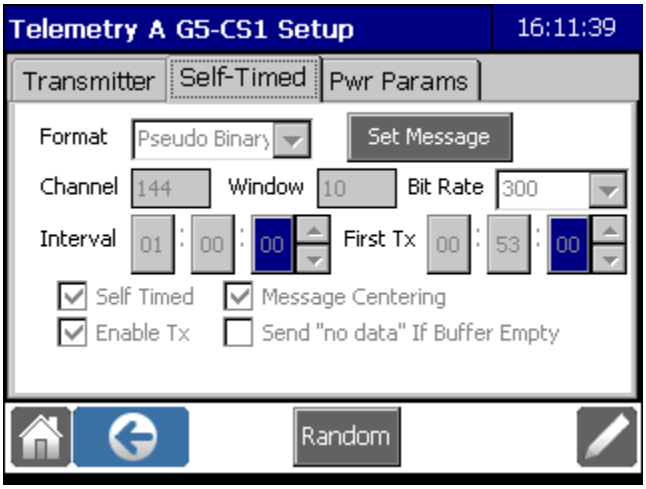


Figure 8-15: G5 Set-up screen for Pseudo Binary Format

Pseudo Binary messages are configured by defining data sets. A data set is a group of datapoints transmitted in a defined ordered. Multiple data sets can be defined for Pseudo Binary transmission (up to 64 unique data sets – numbers 0 to 63). Each data set transmission includes the Data Set's Format ID number followed by the defined data.

While in view mode (not in edit mode), tap **Set Message** (Figure 8-15) and then tap **New** (Figure 8-16) to define a new data set.

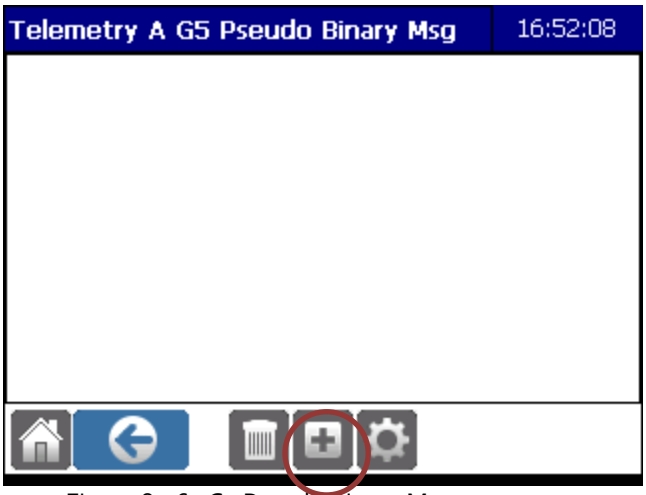


Figure 8-16: G5 Pseudo Binary Message screen

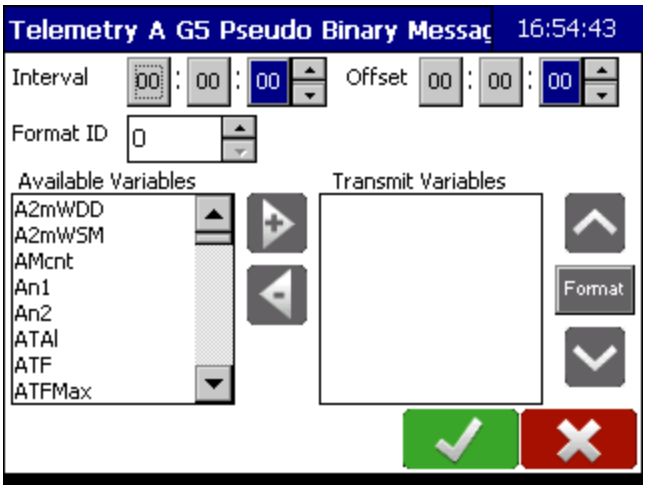


Figure 8-17: G5 Pseudo Binary Message Set-up screen

Figure 8-17 shows the , **Interval** and **Offset** settings are used to specify how often a Sensor Set is written to the transmit buffer. Sensor Sets need to be written to the transmit buffer at least two minutes prior to the G5 transmit time in order for them to be included in the G5's transmission.

The **Up** and **Down** buttons can be used to adjust the order of the Transmit Variables within a specific data set.

The **Format** button sets the precision of the transmitted datapoint (see Figure 8-18). The minimum and maximum value that can be encoded in pseudo binary format is displayed on the **Format** screen.

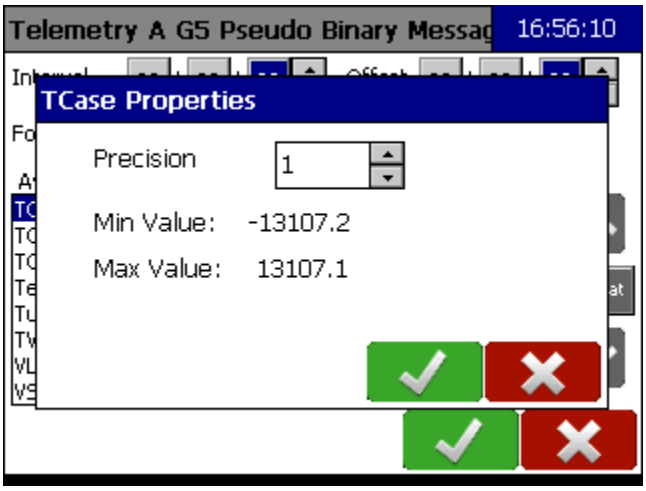


Figure 8-18: G5 Pseudo Binary Message Parameter Format screen

8.2.4.4.1 Pseudo binary example

An example of a Pseudo Binary message transmission is shown below.

GOES Transmission

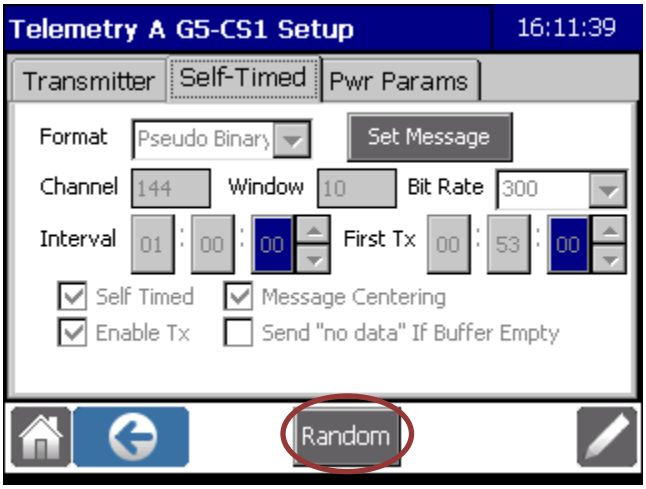
001044E410301160501G35+0NN195EXE00027bBXbPBXbWaETZ□AuEUf***BXb\

001044E410301160501G35+0NN195EXE00027 : GOES Header
bBXbPBXbWaETZ□AuEUf***BXb\ : Data

Note that the transmitted data is not human readable and that a software decode tool is required to extract the data from the transmission.

8.2.4.4.2 Random transmission set-up

Return to the Setup screen and tap **Random**.



This opens the **G5 Random Setup** screen (see Figure 8-19) which enables the user to configure transmit parameters for GOES random transmissions.

Random channel parameters are provided by the United States' National Oceanic and Atmospheric Administration (NOAA).

Channel	Your assigned RANDOM CHANNEL
Bit Rate	Your assigned platform baud rate
Repeat Count	The number of times the G5 transmits the random messages

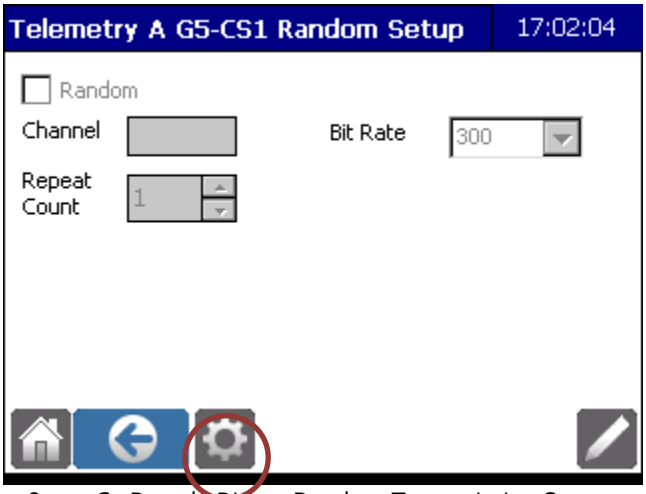


Figure 8-19: G5 Pseudo Binary Random Transmission Set-up screen

Tap the **Setup** button to configure the Radom message. Similar to self timed transmission messages, random messages are also configured by defining data sets (multiple data sets are also allowed for random

transmissions). A combined total of 64 unique data sets can be defined for Pseudo Binary messages. A random message is prepared for transmission when the defined condition (see Figure 8-20) is met.

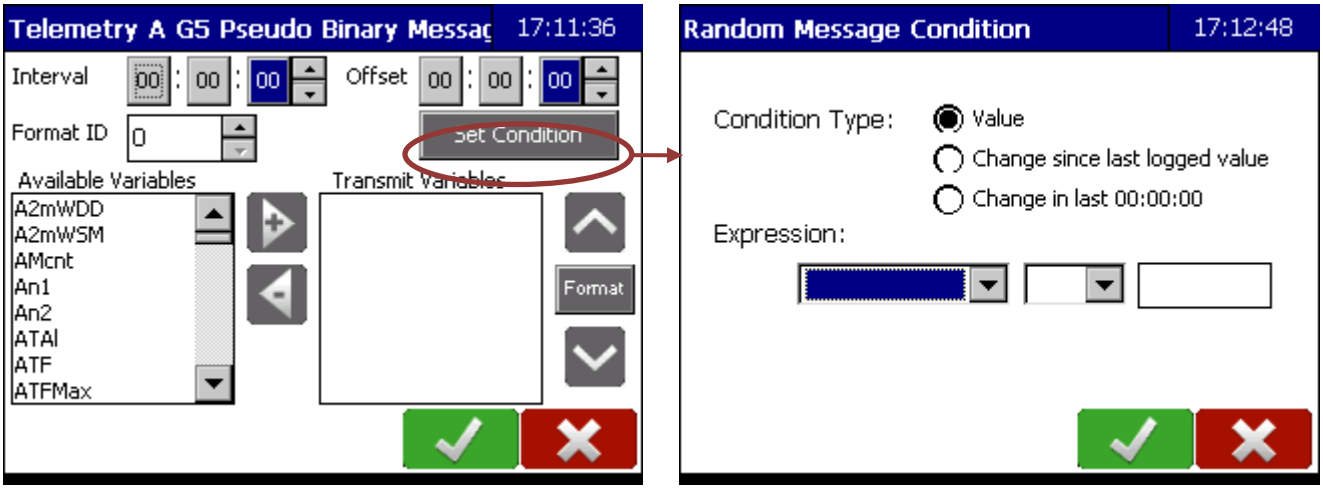
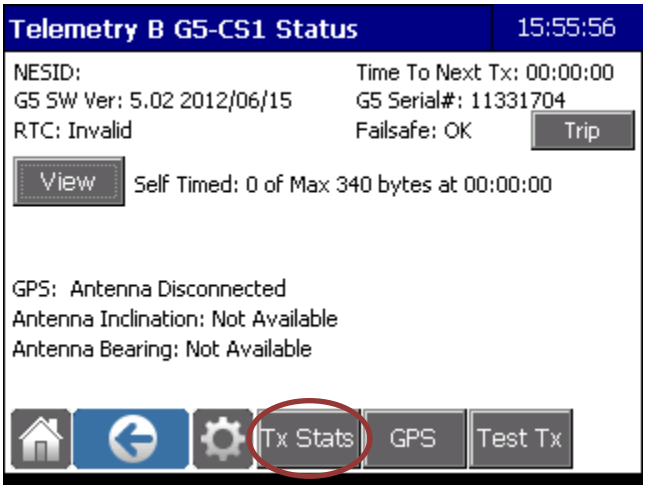


Figure 8-20: G5 Pseudo Binary Random Transmission Message Definition screens

8.2.5 Tx Stats

From the **G5 Status** screen tap the **Tx Stats** button.



This displays the **G5 Stats Log** screen (see Figure 8-21) which displays the success/fail statistics of the most recent G5 GOES transmissions.

The **View Details** button enables the user to look at the individual transmission reports from the G5 transmitter. Approximately 500 transmission reports can be stored in the circular telemetry log file. Once the log file is full, the datalogger begins to overwrite the oldest stored transmission reports.

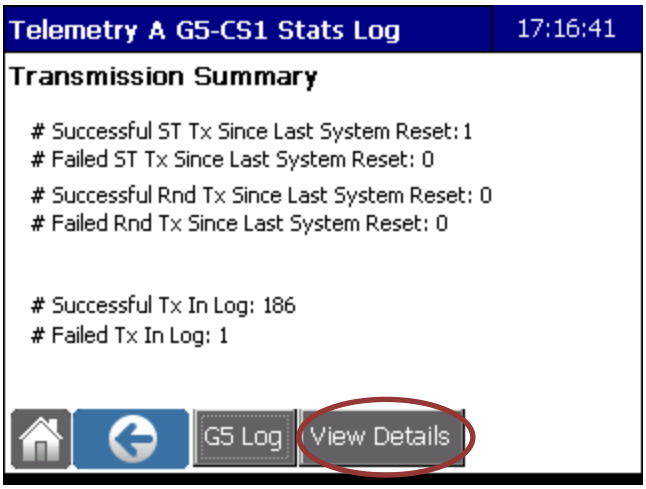


Figure 8-21: G5 Tx Stats Log screen

Example transmission reports are shown in Figure 8-22. The log entry shown on the left is typical of a successful transmission while the log entry shown on the right is that of an unsuccessful transmission.

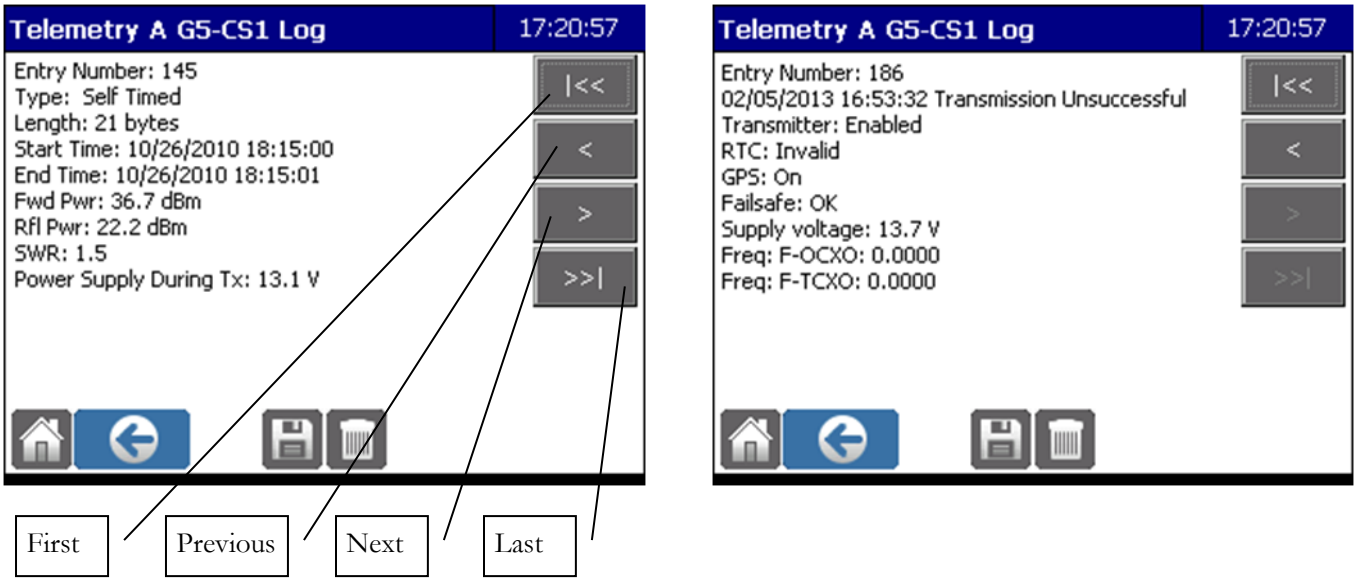


Figure 8-22: G5 Tx Log Examples

The **First**, **Last**, **Previous**, and **Next** buttons are used to navigate through the log entries. The **Save** button writes the telemetry log file to the USB memory stick in the Axiom H2 Data Logger\<station name>\Data folder. The **Clear** button erases all entries in the telemetry file and reset the entry number counter.

Parameters displayed in the transmission reports are different for successful and unsuccessful transmissions. An explanation for each parameter follows.

G5 Telemetry Log Parameters

Entry Number	a unique entry number which is reset when the log is cleared.
Type	the type of transmission (self timed or random)
Length	the number of bytes transmitted
Start Time	the transmission start time
End Time	the transmission end time
Fwd Pwr	the power delivered to the antenna during transmission as measured by the G5
Rfl Pwr	the power reflected from the antenna during transmission as measured by the G5
SWR	the calculated Standing Wave Ratio
Power Supply During Tx	the G5's power supply voltage during the G5's transmission as measured by the G5 (see Figure 74)
Transmitter	G5 transmitter status, either Enabled or Disabled
RTC	G5 real time clock status, either Valid or Invalid
GPS	GPS status, either Off or On
Failsafe	GPS failsafe status, either OK or Tripped
Supply Voltage	G5 power supply voltage at the time of transmission
Freq: F-OCXO:	G5 Oven Controlled Crystal Oscillator Frequency, ideally 10 MHz
Freq: F-TCXO:	G5 Temperature Compensated Crystal Oscillator Frequency, ideally 43.2 kHz.

8.2.6 GPS

The **GPS** button on the **G5 Status** screen displays the **G5 GPS** screen (see Figure 8-23) which enables the user to view information from the G5's internal GPS receiver.

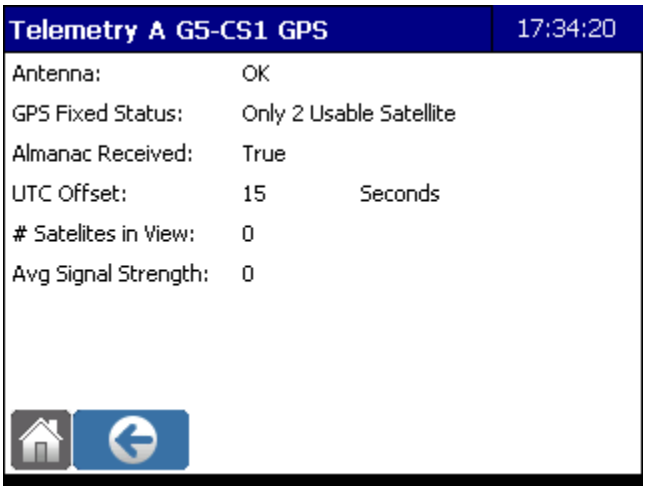


Figure 8-23: G5 GPS screen

For the most part, the G5 transmitter's GPS receiver is turned off. The GPS receiver is only powered on once per day to resynchronize the G5 (note that, due to the accurate timing in the G5, the G5 can continue to operate for approximately 28 days without receiving a GPS resynchronization). The GPS receiver is turned on when the **G5 GPS** screen is displayed. The GPS requires several seconds to update its status. The GPS remains on until the user exits the screen or the datalogger timeout (about 20 minutes) is exceeded.

GPS Parameters

Antenna	GPS antenna connection status (OK, Disconnected, or Shorted).
GPS Fix Status	GPS receiver state information.
Almanac Received	True or false indicating whether or not the GPS has received almanac information.
UTC Offset	Displays the time offset between UTC and GPS time. This time difference is automatically accounted for when synchronizing the G5 and the datalogger to UTC time.
# Satellites in View	Displays the number of satellites from which the GPS is receiving information.
Avg Signal Strength	The average signal strength from the # Satellites in View.

8.2.7 Test Tx

The **Test Tx** button on the **G5 Status** screen displays the **G5 Test Tx** screen (see Figure 8-24) which enables the user to trigger a G5 test transmission. Currently the user can select the test type (RF Carrier or Fixed message), NESID, Bit Rate (100, 3000 or 1200 baud), and the DCS channel number.

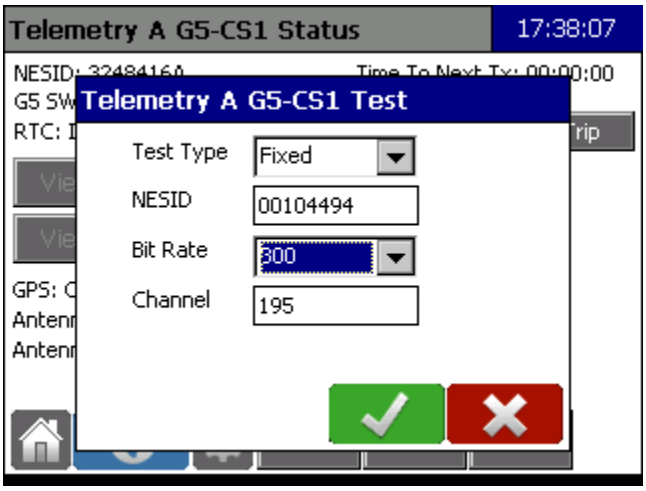


Figure 8-24: G5 Test Tx screen

A test transmission report (similar to a Tx Log) is displayed after the test transmission has completed.

8.2.7.1 Sample fixed message test transmission

The following is a sample of a fixed message test transmission downloaded from Wallops Island Command and Data Acquisition Station. The message consists of a header (added by the GOES Data Collection System) and message data from the test transmission.

```
001014E809124191542G47-0NN195EFF00396
Operator Initiated Test Transmission:
Operator Initiated Test Transmission:
Operator Initiated Test Transmission:
Operator Initiated Test Transmission:
Operator Initiated Test Transmission:
Operator Initiated Test Transmission:
```

8.2.7.1.1 GOES DCS header decoding

The header from the previous fixed message test transmission sample is decoded below.

Code	Meaning
001014E8 09 124 19 15 42 G 47 -0 N N 195 E FF 00396□	Full header
001014E8	DCP Address (NESDIS ID)
09	Year
124	Day of Year
19	Hour
15	Minute
42	Second
G	Message Code (see below)
47	Signal Strength, 33 to 57 dBm (normal is 44 to 49)
-0	Frequency Offset in Hz
N	Modulation Index (N = normal, L = low, H = high)
N	Data Quality (N = normal, F = fair, P = poor)
195	Channel Number
E	Satellite (West, East)
FF	Uplink Carrier Status
00396	Number of Data Characters
□	Flag word, 8 bits (see below)

Message codes

G	good message
?	message received with parity errors
W	message received on wrong channel
D	message received on multiple channels (duplicate)
A	message received with address errors (correctable)
T	message received early or late (time error)
U	unexpected message received (>2 min early or late of assigned time)
M	Scheduled message is missing
N	PDT is incomplete

Flag word definition

	Bit #	Meaning
LSB	1	undefined
	2	clock update since last transmission (1 = update, 0 = not)
	3	Data Compression (1 = on, 0 = off); future enhancement
	4	Reed Solomon (1 = on, 0 = off); future enhancement
	5	undefined
	6 & 7	ASCII = 10, Pseudo binary = 11, Binary = 01 (bit 6 / bit 7)
MSB	8	odd parity for ASCII formatted data

Chapter 9 AirTalk guide

Chapter contents

9.1 Introduction

9.1.1 Purpose and features

AirTalk enables a datalogger to broadcast voice messages over radio about important conditions in the datalogger. Messages can contain values measured and recorded by the datalogger. Messages can be sent either in response to radio-transmitted demands or automatically when the datalogger detects a user-defined alert condition.

AirTalk is compatible with any PTT (push-to-talk) radio, on any band.

AirTalk can be configured for multiple languages and can manage many messages and alert conditions. All messages and conditions are defined by the user.

9.1.2 "AirTalk" vs. "RVT"

AirTalk is the latest generation of FTS radio voice messaging services for the Axiom dataloggers. The first generation of this technology was known as RVT (for "Radio Voice Transmission")[3].

> If you have the first-generation RVT system, please see Chapter 9.

9.1.3 Principles of operation

The key elements in the AirTalk system are:

- **Alert**: A condition together with a message to be transmitted when the condition is detected by the datalogger.
- **Message**: A complete unit of voice transmission that can be transmitted.
- **Phrase**: Part of a message.
- **Phrasing**: Instructions for how to express a phrase in a particular language. The phrase may include data extracted from the datalogger at the moment of message transmission.
- **DTMF** codes: A touch-tone code transmitted by radio to request a message action: either speak a message or cancel one that is currently speaking. DTMF codes are specified as parts of messages.

9.1.3.1 Messages

Figure 9-1 shows how Message, Phrase, and Phrasing, and Datapoint objects fit together to define a message which can be transmitted in any of several languages. A message is made up of a sequence of phrases, which are strung together in order. Each phrase has one or more phrasings, which are pronounceable texts, possibly containing place-holders for datalogger values (datapoints) to be inserted at the time of message transmission. When a message is transmitted, the phrasings are pronounced, one after the other in order, presumably forming an intelligible message to the human listener.

[3] AirTalk was developed with the internal name "RVT2" (RVT version 2). A few last traces of this name remain in the product, mainly in the AirTalk audit log.

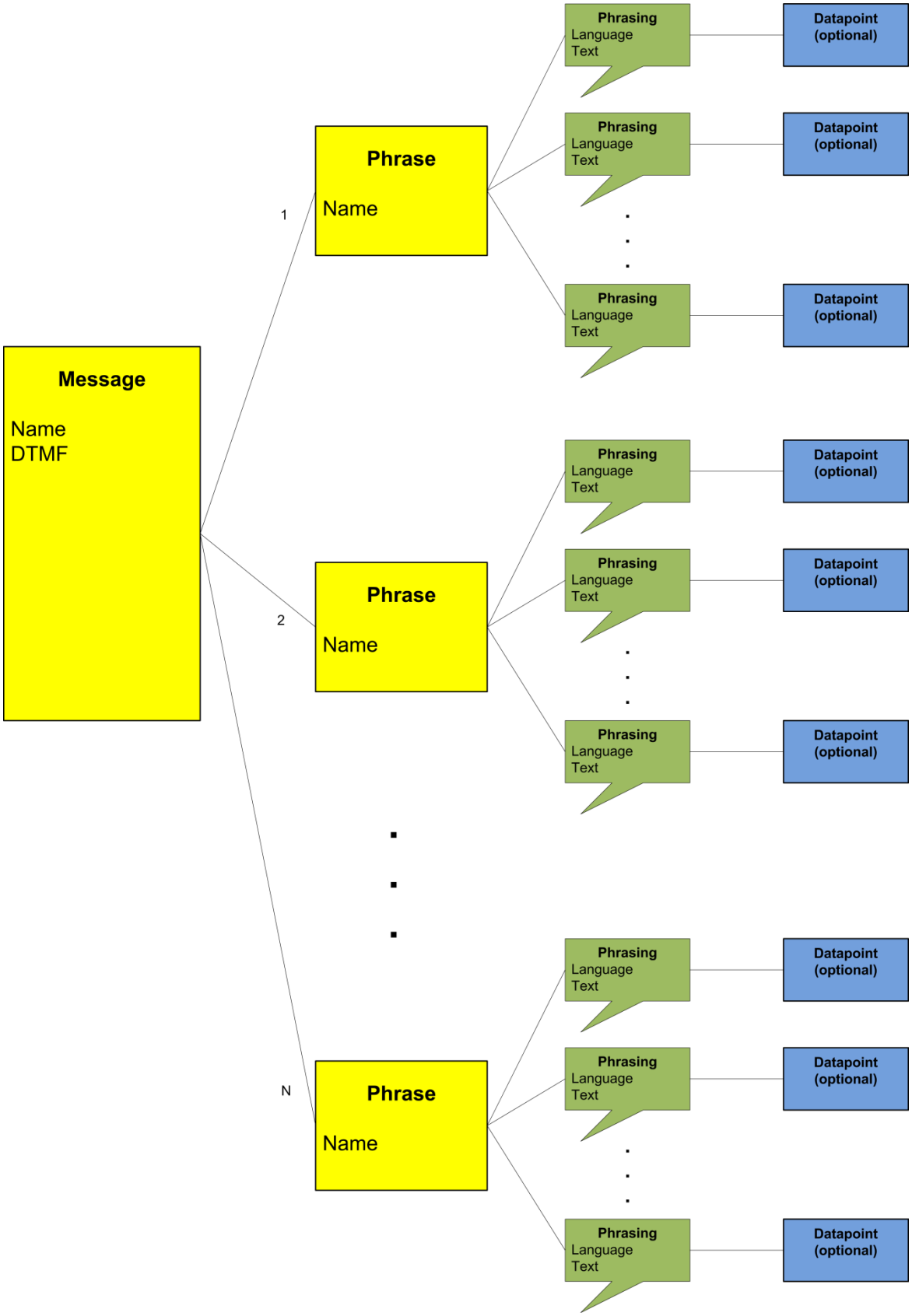


Figure 9-1: Generic message structure in AirTalk

Figure 9-2 shows how an example message for reporting current atmospheric conditions would be set up. This message can be transmitted in English, Spanish or French. (Note: These languages are used for example only. Your system may have different languages installed.) The order of phrases for this message is (1) current temperature, (2) current wind speed, and (3) current wind direction.

Note that other messages in the system can also use some of the same phrase definitions. For example, a wind-only message could use just the "current ws" (wind speed) and "current wd" (wind direction) phrases. A phrase can be used in any number of messages.

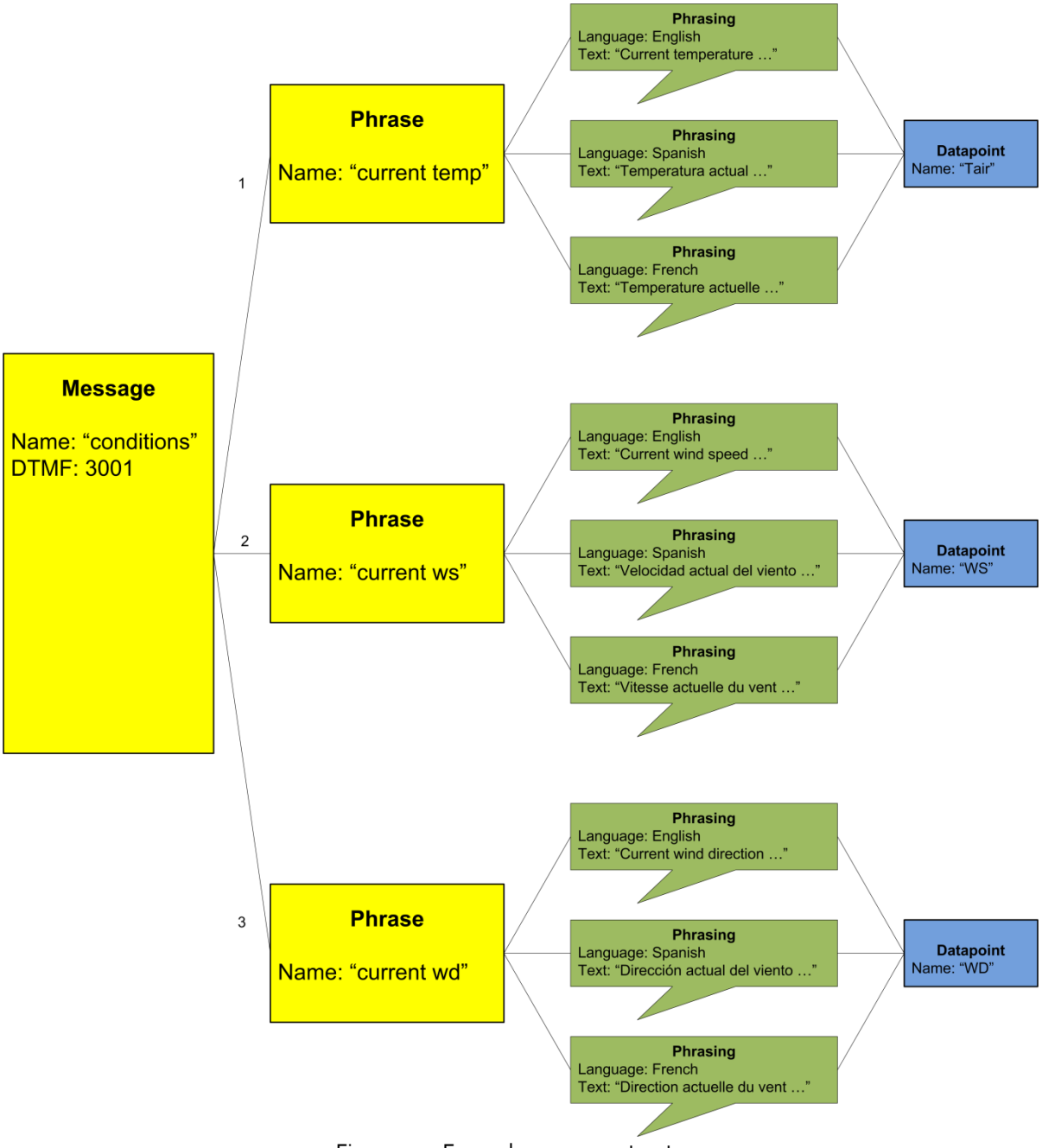


Figure 9-2: Example message structure

9.1.3.2 Alerts

Figure 9-3 shows the components of an alert. An alert consists of a condition and a message. The condition is evaluated according to the Variable, Relation, and Threshold, together with the Dead Zone and Snooze Time attributes of the Alert. The message is simply any message defined in the system, as described above. (An automatically created datapoint called a threshold tracker variable simplifies defining messages that mention the threshold value.)

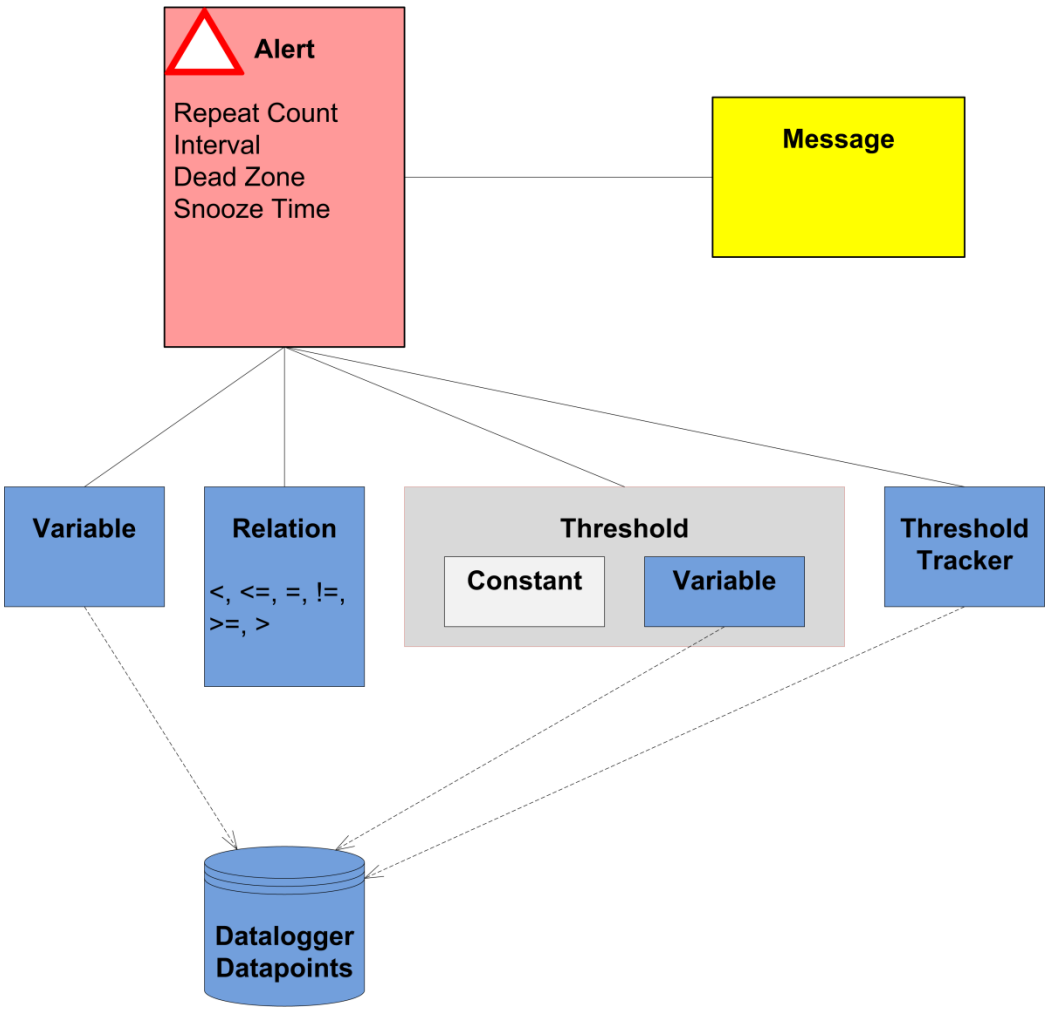


Figure 9-3: Generic alert in AirTalk

Figure shows how an example alert would be set up. The message in this example would likely include the value of the threshold tracker variable (e.g., "Air temperature is over XX degrees.").

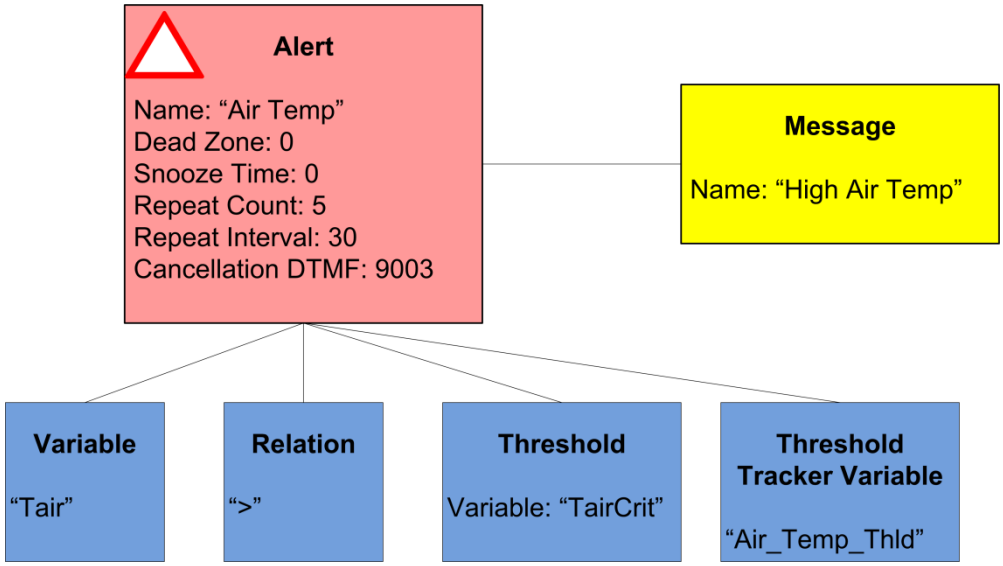


Figure 9-4: Example alert structure

9.1.3.3 Alert triggering

The **alert condition** is defined by a **Variable**, a **Relation** and a **Threshold**.

- **Variable** refers to a datapoint defined in the datalogger.
- **Threshold** is a value to which the Variable is compared. A Threshold may be either:
  - a fixed constant, or
  - a datapoint in the datalogger (normally a User Variable process, which makes it easy to a change an alerting parameter and to share one threshold value between several related alerts).
- **Relation** is the comparison: it is one of the standard arithmetic comparisons < (less than), <= (less than or equal), = (equal), != (not equal), >= (greater than or equal), or > (greater than).

> The alert condition is evaluated using the value of Variable **rounded to the user-specified precision specified for that variable**. This is particularly important for understanding the behaviour of the = (equal) and != (not equal) conditions.

The alert is **triggered** when the alert condition changes from false to true and the following additional conditions are also true:

- at least Snooze Time seconds have passed since the last time the condition changed from true to false;
- at least once during the Snooze Time, Variable took on a value at least Dead Zone away from Value (see table below; Dead Zone does not apply to operator !=)

Operator	Additional condition
<	Variable >= Value + Dead Zone
<=	Variable > Value + Dead Zone
>	Variable <= Value – Dead Zone
>=	Variable < Value – Dead Zone
=	Variable <= Value – Dead Zone OR Variable >= Value + Dead Zone
!=	n/a

When the alert is triggered, the associated message is broadcast (Repeat Count + 1) times, with an interval of Repeat Interval seconds between each rebroadcast.

If the alert condition changes from true to false before Repeat Count broadcasts of the alert message have been made, the broadcasts for that triggering of the alert are stopped immediately.

If the user sends the Cancellation DTMF code to AirTalk and the Alert is currently broadcasting, the remaining repeat count is set to zero and the Alert is in exactly the same state it would be in if all messages has been broadcast. In other words, a cancellation has no other effect than to stop the broadcasting. Condition evaluation continues as usual.

Figure 9-5 shows key behaviours of an alert (with operator > or >=) relative to a graph of the alert condition variable's value.

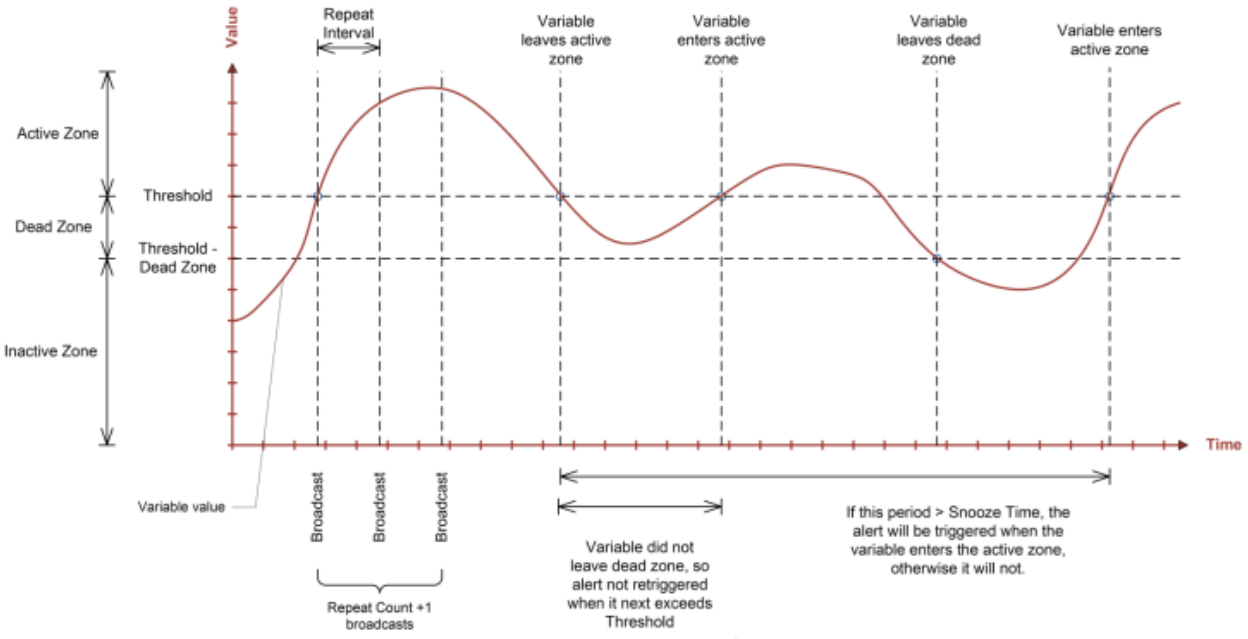


Figure 9-5: Alert triggering behavior on a graph of the alert condition variable value

9.1.3.4 Controlling whether alerts are transmitted

Alerts can be controlled in two ways:

- By suspending and resuming alerting (all alerts)
- By enabling and disabling individual alerts

9.1.3.4.1 Suspending and resuming alerting

Alerting as a whole can be suspended (turned off) or resumed (turned on). When alerting is suspended, no alert will send a message, and all messages queued to be sent are removed. When alerting is resumed, those alerts that are enabled(see below) can once again send their messages when they are triggered by current conditions. (Messages cleared at the time of suspension are removed and are not restarted when alerting resumes.)

Suspending and resuming does not affect the enabled/disabled status of any individual alert. It only prevents or allows the enabled alerts to send their messages.

To suspend alerting:

- click the **Suspend Alerting** button on the **AirTalk Configuration Editor** screen– **Alerts** tab, or
- send the DTMF code 9999 to the datalogger via radio

To resume alerting:

- click the **Resume Alerting** button on the **AirTalk Configuration Editor** screen – **Alerts** tab, or
- send the DTMF code 8888 to the datalogger via radio

To control the suspend/resume state that datalogger starts with after powering up:

- use the **Suspend Alerting on Power Up** control on the **AirTalk Configuration Editor** screen– **Alerts** tab

(See section 9.3.11, AirTalk Configuration Editor screen – Alerts tab).

9.1.3.4.2 Enabling and disabling individual alerts

Each alert can be enabled (turned off)or disabled (turned on) independently of all other alerts. An enabled alert sends its message when its trigger conditions are satisfied and alerting is active. A disabled alert never sends a message, regardless of conditions.

Enabling and disabling individual alerts does not affect whether the alerting system as a whole is suspended or active (resumed). It only affects whether an individual alert will send messages when alerting is active.

To enable or disable an alert, modify the **Enabled/Disabled** setting on the **Alert Editor** page.

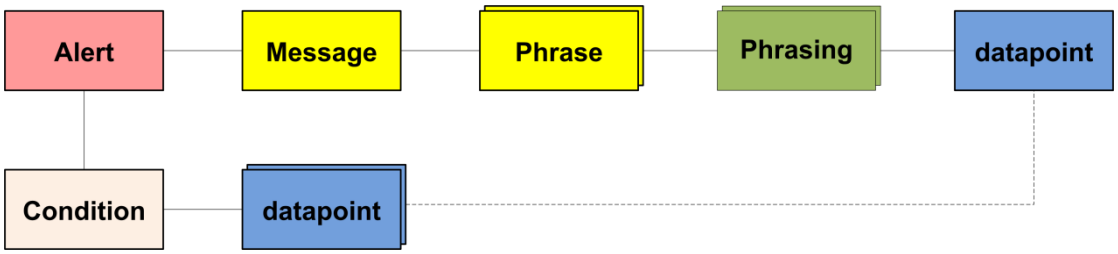
9.1.4 Practical considerations

Most users' final goal is to build an alert. To reach that goal, the message building blocks – phrasings, phrases, and messages – have to be set up, normally in that order.

Just one complication intervenes: Many alert messages need to state the value of the threshold in the condition that triggered the alert. In some cases it is necessary to define the alert before the message content (phrasings) stating the value of the threshold can be set up. However, to define the alert, the message and its content must be defined. Fortunately this apparent roadblock has a straightforward solution, which is described below.

9.1.4.1 Quick review of AirTalk alert and message structure

When constructing alerts, it's helpful to keep this structure in mind. Particularly important is the fact that the phrasing datapoint and the condition threshold tracker datapoint may be the same.



In words:

- An alert is triggered by a condition, which depends on one or two datapoints (the trigger variable and the trigger threshold, which may be a variable or a constant).
- An alert, when triggered, sends a message, which is composed of one or more phrases, each of which uses one or more phrasings, each of which may include a datapoint value.
- Sometimes a phrasing includes a special datapoint created by and for the alert condition called the threshold tracker variable. See below for instructions on using it.

9.1.4.2 Using the threshold tracker variable

Whenever you define an alert, a special datapoint called a threshold tracker variable is also automatically defined in the datalogger. The threshold tracker variable mirrors (tracks) the threshold value, whether it is set by a constant or by a variable. Whenever the threshold value is changed, the value of the threshold tracker variable also changes. The threshold value can change as a result of several different actions:

- a constant threshold value is used, and someone changes the constant
- a variable threshold value is used, and someone changes which variable (datapoint) supplies the value
- a variable threshold value is used, and someone or something changes the value of the variable
- a constant threshold value is changed to a variable value, or vice versa

The threshold tracker variable is a single, reliable source for the value used in the alert trigger condition, no matter how it is defined or changed. Its utility is in constructing the phrase(s) that make up the message that the alert triggers.

Example

Suppose you are setting up a portable (Quick Deploy) station for use in controlled burn or firefighting situations. You need to define an alert condition based on air temperature. In each different deployment of the station, the threshold temperature for triggering the alert will be different. In some situations it might be 30°C, in others 33°C, in others 35°C or 40°C. Personnel will need change this threshold in the field to account for changing conditions.

Your desired alert message is: "Alert, Alert. Air temperature is over XX degrees," and XX must be whatever the current alert trigger threshold is (that is, the message must change whenever the threshold is changed). You could accomplish this by editing the phrasing(s) in the message that state the threshold (XX) every time the threshold is changed, but that is laborious and error-prone, particularly in the field. It would be easy to change the threshold but forget to change the phrasing(s), or to enter an incorrect value.

The most robust solution to this problem uses two datapoints:

1. **Threshold variable**. Define a User Var process to hold the threshold value, and define your alert trigger condition using this datapoint. This datapoint (User Var) can easily be changed in the field, and the alert triggering changes with it.
2. **Threshold tracker variable**. This variable (datapoint) is automatically defined for you when you define your alert. It reflects the value of the threshold variable, which may be changed from time to time. Use it in the phrasing(s) used in the message emitted by the alert.

The threshold tracker variable could be viewed as redundant in this example, since the threshold variable also supplies the current value of the threshold. But if the alert trigger condition was later modified to use a constant trigger value (unlikely but possible) or to use a different threshold variable (a different User Var), then the alert message would be rendered incorrect unless the tracker variable, which always reflects the threshold value no matter what its source, was used. It is this fidelity to the actual threshold value in use, regardless of source, that justifies the existence of the threshold tracker variable.

Application

Some pre-planning makes applying the example above much easier.

First, it's important to know that you cannot use a variable (datapoint) before it is defined. This applies to both the threshold variable that you define directly and the threshold tracker variable that is automatically defined when you define an alert. This fact has two implications, one simple and one more complicated:

1. Threshold variable. Define this variable (with a User Var process) before you begin defining your alert. (You can use the placeholder technique described below in this case, too, but you don't have to if you remember to define your threshold variable first.)
2. Threshold tracker variable.

   Problem: The threshold tracker variable is not defined until you define the alert, and the alert cannot be fully defined until you define a phrasing that uses the threshold tracker variable.

   Solution: Use one of the following "placeholder" techniques:

   a. Placeholder message:

      i. Initially define the alert using any message as a placeholder. If you have no messages defined yet, first define one that has no content.

      ii. Define the phrasing(s) to be used in the alert message, using the threshold tracker variable that now exists because you defined the alert.

      iii. Define the phrase(s) and finally the actual message to be used in the alert.

      iv. Go back to the alert and change the placeholder message to the actual message you just defined.

   b. Placeholder threshold:

      i. Define the phrasing(s) that will be used in the alert. Initially use a temporary placeholder value for the threshold value. The placeholder value can be a constant (probably easiest) or any existing datapoint. (You cannot refer to the threshold tracker datapooint yet because it is not defined until the alert is defined.)

ii. Follow the standard sequence for defining an alert: Define a phrase using the phrasing(s), a message using the phrase, and then the alert using the message.

iii. Go back to the placeholder phrasing(s) and change them to use the threshold tracker variable that now exists because you defined the alert.

Solution (a) is usually the simpler of the two. It is the method used in the detailed instructions below.

A second consideration is to use only a User Var as a threshold variable, or if you need to be especially clever, a process output variable that derives only from User Var values. In particular:

> **WARNING:** Do not define a trigger threshold using any variable (datapoint) that changes often.
>
> AirTalk must do a lot of work to adjust to changes in the threshold value. A quickly changing threshold value would tie up system resources in constantly readjusting to the new values. The likely outcome is that the datalogger will function sluggishly or not at all.

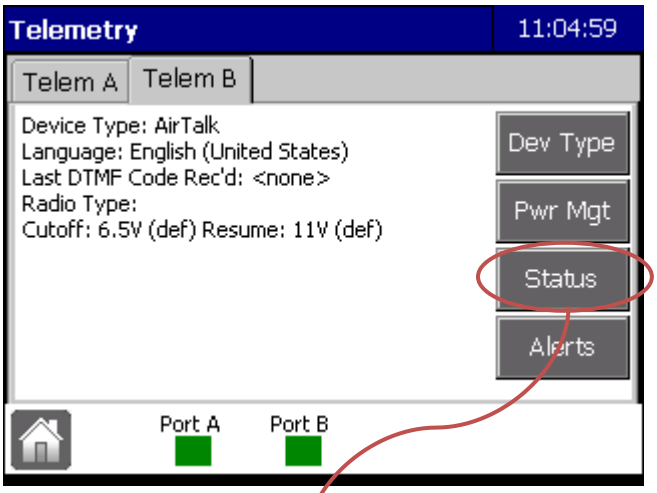
Precision and units of the threshold tracker variable

The threshold tracker variable (datapoint) is defined automatically by AirTalk. You can change its name, but AirTalk determines all its other properties, including precision and units. Precision and units are determined by the following rule:

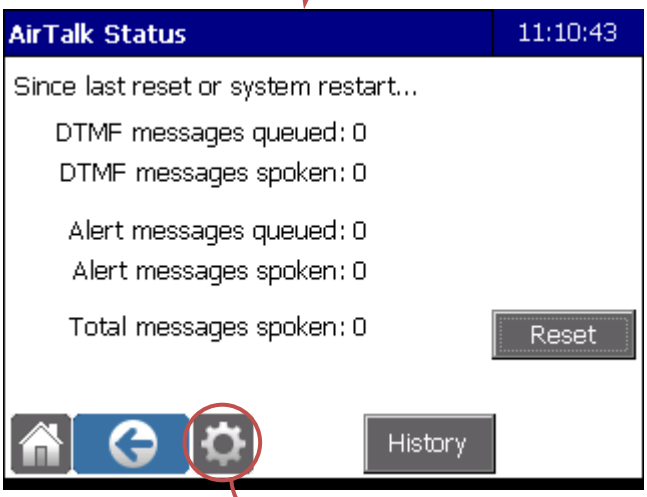
If the threshold is a	the Threshold Tracker Variable precision and units are the same as the
Constant Value	Trigger Variable
Variable Value	Threshold Variable

9.2 Common configuration tasks

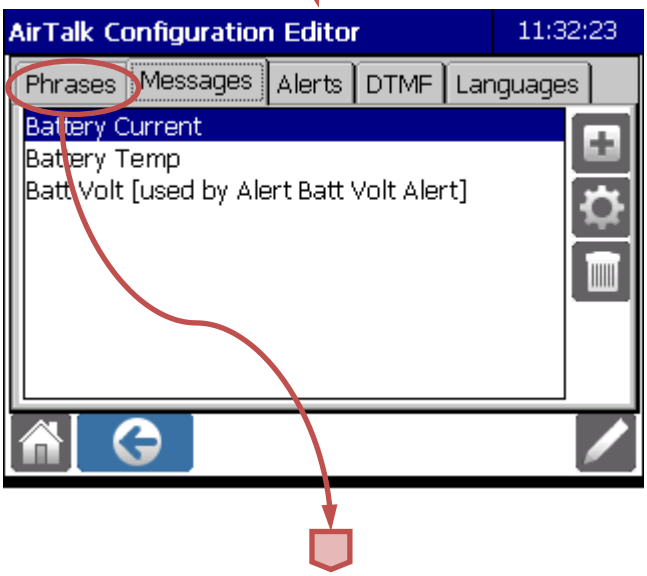
9.2.1 Creating a new phrase and associated phrasings



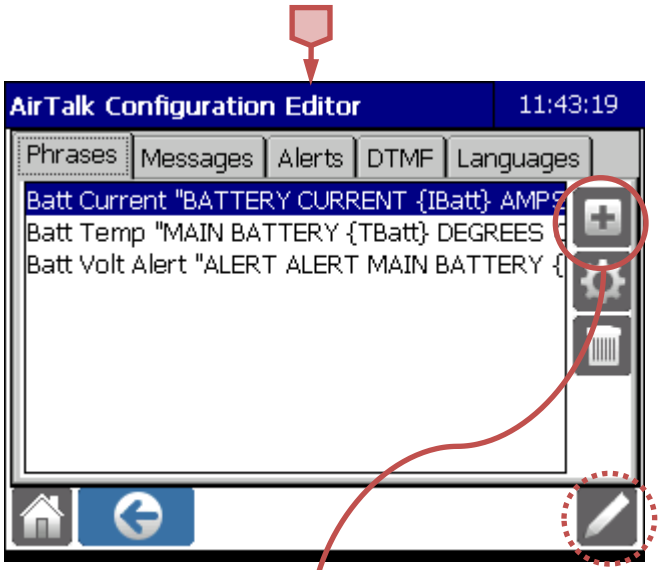
1. On the **Home** screen, tap **Telemetry**.
2. The **Telemetry** screen appears.
3. Navigate to appropriate Telem tab (AirTalk is commonly on Telem port B)
4. Tap the **Status** button next to the Radio Voice Transmitter port.



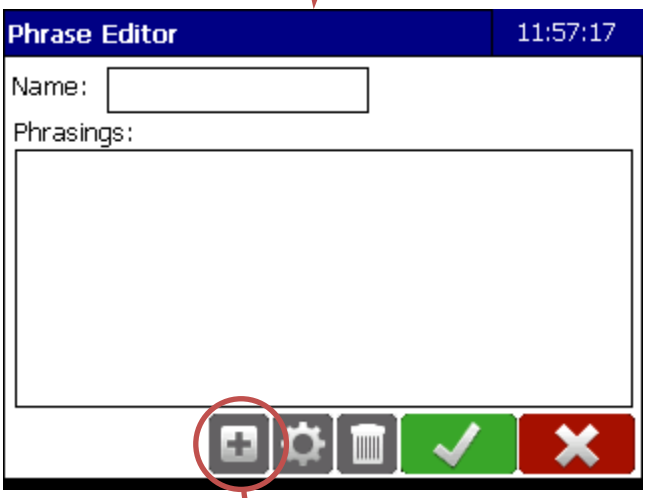
5. The **AirTalk Status** screen appears.
6. Tap the **Setup** button.



7. The **Messages** tab of the **AirTalk Configuration Editor** screen appears.
8. Tap the **Phrases** tab.



9. The **Phrases** tab of the **AirTalk Configuration Editor** screen appears.
10. Tap **Edit**.
11. The **AirTalk Configuration Editor** screen enters edit mode and the **New** button is enabled.
12. Tap **New**.



13. The **Phrase Editor** screen opens with all data controls blank.
14. Enter a short, descriptive name for the new phrase in the **Name** field.
15. Add phrasings in various languages as needed. To add a new phrasing:
    a. Tap **New**.

    *Note: the **New** button is disabled if there are already phrasings for all available languages.*

    b. The **Phrasing Editor** screen opens with all fields blank.
    c. Select the language for the phrasing. No more than one phrasing in each language can be defined for a given phrase.
    d. Select elements of the phrasing: **Preamble**, **Measured Item**, **Comparator**, **Value**, and **Units**. If you wish an element to be omitted from the phrasing, select **<none>**.
    e. To test the phrasing, tap **Talk**: The phrasing is spoken on the AirTalk.
    f. Tap **OK**.

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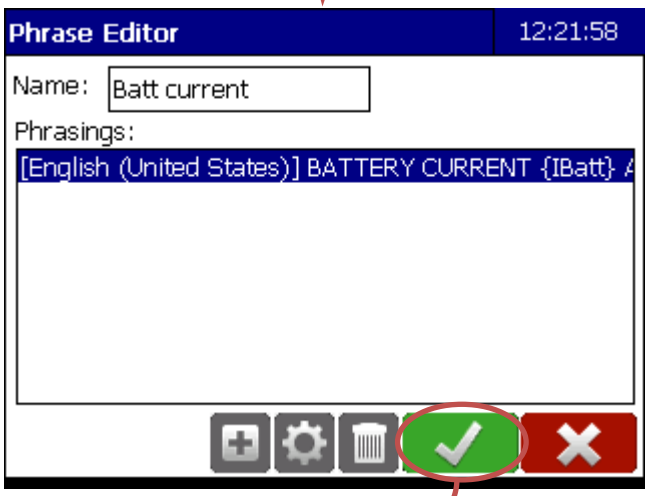
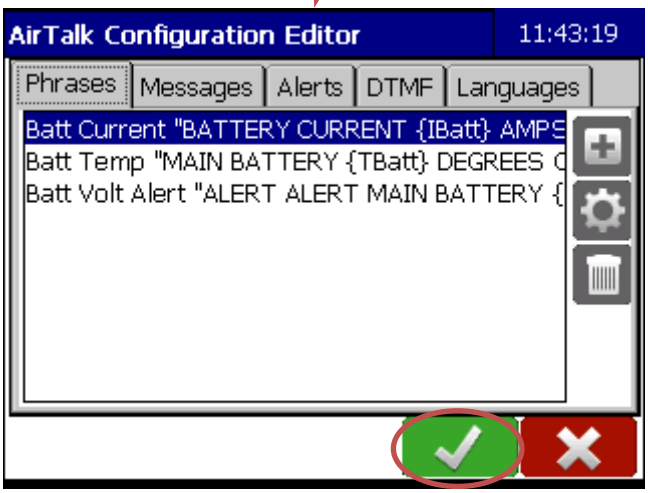


g. The phrasing just defined is saved.

h. The **Phrase Editor** screen appears, with the new phrasing listed.

16. When all required phrasings have been added, tap **OK**.

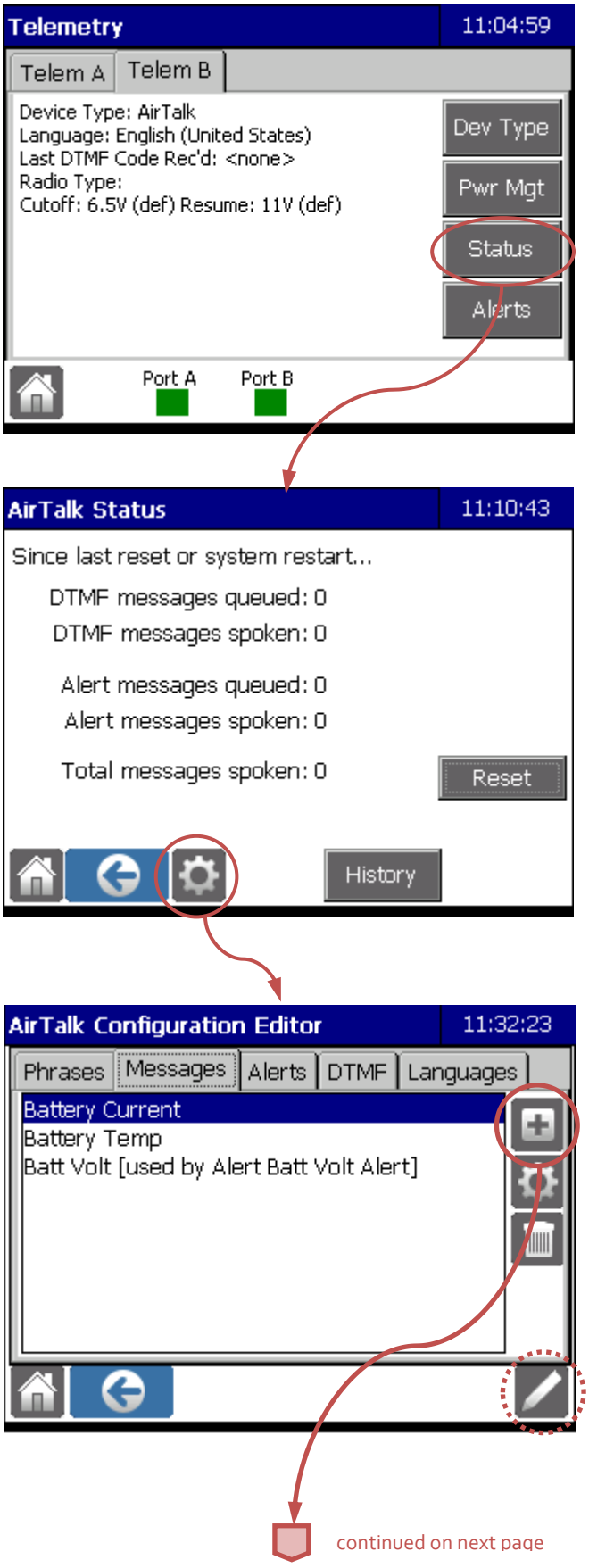


17. The **AirTalk Configuration Editor** screen appears, with the new phrase listed.

18. Tap **OK** to exit edit mode and return to the AirTalk Status screen.

end

9.2.2 Creating a new message



1. On the **Home** screen, tap **Telemetry**.
2. The **Telemetry** screen appears.
3. Navigate to appropriate Telem tab (AirTalk is commonly on Telem port B)
4. Tap the **Status** button next to the Radio Voice Transmitter port.
5. The **AirTalk Status** screen appears.
6. Tap the **Setup** button.
7. The **Messages** tab of the **AirTalk Configuration Editor** screen appears.
8. Tap **Edit**.
9. The **AirTalk Configuration Editor** screen enters edit mode and the **New** button is enabled.
10. Tap **New**.

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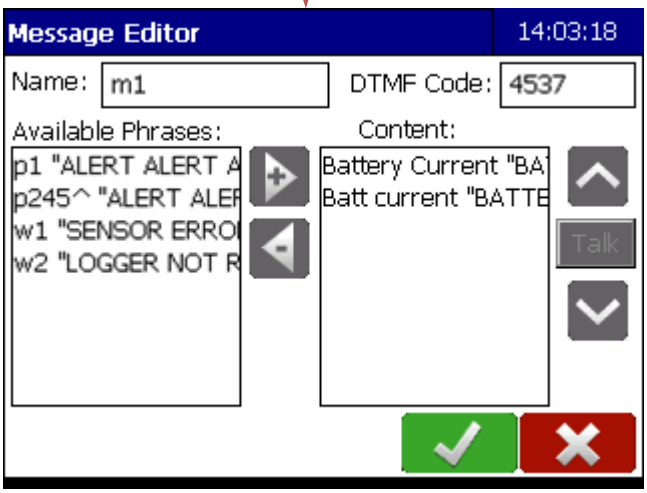
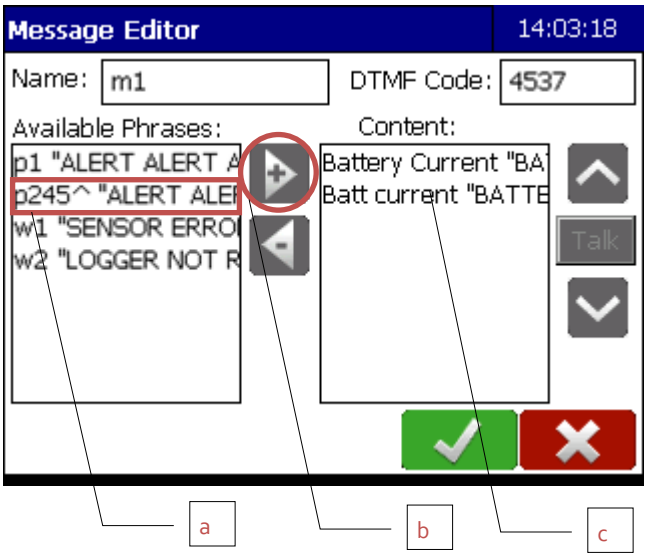
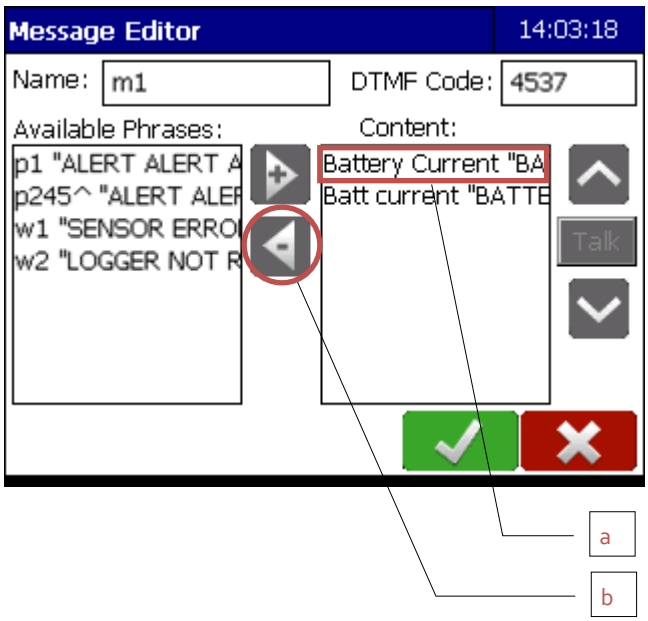


11. The **Message Editor** screen opens with all data controls blank.
12. Enter a short, descriptive name for the message in the **Name** field.
13. Optionally, enter a 2-, 3-, or 4-digit **DTMF Code** used to command that this message be broadcast.



14. Add phrases to the message. Normally they are added in the order they are to be spoken in the message, but their ordering can be modified later if necessary. To add a phrase to the message:
    a. Select a desired phrase in the **Available Phrases** list.
    b. Tap **Move Right Arrow**.
    c. If no item is selected in the Content list, the phrase is added to the end of the **Content** list. If an item is selected in the **Content** list, the phrase is added before (above) it. A phrase can be added more than once to the same message.
    d. A message can have no more than 15 phrases.
15. Optionally, remove phrases from the message. To remove a phrase:
    a. Select the phrase to be removed in the Content list.
    b. Tap **Move Left Arrow**.



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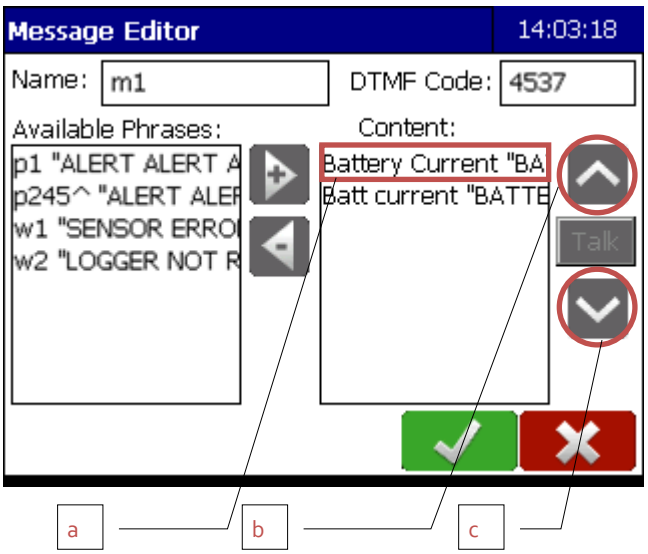
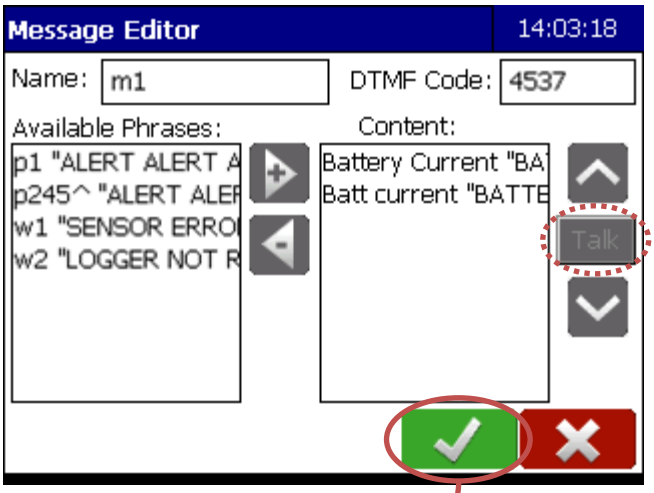
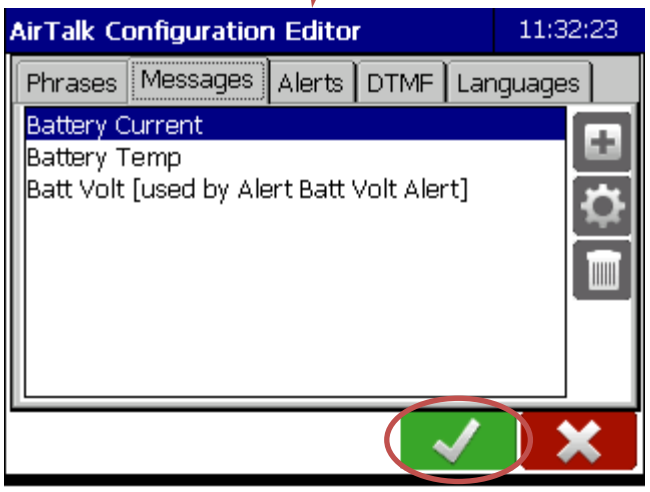


16. Optionally, change the order of phrases. To change the position of a phrase in the Content list:
    a. Select the phrase.
    b. To move it up (earlier) in the list, tap **Up**.
    c. To move it down (later) in the list, tap **Down**.



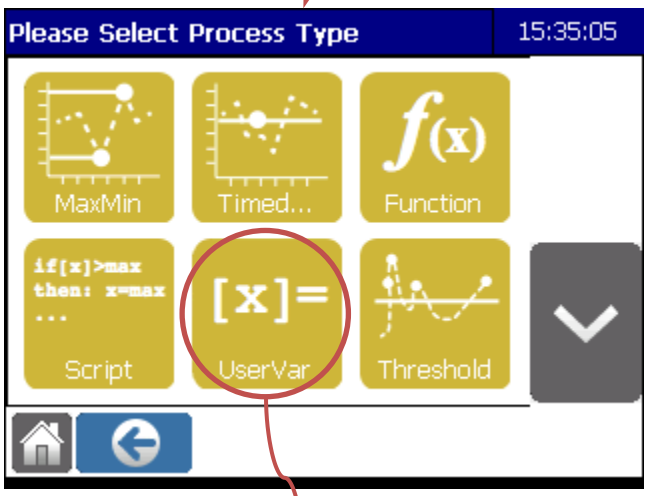
17. To test the message, tap **Talk**: The message is spoken on the AirTalk.
18. When all phrases for the message have been entered and ordered correctly, tap **OK**

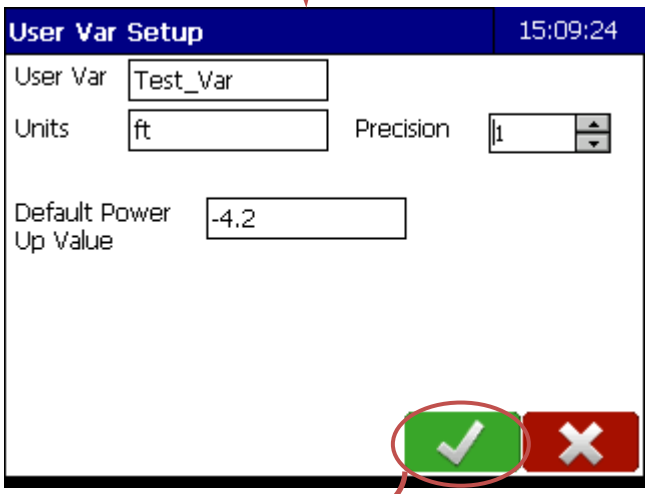


19. The **AirTalk Configuration Editor** screen appears, with the new message listed (not shown in this image).
20. Tap **OK** to exit edit mode and return to the **AirTalk Status** screen.

endc

9.2.3 Creating a new alert





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If you plan to use a variable threshold value in the trigger, and the variable has not yet been defined

1. On the **Home** screen, tap **Processing**.
2. The **Processes** screen opens.
3. Tap **New Process**.
4. The **Please Select Process Type** screen opens.
5. Tap **User Var**.
6. The **User Var Setup** screen appears.
7. Enter the name, units, precision, and a default value(applied on power-up and when you click OK on this screen) for the User Var.
8. Tap **OK**.

9. The **Processing** screen reopens, showing the newly created User Var process.

10. Tap **Home**.

11. The **Home** screen appears. Tap **Telemetry**.

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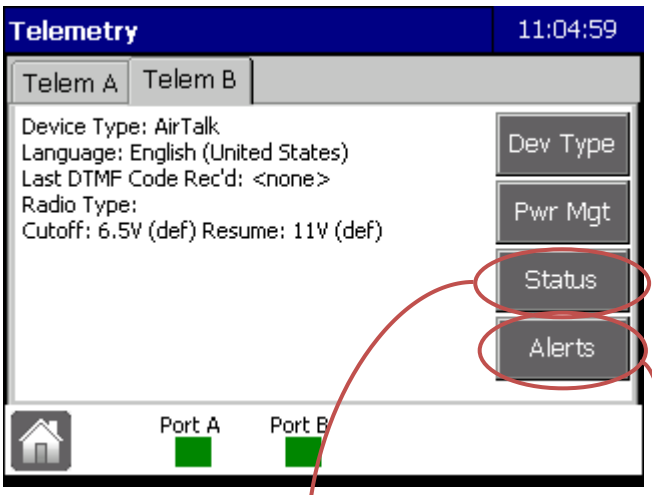
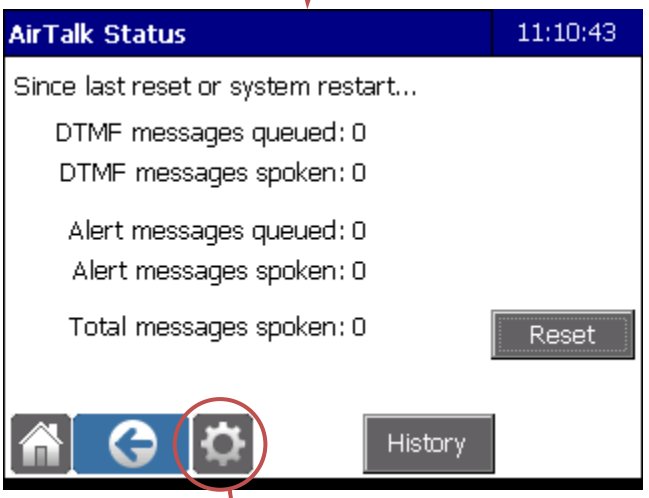
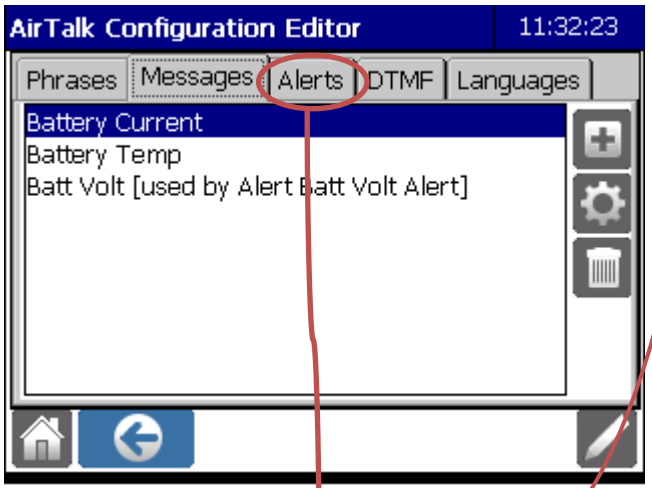


12. The **Telemetry** screen appears.
13. Navigate to appropriate Telem tab (AirTalk is commonly on Telem port B)
14. Tap the **Status** button next to the Radio Voice Transmitter port.

    Alternately, tap the **Alerts** button. This takes the user to the **Configuration Editor** with the **Alerts** tab already selected.



15. The **AirTalk Status** screen appears.
16. Tap the **Setup** button.



17. The **Messages** tab of the **AirTalk Configuration Editor** screen appears.
18. If no messages have yet been defined, define a placeholder message with no content now (see section 9.2.2, Creating a new message).

    To understand the reason for defining a placeholder message, see section 9.1.4.2.
19. Tap the **Alerts** tab.

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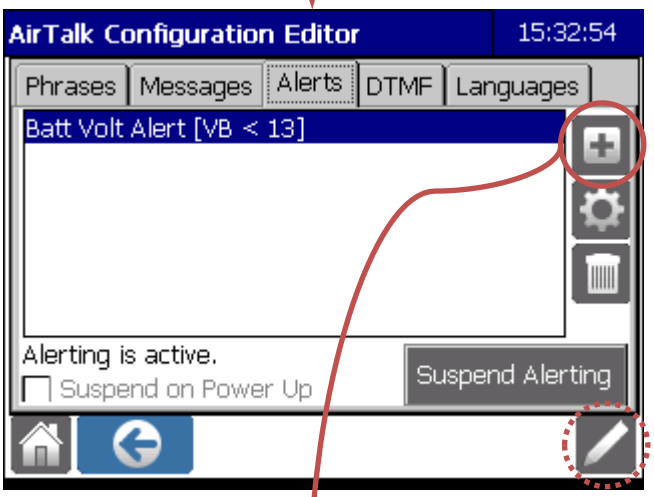

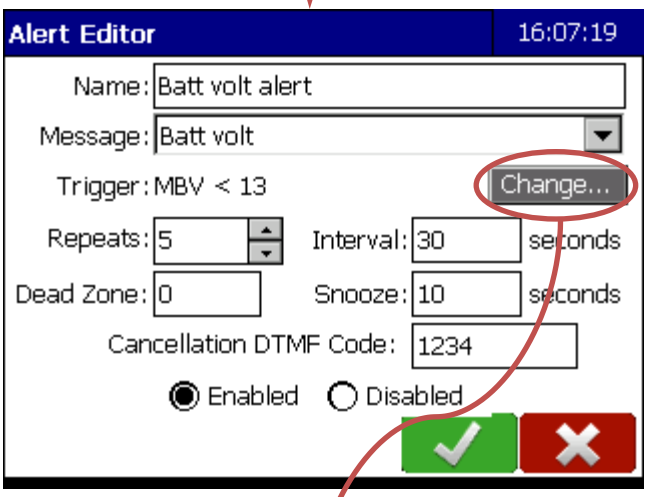

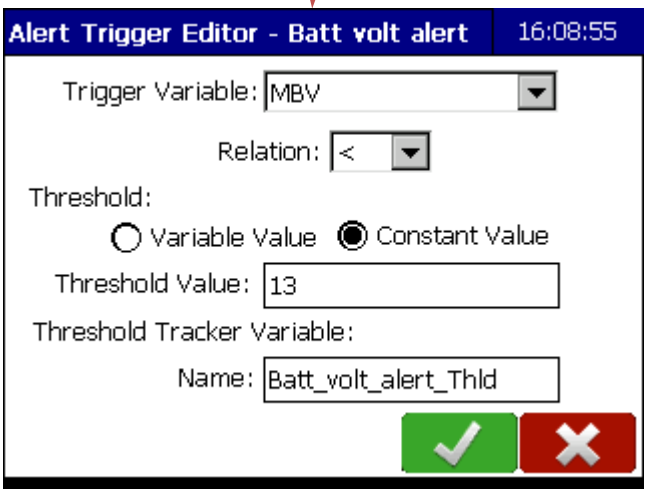

20. The **Alerts** tab of the **AirTalk Configuration Editor** screen appears.
21. Tap **Edit**.
22. The **AirTalk Configuration Editor** screen enters edit mode and the **New** button is enabled.
23. Tap **New**.
24. The **Alert Editor** screen opens with all data controls in their default setting.
25. Enter a short, descriptive **Name** for the alert.
26. In **Message**, select the message that this alert should send when triggered.

    In some circumstances, you may wish to use placeholder message: see section 9.1.4.2 for details.
27. Enter the number of message **Repeats** (repeat count), and the repeat **Interval**.
28. Enter the **Dead Zone** if relevant for the chosen comparison operator and if desired (a dead zone of 0 is permitted).
29. Enter the **Snooze Time**.
30. Enter a 2-, 3-, or 4-digit **Cancellation DTMF Code** if desired.
31. Click **Change…** to define the trigger condition.
32. The **Alert Trigger Editor** screen opens with all data controls in their default settings:
33. Select the **Trigger Variable** and **Relation**
34. Select the **Threshold** type.
    a. If you select a **Constant Value** (the default), enter a **Threshold Value**. A constant value can only be changed from this screen.

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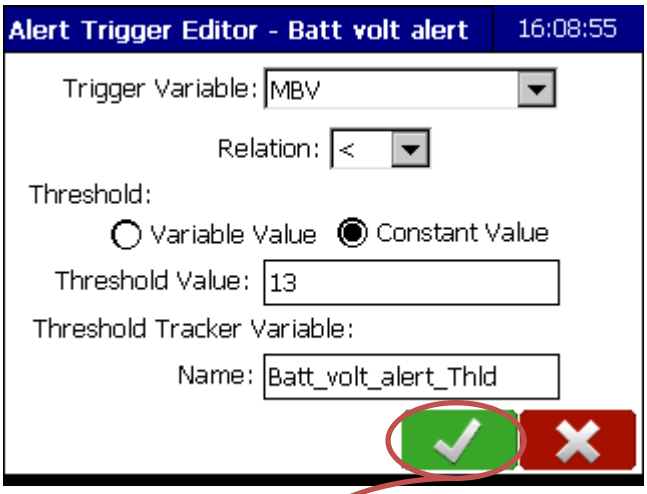
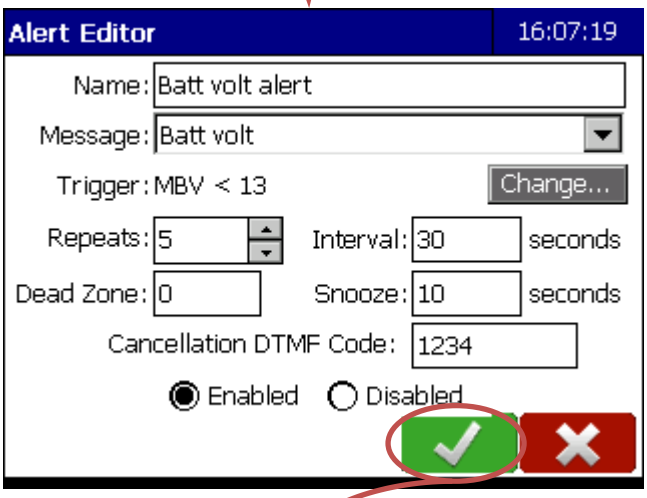


b. If you select a **Variable Value**, select a **Threshold Variable** to supply that value.

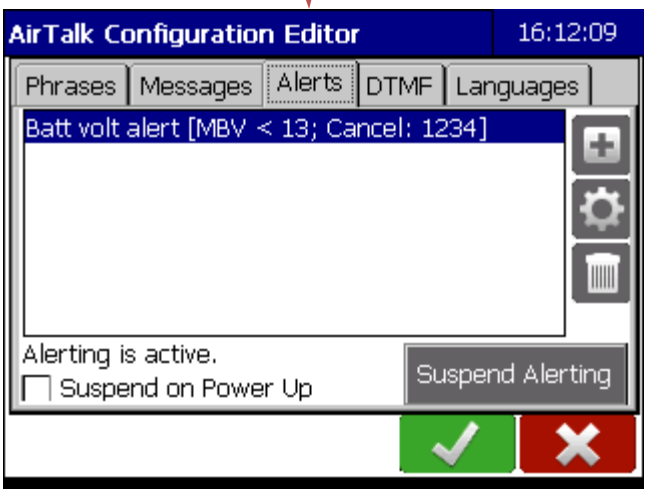
35. **Threshold Tracker Variable** is initially set to the name of the alert followed by `_Thld`. Edit this value if you wish to use a different tracking variable name. (Only the name changes; the variable itself is the same.)

36. Tap **OK**.

37. The **Alert Editor** screen reopens.



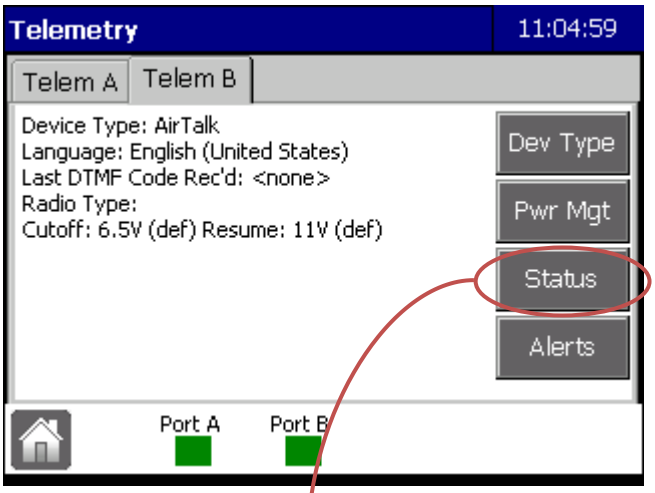
38. Tap **OK**.



39. The **AirTalk Configuration Editor** screen appears, with the new alert listed.

end

9.2.4 Modifying or deleting an existing phrase or phrasing

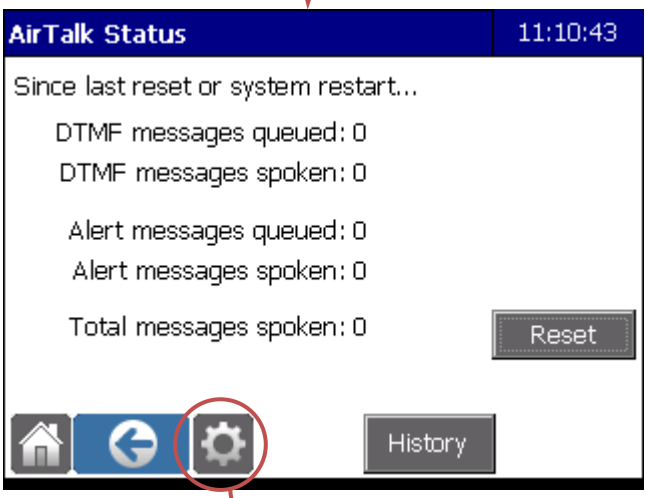


1. On the **Home** screen, tap **Telemetry**.

2. The **Telemetry** screen appears.

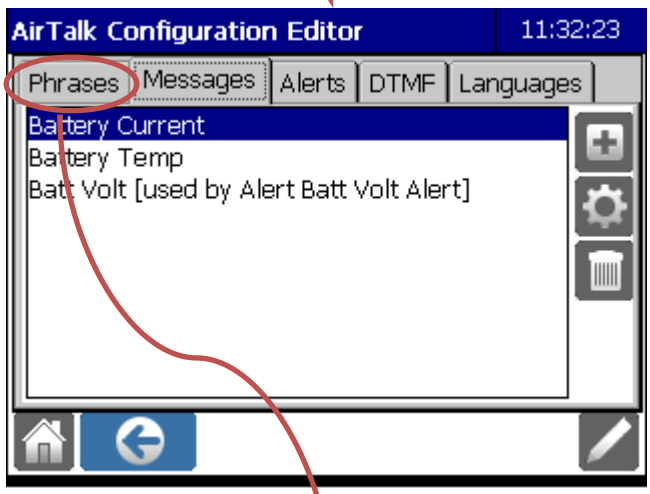
3. Navigate to appropriate Telem tab (AirTalk is commonly on Telem port B)

4. Tap the **Status** button next to the Radio Voice Transmitter port.



5. The **AirTalk Status** screen appears.

6. Tap the **Setup** button.



7. The **Messages** tab of the **AirTalk Configuration Editor** screen appears.

8. Tap the **Phrases** tab.

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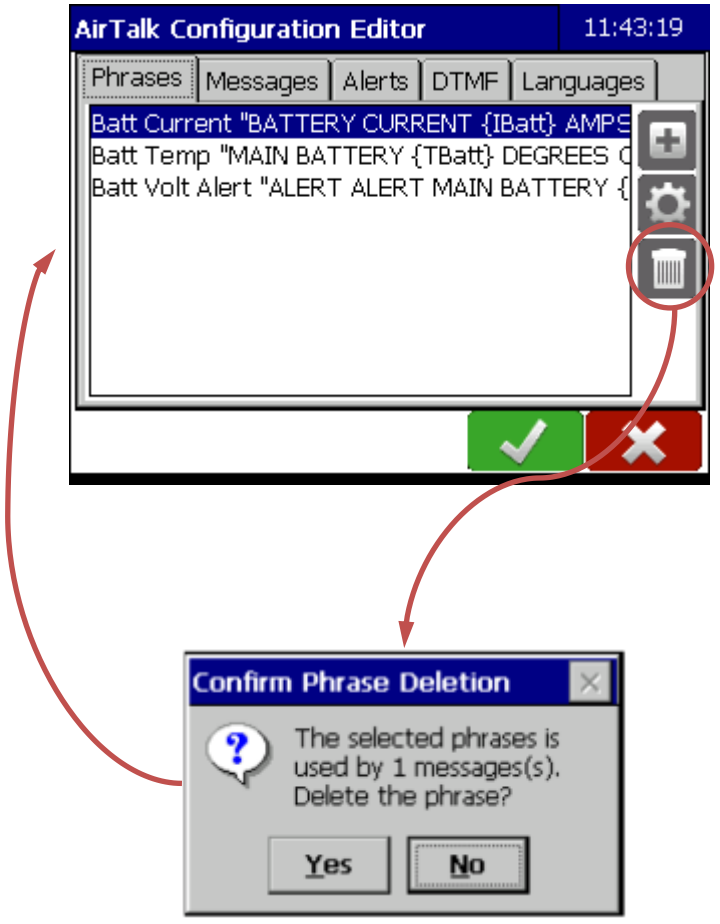
9. The **Phrases** tab of the **AirTalk Configuration Editor** screen appears.
10. Tap **Edit**.
11. The **AirTalk Configuration Editor** screen enters edit mode and the **Modify** and **Delete** buttons are enabled.
12. Select a phrase in the list.

Deleting a phrase



> **WARNING:** When you delete a phrase, it is deleted **permanently** from the datalogger.

13. To delete the selected phrase, tap **Delete**.
14. If the phrase is not used in any messages, no confirmation is required.
15. If the phrase is used in one or more messages, a confirmation dialog appears.
    a. To confirm deletion, click **OK**.
    b. To cancel deletion, click **Cancel**.
16. The phrase is deleted and removed from the list.

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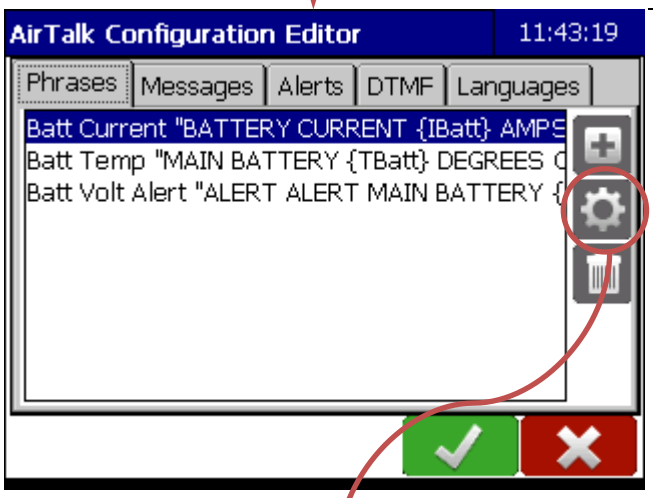
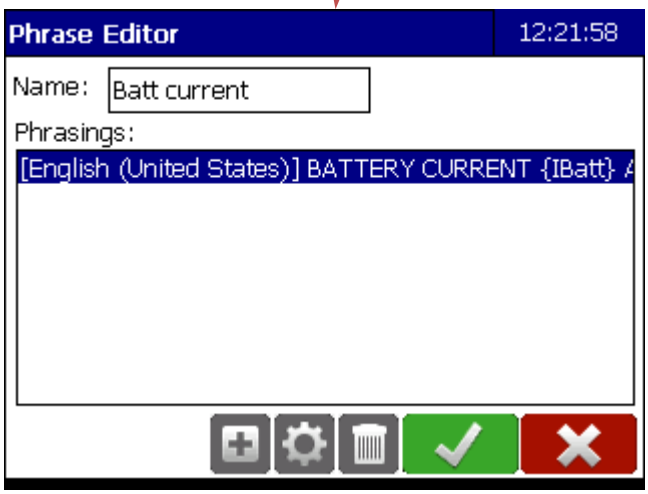
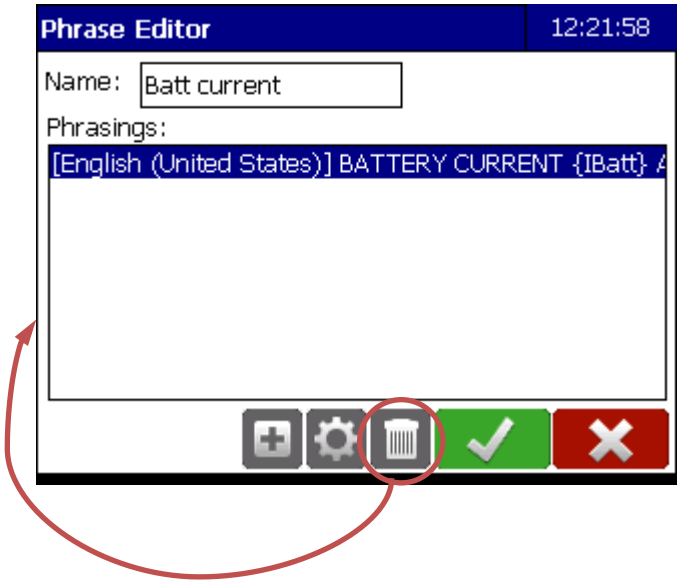


Modifying a phrase (including deleting or modifying a phrasing)

17. To delete phrasings or modify the phrase definition or the phrasings of a selected phrase, tap **Setup**.



18. The **Phrase Editor** screen opens with the data controls filled with the current information (name, defined phrasings) for the selected phrase.



Deleting a phrasing

WARNING: When you delete a phrasing, it is deleted **permanently** from the datalogger.

19. To delete a phrasing:
    a. Select the phrasing in the list.
    b. Tap **Delete**.
    c. The phrasing is removed from the list immediately.

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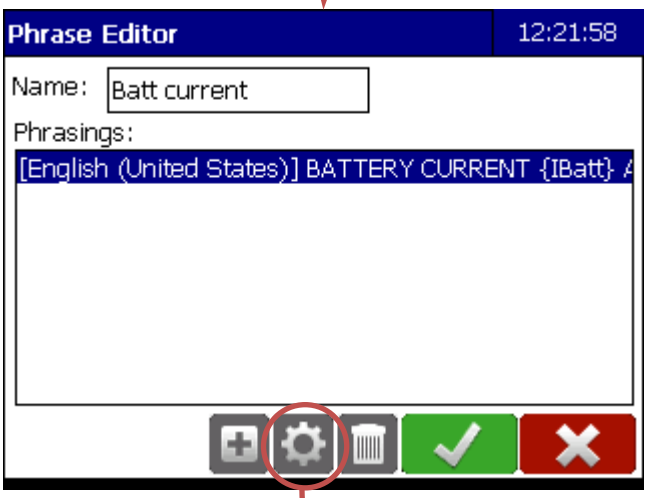

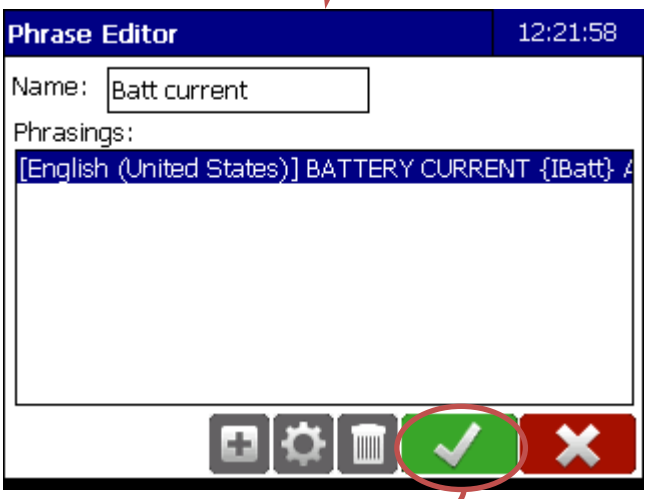

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Modifying a phrasing

20. The **Phrase Editor** screen opens with the data controls filled with the current information (name, defined phrasings) for the selected phrase.
21. To modify a phrasing:
    a. Select the phrasing in the list.
    b. Tap **Setup**
22. The **Phrasing Editor** screen opens with the data controls filled with the current information for the selected phrasing.
23. Modify phrasing elements using the controls.
24. You can click **Talk** to have the modified phrasing spoken on the connected AirTalk.
25. To save your changes, click **OK**.
26. Alternately, to abandon your changes, click **Cancel**.
27. The **Phrase Editor** screen appears.
28. To save all changes to the phrase, tap **OK**.
29. To abandon all changes to the phrase, tap **Cancel**.

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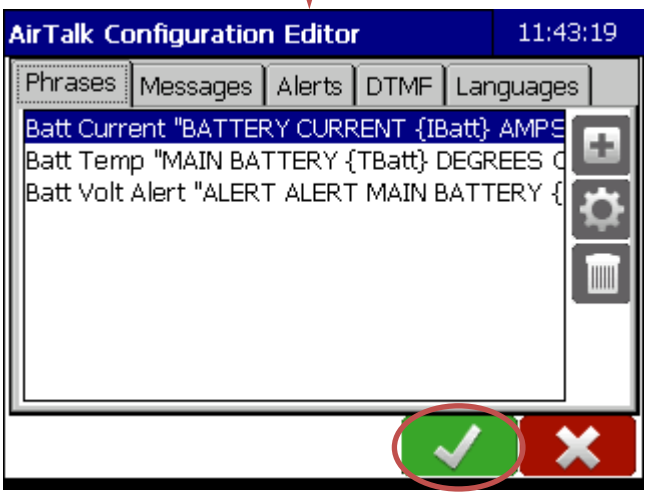
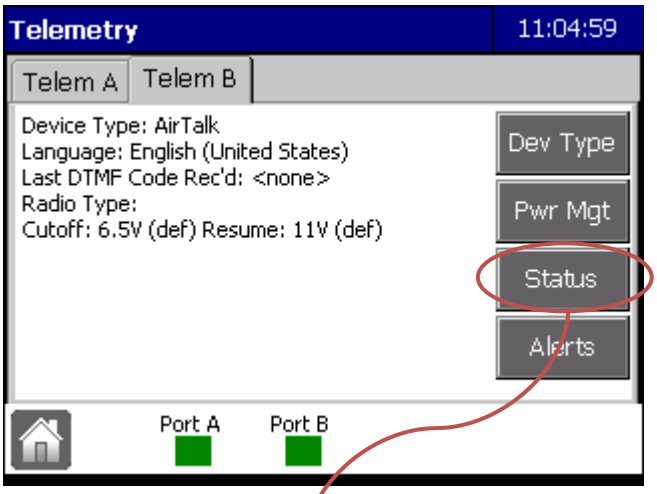


30. The **AirTalk Configuration Editor** screen appears.

31. Tap **OK** exit edit mode and return to the **AirTalk Status** screen.

end

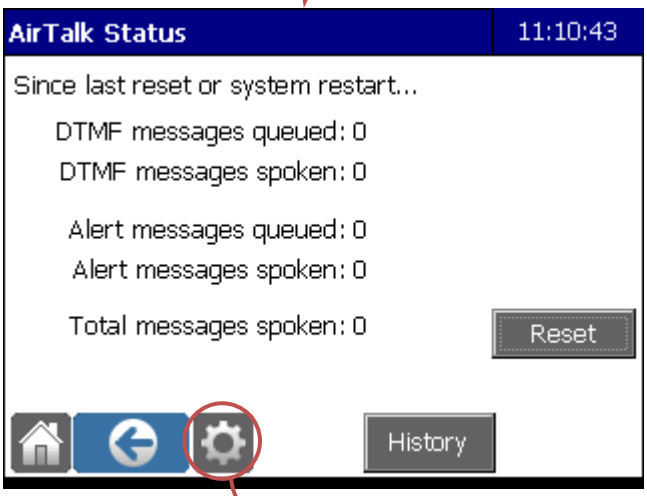
9.2.5 Modifying or deleting an existing message



1. On the **Home** screen, tap **Telemetry**.

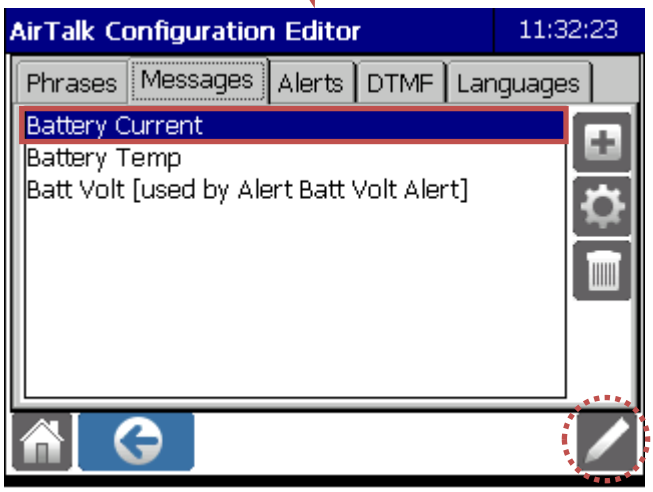
2. The **Telemetry** screen appears.

3. Tap the **Status** button next to the Radio Voice Transmitter port.



4. The **AirTalk Status** screen appears.

5. Tap the **Setup** button.



6. The **Messages** tab of the **AirTalk Configuration Editor** screen appears.

7. Tap **Edit**.

8. The **AirTalk Configuration Editor** screen enters edit mode and the **Modify…** and **Delete** buttons are enabled.

9. Select a message in the list.

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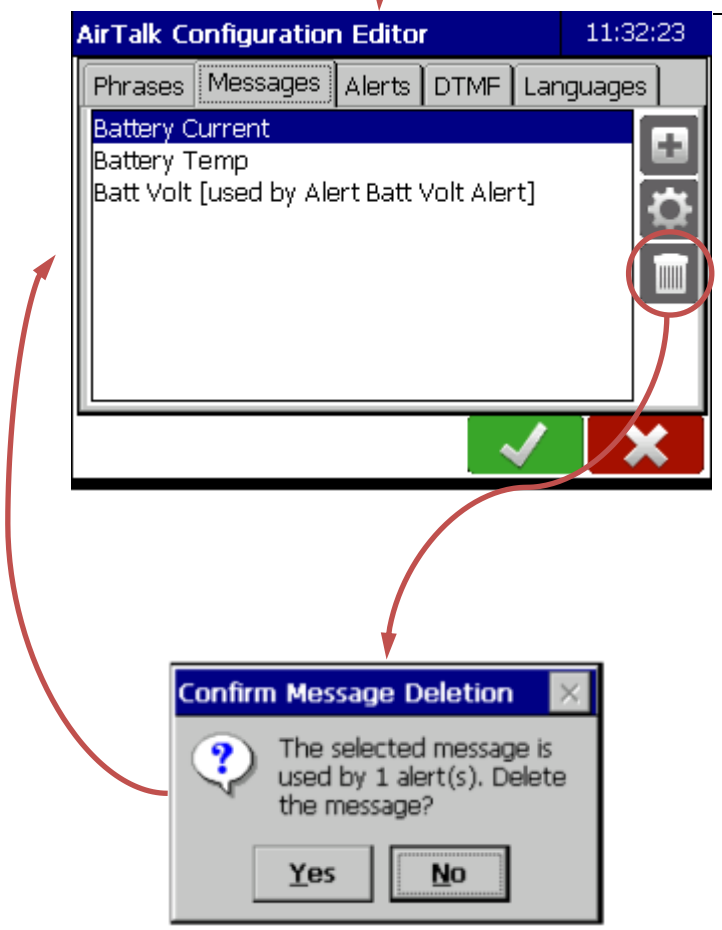
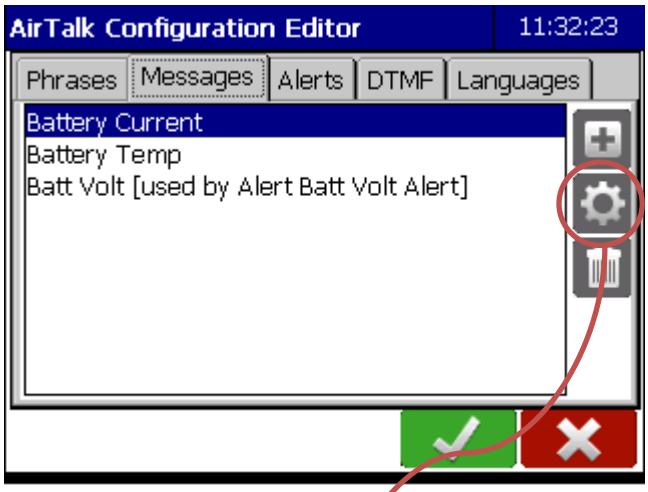


Deleting

> **WARNING:** When you delete a message, it is deleted **permanently** from the datalogger.

10. To delete the selected message, tap **Delete**.
11. If the message is not used in any alerts, no confirmation is required.
12. If the message is used in one or more alerts, a confirmation dialog appears.
    a. To confirm deletion, click **OK**.
    b. To cancel deletion, click **Cancel**.
13. The message is deleted and removed from the list.



Modifying

14. To modify the selected message, tap **Setup**.

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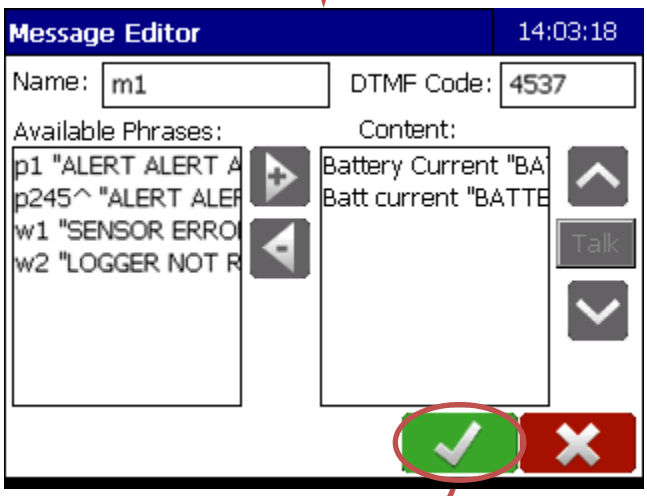

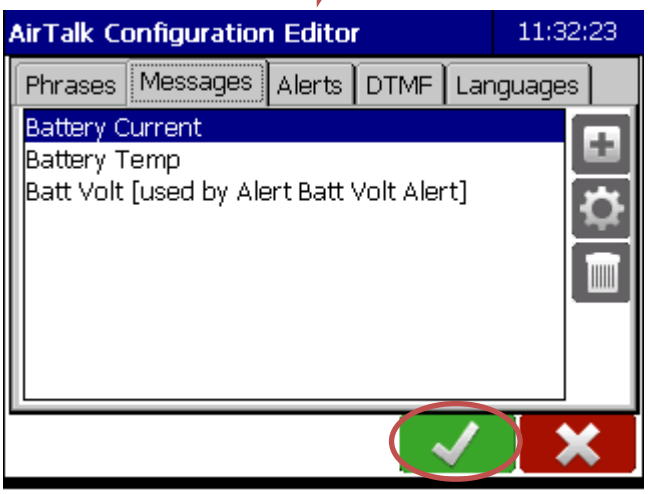

15. The **Message Editor** screen opens filled with the current information (name, defined phrasings) for the selected phrase.
16. You can change the **Name**, **DTMF Code** and the phrases and their ordering. This is done exactly as described in section 9.2.2, *Creating a new message*.
17. When all changes are complete:
    a. Tap **OK** to save them.
    b. If you do not wish to save, tap **Cancel** to abandon your changes.
18. The **AirTalk Configuration Editor** screen appears, with the modified message listed.
19. Tap **OK** exit edit mode and return to the **AirTalk Status** screen.

end

9.2.6 Modifying or deleting an existing alert

1. On the **Home** screen, tap **Telemetry**.
2. The **Telemetry** screen appears.
3. Navigate to appropriate Telem tab (AirTalk is commonly on Telem port B)
4. Tap the **Status** button next to the Radio Voice Transmitter port.

   Alternately, tap the **Alerts** button. This takes the user to the **Configuration Editor** with the **Alerts** tab already selected.
5. The **AirTalk Status** screen appears.
6. Tap the **Setup** button.
7. The **Messages** tab of the **AirTalk Configuration Editor** screen appears.
8. Tap the **Alerts** tab.

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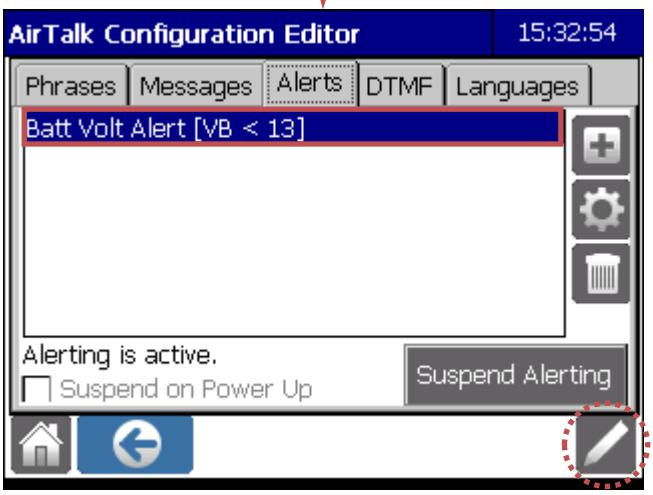
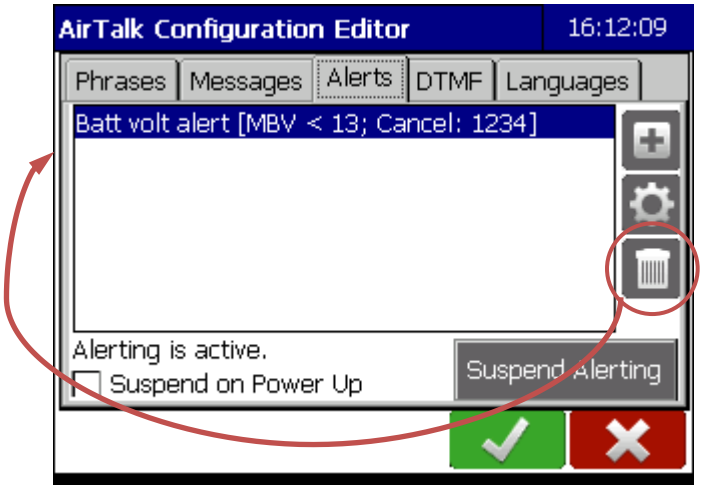


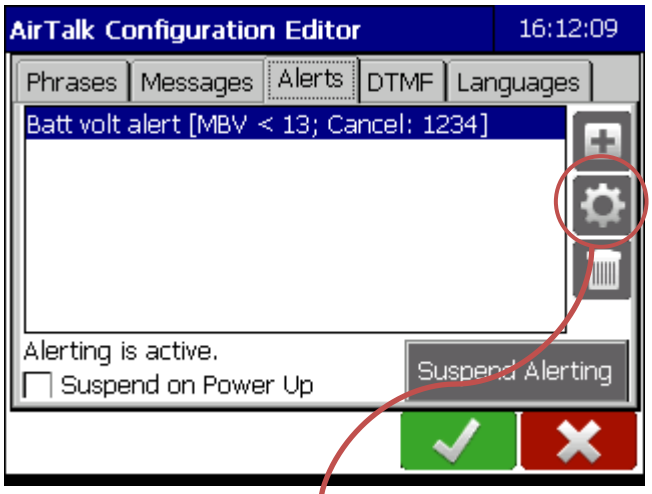
9. The **Alerts** tab of the **AirTalk Configuration Editor** screen appears.
10. Tap **Edit**.
11. The **AirTalk Configuration Editor** screen enters edit mode and the **Setup** and **Delete** buttons are enabled.
12. Select an alert from the list.



Deleting

> **WARNING:** When you delete an alert, it is deleted **immediately and permanently** from the datalogger.

13. To delete the selected alert, tap **Delete**.
14. The alert is deleted immediately, without any intervening confirmation step.



Modifying

15. To modify the selected alert, tap **Setup**.

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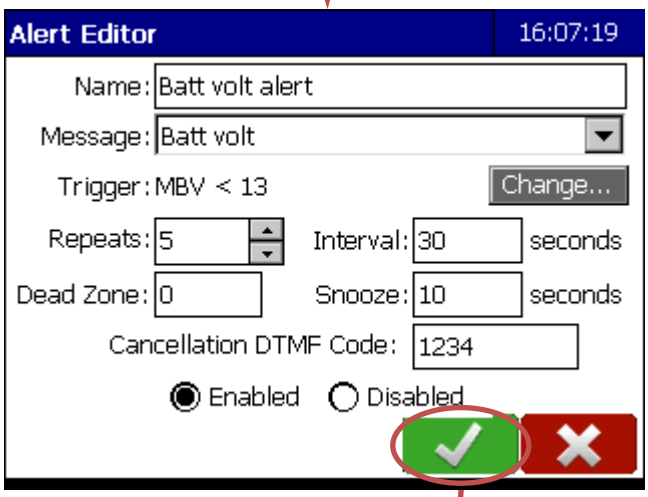
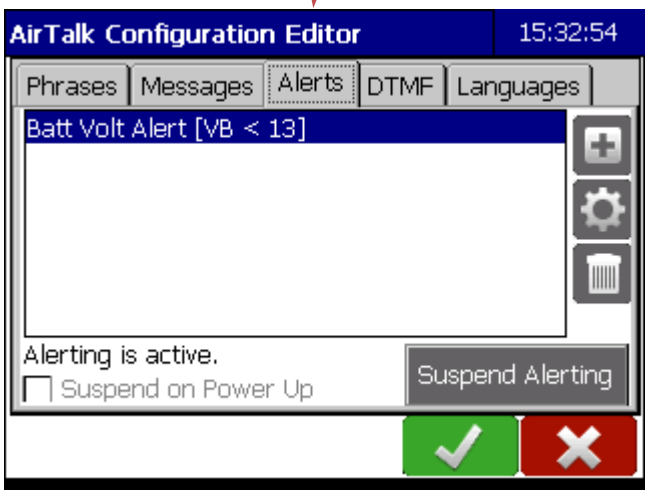


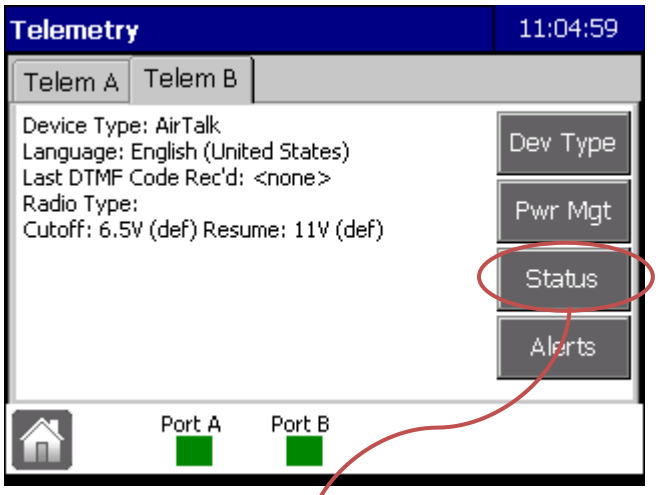
16. The **Alert Editor** screen opens with data controls filled with the current information for the selected alert.
17. Change the information defining the alert.
18. When all changes are complete:
    a. To save your changes, click **OK**.
    b. Alternately, to abandon your changes, click **Cancel**.



19. The **AirTalk Configuration Editor** screen appears.
20. Tap **OK** or **Home** to close the **AirTalk Configuration Editor** and return to the **AirTalk Status** screen or the datalogger **Home** screen, respectively.

end

9.2.7 Selecting the current language

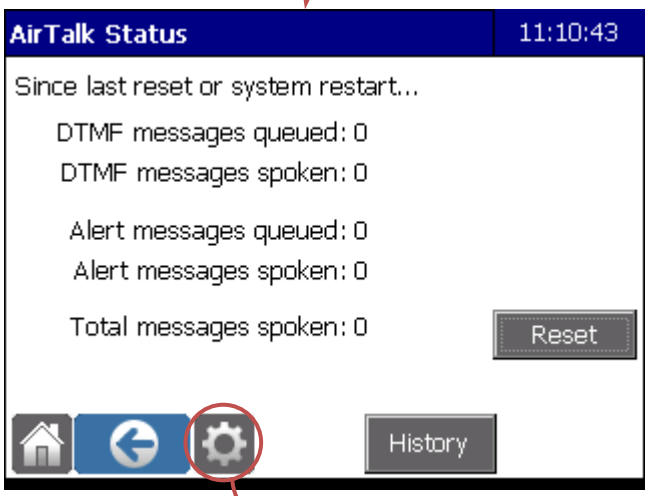


1. On the **Home** screen, tap **Telemetry**.

2. The **Telemetry** screen appears.

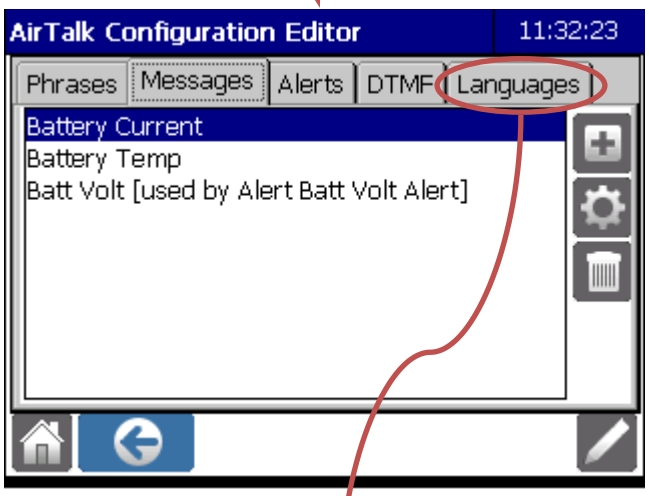
3. Navigate to appropriate Telem tab (AirTalk is commonly on Telem port B)

4. Tap the **Status** button next to the Radio Voice Transmitter port.



5. The **AirTalk Status** screen appears.

6. Tap the **Setup** button.



7. The **Messages** tab of the **AirTalk Configuration Editor** screen appears.

8. Tap the **Languages** tab.

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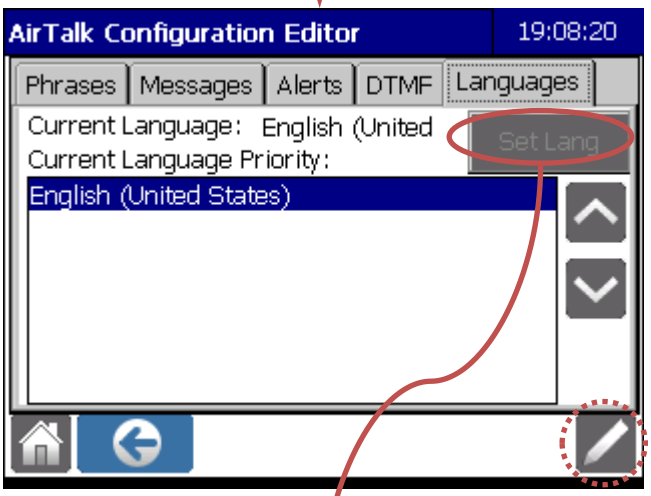
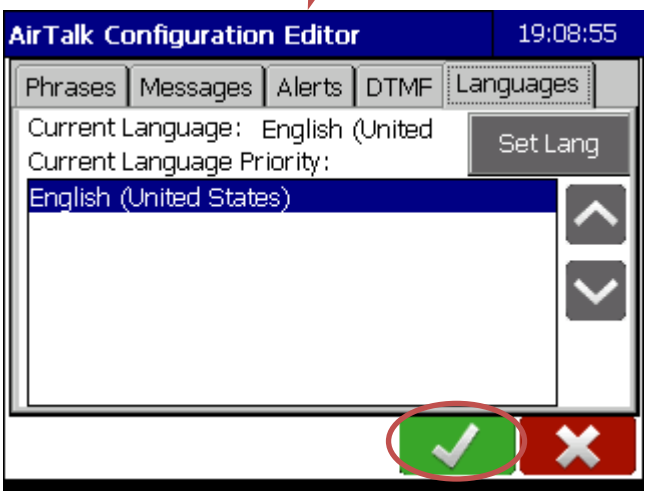


9. The **Languages** tab of the **AirTalk Configuration Editor** screen appears.
10. Tap **Edit**.
11. The **AirTalk Configuration Editor** screen enters edit mode and the **Set Lang** button is enabled.
12. Tap **Set Lang**.

13. The Set AirTalk Language screen appears.
14. Tap to select a language from the list.
15. Tap **OK**.



16. The **AirTalk Configuration Editor** screen appears.
17. Tap **OK** exit edit mode and return to the **AirTalk Status** screen.

end

9.3 Configuration reference

9.3.1 Home screen (parts related to AirTalk)

Access: **Home**

Note: The Home screen has many functions. This section discusses only functions related to AirTalk.

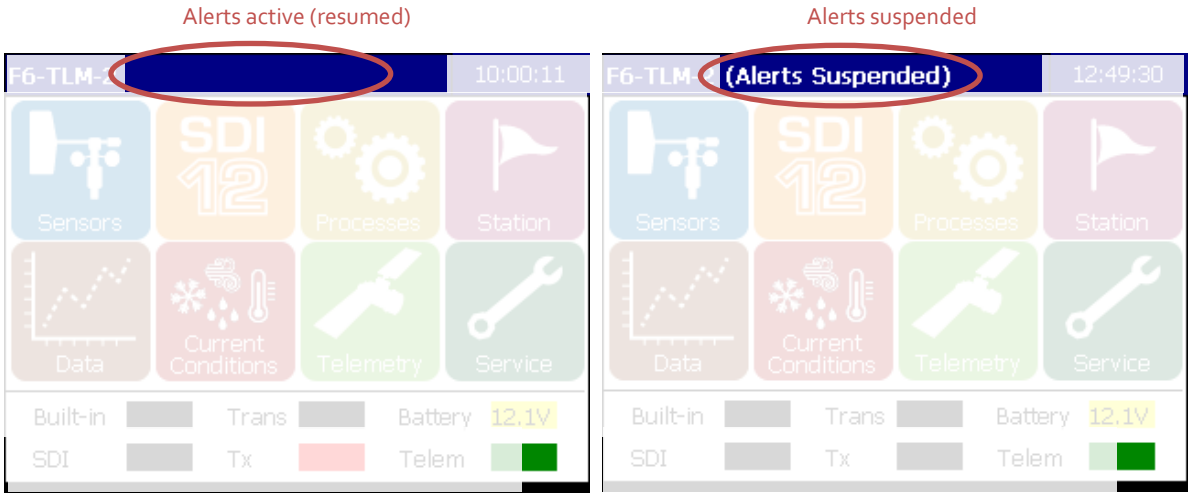


Figure 9-6: Home Screen with **AirTalk Status**

9.3.1.1 *Indicators and controls*

Alert suspend status

Display text in screen title. Visible when alerts are suspended (see section 9.1.3.4.1).

Telem

Status indicator. Always visible. Displays power information for the telemetry devices.

When the AirTalk extension is installed, the right half of this indicator shows power status for the AirTalk hardware (on the right, since AirTalk is always attached to Telemetry Port B).

Colour	Meaning
Green	Datalogger is supplying power to the AirTalk port
Red	Port power is turned off
Black	Port power is disabled

9.3.2 Telemetry screen

Access: **Home ► Telemetry**

The **Telemetry** screen shows a summary of the telemetry devices connected to the datalogger in a tabbed format.

When the AirTalk extension is installed the applicable tab (usually Port B) displays a brief summary of AirTalk status, as shown in the figure below.

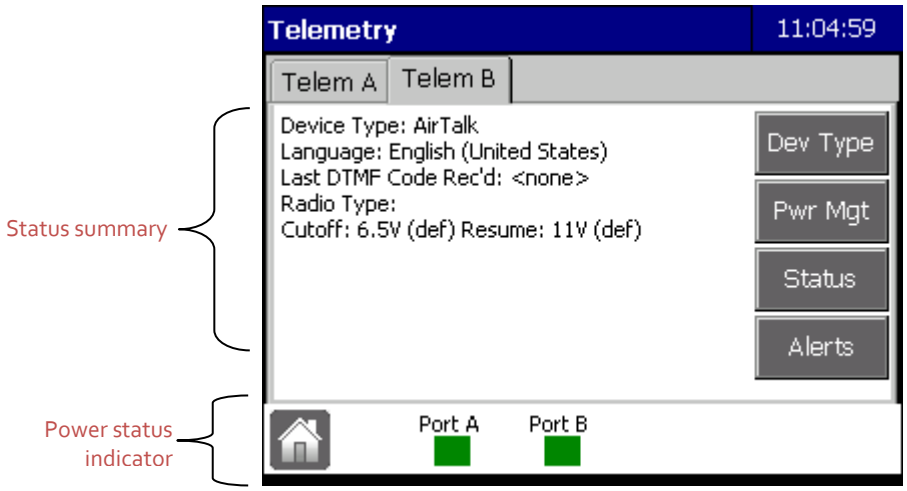


Figure 9-7: **Telemetry** screen, Port B, with AirTalk installed

9.3.2.1 Indicators and controls

Power status indicator

Coloured display box. Always visible.

Colours as for **Telem** status indicator on **Home** screen (see section 9.3).

Status summary

Display text. Always visible.

Summarizes configuration and current or recent events on AirTalk:

- **Device Type**: indicates an AirTalk device is connected to this port, followed optionally by a word describing its current state (initializing, stopped) if different than running normally.
- **Language**: Currently selected language (see section 9.3.15).
- **Last DTMF Code rec'd**: Displays the last DTMF code received via radio. If the DTMF code is not used (unassigned) in the current AirTalk configuration, the annotation "not used" appears in parentheses following the code.
- **Radio Type**: Displays the type of radio connected to the AirTalk hardware (set in the **Factory Settings** screen, not normally modified by the user).
- **Cutoff**: Telemetry port power supply voltage cutoff value (see section 7.9.2).
- **Resume**: Telemetry port power supply voltage resume value (see section 7.9.2).

Pwr Mgt

Button. Always enabled.

Opens the **Power Management** screen for the telemetry port.

Status

Button. Always enabled.

Opens the **AirTalk Status** screen.

Alerts

Button. Always enabled.

Opens the **AirTalk Configuration Editor** screen – **Alerts** tab, for quick access to the Alerts Editor.

9.3.3 AirTalk Status screen

Access: **Home ► Telemetry ► Status**

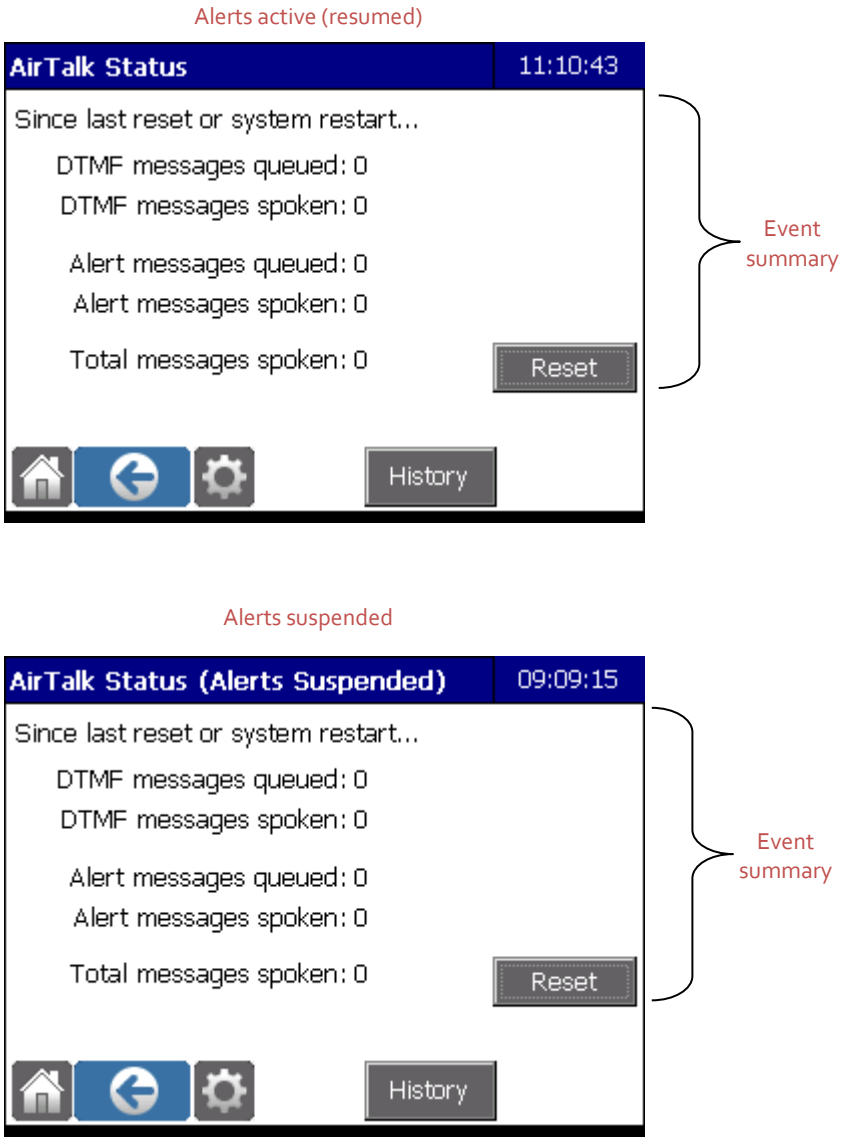


Figure 9-8: **AirTalk Status** screen

9.3.3.1 Indicators and controls

Alert suspend status

Display text in screen title. Visible when alerts are suspended (see section 9.1.3.4.1).

Event summary

Display text.

Displays statistics on message events that have occurred on AirTalk since the last time the system was reset or the last time the **Reset** button was pressed. If a message is currently being spoken by AirTalk, further message requests are queued. Messages are spoken in the order they are queued. When the queue is empty, AirTalk stops transmitting.

Reset

Button. Always enabled.

Resets the "messages spoken" counts.

Back

Button. Always enabled.

Returns to the **Telemetry** screen.

Setup

Button. Always enabled.

Opens the **AirTalk Configuration Editor** screen.

History

Button. Always enabled.

Opens the **AirTalk History** screen.

Home

Button. Always enabled.

Returns to the **Home** screen.

9.3.4 AirTalk History screen

Access: **Home ► Telemetry ► Status ► History**

This screen displays a log of AirTalk activity.

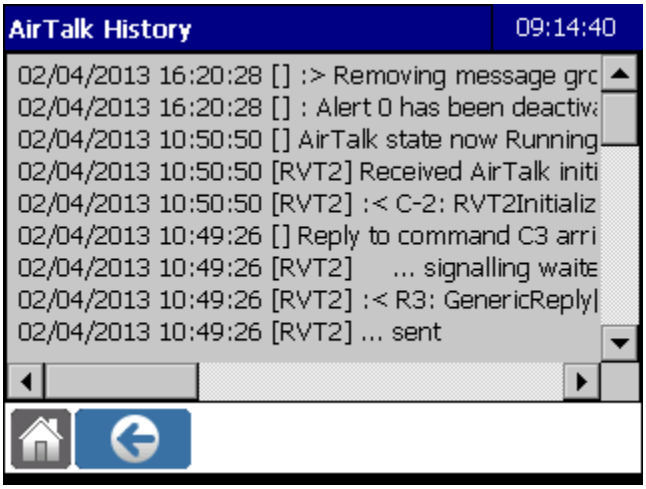


Figure 9-9: **AirTalk History** screen

9.3.4.1 Indicators and controls

OK

Button. Always enabled.

Returns to the **AirTalk Status** screen.

Home

Button. Always enabled.

Returns to the **Home** screen.

9.3.5 AirTalk Configuration Editor screen – common elements

Access: **Home ► Telemetry ► Status ► Setup**

The **AirTalk Configuration Editor** screen consists of a set of tabs and a set of common controls. This section describes the common controls and features.

All **AirTalk Configuration Editor** screens (tabs) are either in **view mode** or **edit mode**. When a screen is in view mode, the user can see information but not modify it. When in edit mode, the user can modify it.

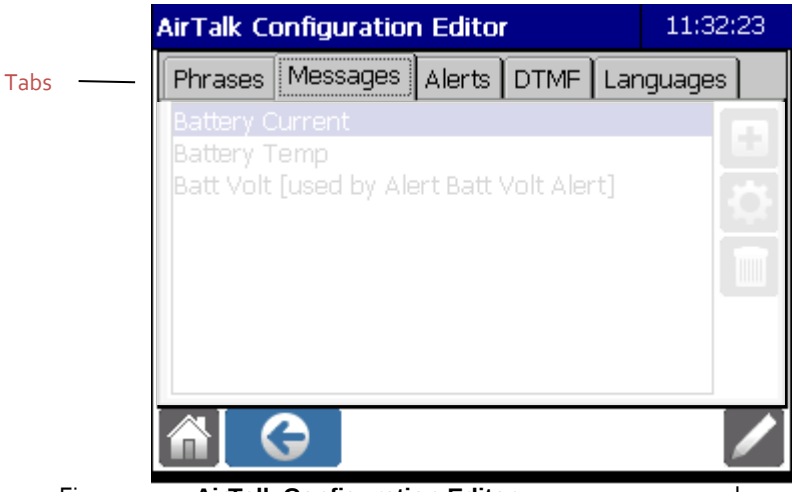


Figure 9-10: **AirTalk Configuration Editor** screen – common elements

9.3.5.1 Indicators and controls

Tabs

Opens the selected tab.

OK

Button. Always enabled.

Returns to the **AirTalk Status** screen.

Edit

Button. Enabled when the user has edit permission.

Places the screen (including tab contents) in edit mode.

Home

Button. Always enabled.

Returns to the **Home** screen.

9.3.6 AirTalk Configuration Editor screen – Phrases tab

Access: **Home ► Telemetry ► Status ► Setup ► Phrases**

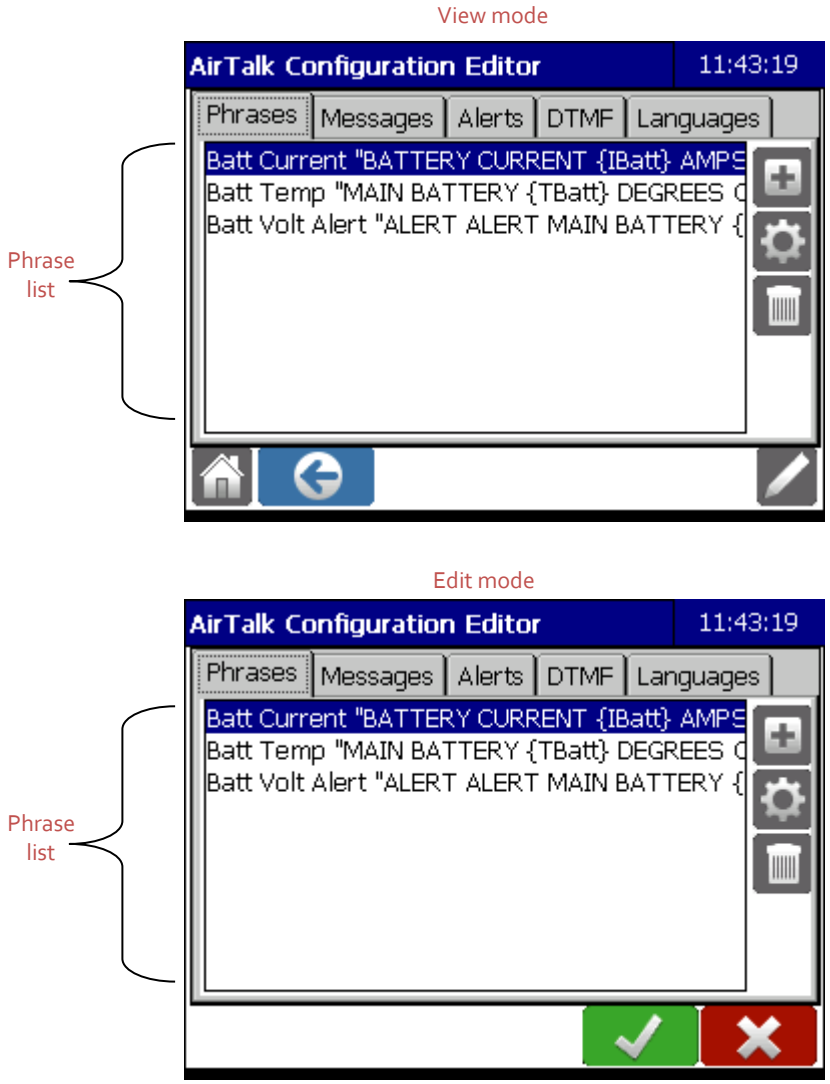


Figure 9-11: **AirTalk Configuration Editor** screen – **Phrases** tab

9.3.6.1 Indicators and controls

Phrase list

Single-select list. Always enabled.

Lists all phrases defined in the datalogger. For each phrase, the phrase's name and its (possibly abbreviated) content (in the AirTalk's current language) are displayed.

New

Enabled in edit mode.

Opens the **Phrase Editor** screen in edit mode, with blank fields.

Setup

Visible in view mode. Enabled when a phrase is selected in the list.

Opens the **Phrase Editor** screen in current mode (view or edit), loaded with the selected phrase.

Delete

Enabled when in edit mode and a phrase is selected in the list.

Deletes the selected phrase . If the phrase is associated with one or more messages, a **Confirm Delete** dialog intervenes. If not, the phrase is deleted immediately.

Deletion is permanent (not undoable).

9.3.7 Phrase Editor screen

Access:

Home ► Telemetry ► Status ► Setup ► Phrases ► Setup (view or edit mode)

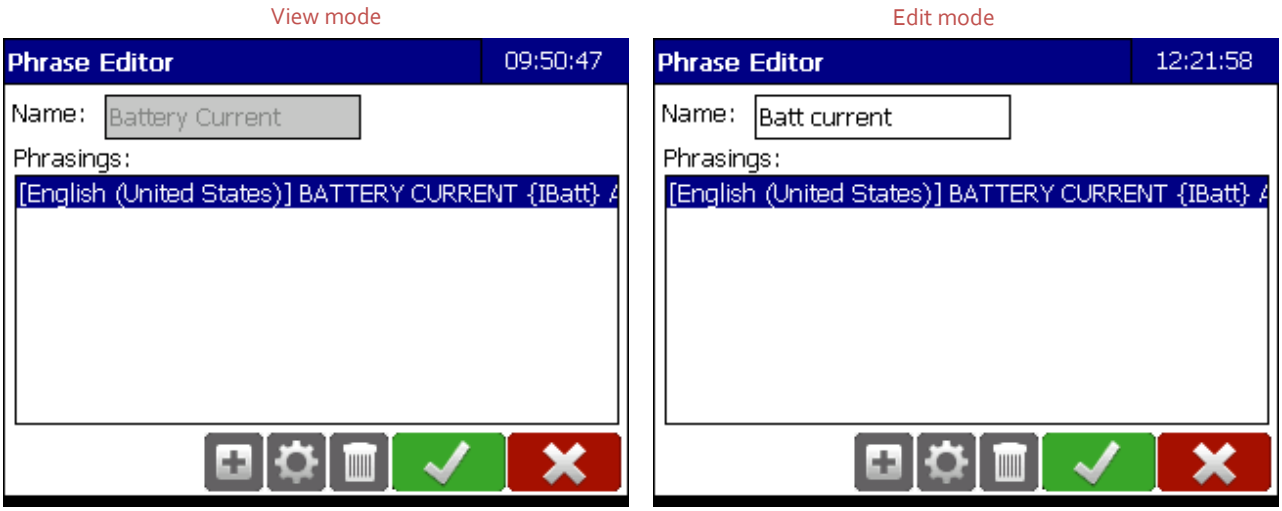


Figure 9-12: **Phrase Editor** screen

9.3.7.1 Indicators and controls

Name

Textbox.

Displays/edits the name for the phrase. Name must be unique amongst all phrases.

Phrasings

Single-select list. Always enabled.

Lists the names of all currently defined phrasings for the phrase. The language of each phrasing is shown as well as its (possibly abbreviated) content.

New

Enabled in edit mode.

Opens the **Phrasing Editor** screen in edit mode, with blank fields.

Setup

Enabled when a phrasing is selected in the list.

Opens the **Phrasing Editor** screen in current mode (view or edit), loaded with the selected phrasing .

Delete

Enabled when in edit mode and a phrasing is selected in the list.

Deletes the selected phrasing immediately (no confirmation dialog).

Deletion is permanent (not undoable).

OK

Button. Always enabled.

Commits changes made in this dialog by adding, changing or deleting phrasings, and returns to the **AirTalk Configuration Editor – Phrases** screen. Changes are not committed until this button is pressed.

Cancel

Button. Always enabled.

Cancels all changes made in this dialog and returns to the **AirTalk Configuration Editor – Phrases** screen.

9.3.8 Phrasing Editor screen

Access:

Home ► Telemetry ► Status ► Setup ► Phrases ► Setup ► Setup (view or edit mode)

Each of **Preamble**, **Measured Item**, **Comparator**, **Value**, and **Units** corresponds to one "part" of the vocabulary. Each of these controls is initialized to contain its part of the vocabulary, along with the additional entry "<none>". If the phrasing contains an item of that part, that item is selected in the combo box. Otherwise "<none>" is selected.

In English, a phrasing defined on this screen is spoken in the following form:

<Preamble>. <Measured Item> <Comparator> <Value> <Units>.

Example:

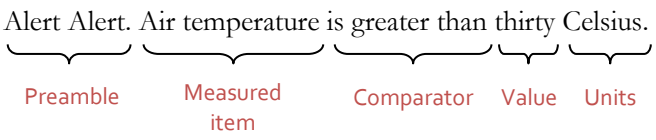


Figure 9-13: Example phrasing

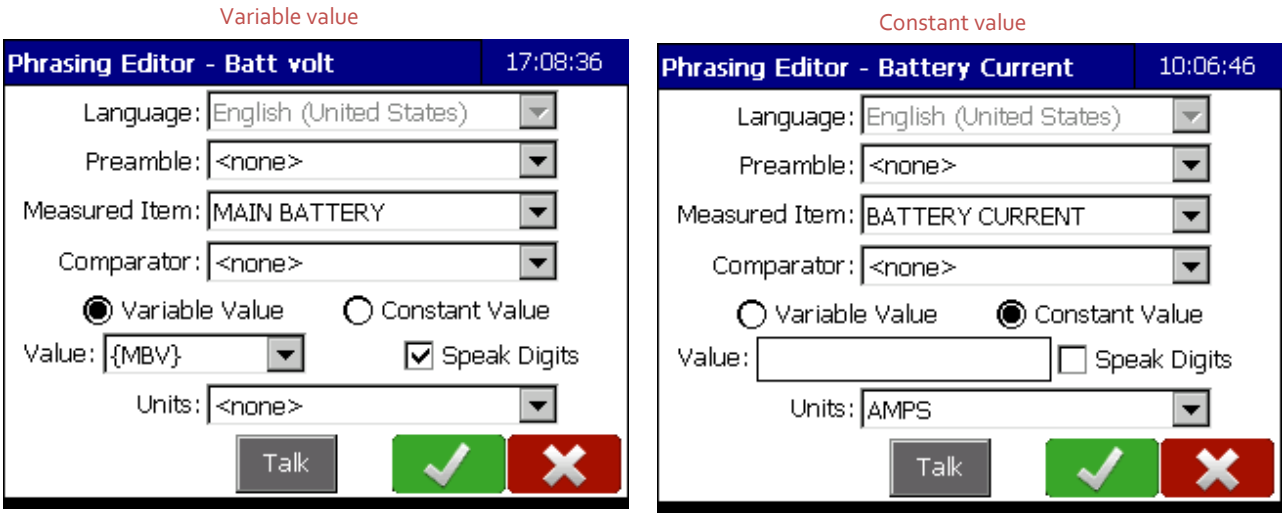


Figure 9-14: **Phrasing Editor** screen

9.3.8.1 Indicators and controls

Language

Drop-down selector. Enabled when and only when creating a new phrasing.

Displays/edits the language for this phrasing. When editing (creating a new phrasing), the selections are limited to those languages for which a phrasing does not already exist for the parent phrase.

When the user changes this value, **Preamble**, **Measured Item**, **Comparator**, **Value**, and **Units** are set to **<none>**.

Preamble

Drop-down selector. Enabled when in edit mode.

Measured Item

Drop-down selector. Enabled when in edit mode.

This item should correspond to **Value** on this screen (e.g. AIR TEMPERATURE and AirTemp). This condition cannot be checked automatically, so the user must ensure **Measured Item** and **Value** are consistent with each other.

Comparator

Drop-down selector. Enabled when in edit mode.

Variable Value / Constant Value

Radio buttons. Enabled when in edit mode.

Selects the type of **Value**, and the control for it.

Variable Value causes **Value** to be retrieved from a datapoint in the datalogger memory, selected by the **Value** control.

Constant Value causes **Value** to be determined by a fixed sequence of numbers or phonetic alphabet letters ("Alpha," "Bravo," "Charlie," etc.), entered in the **Value** control.

Value

Enabled when in edit mode. Drop-down selector when **Data Point Value** selected. Text box when **Constant Value** selected.

When **Constant Value** is selected, the user must enter a space-separated sequence of one or more numbers or words. See notes below for details.

Speak Digits

Checkbox. Enabled when in edit mode.

When selected, numeric values are spoken as separate digits. Example: 137 is spoken as "one three seven."

When unselected, numeric values are spoken as compound words. Example: 137 is spoken as "one hundred thirty-seven."

Units

Drop-down selector. Enabled when in edit mode.

OK

Button. Always enabled.

Accepts but does not commit changes made in this dialog and returns to the **Phrase Editor** screen. Changes are not committed until the **OK** button in the **Phrase Editor** screen is pressed.

Talk

Button. Always enabled.

If the phrasing is valid, sends the Phrasing to the AirTalk hardware, on which it is spoken. If the phrasing is invalid, the user is informed and the Phrasing is not spoken.

Cancel

Button. Always enabled.

Cancels all changes made in this dialog and returns to the **Phrase Editor** screen.

9.3.8.2 Validity conditions

A Phrasing must have at least either a **Preamble** part or both a **Measured Item** part and a **Value** part. It may have anything in addition to these minimums.

9.3.8.3 Constant values

A constant value is a sequence of one or more numbers or words separated by spaces.

A number is any decimal number possibly prefixed by a minus sign. (Plus signs are allowed but not spoken.) Numbers are spoken just as they are spoken as data values (including the effect of the "Check Digits" box.)

A word is a sequence of one or more letters and/or digits, without spaces. It must contain at least one letter (or else it's considered a number.) If the word happens to be a NATO phonetic alphabet member (e.g. "bravo"; see below) that word is spoken. Otherwise, the individual letters are spoken as phonetic alphabet letters. Digits are spoken individually (even if there's a sequence of them.)

Examples

alfa 23.25 hotel	alfa twenty-three point two five hotel (if **Speak Digits** is not checked)
alfa 23.25 hotel	alfa two three point two five hotel (if **Speak Digits** is checked)
fts	foxtrot tango sierra
fts23	foxtrot tango sierra two three (regardless of the setting of **Speak Digits**)
1635 maple	one six three five mike alfa papa lima echo (if **Speak Digits** is checked)

NATO phonetic letters:

A — Alfa
B — Bravo
C — Charlie
D — Delta
E — Echo
F — Foxtrot
G — Golf
H — Hotel
I — India
J — Juliet
K — Kilo
L — Lima
M — Mike
N — November
O — Oscar
P — Papa
Q — Quebec
R — Romeo
S — Sierra
T — Tango
U — Uniform
V — Victor
W — Whiskey
X — Xray
Y — Yankee
Z — Zulu

9.3.9 AirTalk Configuration Editor screen – Messages tab

Access: **Home ► Telemetry ► Status ► Setup ► Messages**

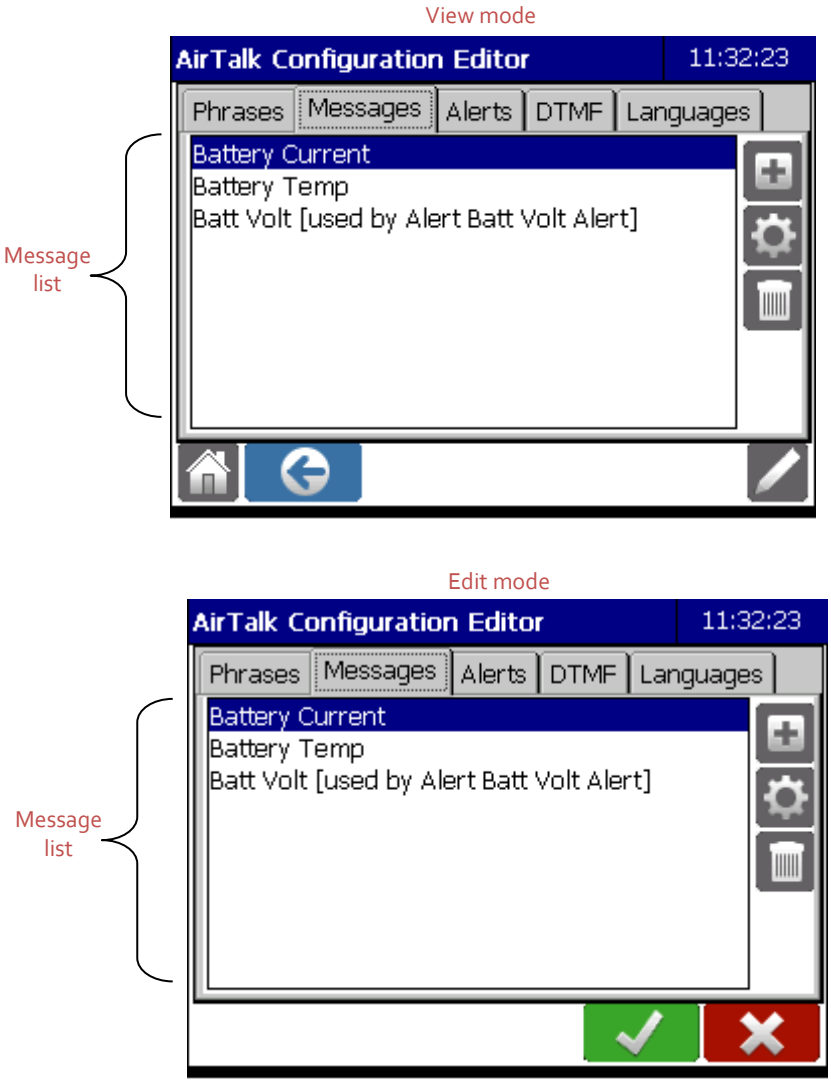


Figure 9-15: **AirTalk Configuration Editor** screen – **Messages** tab

9.3.9.1 Indicators and controls

Message list

Single-select list. Always enabled.

Lists all messages defined in the datalogger. For each message, displays its name, DTMF code (if any), and the alerts that use it (the name of the alert if just one; the number of alerts if more than one).

New

Enabled in edit mode.

Opens the **Message Editor** screen in edit mode, with blank fields.

Setup

Always visible. Enabled when a message is selected in the list.

Opens the **Message Editor** screen in current mode (view or edit), loaded with the selected message.

Delete

Enabled when in edit mode and a message is selected in the list.

Deletes the selected message. If the message is associated with one or more alerts, a **Confirm Delete** dialog intervenes. If not, the message is deleted immediately.

Deletion is permanent (not undoable).

9.3.10 Message Editor screen

Access:

Home ► Telemetry ► Status ► Setup ► Messages ► Setup (view or edit mode)

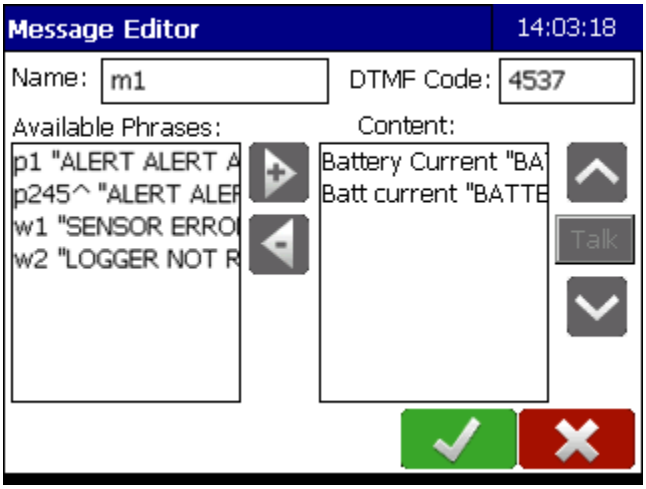


Figure 9-16: **Message Editor** screen

9.3.10.1 Indicators and controls

Name

Textbox.

Displays/edits the name for the message. Name must be unique amongst all messages.

DTMF Code

Textbox. Enabled in edit mode.

DTMF codes can be 2 to 4 digits long.

Content

Single-select list. Enabled (selection) in edit mode.

Lists the names of all phrases in the message, in order of speaking.

A message can have no more than 15 phrases.

Up

Button. Enabled when in edit mode and a phrase not at the top of the list is selected.

Moves the current selection in the **Content** list up one line.

Down

Button. Enabled when in edit mode and a phrase not at the bottom of the list is selected.

Moves the current selection in the **Content** list down one line.

Available Phrases

Single-select list. Enabled (selection) in edit mode.

Lists all phrases available for use in messages. For each phrase, the phrase name and a possibly abbreviated text string representing the message in the current language are listed.

Move Right Arrow

Button. Enabled when in edit mode and a phrase is selected in **Available Phrases**.

Adds the current selection in **Available Phrases** to **Content**. If no item is selected in **Content** , the phrase is added to the end of **Content**. If an item is selected in **Content**, the phrase is added before (above) it.

Available Phrases remains unchanged. A phrase can be added more than once to the same message.

Move Left Arrow

Button. Enabled when in edit mode and a phrase is selected in **Content**.

Removes the selected item from **Content**. **Available Phrases** remains unchanged.

9.3.11 AirTalk Configuration Editor screen – Alerts tab

Access: **Home ► Telemetry ► Status ► Setup ► Alerts**

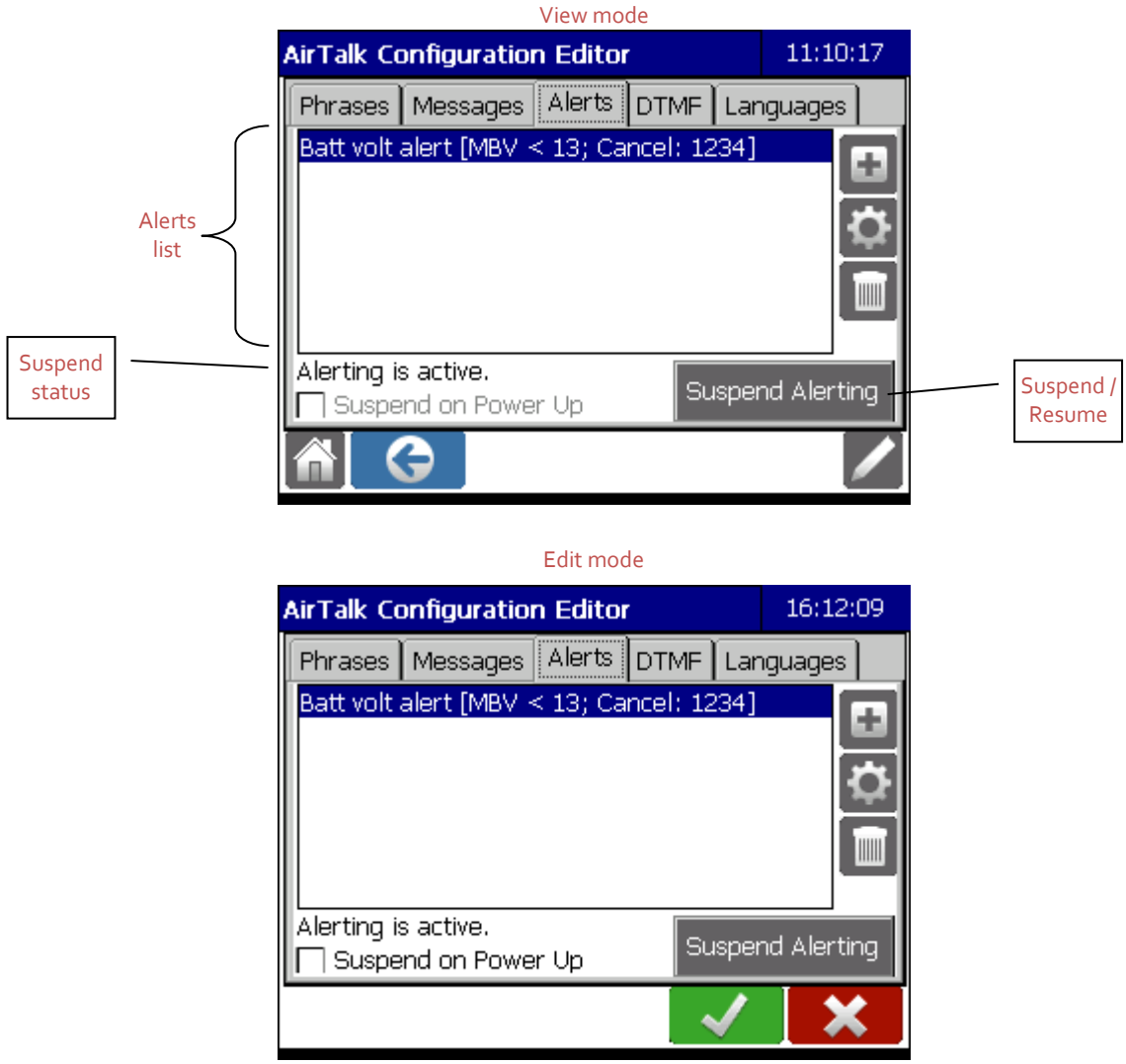


Figure 9-17: **AirTalk Configuration Editor** screen – **Alerts** tab

9.3.11.1 Indicators and controls

Alerts list

Single-select list. Always enabled.

Lists all alerts defined in the datalogger. For each alert, the alert's name and its trigger condition are displayed.

Disable Alerts

Button. Visible when alerts are globally enabled.

Deactivates all alerts whose activation setting is "Use Global Setting." Any currently firing alerts that are deactivated by this action are immediately stopped.

This setting is recorded in the datalogger configuration, and so will persist between datalogger reboots.

Suspend Alerting

Button. Visible when alerting is active.

Suspends alerting and is replaced by Resume Alerting button.

Resume Alerting

Button. Visible when alerting is suspended.

Resumes (activates) alerting and is replaced by Suspend Alerting button.

Suspend Alerting on Power Up

Checkbox. Enabled in edit mode.

Sets the initial behaviour for alerting (active or suspended) when the datalogger powers up.

New

Button. Enabled in edit mode.

Opens the **Alert Editor** screen in edit mode, loaded with default values.

Setup

Button. Always visible. Enabled when an alert is selected in the list.

Opens the **Alert Editor** screen in current mode (view or edit), loaded with the selected alert.

Delete

Button. Enabled when in edit mode and an alert is selected in the list.

Deletes the selected alert immediately (no **Confirm Delete** dialog intervenes).

Deletion is permanent (not undoable).

9.3.12 Alert Editor screen

Access:

Home ► Telemetry ► Status ► Setup ► Alerts ► Setup (view or edit mode)

For an explanation of the meanings of **Trigger Condition**, **Repeats**, **Interval**, **Dead Zone**, and **Snooze Time**, see section 9.1.3.2 *Alerts*.

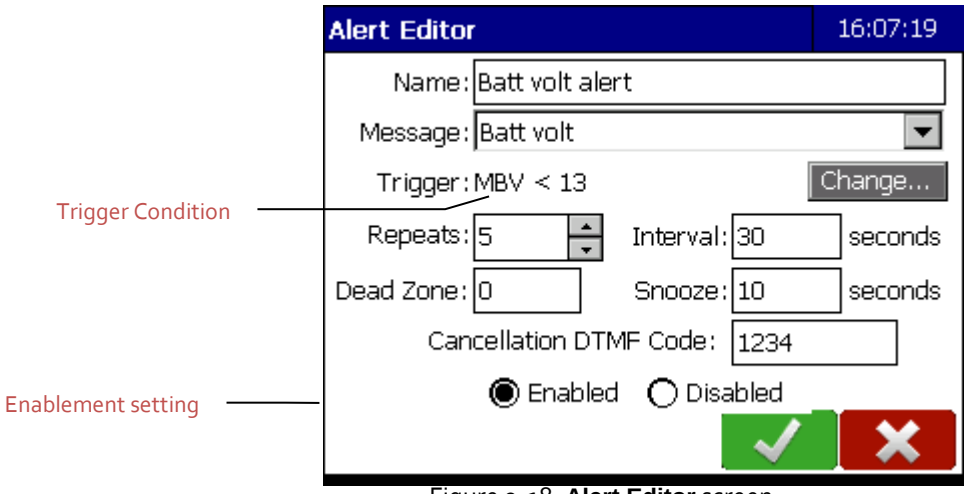


Figure 9-18: **Alert Editor** screen

9.3.12.1 Indicators and controls

Name

Textbox.

Displays/edits the name for the alert. Name must be unique amongst all alerts.

Message

Drop-down selector. Enabled when in edit mode.

Lists all defined messages in the datalogger.

Trigger Condition

Display. Always visible.

Displays the current trigger condition. (To modify, click **Change…**).

Change…

Button. Always enabled.

Opens the **Alert Trigger Editor** screen.

Repeats

Textbox with spinners. Enabled when in edit mode.

Displays/edits number of times to repeat transmission of the message when the alert is triggered.

Interval

Textbox. Enabled when in edit mode.

Displays/edits the time interval (in seconds) between repeat transmissions of the message when the alert is triggered.

Dead Zone

Textbox. Enabled when in edit mode.

Displays/edits dead zone value (floating point number) for alert triggering evaluation.

Snooze Time

Textbox. Enabled when in edit mode.

Displays/edits snooze time (seconds) for alert triggering evaluation.

Cancellation DTMF Code

Textbox. Enabled when in edit mode.

Displays/edits DTMF code used to cancel alert message repeat transmissions.

DTMF codes must be 2 to 4 digits long. Alerts can share a common cancellation code. However a cancellation code cannot be the same as a message transmission code.

Enabled / Disabled

Radio button group. Always enabled.

Enablement setting for the alert.

Enabled: The alert is enabled.

Disabled: The alert is disabled.

For information about enabling and disabling alerts, see section 9.1.3.4, Controlling whether alerts are transmitted.

OK

Button. Always enabled.

Commits changes made in this dialog and returns to the **AirTalk Configuration Editor – Alerts** screen, providing the defined alert is valid (see below). Changes are not committed until this button is pressed.

Cancel

Button. Always enabled.

Cancels all changes made in this dialog and returns to the **AirTalk Configuration Editor – Alerts** screen.

9.3.12.2 Validity conditions

Name must not be the name of any other defined alert.

Selections must be made in **Message**, **Trigger Condition**.

Snooze Time must be either empty or an integer at least 0 (seconds).

Interval must be integer at least 20 (seconds); if **Repeat Count** is zero, then **Interval** may be blank.

Dead Zone must be either empty or a floating point number at least 0.

Cancellation DTMF Code must be either empty or between two and four digits.

9.3.13 Alert Trigger Editor screen

Access: **Home ► Telemetry ► Status ► Setup ► Alerts ► Edit ► Alert Editor ► Change…**

For an explanation of the meanings of **Trigger Variable**, **Relation**, and **Threshold**, see section 9.1.3.2 *Alerts*.

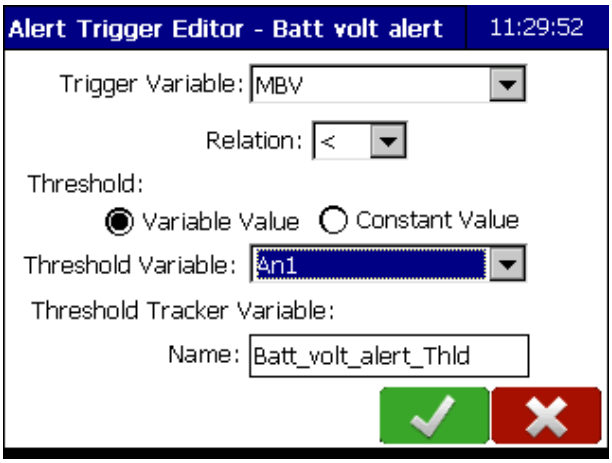
Briefly, this screen defines the condition on which an alert may be triggered (depending also on additional conditions; see section 9.1.3.2). The condition has the form of an arithmetic comparison (less, greater, equals, etc.):

Variable Relation Threshold

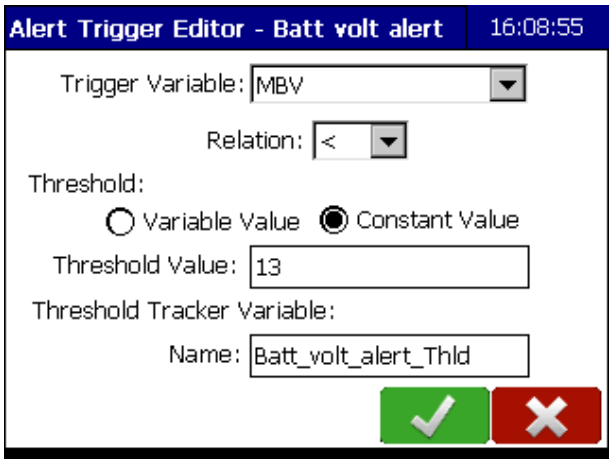
example: VB *(Variable)* < *(Relation)* 13 *(Threshold)* (shown below in constant threshold screen shot).

and is satisfied when the value of *Variable* satisfies the specified relation to *Threshold*.

Variable threshold



Constant threshold



9.3.13.1 Indicators and controls

Trigger Variable

Drop-down list. Enabled in edit mode. Lists all defined datapoints (variables) in the datalogger.

Determines the variable in the trigger condition.

Relation

Drop-down list. Enabled in edit mode. Lists all arithmetic relations (less, greater, equal and their negations).

Determines the relation in the trigger condition.

Threshold

Radio button set.

Variable Value displays the controls for selecting a variable defined in the datalogger as the threshold in the trigger condition.

Constant Value displays the controls for setting a constant value as the threshold in the trigger condition.

Threshold Variable

Drop-down list. Enabled in edit mode. Visible when **Threshold** is set to **Variable Value**.

Lists all defined datapoints (variables) in the datalogger. Determines the datapoint whose value is used as the threshold in the trigger condition.

Threshold Value

Textbox. Enabled in edit mode. Visible when **Threshold** is set to **Constant Value**.

Determines the fixed constant value used as the threshold in the trigger condition.

Threshold Tracker Variable

Textbox. Enabled in edit mode.

Sets the name of the datapoint that tracks (duplicates) the value of the threshold setting (whether set by a variable or constant) used in the trigger condition.

9.3.14 AirTalk Configuration Editor screen – DTMF tab

Access: **Home ► Telemetry ► Status ► Setup ► DTMF**

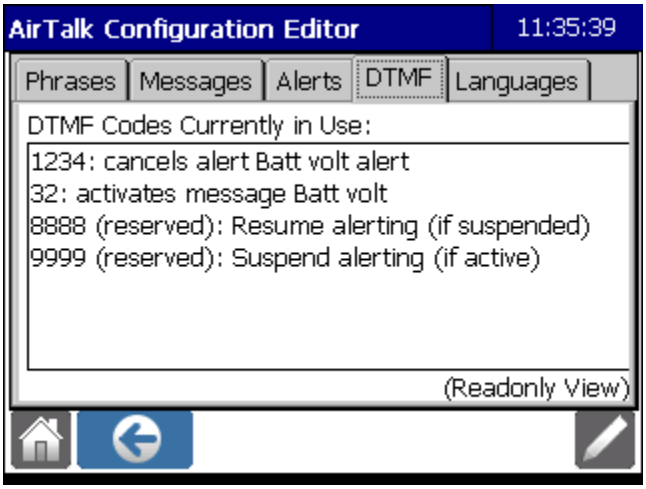


Figure 9-19: **AirTalk Configuration Editor** screen – **DTMF** tab

9.3.14.1 Indicators and controls

DTMF Codes Currently in Use

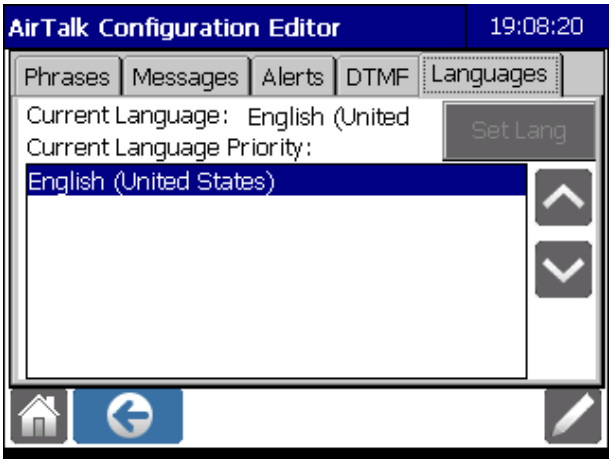
Lists all DTMF codes that are currently in use by the AirTalk configuration. The list includes DTMF codes that

- trigger messages
- cancel alerts
- resume alerting (reserved code 8888)
- suspend alerting (reserved code 9999)

9.3.15 AirTalk Configuration Editor screen – Languages tab

Access: **Home ► Telemetry ► Status ► Setup ► Languages**

View mode



Edit mode

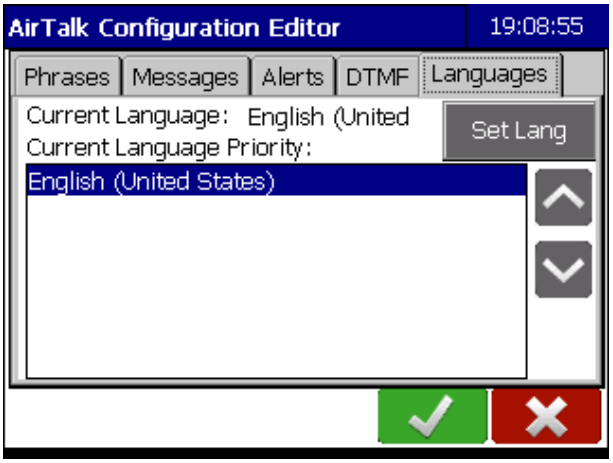


Figure 9-20: **AirTalk Configuration Editor** screen – **Languages** tab

9.3.15.1 Indicators and controls

Current Language

Display text.

Displays the currently selected language for AirTalk transmissions.

Set Lang

Button. Enabled in edit mode.

Opens the **Set AirTalk Language** dialog.

Current Language Priority

Enabled (selection) in edit mode.

A single-select list showing all supported languages in priority order.

Up

Button. Enabled when in edit mode and a language not at the top of the list is selected.

Moves the current selection in the **Current Language Priority** list up one line.

Down

Button. Enabled when in edit mode and a language not at the bottom of the list is selected.

Moves the current selection in the **Current Language Priority** list down one line.

9.3.16 Set AirTalk Language screen

Access: **Home ► Telemetry ► Status ► Setup ► Edit ► Languages ► Set Lang**

Figure 9-21: **Set AirTalk Language** screen

9.3.16.1 Indicators and controls

Languages list

Single-select list. Always enabled.

Displays/selects the current language for AirTalk messages.

OK

Button. Always enabled.

Commits changes made in this dialog and returns to the **AirTalk Configuration Editor – Languages** screen. Changes are not committed until this button is pressed.

Commit includes sending the necessary language sound files to the AirTalk hardware if they are not already loaded.

If the commit fails (AirTalk hardware returns a failure code), some indication of this is presented to the user and the dialog is not dismissed. The user may retry with **OK** or tap **Cancel** to abandon.

Cancel

Button. Always enabled.

Cancels all changes made in this dialog and returns to the **AirTalk Configuration Editor – Languages** screen.

9.3.17 Visit Report

AirTalk maintains a history log (viewable via **Home ► Telemetry ► Status ► History**). This log is downloaded from the AirTalk hardware and included in the Visit Report when a Visit Report is requested by a user.

9.4 Operational notes

9.4.1 DTMF codes

9.4.1.1 Description

DTMF (*dual-tone, multi-frequency*) is the name for the tone coding used on telephone touch-tone keypads, including the keypads on the two-way radios used with AirTalk.

AirTalk can be configured to respond to DTMF codes sent from users' radios. A DTMF code can serve one of the following functions:

- request a message to be spoken, or
- request a currently repeating message to stop repeating (be cancelled)
- request alerting to be suspended (reserved code 9999)
- request alerting to be resumed (reserved code 8888)

(For details on configuring DTMF codes in AirTalk, see section 9.2.2, Creating a new message.)

9.4.1.2 Sending DTMF codes from a radio

No other traffic

A DTMF code can only be sent when there is no other traffic on the channel.

If AirTalk (or another person) is transmitting on the frequency, then you must wait until the transmission completes before sending a DTMF code. In particular, a currently transmitting message cannot be cancelled until its current repeat has finished being spoken. Because AirTalk has a non-receptive "blank period" of about 1 second after each transmission, cancelling may be difficult if the repeat interval (time between repeats) is short, and impossible if the repeat interval is very short.

Do not send a DTMF code if you can hear another person sending one at the same time.

Speed of keying

When you send a DTMF code, you must key it in reasonably quickly.

Approximately stated (details below), the digits in a code must be pressed no more than one second apart. Having a time limit enables the system to determine if you are sending a 2-, 3-, or 4-digit code. (AirTalk can have 2-digit or 3-digit codes that are the same as the beginning of one or more longer codes. Therefore the datalogger has to wait to see which one you meant.) Having the time limit set at one second allows the system to decide what is happening and respond to it reasonably quickly.

A more precise description of the one-second keying constraint needs a little more explanation:

- When you press a button on the keypad, the tone begins sending as soon as the button contact is closed. The tone continues until you release the button and the button contact opens. So each tone has a beginning and an end.
- The exact requirements on speed of DTMF keying are this: You must *begin* sending the next DTMF digit no more than one second after the *beginning* of the previous one (not after the end, which would be a looser condition).

9.4.1.3 How AirTalk processes DTMF codes

If you key in a single digit and no further digit within one second, AirTalk ignores the digit.

If you key in two or three digits with no more than one second between digit starts, and no further digit within one second after the last one, AirTalk sends the two- or three-digit code to the datalogger for processing.

If you key in four digits within four seconds, AirTalk sends the four-digit code immediately to the datalogger for processing.

If you continue keying digits after keying in four digits within four seconds:

- AirTalk dispatches the first four digits to the datalogger for processing.
- AirTalk continues storing any following digits it receives until the datalogger tells AirTalk to transmit a message and AirTalk actually begins transmitting. (While AirTalk is transmitting, it cannot receive any digits.)
- The additional digits stored are subject to the processing rules above (one-second rule, etc.). They are treated as another DTMF code, and may therefore cause the system to respond.
- The number of digits stored depends on how fast you key them in and how soon AirTalk begins transmitting the message. Therefore the number of digits stored is unpredictable, and so entering more than four digits in succession could result in unexpected behaviour.

> FTS recommends that you key in only one DTMF code at a time, and that you wait for the response to a code before keying in another code.

9.4.1.4 How the system responds to DTMF codes

When the datalogger receives a code, it compares it to all configured DTMF codes (transmit codes, cancel codes, and suspend/resume codes).

- Updates the **Last Received** display on the **Telemetry Status** screen with this code.
- If it finds a match, the datalogger takes the appropriate action (triggers or cancels a message transmission, or suspends or resumes alerting).
- If the code received does not match any configured code, the datalogger does nothing except to indicate on the **Telemetry Status** screen that the last received code was unused (not defined in AirTalk).

Chapter 10 RVT telemetry reference

10.1 "RVT" vs. "AirTalk"

RVT is the first (and quite different) release of the FTS radio voice messaging system whose current release is known as AirTalk. This chapter documents the first-generation RVT system for those customers who have it.

> If you have AirTalk, please see , Chapter 9 AirTalk guide.

10.2 Status

The **RVT Status** screen is displayed (Figure 10-1) when **Status** associated with the RVT transmitter on the **Telemetry** screen (usually on tab **Telem B**) is pressed. The **RVT Status** screen provides an interface for the user to configure the RVT settings. The **Get** and **Send** buttons are used to download and upload configuration files to the RVT. The **Save** and **Load** buttons are used to store and retrieve configuration files from a USB flash drive or the datalogger memory.

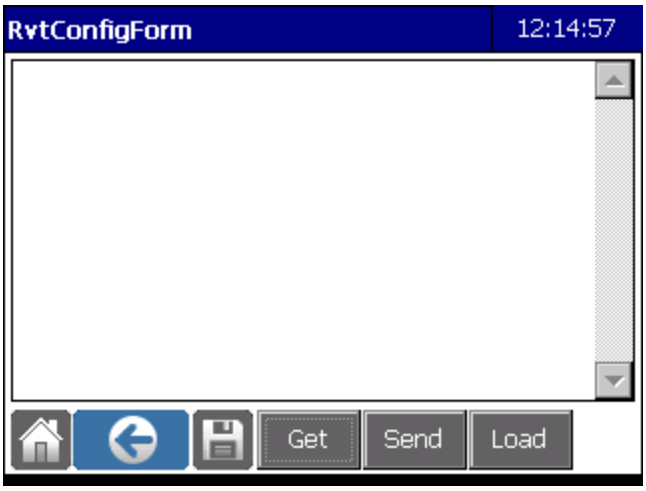


Figure 10-1: RVT Status screen

10.2.1 Get configuration

The **Get** button on the **RVT Status** screen is used to download the connected RVT's current configuration file to the datalogger. The retrieved configuration is displayed on the **RVT Status** screen as shown in Figure 10-2. It is recommended that the retrieved RVT configuration be saved to a file (either on the datalogger or on a USB memory stick) so that the user can revert to the original configuration if required.

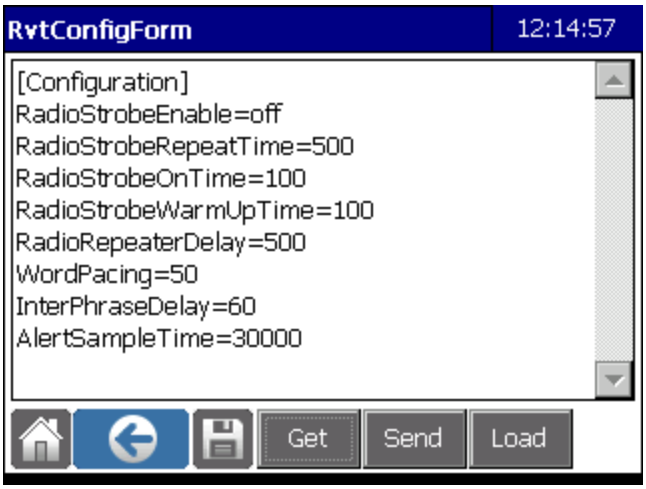


Figure 10-2: RVT Get Configuration screen

10.2.2 Send configuration

The **Send** button is used to upload the configuration file displayed on the **RVT Status** screen to the connected RVT. When uploading the file to the connected RVT a 'please wait' message is displayed followed by the message shown in Figure 10-3. If an error is displayed, the user should re-try the upload process. The error may be due to the tight timing requirements between the RVT and the datalogger and this timing may have been affected by normal datalogger or RVT operation.

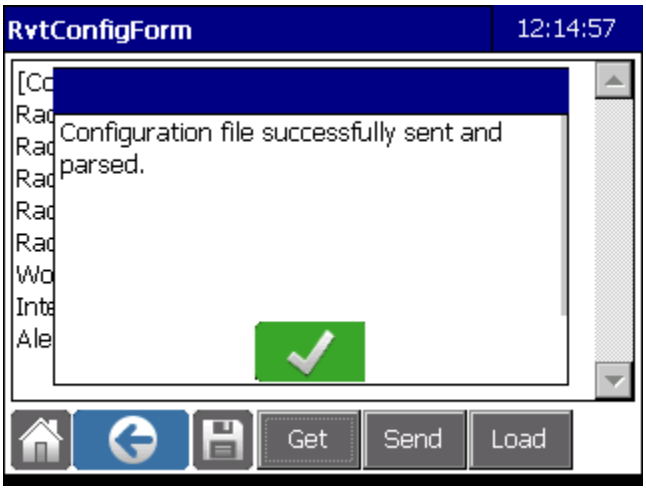


Figure 10-3: RVT Send Configuration screen

10.2.3 Save configuration

The **Save** button on the **RVT Status** screen is used to store the retrieved RVT configuration to a file on the USB memory stick or datalogger memory. The user is required to specify a filename after pressing **Save** (see Figure 10-4). The Save process defaults to the USB memory stick if a memory stick has been inserted in the datalogger.

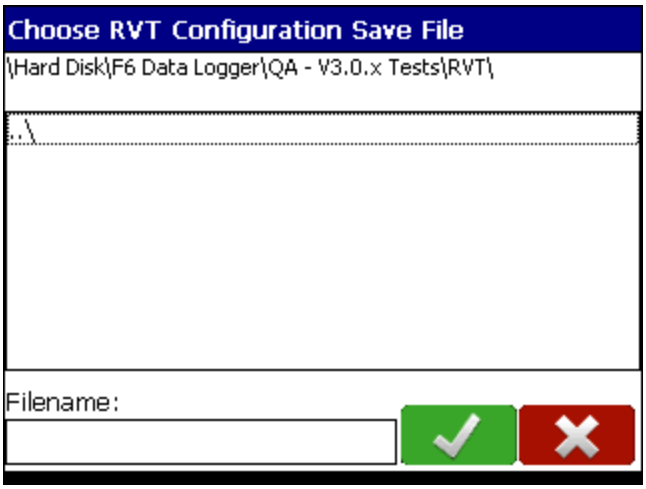


Figure 10-4: Choose RVT Configuration Save File screen

10.2.4 Load configuration

The **Load** button is used to retrieve an RVT configuration file from the USB memory stick or datalogger memory. The user is required to select a file after pressing **Load** (see Figure 10-5). The Load process defaults to the USB memory stick if a memory stick has been inserted in the datalogger. The newly loaded file appears on the **RVT Status** screen, it can then be uploaded to the RVT using **Send**.

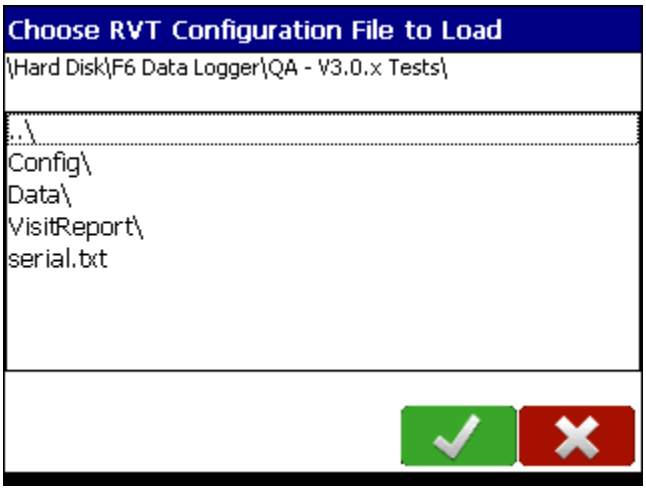


Figure 10-5: RVT Load Configuration screen

10.3 Editing an RVT configuration

An RVT configuration file can be edited on the datalogger or the file can be edited externally using any text editor. The RVT configuration makes reference to variables in the datalogger program. In order to configure the RVT you should have a working knowledge of the datalogger's operation. RVT response to DTMF codes can be easily modified or added. Also, new Alerts can be defined in conjunction with the datalogger configuration.

10.3.1 RVT configuration file format

A typical RVT configuration file is shown below. The file is divided into four sections: Configuration; Phrases; Responses; and Alerts.

```
[Configuration]
RadioStrobeEnable=off
RadioStrobeRepeatTime=500
RadioStrobeOnTime=100
RadioStrobeWarmUpTime=100
RadioRepeaterDelay=500
WordPacing=50
InterPhraseDelay=60
AlertSampleTime=30000

[Phrases:English]
SN=STATION NUMBER (Station)
AT=AIR TEMPERATURE (Temp) DEGREES
RH=HUMIDITY (Rh) %
WS=WIND SPEED (Wspd) MILES PER HOUR
WD=WIND DIRECTION (Dir) DEGREES
FM=FUEL MOISTURE (FSM) %
FT=FUEL TEMPERATURE (FST) DEGREES
PWS=PEAK WIND SPEED (PkWS) MILES PER HOUR
PWD=PEAK WIND DIRECTION (PkWD) DEGREES
RN=RAIN (RNIN) INCHES
SR=SOLAR RADIATION (PYRSR) WATTS PER SQUARE METER
MB=MAIN BATTERY (Telem) VOLTS
ALERT=ALERT ALERT
RHAL1=HUMIDITY (Rh) %
PKWSAL1=PEAK WIND SPEED (PkWs10m) MILES PER HOUR
WSAL1=WIND SPEED (Wspd) MILES PER HOUR

 [Responses]
1234=AT RH WS WD FM FT PWS PWD SR RN MB
1235=AT RH WS WD
1236=WS WD

 [Alerts]
al1=(RhAl > 0) ALERT SN RHAL1 RHAL1
al2=(PkWsAl > 0) ALERT SN PKWSAL1 PKWSAL1
al3=(WspdAl > 0) ALERT SN WSAL1 WSAL1
```

10.3.1.1 Configuration section

This portion of the RVT configuration files contains parameters specific to the internal operation of the RVT. These parameters should not be altered.

10.3.1.2 Phrases section

This portion of the RVT configuration files contains phrases that the RVT uses to respond to DTMF information requests. Normally phrases nots need to be added or modified. Refer to the RVT operating manual for phrase details if a new phrase is required.

10.3.1.3 Responses section

This portion of the RVT configuration files defines the RVT response to the received DTMF sequence. For instance, in the sample RVT configuration file, the RVT responds with the wind speed and wind direction when a DTMF sequence of 1 2 3 6 is received. Response can be edited or added to the configuration file. The format of the response follows that shown in the sample RVT configuration file.

10.3.1.4 Alerts section

This portion of the RVT configuration files defines when the RVT broadcasts an Alert. The alert flags must be defined in the datalogger (i.e. RhAl, PkWsAl, and WspdAl) as it is the datalogger which determines if there is an alert condition. Alerts are numbered sequentially (i.e. al1, al2, and al3) and the format of the alert follows that shown in the sample RVT configuration file.

Chapter 11 Specifications

Error! Bookmark not defined.

11.1 Datalogger

11.1.1 General

11.1.1.1 Protection

Inputs are lightning / static protected
Connectors are metal shell circular waterproof types
Built-in case temperature sensor

11.1.1.2 Physical

Size:	25 cm wide, 20 cm high. 15 cm deep (10" x 8" x 6")
Weight:	3.3 kgs (7.3 lbs) 4.2 kgs (9.2 lbs) with optional internal G5 GOES Transmitter

11.1.1.3 Environmental

Operating Temperature Range	-40 ºC to 60 ºC (refer to the display specification for the display's operating temperature range)
Storage Temperature Range	-50 ºC to 70 ºC
Enclosure	watertight, even without connectors attached

11.1.1.4 Power management

9.6 Vdc to 20 Vdc operating voltage
Internal solar panel voltage and current measurement
Internal battery voltage, current, and temperature measurement
Internal, temperature compensated battery charge regulator

11.1.1.5 Power consumption

State	Current draw	
	without internal GOES transmitter	**with internal GOES transmitter**

Idle	3 mA with)	8 mA
Active	10 mA	15 mA
Display On	60 mA	65 mA
Transmit	n/a	2.6 A max

11.1.1.6 Memory

RAM	64M
non-volatile flash storage	256M
memory allocations	14 MB circular memory file for data 20 kB circular audit log, transmit log 70 kB circular transmit log

11.1.1.7 Real time clock

Battery backed clock
Synchronized to optional GPS
Clock accuracy: ±1 second if connected to a G5 GOES transmitter.
Otherwise, maximum drift of 2 sec/day (room temperature).

11.1.2 User interface

11.1.2.1 Display / user interface

Display	Built-in quarter VGA colour display, 7 cm wide x 5.5 cm high (2.8" x 2.125") with touchscreen user interface.
Operating Temperature Range	-20 ºC to 60 ºC
Functions	System status; Stored data (tables and graphs); System configuration; Troubleshooting/diagnostics.

11.1.2.2 USB device port

1 waterproof front panel connector
USB (full-speed, 12Mbps)
Automatic PC detection

11.1.2.3 USB host ports

2 waterproof front panel connectors
USB (full-speed, 12Mbps)
Supports 1.5Mbps and 12Mbps USB devices including memory sticks, mouse and keyboard.

11.1.3 Connectors

The connectors used on the datalogger are commercial versions of the MIL-C-26482 Series 1 family of connectors and are compatible with their military equivalents.

All pin-out diagrams on the following pages show the face of the chassis connector. This is the same as the back of the mating cable connector.

There are several different manufacturers of connectors that mates with the datalogger connectors, but not all manufacturers make all of the pin-out variations. The part numbers we specify below are for Souriau connectors with solder cup connections. Crimp connections are also available, but do not order these unless you have the proper assembly tools.

Be particularly aware of problems in the 8-3 family, there are some variations that look like they should mate, but the pins are in slightly different positions.

There are several different styles of environmental sealing, depending on the type of wire used. The part numbers we have specified are for sealing to jacketed cables. There are also types that are for loose wire bundles and thus seal the individual wires, or are intended for potting. Not all manufacturers make all variations in sealing, so check the catalog very carefully before ordering a different brand. The true military equivalents usually do not seal to jacketed cable -- check with your supplier. Note that individual wire seals require wires of a specific diameter to work.

Delivery can be slow from the suppliers -- there are so many possible variations of these military style connectors that the suppliers often stock the raw parts and then assemble the ordered combination when they get an order.

> **WARNING !** If you are soldering wires to the connector, make sure you clean the flux off the connector after soldering. Any moisture present inside the connector will combine with the flux and cause corrosion eventually resulting in a connection failure.

Part number example

Part number: 851-06JC10-6PN50

851	Souriau series designation for this family of connectors
06	cable connecting plug (i.e., plugs into the datalogger connectors)
JC	seals to jacketed cable, with cable clamp
10	shell size (connector diameter)
6	contact arrangement (6 pins in hexagon)
P	pins (as opposed to sockets)
N	normal - insert not rotated (this is left out of the part number)
50	Souriau series index

In general, all of the connectors is of the form 851-06JCxx-xxYN50 where xx-xx is the shell size and contact arrangement, and Y is the pin (P) or socket (S) descriptor. This cable end connector is equivalent to MS3116Fxx-xxYN except that the military has individual wire seals instead of sealing to jacketed cable. Check with your supplier to see if a jacket seal is available.

11.1.3.1 Battery

Mating Connector:	851-06JC10-7S50
FTS Part Number:	521-107S

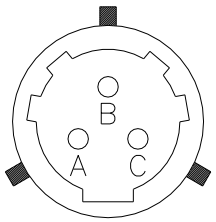
PIN	Function
A	Signal ground
B	Battery negative sense
C	Battery negative (Chassis ground)
D	Battery positive sense
E	Battery positive
F	Temperature input
G	Optional battery back-up input

Signal input

- 9.6 VDC to 20 VDC operating voltage
- Internal battery voltage, current (+ or -), and temperature measurement

11.1.3.2 Solar panel

Mating Connector:	851-06JC8-3AS50
FTS Part Number:	520-83AS



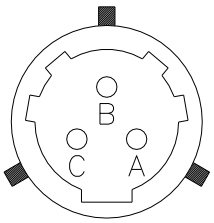
PIN	Function
A	Power positive
B	Power negative
C	Chassis ground

Signal input

- 100 W (25 Vdc, 7A) maximum input
- Internal solar panel voltage and current measurement
- Internal, temperature compensated battery charge regulator

11.1.3.3 Rain

Mating Connector:	851-06JC8-3AP50
FTS Part Number:	520-83AP



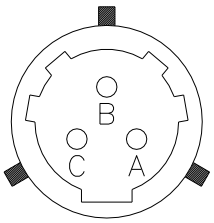
PIN	Function
A	Chassis ground
B	Signal input
C	Signal ground

Signal input

- Contact closure to ground or 0 to 3 V
- 10 kΩ pull-up to 3 Vdc internally
- 0 to-400 Hz at 50% duty cycle
- Minimum closure (low level) duration 1 ms
- Compatible with any tipping bucket rain gauge with contact closure.
- 53 bit counter (floating point, double precision)
- Configurable units and tip increment
- Optional reset date for automatic resetting of rain accumulation

11.1.3.4 SDI

Mating Connector:	851-06JC8-3AP50
FTS Part Number:	520-83AP



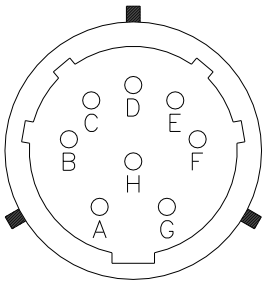
PIN	Function
A	SDI power out
B	SDI data
C	SDI ground

Signal input

- Two independent SDI-12 version 1.3 ports
- Supports M, C and R measurements with or without CRC error control.
- CMOS Signal Levels
- SDI over-voltage
- Current limited to approximately 750 mA. Short duration transients of higher current can be supplied without triggering the limit.

11.1.3.5 Telemetry

Mating Connector:	851-06JC12-8S50
FTS Part Number:	520-128S



PIN	Function
A	CTS (to datalogger)
B	Chassis ground
C	RXD (to datalogger)
D	TXD (from datalogger)
E	RTS (from datalogger)
F	Signal ground
G	Power from datalogger
H	Transmit enable

Signal input

- Two ports factory configured as either:
  - one internal GOES transmitter and one external connector, or
  - two external connectors
- Signal Levels: RS232C
- Flow control may be enabled, depending on port configuration
- Port settings are preserved through power failures

11.2 Internal GOES transmitter (OPTIONAL)

11.2.1 Transmission data rates

- 100, 300 and 1200 BPS
- Self-timed and Random transmissions

11.2.2 Output

- Antenna: 11 dBi, right hand circular polarization
- Connector: N-Type female
- RF Power:

Data rate	Power
100 BPS	5.6 W
300 BPS	5.6 W
1200 BPS	11.2 W

11.2.3 Frequency range

- 401.701MHz – 402.09850 MHz

11.2.4 Frequency stability

- Initial Accuracy: ±20 Hz disciplined to GPS
- Short term drift: ±0.04 Hz/s
- Ageing: ± 0.1 ppm/year
- Vcc + Temperature: ± 0.1 ppm

11.2.5 Channel bandwidth

Data rate	Bandwidth
100 BPS	1.5 kHz
300 BPS	1.5 kHz
1200 BPS	3.0 kHz

11.2.6 Time keeping

- Setting Accuracy: +/- 100 us synchronized to GPS
- Drift: +/- 10 ms/day over operating temperature range.
- Transmission continuation without GPS fix: 28 days

11.2.7 GPS

- Antenna type: 3 V active
- Connector: SMA female
- Time synchronization / frequency correction schedule:
- - 1 fix at power up, 1 fix per day thereafter