EXTREME ENVIRONMENTS. EXTREMELY RELIABLE.

Axiom

Smart Datalogger for Extreme Environments

Operator's Manual

1.800.548.4264 | www.ftsinc.com

700-Axiom Man Rev.11 15 Apr 2021

Contact Information

Canadian Headquarters:
1065 Henry Eng Place
Victoria, BC | V9B 6B2 | Canada
www.ftsinc.com

Toll-free: 1.800.548.4264
Local: 250.478.5561

Technical support portal: http://support.ftsinc.com

Email: service@ftsinc.com

The Axiom Suite of Manuals

Axiom (F6/H2/H1) Overview	Description, Quick Start Guide, General Operating Instructions, Specifications
Axiom Operator's Manual	Detailed description of all functions of 7 home screen icons. Brief description of Telemetry (8th icon). Covers Sensor Extensions and sensor mapping.
Axiom Telemetry Reference	Detailed description of the G5/G6 Telemetry functions, other telemetry devices and message formatting.
Axiom Field Guide	A field reference with the most common features used on site visits.
Axiom Installation and Maintenance Guide	Installation and maintenance details.

TABLE OF CONTENTS

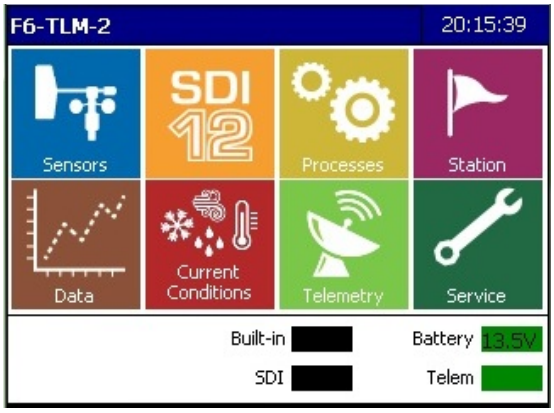
CHAPTER 1 - GENERAL

This reference manual provides a detailed explanation of configuration options for the Axiom Datalogger provided with a G6 transmitter. This manual is relevant for Dataloggers fitted with a G5 transmitter, except all the transmitter telemetry functions will not be available. The information and screenshots present in this manual are representative of the Application version annotated in the Document Revision history.

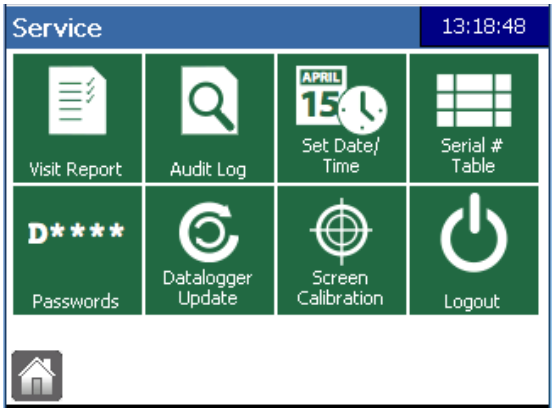
1.1 SCREENS AND ICONS

The Axiom Datalogger has a **Home** screen which consists of eight **Main Menu** icons. Each icon accesses screens to configure or view information related to a particular subarea of the Datalogger's functionality. The Datalogger screen will go black after 10 minutes of inactivity but can be reactivated by a touch to the screen. After 20 minutes of inactivity automatic logout from User Level or Tech Level occurs and the Datalogger defaults back to the home screen. If any passwords have been set, they will need to be entered in order to use the Datalogger screen.

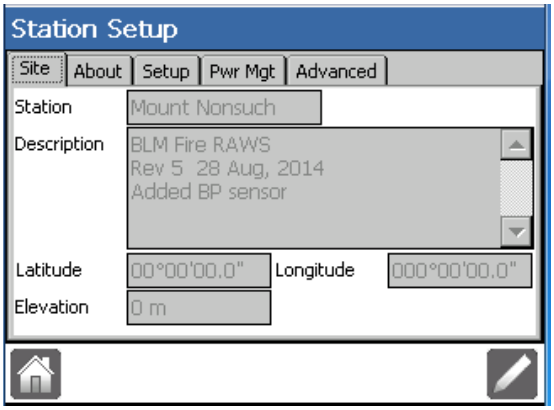
When a MAIN MENU icon is selected, the next screen could consist of **Sub Icons, Tabs,** or **Information Fields**, depending on the function. A variety of **Action** buttons are displayed on the bottom of some screens. This selection varies according with the functions available on the screen. See Figure 1-1 for examples of the different screens and functions.



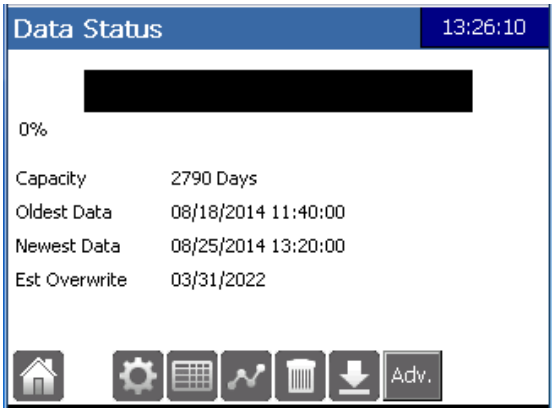
The **HOME** screen showing the 8 MAIN ICONS



The SERVICE screen showing ***Sub-icons***



Screen with several *Tabs* and **Information fields**



Screen with several **Action icons**

Figure 1-1: Screen Examples

The action icons and their functions are shown in Figure 1-2.

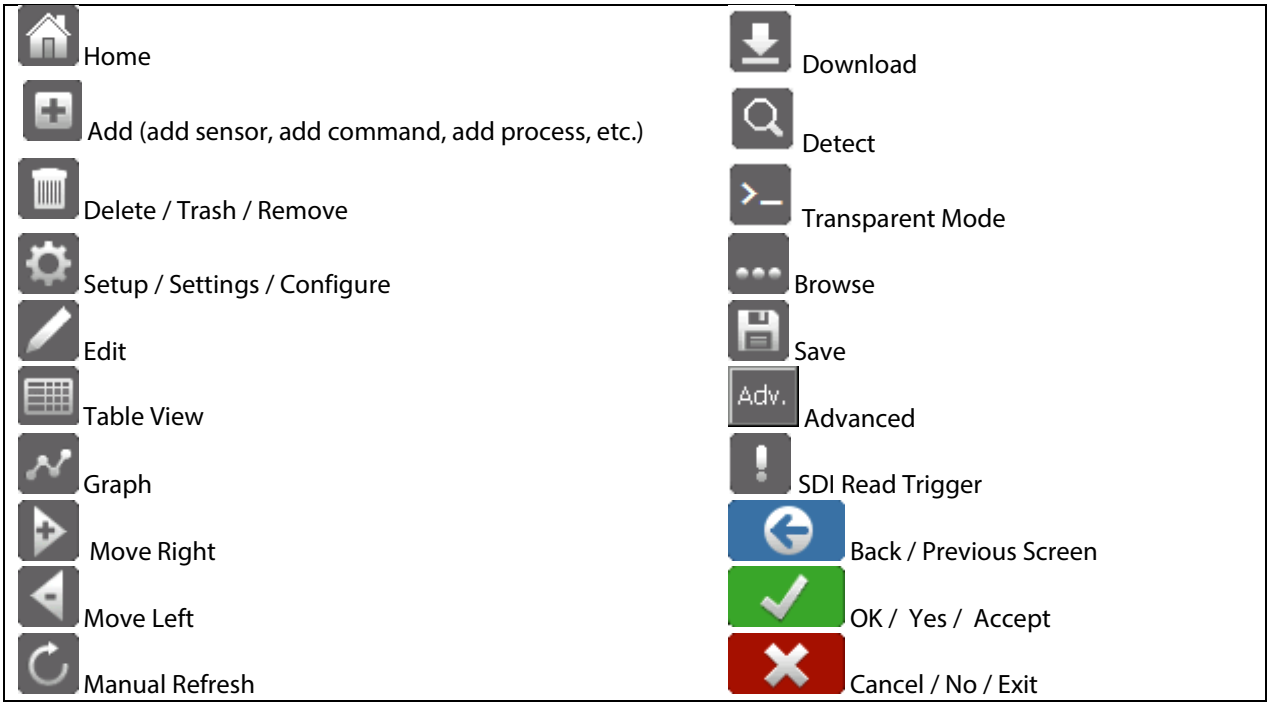


Figure 1-2: Action icon descriptions

Selections are made by tapping the desired portion of the screen with the stylus or your finger tip. In order to amend fields, select the edit icon , then select the field you wish to amend. Some fields will turn white when in edit mode; others will remain grey but will be highlighted once they are selected. Read only fields will remain greyed out and will not highlight.

When directions are provided in this manual, a series of selections to bring the user to a particular screen or function shall be illustrated as follows: **Home>Main Icon>Sub Icon>Tab> Action Icon/Information Field.**

1.1.1 HOME SCREEN STATUS INDICATORS

Home screen status indicators provide information on sensor activity, battery voltage and state, and telemetry to allow the user to make a quick assessment as to how the Datalogger is operating. The four status indicators at the bottom of the Home screen are Built-in, SDI, Battery, and Telem.

Figure 1-3: Home Screen Status Indicators

1.1.1.1 *Built-in*

This indicates the status of the built-in sensors.

Colour	Meaning
Green	Dedicated front panel sensors or internal sensors are being read by the Datalogger
Black	No sensor activity

1.1.1.2 *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.

1.1.1.3 *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 Sensor screens.

1.1.1.4 *Telem*

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

For G5/G6 telemetry:

Colour	Meaning
Black	No G6 transmitter attached or G6 status not available
Red	No G6 transmissions have occurred
Green	Data loaded into the G6 transmit buffer (black text on green background indicates the combined number of bytes loaded for self-timed and random transmissions)

For other telemetry devices:

Colour	Meaning
Black	Port not in use
Red	The port is configured for use with a device but not powered
Green	Power supplied to the port

For WRLS-AXIOM-PC telemetry, in addition to the indications for other telemetry devices:

Colour	Meaning
Blue	Ready to connect to PC.
Blue with W	Waiting. Has established connectivity and waiting for commands.
Blue with A	Active. Actively transmitting/receiving information.

Examples:

	Port A in power saving mode Port B has power supplied		Port A has power supplied Port B not in use
	Port A is operating with a WRLS-AXIOM-PC and is actively transmitting / receiving information Port B has power supplied		

The three basic building blocks used to configure the Datalogger are sensors, processes, and outputs (see Figure 2-1).

Sensors (dedicated, internal, or SDI) are configured to provide variables which can be selected to be used as data points when logged. The data points can be processed or output as required.

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

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

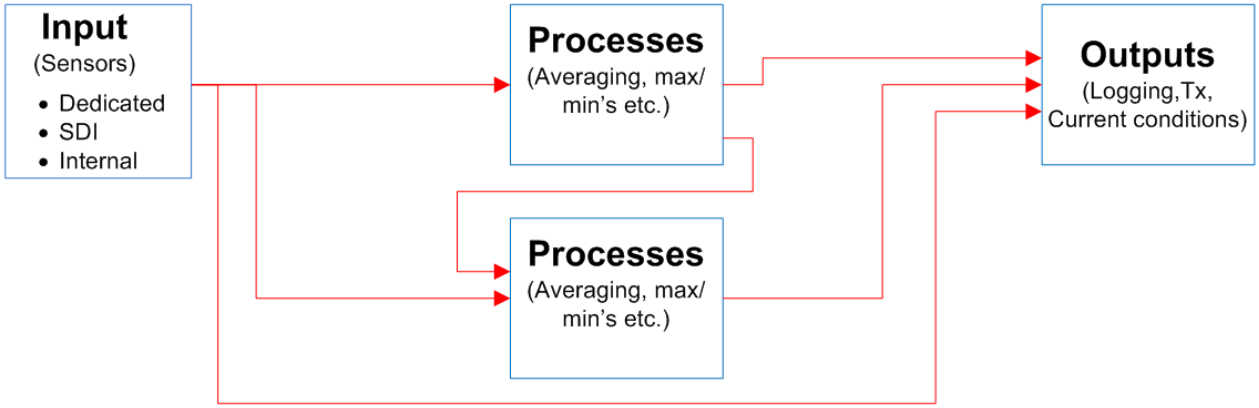


Figure 2-1: Datalogger configuration structure

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 data logging (i.e. define what data is to be stored and when) and telemetry parameters (i.e. for a G6 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.

2.1 OPERATING ALGORITHMS

There are five separate algorithms running in the Datalogger (see Figure 2-2). 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.

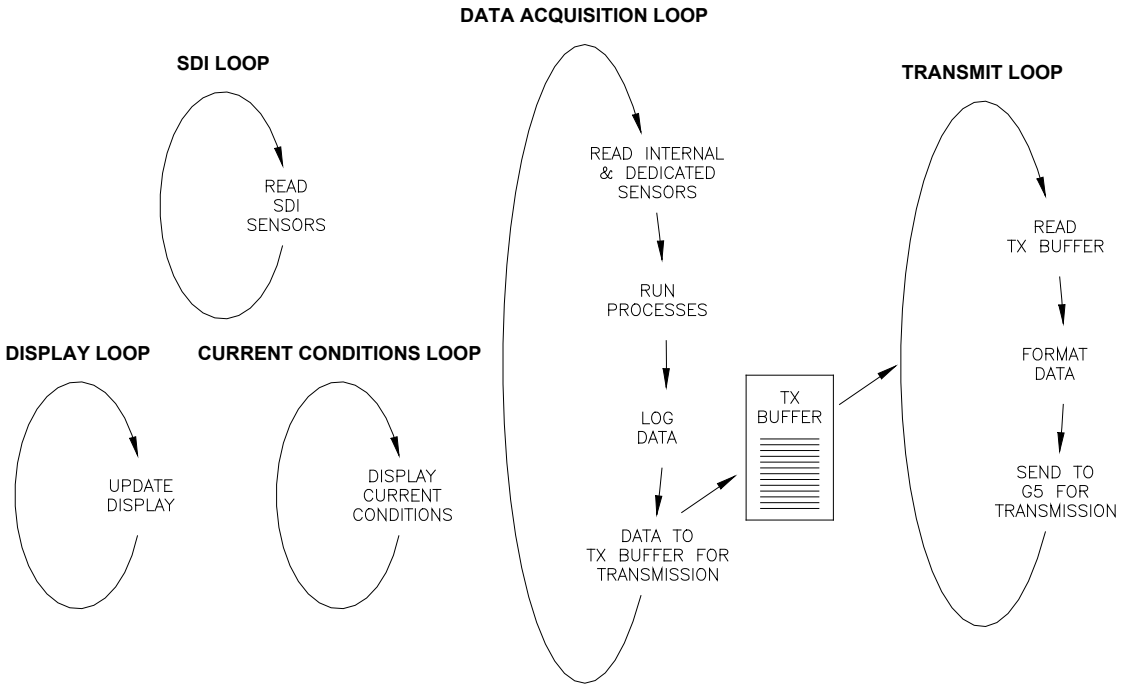


Figure 2-2: Datalogger operating algorithms

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

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

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 Transmit Loop is responsible for G6 GOES data transmission and its timing is set by the G6 transmission cycle. The Transmit Loop sends the contents of the transmit buffer to the G6 transmitter 90 seconds prior to the G6 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 G6 transmit time.

CHAPTER 3 - STATION FUNCTIONS

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 to load and save Datalogger configuration and template files.

3.1 SITE TAB

The Station Set-up screen Site tab identifies the Datalogger's Station name, description and location.

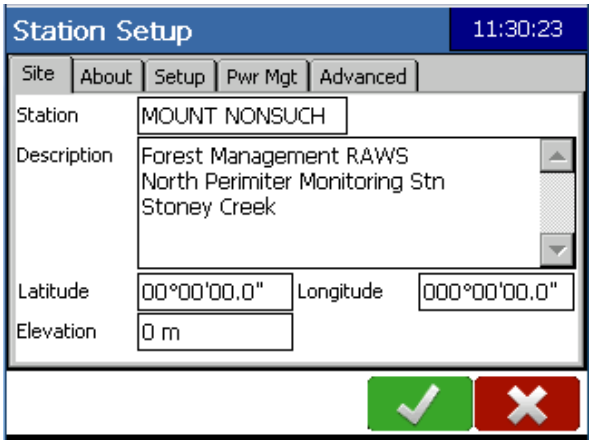


Figure 3-1: Station Setup – Site Tab

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.**

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.

Location: Station location fields include latitude, longitude, and elevation. If the Datalogger has an FTS G6 GOES transmitter, then the station location fields are read-only fields as this information is provided by the G6 transmitter. If the Datalogger is not connected to a G6 transmitter, the user can manually enter the appropriate information.

Latitude and Longitude: Station latitude and longitude are entered or reported in degrees-minutes-seconds (DMS) format (dd° mm' ss.s") where D is either N or S for latitude or E or W for longitude. Although latitude and longitude are stored on the Site tab in DMS format they are logged in the Datalogger in signed decimal degree format: ddd°.ddddd where N=(+), S=(-), E=(+) and W=(-).

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

3.2 ABOUT TAB

The **Station Set-up** screen **About** tab displays read-only details such as the Datalogger's model and serial number as well as application and software versions. These fields are populated automatically by the Datalogger.

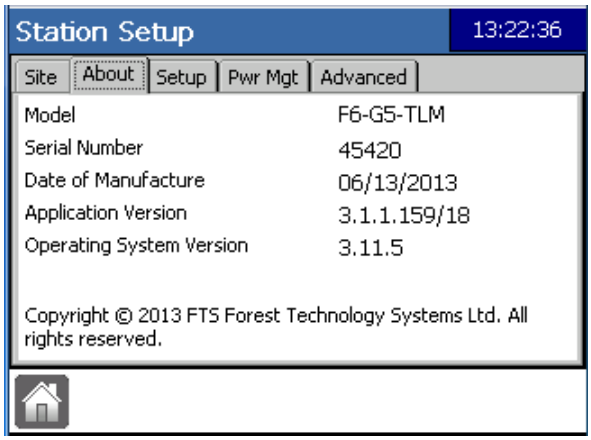


Figure 3-2

Model: This is the model assigned to the Datalogger during the manufacturing process.

Serial Number: This is the serial number assigned to the Datalogger during the manufacturing process.

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.

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.

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. Operating system software can be field updated via a USB memory stick.

See the Technical Support Portal>software updates at http://www.ftsenvironmental.com/support/Software_updates/ for instructions and access to latest update.

3.3 SETUP TAB

The **Station Set-up** screen **Set-up** tab enables the user to save a configuration to a USB memory stick and to load a Datalogger configuration from a USB memory stick. 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, data logging 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.

> **IMPORTANT !** We recommend working with configurations as opposed to templates since configurations contain full configuration/site specific details.

The **Set-up** tab also provides the ability to view a summary of the Datalogger's configuration and to clear a configuration.

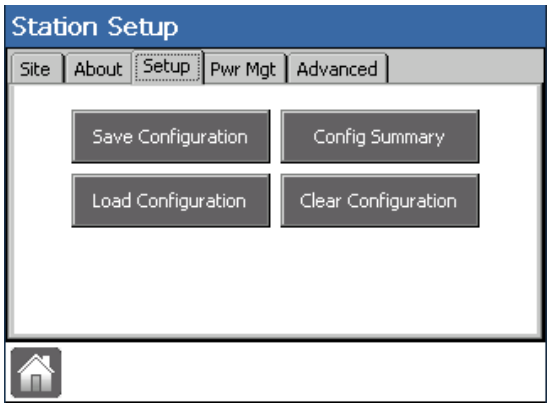


Figure 3-3: Station Setup – Setup Tab

3.3.1 SAVE CONFIGURATION

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

> **IMPORTANT !** It is recommended to save a configuration as opposed to a template since configurations contain full configuration/site specific details. Select "Save to USB Station Folder" in order to save as a configuration file to a USB memory stick.

3.3.1.1 *Save file name*

The **Save File Name** box specifies a name for the file to be saved. Configuration files are 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.

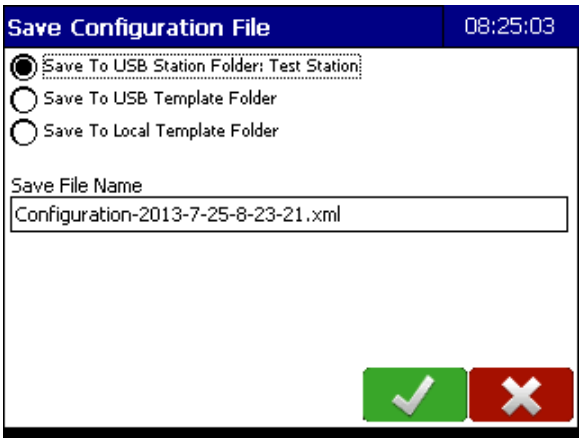


Figure 3-4

3.3.1.1.1 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. **Save to USB Station Folder** is the recommended saving selection as it will save all of the site specific configuration details as well as the general setup information. 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.

Figure 3-5: Save to USB station folder structure

3.3.1.1.2 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. **Save to USB Template Folder** is not recommended, unless you are familiar with its functionality, because the template does not contain all of the site specific details or general setup information.

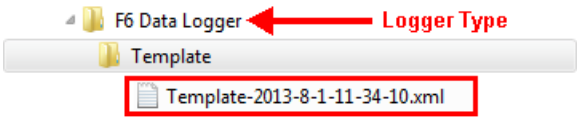


Figure 3-6: Save to USB template folder structure

3.3.1.1.3 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. **Save to Local Template Folder** is not recommended, unless you are familiar with its functionality, because the template does not contain all of the site specific details or general setup information; also, the file will be located on the Datalogger which is less portable than a USB memory stick.

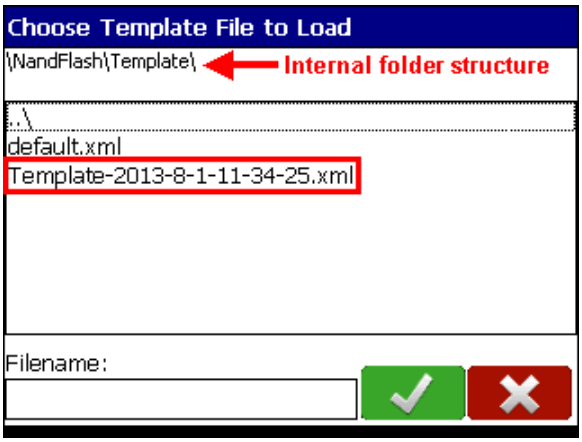


Figure 3-7: Save to local template folder structure

3.3.2 LOAD CONFIGURATION

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

The screen automatically displays the contents of the folder appropriate to the **Load From** option selected. If your file is located in the appropriate folder it can be loaded by selecting the desired file and then selecting OK.

> IMPORTANT ! It is recommended to load a configuration as opposed to a template since configurations contain full configuration/site specific details.

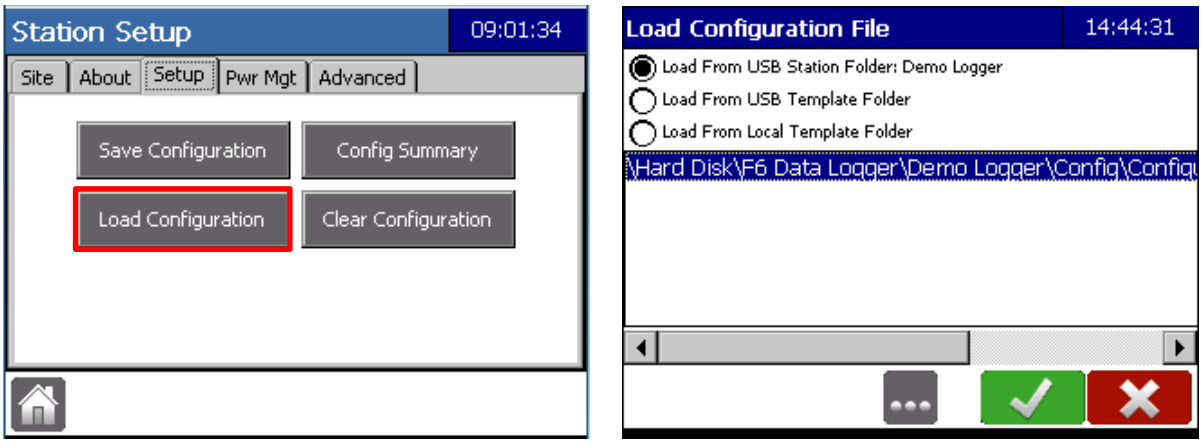


Figure 3-8: Load Configuration showing automatic detection of the configuration file

If the Datalogger does not automatically detect the configuration file, then it must be found prior to downloading. To search for and select any file in the Datalogger or on USB, press **Browse**.

> **IMPORTANT!** If the station is transmitting via GOES then it may lose its GPS fix during the configuration update. It can take up to 20 minutes to obtain a GPS fix which is needed before a GOES transmission can occur. Therefore, if there are less than 25 minutes before the next scheduled GOES transmission, that next transmission may not occur. We recommend waiting until there are more than 25 minutes before the next transmission before loading a configuration file.

When loading a file, **Browse** ( ) allows the user to select a specific file located outside of the preselected folder. After selecting **Browse** go up one level to the root directory by tapping **"..\"**, then select **Hard Disk**. You are now in the USB memory stick's memory; select the appropriate **Configuration File** then click **OK**. A configuration named "BLM Rev5.xml" is used in the example below. Configuration files always end in ".xml".

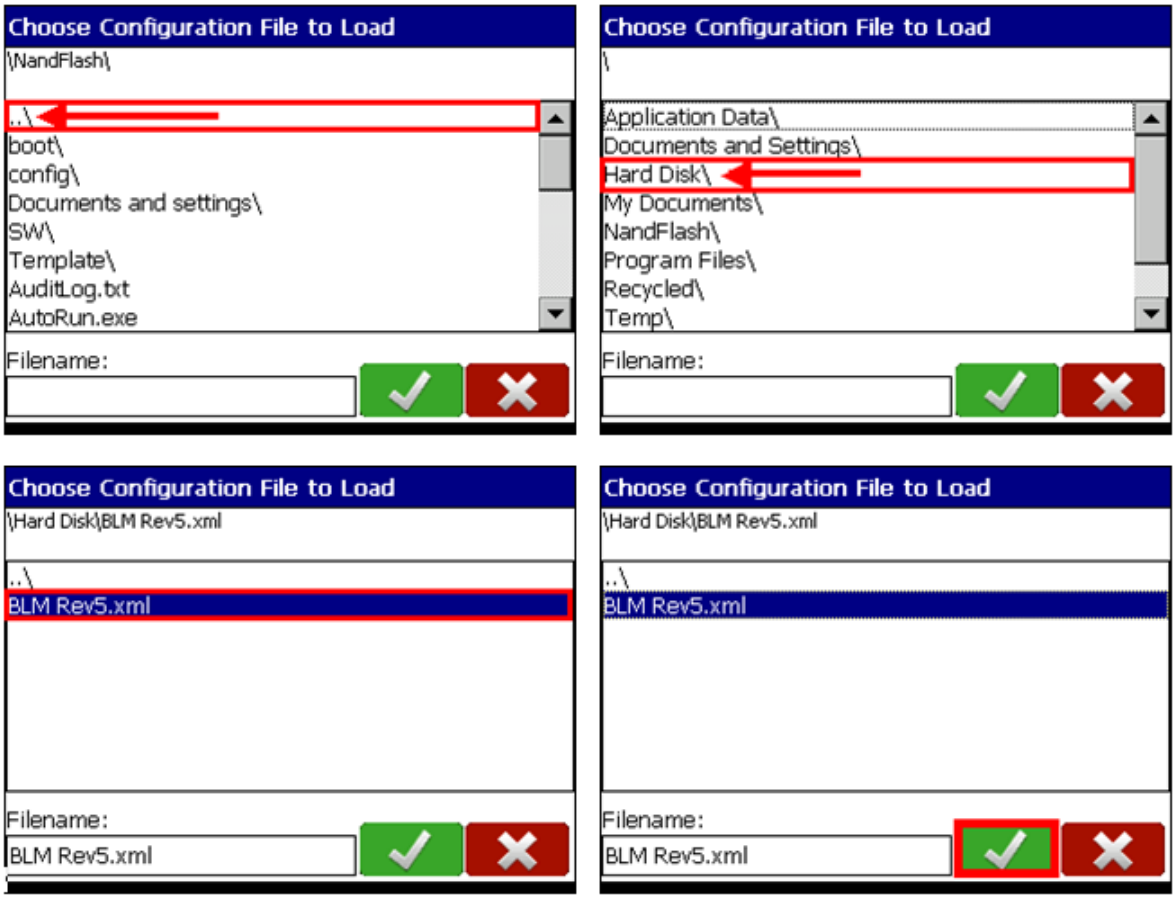


Figure 3-9: Load Configuration - Browse

3.3.2.1 *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**. If the desired configuration does not appear on the screen then press **Browse** to search for the file on your USB thumb drive. **Load from USB Station Folder** is the recommended choice since this load selection will incorporate the full configuration information and site specific details

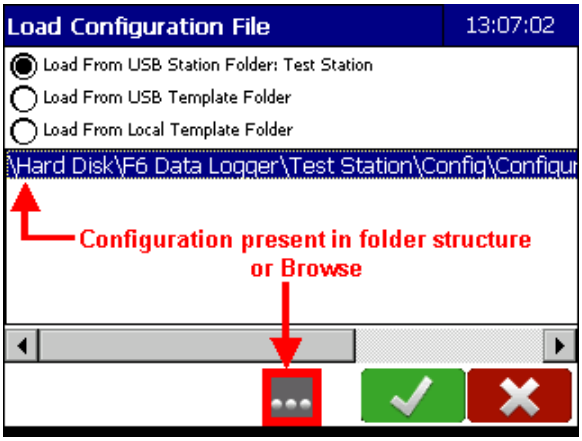


Figure 3-10: Load from USB Station Folder

3.3.2.2 *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. If the desired template does not appear on the screen then press **Browse** to search for the file on your USB thumb drive.

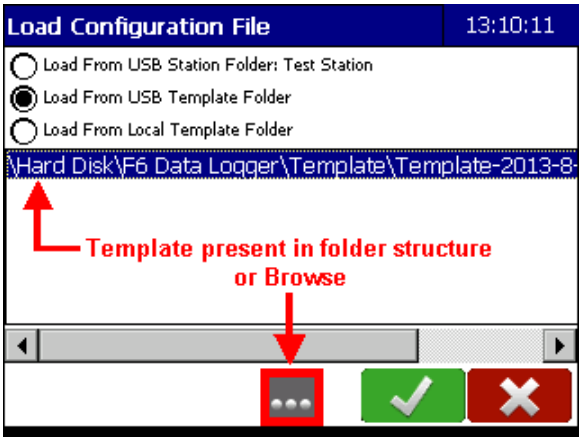


Figure 3-11: Load from USB Template Folder

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. Only use this function if you do not need all of the configuration details/site specific information.

3.3.2.3 *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. Only use this function if you do not need all of the configuration details/site specific information.

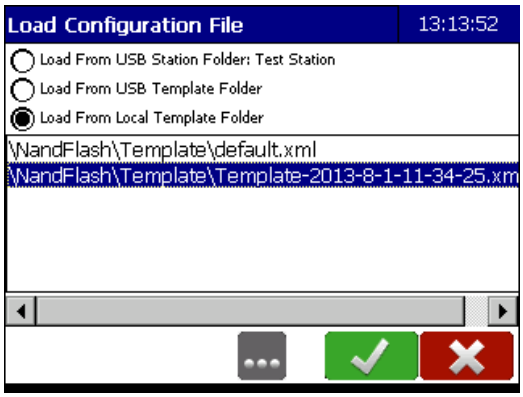


Figure 3-12: Load from Local Template Folder

Note: the template title "default.xml" is a blank default template.

3.3.2.4 *Loading a Configuration File from a Start Visit Report*

It is sometimes necessary to return a Datalogger to a prior configuration, commonly due to inadvertent or erroneous changes made to the Datalogger's configuration during a site visit. Because Start Visit Reports (Section 1.4.1.3) are saved as configuration files and will appear automatically on the USB memory stick when **Load from USB station folder: *Station Name is selected,*** this can easily be done.

If reloading a configuration from a start visit report, the file will be found on the Hard Disk and will be displayed in the selection box under the station's name. By scrolling right, the timestamp from the Start Visit, named as Configuration, will be displayed in **yyyy-mm-dd-hh-mm-ss** format. Ensure you select the configuration file which corresponds to the timestamp of the Start Visit report.

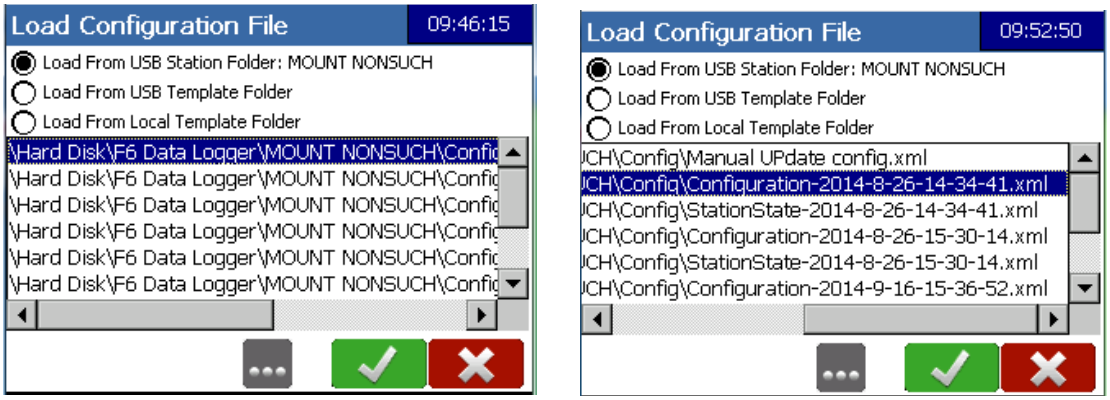
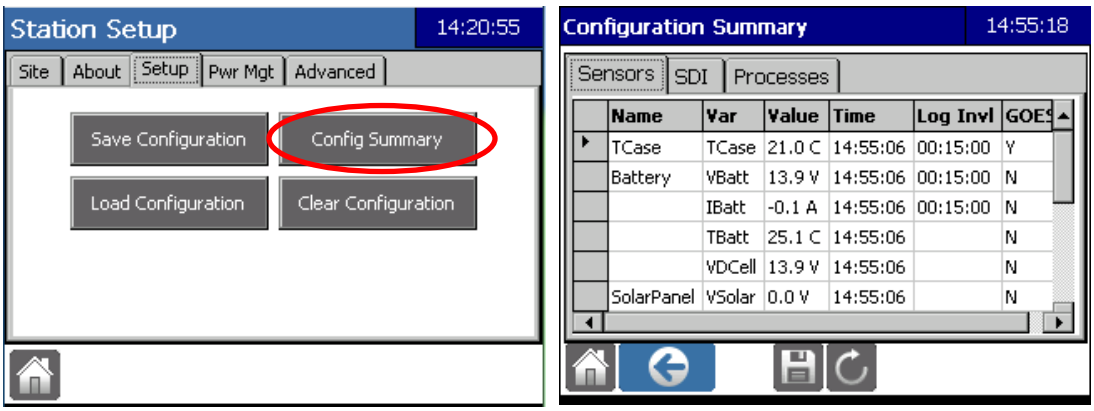


Figure 3-13

3.3.3 CONFIGURATION SUMMARY

The **Configuration Summary** screen (**Home > Station > Set-up tab > Config Summary**) provides the user with a basic configuration summary of the sensors and processes defined in the Datalogger.

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.



Set up – Config Summary

Sensor Tab

Figure 3-14: Configuration Summary

3.3.3.1 *Sensors Tab*

The **Configuration Summary** screen – **Sensors** tab provides information on the Datalogger's dedicated and internal sensors. Sensors and their variable names, values and time they were read are shown. If the variable is being logged as a data point, the logging interval and whether it is being transmitted are also shown.

Column Heading	Contents
Name	Sensor Name - an X preceding the sensor name indicates the sensor is Inactive
Var	Sensor Variable Name
Value	Sensor Variable Reading Value
Time	Time of the sensor variable reading*
Log Invl	Data logging Time Interval* - a C preceding the log interval time indicates a conditional data log - a D preceding the log interval time indicates a disabled data log
GOES	Indicates if the Data point is defined as part of a GOES transmission - a Y indicates the data point is to be transmitted in the GOES message - an N indicates the data point is not transmitted

***Note: times are in hh:mm:ss format**

3.3.3.2 *SDI sensors*

The **Configuration Summary** screen – **SDI** tab provides information on the Datalogger's SDI sensors. SDI command details are shown in addition to the same headings displayed on the Sensor tab.

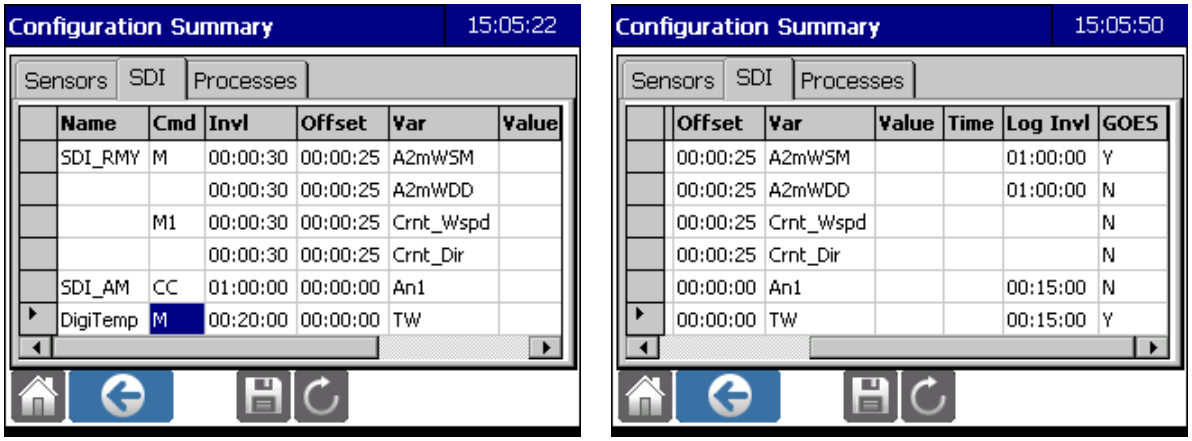


Figure 3-15: Configuration Summary – SDI tab

Column Heading	Contents
Name	Sensor Name - an X preceding the sensor name indicates the sensor is Inactive
Cmd	the SDI command sent to the sensor
Invl	SDI Command Time Interval*
Offset	SDI Command Time Offset*
Var	Sensor Variable Name
Value	Sensor Variable Reading Value
Time	Time of the sensor variable reading*
Log Invl	Data logging Time Interval* - a C preceding the log interval time indicates a conditional data log - a D preceding the log interval time indicates a disabled data log
GOES	Indicates if the Data point is defined as part of a GOES transmission - a Y indicates the data point is to be transmitted in the GOES message - an N indicates the data point is not transmitted

***Note: times are in hh:mm:ss format**

3.3.3.3 *Processes*

The **Configuration Summary** screen – **Process** tab provides information on the various processes defined in the Datalogger. Process details are shown in addition to the headings displayed on the **Sensor** tab.

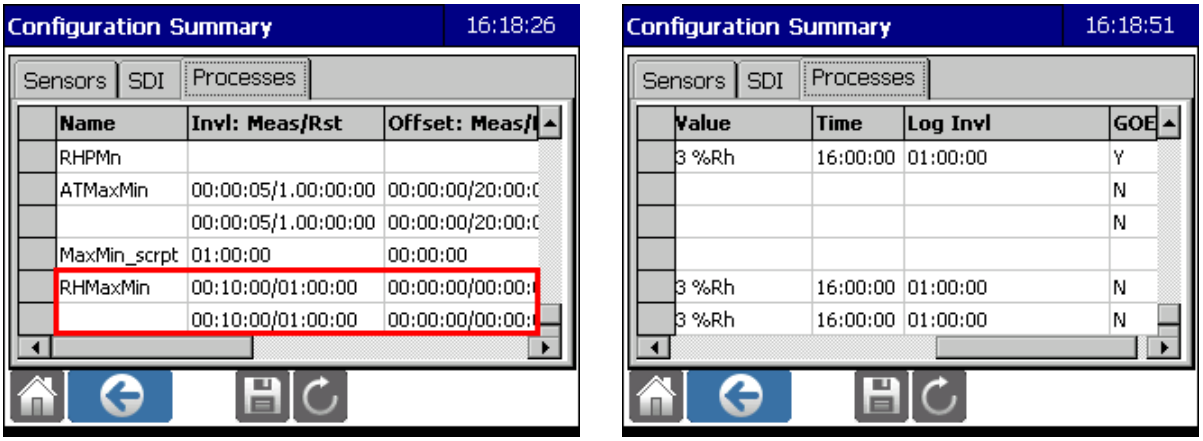


Figure 3-16

Column Heading	Contents
Name	Process Name
Invl: Meas/Rst	Process Measurement and Reset Interval Times*
Offset: Meas/Rst	Process Measurement and Reset Interval Offset Times*
Var	Sensor Variable Name
Value	Sensor Variable Reading Value
Time	Time of the sensor variable reading*
Log Invl	Data logging Time Interval* - a C preceding the log interval time indicates a conditional data log - a D preceding the log interval time indicates a disabled data log
GOES	Indicates if the Data point is defined as part of a GOES transmission - a Y indicates the data point is to be transmitted in the GOES message - an N indicates the data point is not transmitted

Example:

The RhMaxMin process shown in the **Configuration Summary** in Figure 3-17 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.

3.3.4 CLEAR CONFIGURATION

Clears all user settings and loads a blank factory default configuration (**Home > Station > Set-up tab > Clear Configuration**).

> **IMPORTANT !** All configuration settings are cleared during a Clear Configuration (sensors/telem/process/logging/station settings). Data, serial number table, and most Datalogger logs are preserved.

3.3.4.1 S*tation State*

The station state file is a holding place for Datalogger parameters that are not linked to the configuration file but are associated with the Datalogger or station. Station state parameters include serial number table entries, sensor offsets (stage, rain etc) and visit report number and tech name.

3.4 POWER MANAGEMENT TAB

The Station Set-up screen – Pwr Mgt tab **(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, turns off power to the telemetry devices, stops all datalogging, turns off power to the touchscreen, and enters 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.

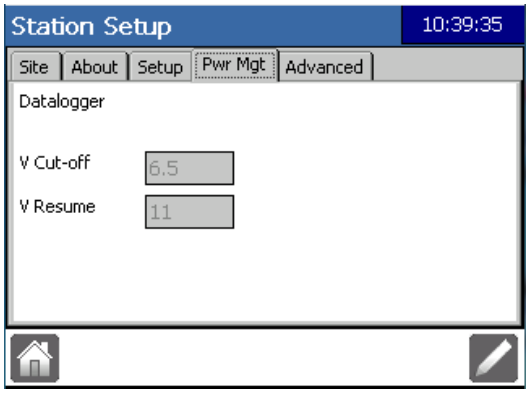


Figure 3-17

3.5 ADVANCED TAB

The Advanced Tab is used to enable **In-line Logging, Auto-fill Measurement** Time (automatic SDI-12 Offset calculation) and advanced features for the **SDI Port** and **GPS**.

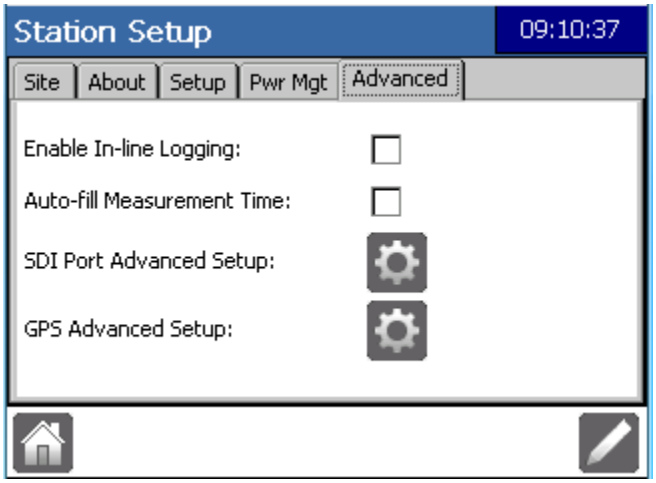


Figure 3-18: Station Setup – Advanced Tab

3.5.1 IN-LINE LOGGING

In-line logging permits users to log data points through the Sensor Setup function. To enable in-line logging, select **Edit** then toggle the **Enable In-line Logging** checkbox (Figure 3-19).

Once **Enable In-line Logging** is checked, when adding a new sensor or editing a currently mapped sensor, once the **"Sensor Name" Sensor Setup** appears, selecting **OK** will display the **In-line logging Setup** screen. The Datapoint names will be unique to each type of sensor.

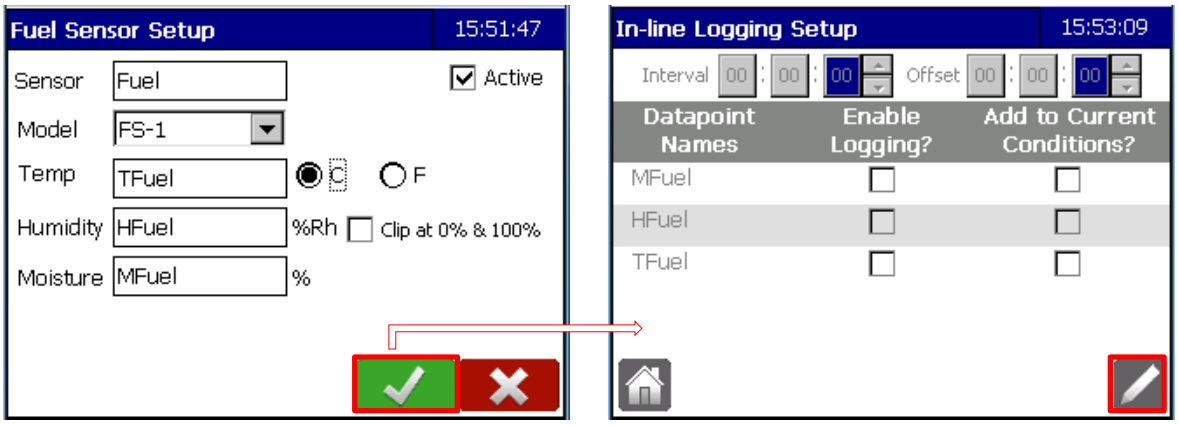


Figure 3-19: Fuel Sensor Setup Example

To setup the In-Line logging, select **Edit**, then use the arrows to select the desired Interval and Offset. SDI sensors will have the recommended Offset times auto-populated based on the time it takes the sensor to take its readings. These can be edited if desired.

Toggle the appropriate boxes for the datapoints to **Enable Logging** and **Add to Current Conditions** options.

3.5.2 AUTO-FILL MEASUREMENT TIME

This feature will automatically calculate and apply the correct offset for the desired interval. This feature is not enabled by default and the user must "opt in" to use it by using this screen (**Station Setup<Advanced**).

However, the Auto-fill Measurement Time is intended for simple operations. It only takes into account the one action to which it is related. If a user sets up the Datalogger to take concurrent readings from a variety of sensors, or creates other complex setups, the Auto-fill offset methodology will not calculate for this. Data processing time is not being factored into the computations
If the user wants logging to occur at any other time then that calculated, the offset must be manually input (the Auto-fill Measurement feature must be disabled).

The sensor must be connected to the Datalogger for this feature to work. It has been implemented for the following SDI-12 sensors:

- Generic SDI-12
- Stage
- Pressure Transducer
- Shaft Encoder

When enabled, the Datalogger will calculate the offset using the following formula:

$$Offset = I - (M + pad)$$

I=Interval
M=M command time to execute (sec)
pad = padding applied to offset (sec)*

*Note: padding time is 2 seconds to ensure full data transfer prior to logging

This feature can also be used to determine the Offset time when Burst Averaging is enabled. It will use the following formula:

$$Offset = I - [(M + P + pad) * S - P]$$

I = Interval
M = M command time to execute (sec)
S = Number of Samples
P = Sample Period (sec)
pad = padding applied to offset (sec) *

*Note: padding time is 2 seconds to ensure full data transfer prior to logging

To enable the Auto-fill feature:

From **Home<Station** select the **Advanced Tab<Edit.**

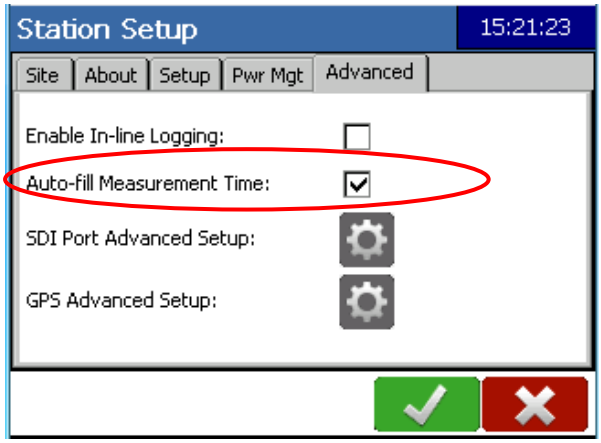
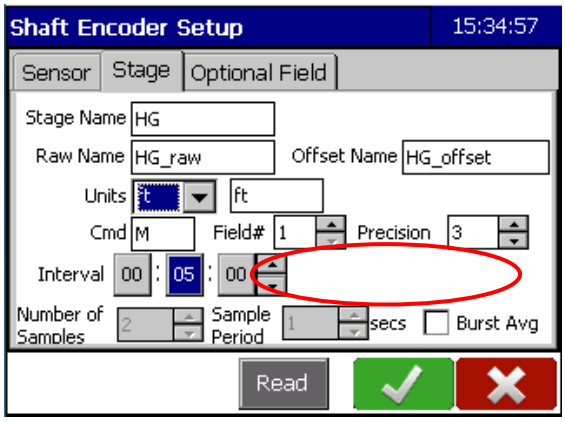


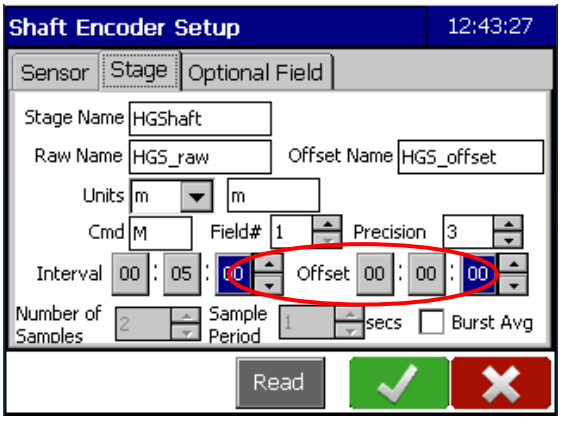
Figure 3-20

Toggle the **Auto-fill Measurement Time** checkbox, and then **OK.**

Once enabled, the Offset field will not appear in the sensor setup pages.



Shaft Encoder – Auto-Fill Measurement Time enabled



Shaft Encoder – Auto-fill Measurement Time disabled

Figure 3-21

CONSTRAINTS

- If the sensor has not been detected **and** mapped, the Datalogger will not be able to communicate with it in order to calculate the appropriate offset.

- If the Datalogger cannot communicate with the sensor then the following offsets will be used:

    1) If it the first time a sensor has been configured, the offset will be left as 00:00:0;

    2) If the offset has been set previously, either automatically or manually, the last set value will be retained.

- If the user sets an interval such that the automatically calculated Offset will be a negative number, the Offset will be made 00:00:00.

3.5.3 DELAYING AN SDI PORT

Delaying an SDI Port would be used to delay the time between an **M** and **D** command on a specific port to accommodate SDI sensors which run older protocols. This prevents the sensors from resetting themselves and reporting zero measurements because they cannot respond when the **D** command is sent too quickly.

Select **Station>Advanced>Setup>Edit**.

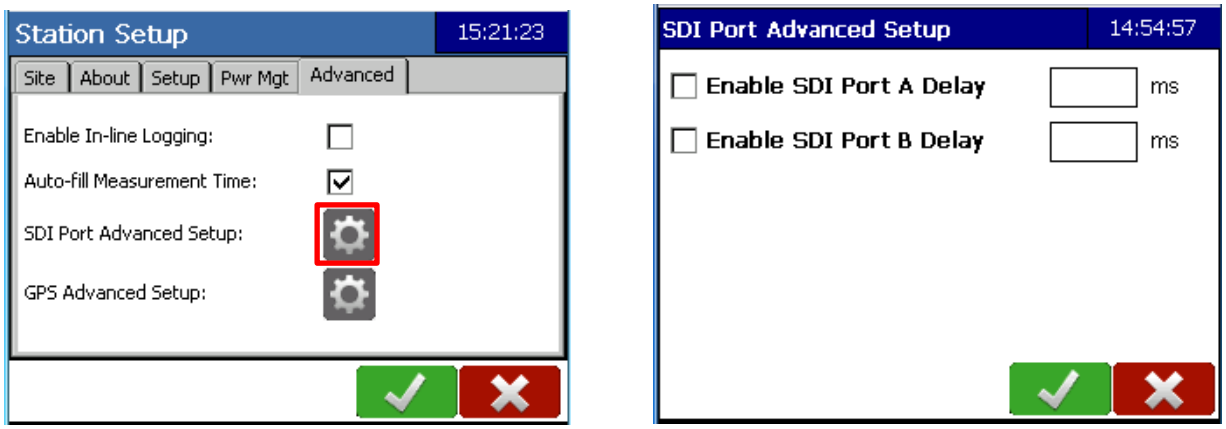


Figure 3-22: SDI Port Advanced Setup

Toggle the **Enable SDI Port Delay** for the appropriate port. Input the desired time delay in ms. Select **OK.**

> **IMPORTANT!** The default time delay is 0 ms so if you fail to input a time, even though the delay is enabled, there will be no increase in time between the **M** and **D** commands.

3.5.4 GPS SYNCHRONIZATION – GOES/UBICOM

Both GOES and Ubicom telemetry have the ability to update GPS fixes and synchronize the Datalogger's time. GOES is the default synchronization source, set at once a day (interval of 24:00:00). It is possible to assign Ubicom as the GPS synchronization source.

Select **Station>Advanced>Setup>Edit**. Then select the **GPS Advanced Setup cog<Edit**.

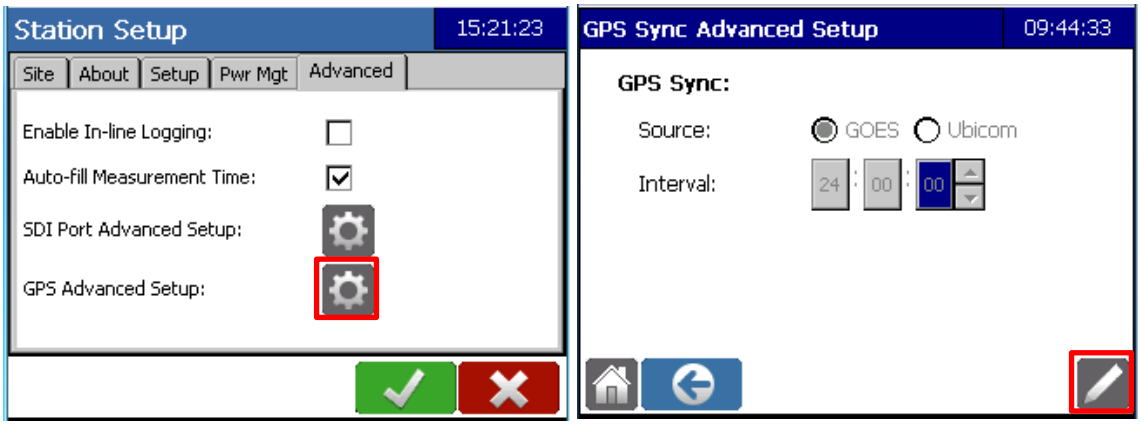


Figure 3-23: GPS Synchronization Setup

Select the Ubicom radio button and assign the desired synchronization interval. The interval is how often the Ubicom will synchronize GPS information with the Datalogger.

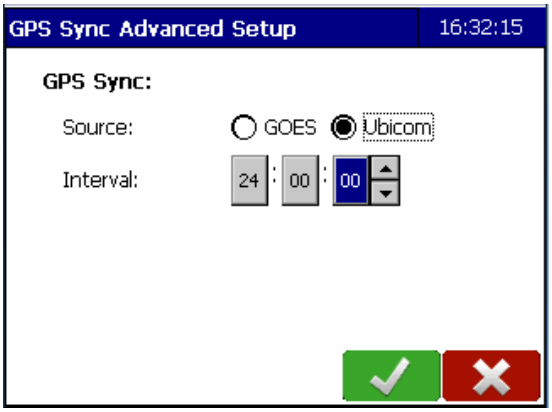


Figure 3-24: Synchronizing GPS to Ubicom

GPS positioning data obtained from the Ubicom will be included in transmitted reports and messages which are formatted for that information.

To return to GOES select the GOES radio button. The Interval will not be editable; however, once **OK** is selected the GOES interval will automatically return to the 24:00:00 GOES default synchronization interval.

CHAPTER 4 - SERVICE FUNCTIONS

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

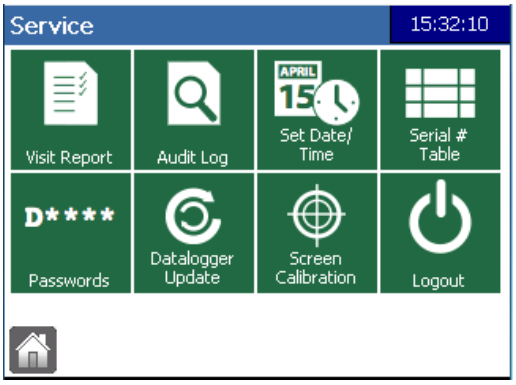


Figure 4-1: Service Functions

4.1 VISIT REPORT

The **Visit Report** (**Home > Service > Visit Report**) provides the user with a convenient tool which saves the station's current operating state, onto a USB memory stick, 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.

> IMPORTANT! It is highly recommended to save a visit report on every site visit as it contains information on the exact state of the Datalogger upon arrival and departure, any changes made, and the configurations, all of which can be used for trouble shooting without making another trip to the site.

An Axiom folder will be created and named by model type (F6 Data Logger, H2 Data Logger, H1 Data Logger or F6-T Data Logger). The Datalogger folder will have the following **Visit Report File Structure**. Files present in the data folder may vary depending on the telemetry configuration on the Datalogger. Copies of each file are created at the start and end of the visit.

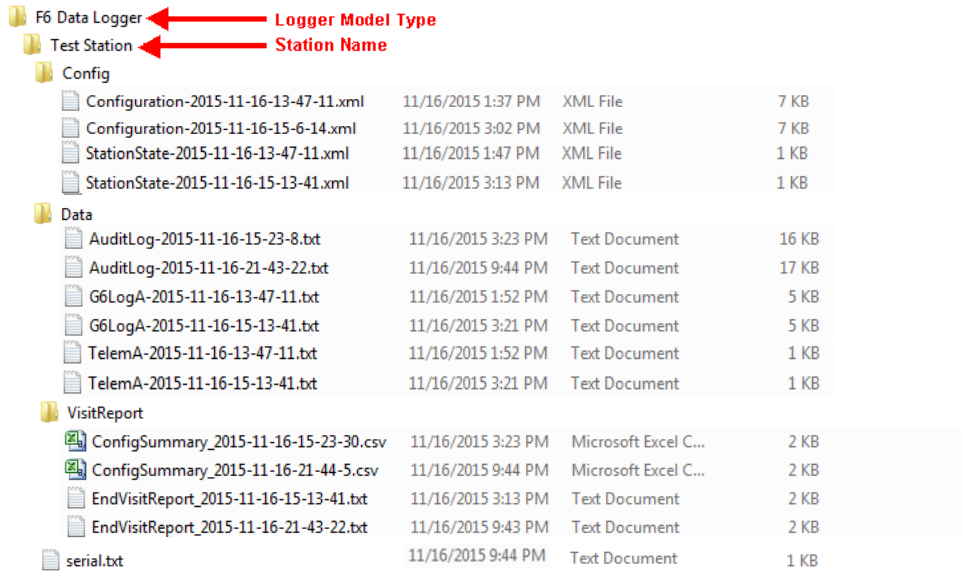


Figure 4-2: Visit Report folder structure

Note: timestamp format is YYYY-MM-DD-hh-mm-ss format. E.g, 2013-7-18-10-3-47 = 2013, July 18, at 10:03:47.

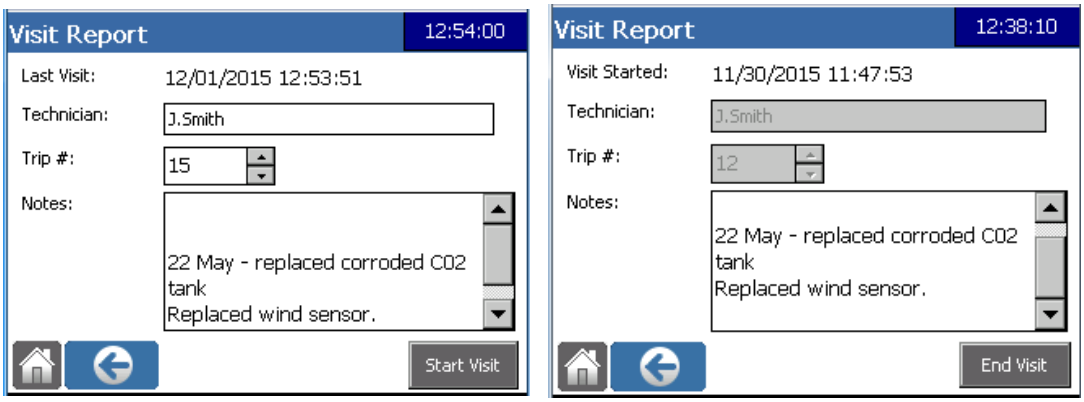


Figure 4-3: Start Visit Report

Last Visit: This field is displayed before the **Start Visit button** is pressed. It informs you when the last visit took place.

Visit Started: This will display the time the **Start Visit** button was pressed.

Technician: The **Technician** box allows users to enter their name, initials, or an alphanumeric identifier (ie: Tech 213) as a record of who performed the site visit.

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.

Notes: Tap on the Notes field and use the keyboard to input any notes you may have. Notes will be displayed in reverse chronological order (most recent at the top). Use the scroll bar to view older

notes. The notes will also be compiled and displayed in full at the end of the **Start** and **End Visit Reports**.

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.

Once **OK** is pressed, the entire Visit Report information is written to the memory stick. If any unwanted configuration changes are made during the site visit then the user can easily revert back to the Datalogger's initial state using the saved Start Visit Report. The **Visit Report** screen now displays an **End Visit** button in place of the **Start Visit** button

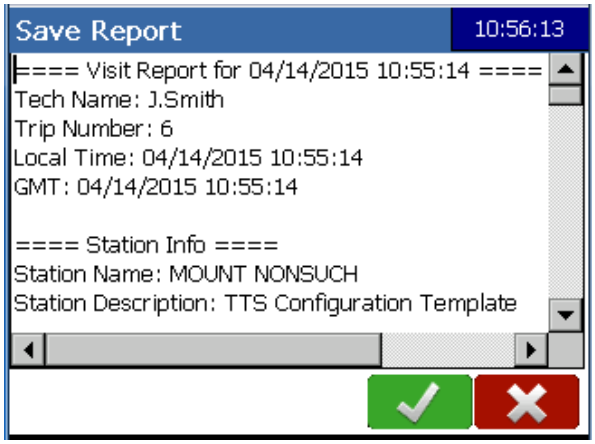
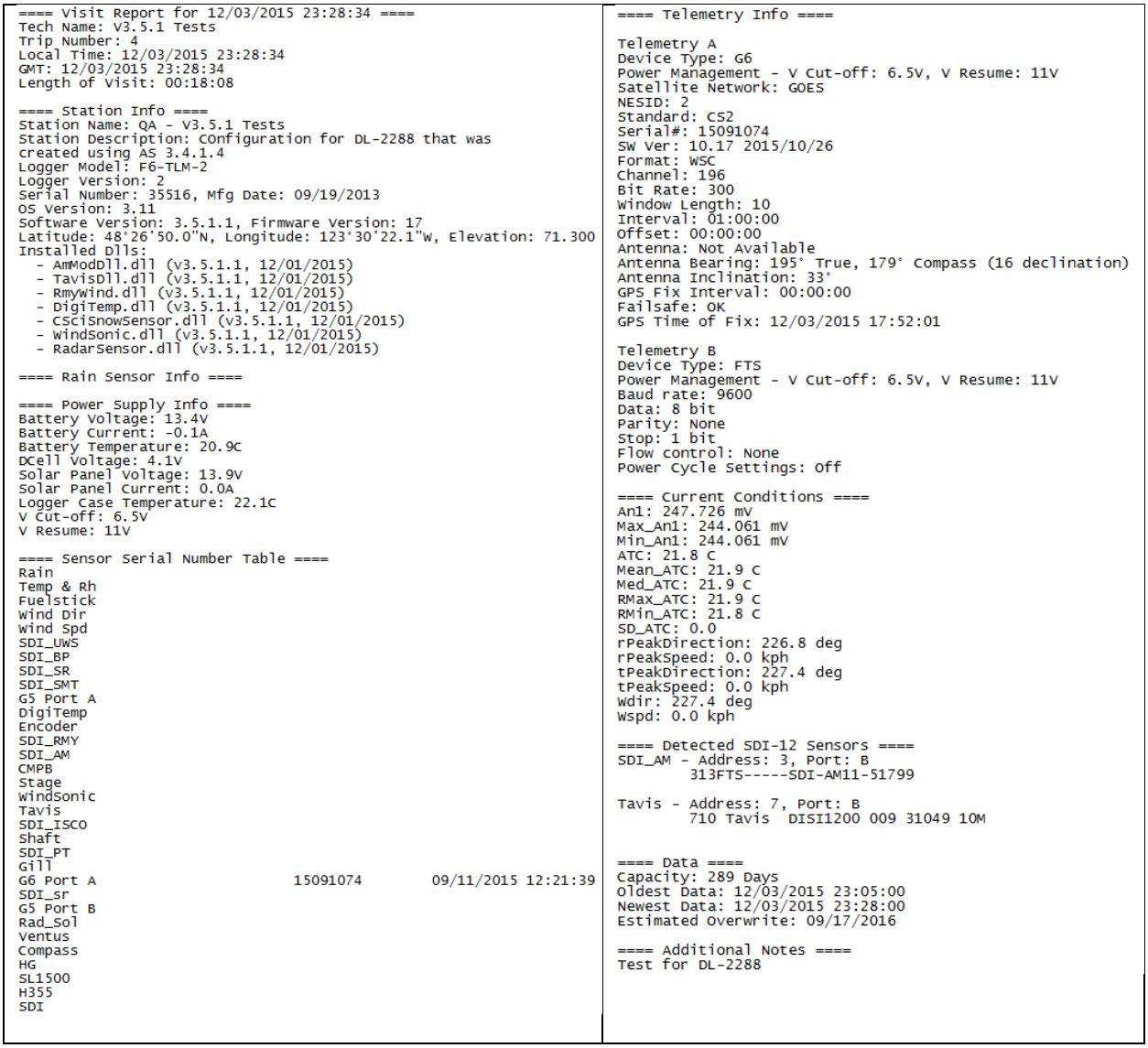


Figure 4-4: Visit Report

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. The End Visit Report includes Length of Visit information.

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. Below is an example of a Start Visit Report.

> IMPORTANT! Performing a visit report does not download data. See Chapter 7 for data download instructions.



```
==== Visit Report for 12/03/2015 23:28:34 ====
Tech Name: V3.5.1 Tests
Trip Number: 4
Local Time: 12/03/2015 23:28:34
GMT: 12/03/2015 23:28:34
Length of Visit: 00:18:08

==== Station Info ====
Station Name: QA - V3.5.1 Tests
Station Description: COnfiguration for DL-2288 that was
created using AS 3.4.1.4
Logger Model: F6-TLM-2
Logger Version: 2
Serial Number: 35516, Mfg Date: 09/19/2013
OS Version: 3.11
Software Version: 3.5.1.1, Firmware Version: 17
Latitude: 48°26'50.0"N, Longitude: 123°30'22.1"W, Elevation: 71.300
Installed Dlls:
  - AmModDll.dll (v3.5.1.1, 12/01/2015)
  - TavisDll.dll (v3.5.1.1, 12/01/2015)
  - RmyWind.dll (v3.5.1.1, 12/01/2015)
  - DigiTemp.dll (v3.5.1.1, 12/01/2015)
  - CSciSnowSensor.dll (v3.5.1.1, 12/01/2015)
  - WindSonic.dll (v3.5.1.1, 12/01/2015)
  - RadarSensor.dll (v3.5.1.1, 12/01/2015)

==== Rain Sensor Info ====

==== Power Supply Info ====
Battery Voltage: 13.4V
Battery Current: -0.1A
Battery Temperature: 20.9C
DCell Voltage: 4.1V
Solar Panel Voltage: 13.9V
Solar Panel Current: 0.0A
Logger Case Temperature: 22.1C
V Cut-off: 6.5V
V Resume: 11V

==== Sensor Serial Number Table ====
Rain
Temp & Rh
Fuelstick
Wind Dir
Wind Spd
SDI_UWS
SDI_BP
SDI_SR
SDI_SMT
G5 Port A
DigiTemp
Encoder
SDI_RMY
SDI_AM
CMPB
Stage
WindSonic
Tavis
SDI_ISCO
Shaft
SDI_PT
Gill
G6 Port A                       15091074        09/11/2015 12:21:39
SDI_sr
G5 Port B
Rad_Sol
Ventus
Compass
HG
SL1500
H355
SDI
```

```
==== Telemetry Info ====

Telemetry A
Device Type: G6
Power Management - V Cut-off: 6.5V, V Resume: 11V
Satellite Network: GOES
NESID: 2
Standard: CS2
Serial#: 15091074
SW Ver: 10.17 2015/10/26
Format: WSC
Channel: 196
Bit Rate: 300
Window Length: 10
Interval: 01:00:00
Offset: 00:00:00
Antenna: Not Available
Antenna Bearing: 195° True, 179° Compass (16 declination)
Antenna Inclination: 33°
GPS Fix Interval: 00:00:00
Failsafe: OK
GPS Time of Fix: 12/03/2015 17:52:01

Telemetry B
Device Type: FTS
Power Management - V Cut-off: 6.5V, V Resume: 11V
Baud rate: 9600
Data: 8 bit
Parity: None
Stop: 1 bit
Flow control: None
Power Cycle Settings: Off

==== Current Conditions ====
An1: 247.726 mV
Max_An1: 244.061 mV
Min_An1: 244.061 mV
ATC: 21.8 C
Mean_ATC: 21.9 C
Med_ATC: 21.9 C
RMax_ATC: 21.9 C
RMin_ATC: 21.8 C
SD_ATC: 0.0
rPeakDirection: 226.8 deg
rPeakSpeed: 0.0 kph
tPeakDirection: 227.4 deg
tPeakSpeed: 0.0 kph
Wdir: 227.4 deg
Wspd: 0.0 kph

==== Detected SDI-12 Sensors ====
SDI_AM - Address: 3, Port: B
        313FTS-----SDI-AM11-51799

Tavis - Address: 7, Port: B
        710 Tavis  DISI1200 009 31049 10M


==== Data ====
Capacity: 289 Days
Oldest Data: 12/03/2015 23:05:00
Newest Data: 12/03/2015 23:28:00
Estimated Overwrite: 09/17/2016

==== Additional Notes ====
Test for DL-2288
```

Figure 4-5

4.2 AUDIT LOG

To view the Datalogger's Audit Log, use the **Audit Log** screen (**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.

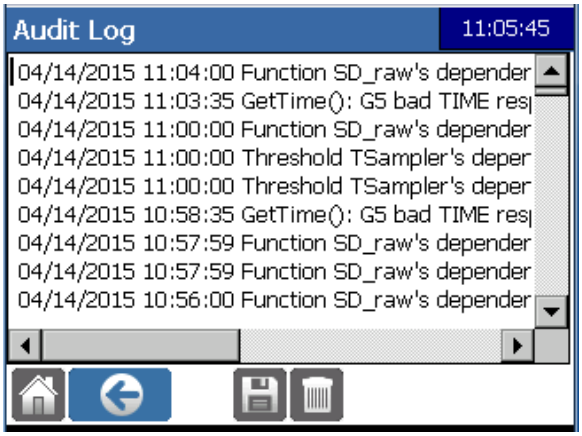


Figure 4-6

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 <model> Data Logger\<station name>\Data\AuditLog-YYYY-MM-DD-hh-mm-ss.txt.** The Datalogger's Audit Log file is not altered by writing the file to a memory stick. A copy of the Audit log is also downloaded during either a start or end visit report.

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.

4.3 SET DATE/TIME

To set the Datalogger's local date and time, open the **Set Date Time** screen (**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 **Cancel**.

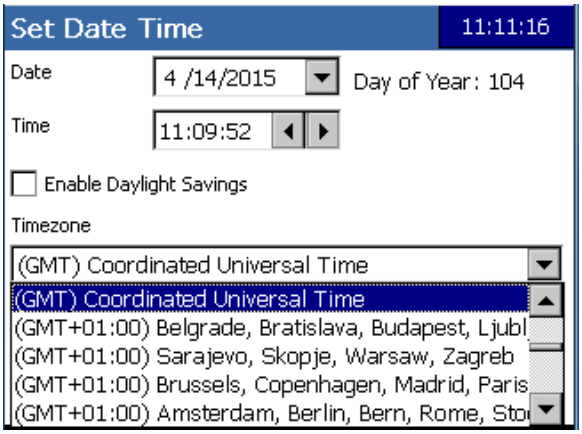


Figure 4-7: Setting the Time Zone

4.3.1 SET DATE TIME FOR GOES SYSTEMS

If the Datalogger is connected to a G6 transmitter, the Datalogger has its time synchronized with the transmitter'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.

Enable Daylight Savings: Check this box for time zone selection to be converted to Daylight Savings time.

Timezone: Use the drop down menu to select the desired time zone.

4.3.1.1 *G6 Transmitter Time Synchronization*

If the Datalogger is connected to a G6 transmitter, then Datalogger time synchronization with the transmitter occurs in the following cases:

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

The Datalogger's clock is adjusted if the time difference between the Datalogger and the 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.

4.3.2 SET DATE TIME FOR NON-SATELLITE SYSTEMS

A system without DCP satellite telemetry should have its date and time set by the user upon installation. The time should be checked periodically for any drift. If the displayed Date, Time, and Time Zone values are correct, select **OK**.

Date: Set the desired date by using the drop-down menu. 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.

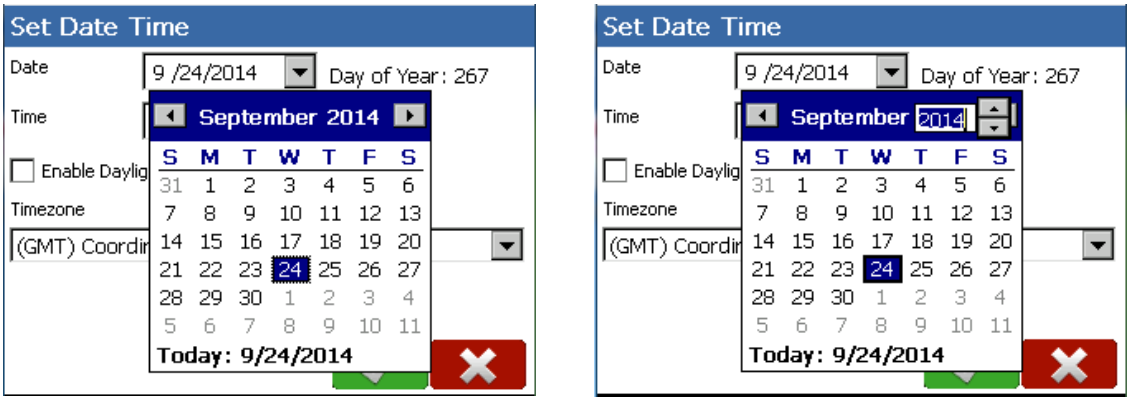


Figure 4-8: Setting Date and Time

Time: Time elements (hh:mm:ss) can be individually adjusted by tapping on the desired element to highlight it and increasing or decreasing it using the arrows. To set time precisely, enter a time that is slightly ahead of the current time (10 seconds is usually sufficient), then press OK at the precise moment corresponding to the entered time.

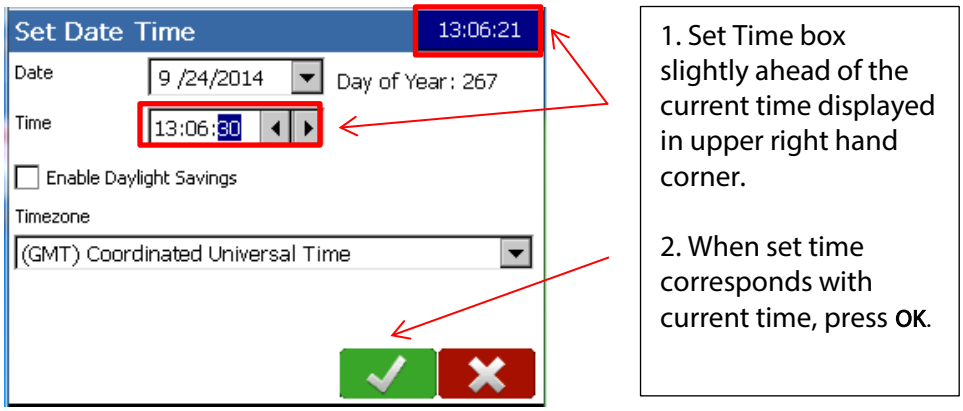


Figure 4-9: Setting the Date and Time

Enable Daylight Savings: Check this box for time zone selection to be converted to Daylight Savings time.

Timezone: Use the drop down menu to select the desired time zone. 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.

4.4 SERIAL NUMBER TABLE

The **Serial Number Table,** accessed via the **Service Screen** (**Home > Serial # Table**), is used 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., Wind Spd). A device capable of reporting its serial number is identified with a yellow background (e.g., SDI_SR). Devices whose serial numbers have not been entered or detected are shown with a red background (e.g., SDI_BP). The **Last Update** column is automatically populated with the time the serial number of the device was entered.

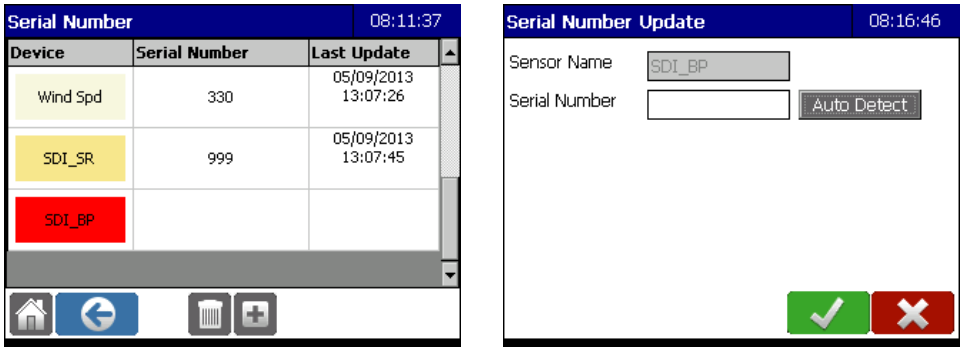


Figure 4-10: Serial Number Table

To enter a serial number, touch the name of the device in the serial number table. The **Serial Number Update** screen opens. Sensors capable of reporting their serial number will display the **AutoDetect** button. Press on this. If the device is not capable of reporting its serial number then the **Auto Detect** button is absent and the serial number will have to be manually entered.

When a sensor or telemetry is added to the Datalogger, it is automatically added to the serial number table.

4.4.1 ADDING AND DELETING FROM THE SERIAL NUMBER TABLE

A device can be added 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. Select the device to be deleted from the list on the screen. A prompt will appear confirming the deletion. Select **OK** or **Cancel.**

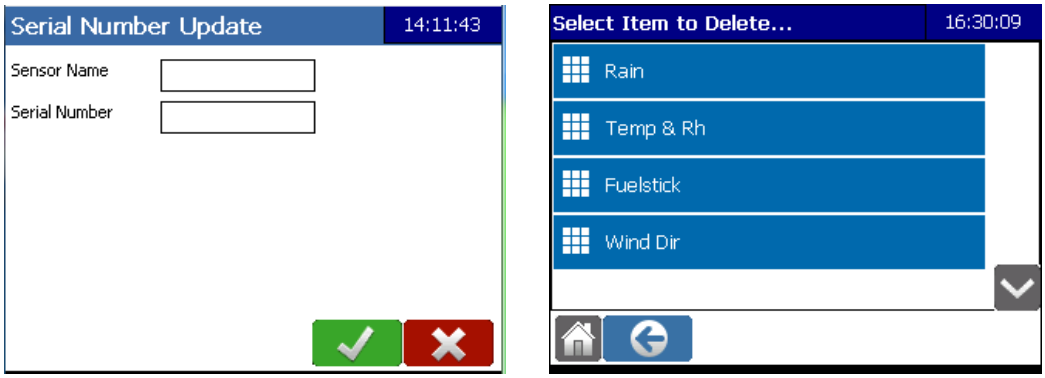


Figure 4-11: Serial Number Update Screen

4.5 PASSWORDS

Two levels of password protection are available in the Datalogger – User Level and Tech Level. Each level can be individually enabled by using the down arrow and tapping on your selection. The 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.

Figure 4-12: Setting a Password

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.

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.

4.5.1 LOST PASSWORDS

Every Datalogger has a master FTS password which allows FTS personnel to reset the Datalogger password if the user-set password is lost. Contact FTS Service and Support for lost password assistance.

4.6 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 (**Home > Service > Datalogger Update**). 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.

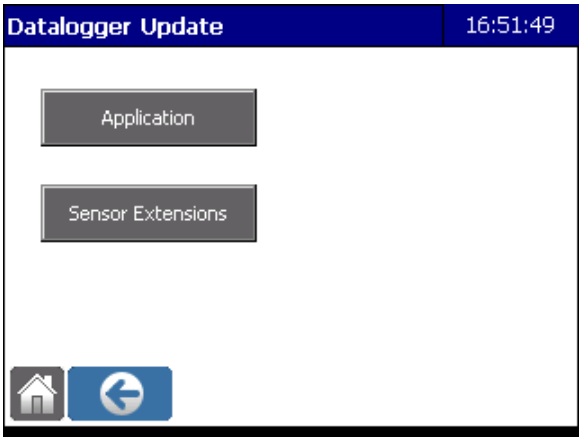


Figure 4-13: Datalogger Update

4.6.1 APPLICATION

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

Latest software updates can be downloaded via the Support Portal on the FTS Service and Support web page: http://www.ftsenvironmental.com/

> **IMPORTANT !** If the station is transmitting via GOES then it will lose its GPS fix during software updates. It can take up to 20 minutes to obtain a GPS fix which is needed before a GOES transmission can occur. Therefore, if there are less than 25 minutes before the next scheduled GOES transmission, that next transmission may not occur. FTS recommends waiting until there are more than 25 minutes before the next transmission.

4.6.1.1 *Application Update Procedure*

The steps to updating the Datalogger are outlined below.

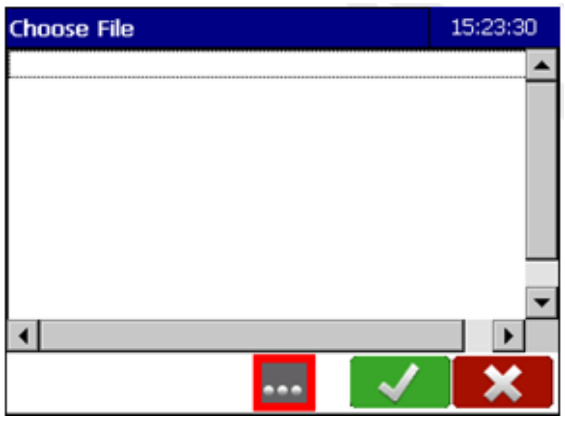
1. Load the desired **Application File** onto a USB memory stick and insert the USB memory stick into either of the Datalogger's USB HOST ports. Application files always have the **".CAB"** extension. If the application is placed in the **Datalogger > "Station name" > SW** folder then the Datalogger will auto detect it.

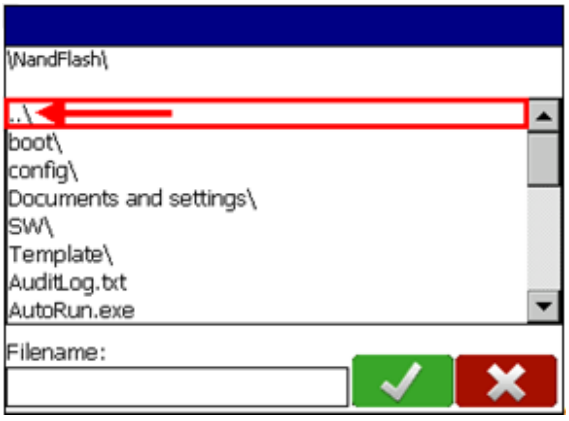
2. **Select Home>Service>Datalogger Update>Application.**

3. If the desired Application was placed in the **Datalogger > "Station name" > SW** folder the "Latest Version Available" field will be populated and the Application file can be directly loaded by selecting **OK**.

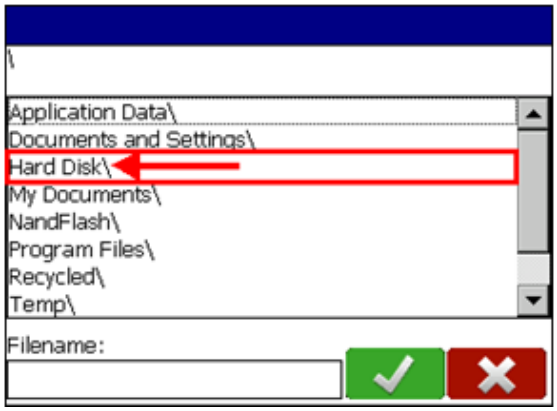
4. If the Application was not placed in the the **Datalogger > "Station name" > SW** folder, select **Adv**.

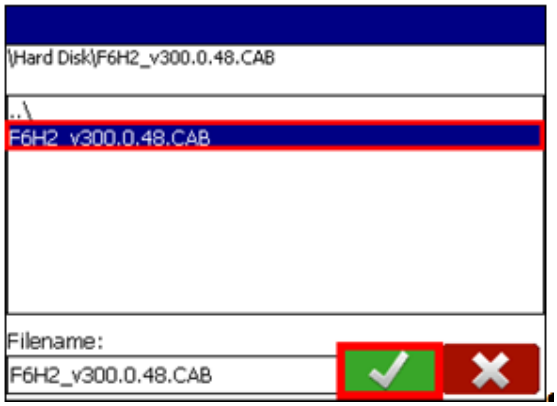
5. Click **Browse**. To browse to your file on the USB memory stick, first go up one level to the root directory by tapping **"..\".**





6. Select **Hard Disk**. You are now in the USB memory stick's memory; select the appropriate **Application File** then click **OK**. Application files always have the **".CAB"** extension.





4.6.2 SENSOR EXTENSIONS

A **Sensor Extension** provides advanced set-up functionality for a specific sensor. All available sensor extensions are automatically included and installed with the Application Software. Because of this feature, there should be no need to add or delete any extension as any software update will automatically reload all sensor extensions. See Chapter 4 for detailed instructions on using the sensor extensions.

To view the Sensor Selections page, select **Home>Service>Datalogger Update>Sensor Extensions.** The **Sensor Extensions** screen has two list boxes: **Available For Install** and **Installed On Datalogger**. **Sensor Extensions** will only appear in the **Available For Install** list box if there is a USB memory stick plugged into the Datalogger and the memory stick has the sensor extensions files present in the correct folder structure (see section 3.6.2.1). **Sensor Extensions** that appear in the **Installed On Datalogger** are already installed on the Datalogger in the Datalogger's Program Files\CustomDevices folder and are ready for use. The **Add** and **Delete** buttons on the left side of the **Sensor Extensions** screen are used to install and remove extensions from the Datalogger.

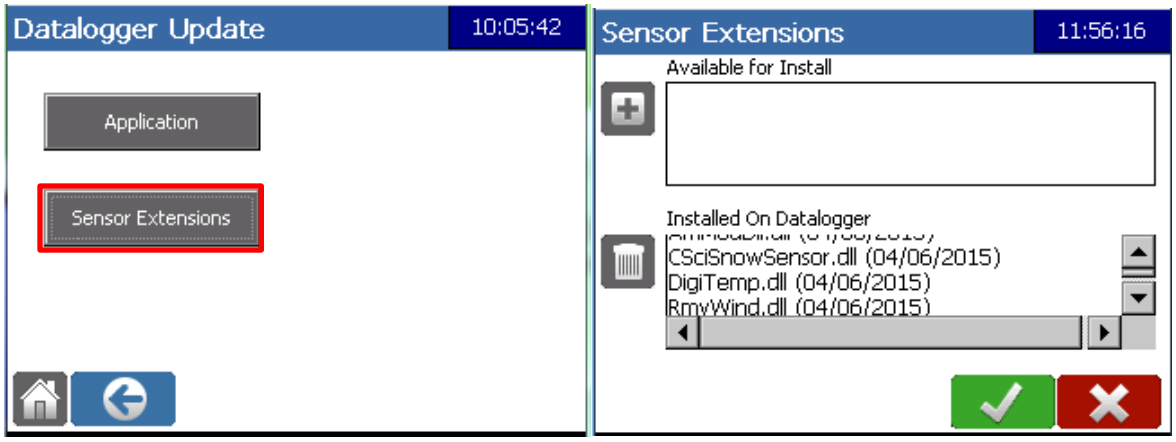


Figure 4-14: Sensor Extensions

When updating or removing a **Sensor Extension** the Datalogger's application software needs to be restarted and will happen automatically. Adding a new extension can be done directly with no restart.

> **IMPORTANT !** If the station is transmitting via GOES then it will lose its GPS fix during software updates. It can take up to 20 minutes to obtain a GPS fix which is needed before a GOES transmission can occur. Therefore, if there are less than 25 minutes before the next scheduled GOES transmission, that next transmission may not occur. FTS recommends waiting until there are more than 25 minutes before the next transmission.

4.6.2.1 *Adding a Sensor Extension*

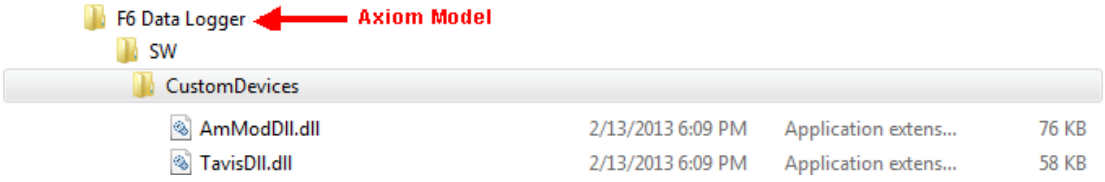
Should you wish to re-install (add) an extension which had been deleted, there are two options. The first is to re-install the currently running Application Software version or to install the most recent

version, following the procedure outlined in Section 3.6.1.1. All sensor extensions will be automatically installed.

The second is to use the latest sensor extension from FTS. 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. When updating an extension, the existing extension on the Datalogger is overwritten.

To **add or update** Sensor Extensions on the Datalogger using Sensor Extension files:

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 in a specific folder structure. The folder path is: <Datalogger Model> Data Logger\SW\CustomDevices. 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. Select the sensor extension you wish to install in the upper listbox
6. Press **Add**.
7. The Datalogger moves the selected file to the lower listbox
8. 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. This will occur automatically once you confirm device update. Restarting the application software cycles the power to the telemetry devices attached to the Datalogger.

4.6.2.2 *Deleting a Sensor Extension*

Under normal circumstances, there should be no reason to delete a sensor extension. However, should you decide to do so, use the following procedure.

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.

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 list box.
4. Select the sensor extension you wish to remove in the lower list box.
5. Press **Delete.** The **Confirm Device Update** screen appears.
6. Press **Cancel** to abort the operation or press **OK** to complete the sensor extension removal process. The Datalogger will prompt you for confirmation and then the Datalogger application will automatically restart.

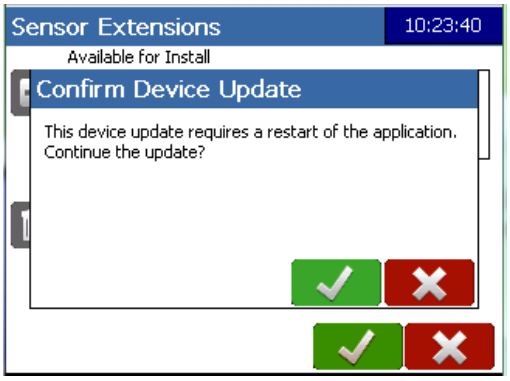


Figure 4-15: Confirm Device Update

> **IMPORTANT!** The Datalogger's application software needs to be restarted when removing a Sensor Extension from the Datalogger. This will occur automatically once you confirm device update. Restarting the application software cycles the power to the telemetry devices attached to the Datalogger.

Note that with any subsequent Application Software update, all available sensor extensions will be installed as part of the update, including any you may have previously deleted.

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. Strive to accurately touch each location as this ensures optimum touchscreen operation. The touchscreen calibration routine monitors the calibration attempt and requests you try again if your calibration attempts are inaccurate. Conclude by tapping anywhere on the screen.

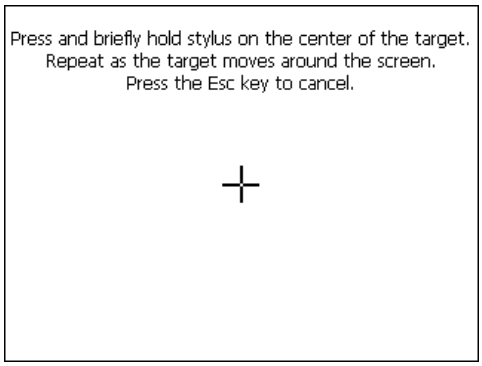


Figure 4-16: Screen Calibration

4.8 LOGOUT

A forced **logout** can be operator initiated from the service screen **Home > Service > Logout**. If **Tech Level** or **User Level** passwords are set then the logout button will return the user to the home screen and exit these modes; a password entry will be required at the next touch screen action in order to login. If no passwords are set then the user is simply returned to the home screen. After 20 minutes of inactivity automatic logout from User Level or Tech Level occurs and the Datalogger defaults back to the home screen. If any passwords have been set, they will need to be entered in order to use the Datalogger screen.

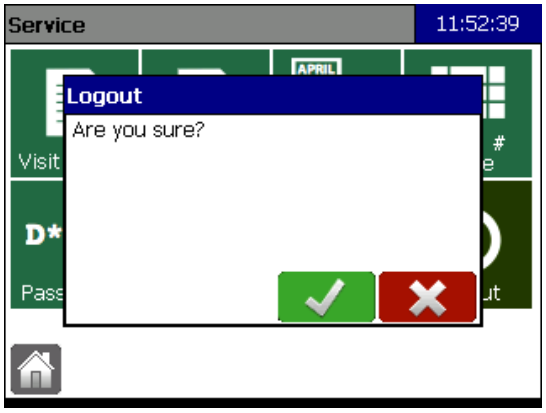
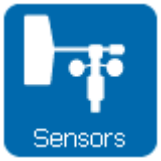


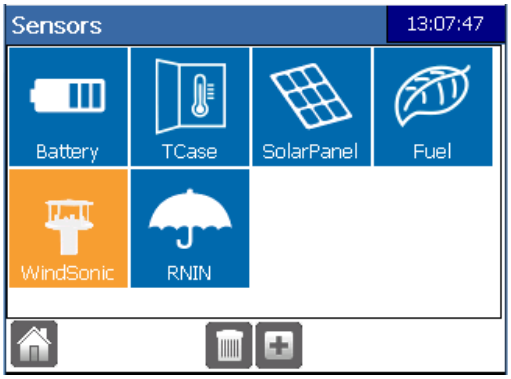
Figure 4-17: Logging Out

CHAPTER 5 - SENSORS



The **Sensors** icon opens the **Sensors** screen, which enables the user to configure sensors for the Axiom Datalogger. Figure 5-1 shows the **Sensors** screen for a blank Datalogger (no sensors configured) and a preconfigured Datalogger. Normally the Datalogger would be preconfigured by FTS and several sensors would be visible on the **Sensor** screen.

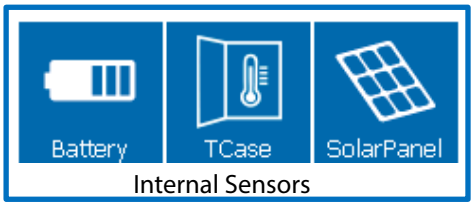
Datalogger with no sensors configured



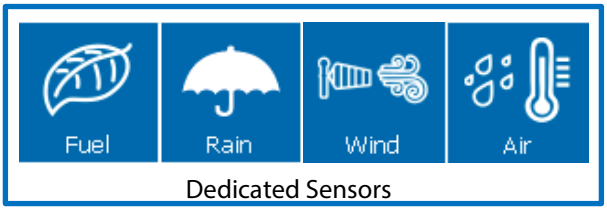
Datalogger with sensors configured

Figure 5-1: Sensors screen

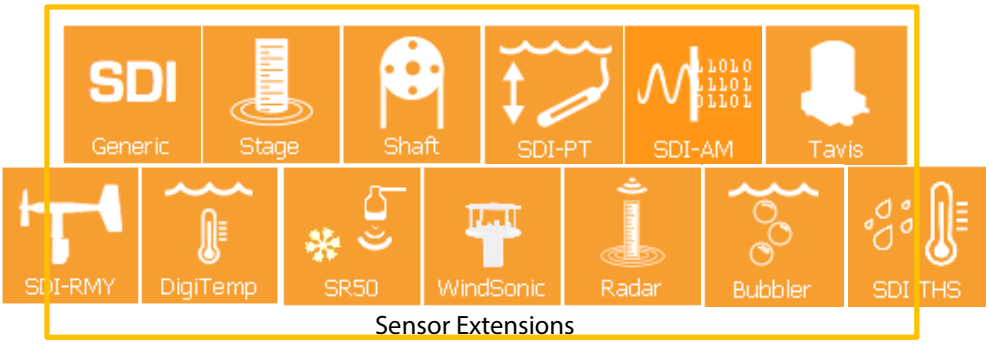
There are three categories of sensors which are available: **Internal Sensors, Dedicated Sensors**, and **Sensor Extensions**.



Internal Sensors



Dedicated Sensors



Sensor Extensions

Figure 5-2: Categories of Sensors and their Icons

Internal Sensors	These sensors measure variables essential to the operation of the Datalogger itself.
Dedicated Sensors	These sensors vary by Datalogger model and have individually labelled, unique ports to which they attach.
Sensor Extensions	For use with SDI sensors. There are a variety of Extensions that can be used with specific sensors which have options unique to those sensors, making setup easier. The SDI Generic is for use with an SDI sensor which does not have a specific extension. Additionally, any SDI sensor (whether there is an extension or not) can be setup using the SDI Generic icon.

5.1 ADDING A SENSOR

To add a sensor, press the **Add** button. This will display all available sensor icons (see Figure 5-1). Scroll through the screen and tap on the icon of the sensor you wish to add. This will automatically bring up that sensor's setup page. A detailed explanation of how to setup individual sensors is included in this chapter. However, the next section provides general information which is common to setting up all sensors.

5.2 SENSOR SETUP - GENERAL

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 data point in the Datalogger.

After a sensor has been configured, its icon appears on the **Sensors** screen. The sensor displays its parameters when the sensor's icon is pressed as well as its **Time To Next Acquisition** (Figure 5-3). **Time To Next Acquisition** is a countdown timer to the next time that the sensor will be read.

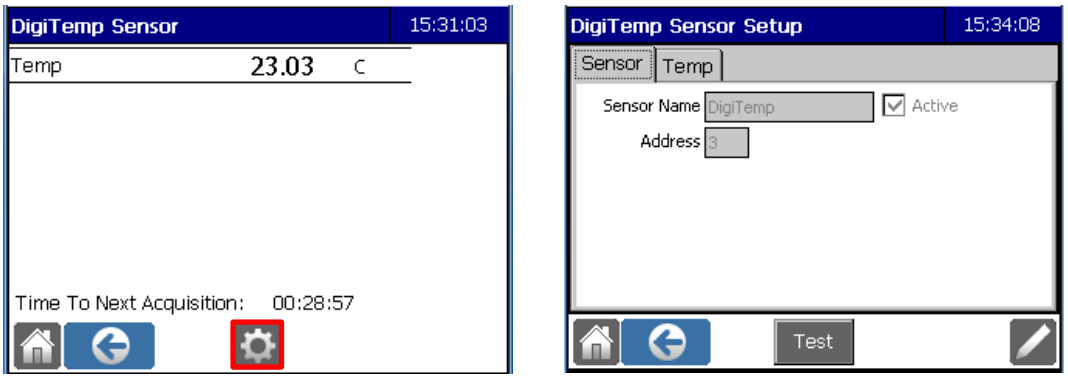


Figure 5-3: Sensor Setup

The Setup cog calls up the Sensor Setup page (Figure 5-3). All sensor set-up screens have a checkbox titled **Active**. It is checked by default.

> IMPORTANT! 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.

It is possible to edit the Sensor name and address at the **Sensor Setup Screen** but the sensor will have to be remapped from **Home>SDI** (see section 6.4). The **Test** button returns information about the sensor: the port, SDI version, vendor, model, version, and serial number.

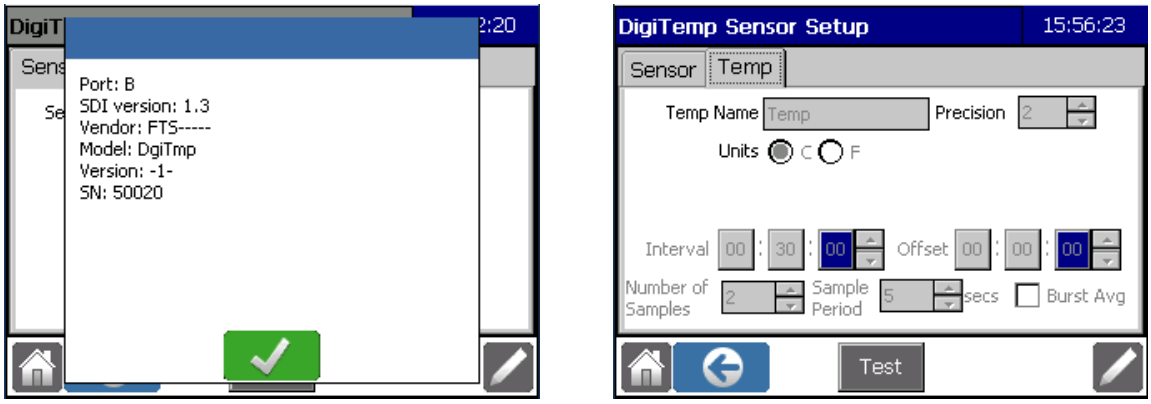


Figure 5-4: Test Information and Sensor Setup page showing Temp variable tab for the DigiTemp

Each sensor will have additional Tabs identifying a variety of variables. From these tabs the sensor can be configured to read the variables as directed in accordance with the information input in the different fields.

5.2.1 RESTRICTIONS ON SENSOR VARIABLE NAMES

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

- The name must contain only upper or lowercase letters, digits, or the underscore character ("_").
- There can be no spaces.
- The name must start with a letter.
- The name cannot be any of the following reserved names (reserved names are case sensitive):

  - ABS
  - ACOS
  - ASIN
  - AT
  - ATAN
  - CMD
  - COS
  - Elev
  - ELSE
  - ERR
  - EXP
  - FRAC
  - IF
  - INT
  - LN
  - Lat
  - Long
  - MAX
  - MIN
  - MOD
  - PI
  - POW
  - SIN
  - SQRT
  - SteinhC
  - SWR
  - t_DySince
  - t_DySYr
  - t_HrSince
  - t_HrSYr
  - t_IsLeap
  - t_MnSince
  - t_MnSYr
  - t_SeSince
  - TAN
  - t_dd
  - t_doy
  - t_HH
  - t_mm
  - t_MM
  - t_ss
  - t_TZ
  - t_yyyy
  - YB
  - YF
  - YR

5.2.2 IN-LINE LOGGING

It is possible to set up a logging function directly from the Sensor Setup page rather than through the Data icon. In order to do so, In-Line Logging has to be enabled (**Home>Station>Advanced>Enable In-Line Logging** (see Chapter 2.6).

From the home page select the **Sensors** icon. Select the desired Sensor icon from the **Sensors** page. Select **Setup>Edit** to display the **Sensor Setup** page. Select **OK** to bring up the **In-line Logging Setup** screen. Enter **Edit** mode and select the Datapoints you desire to have logged and added to current conditions. Once done select **OK.**

If In-line Logging is selected, and no Enable Logging checkboxes are selected, the In-line Logging Interval will not appear for that sensor.

5.2.2.1 *In-line logging when setting up an Internal or Dedicated sensor*

Ensure In-line logging is enabled. During the setup process, when the Sensor Setup screen appears, select **OK**. The In-line Logging screen will be displayed in read only mode. The data point names will be unique to each type of sensor. Select **Edit.**

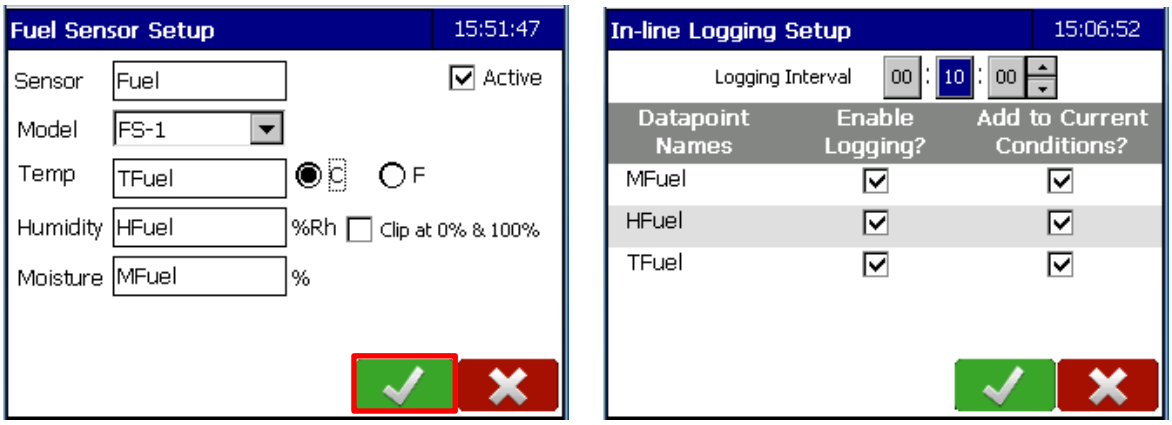


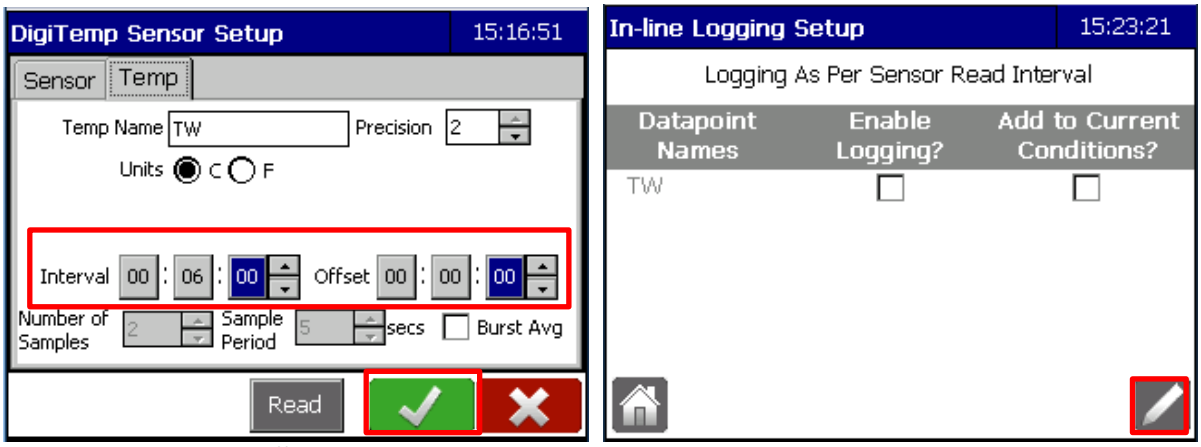
Figure 5-5: Setting up In-Line Logging

Input the desired Logging Interval and toggle the desired **Enable Logging** and **Add to Current Conditions** boxes. Select **OK.**

5.2.2.2 *In-line logging when setting up an SDI sensor*

Ensure In-line logging is enabled. During the setup process, when the Sensor Setup screen appears, input the desired Interval and Offset times. Note that some SDI sensors will have several tabs and the Offset/Interval menu will not always be in the first tab to open.

> IMPORTANT! For SDI Sensors, an Interval Time must be set prior to advancing to the **In-line Logging Setup**. If an interval time is not set, the In-line Logging will not complete.



Input interval/offset times(on Temp tab) In-line Logging Setup

Figure 5-6: SDI (Digitemp) Sensor Setup Example

Input the Interval time and select **OK** to display the **In-line Logging Setup** screen. . The data point names will be unique to each type of sensor. Select **Edit**, and toggle the desired **Enable Logging** and **Add to Current Conditions** boxes. Select **OK.**

5.2.2.3 *In-line logging when setting up an SDI sensor with M Commands*

Ensure In-line logging is enabled. During the setup process, when the Sensor Setup screen appears, if there is more than one M Command the Interval time must be set for the Command whose datapoints will be used for In-line Logging. Select the desired Command bar and input the Interval and Offset times. Select **OK**. This will return you to the Sensor Setup page. Repeat with other M Command bars to input desired interval and offset times.

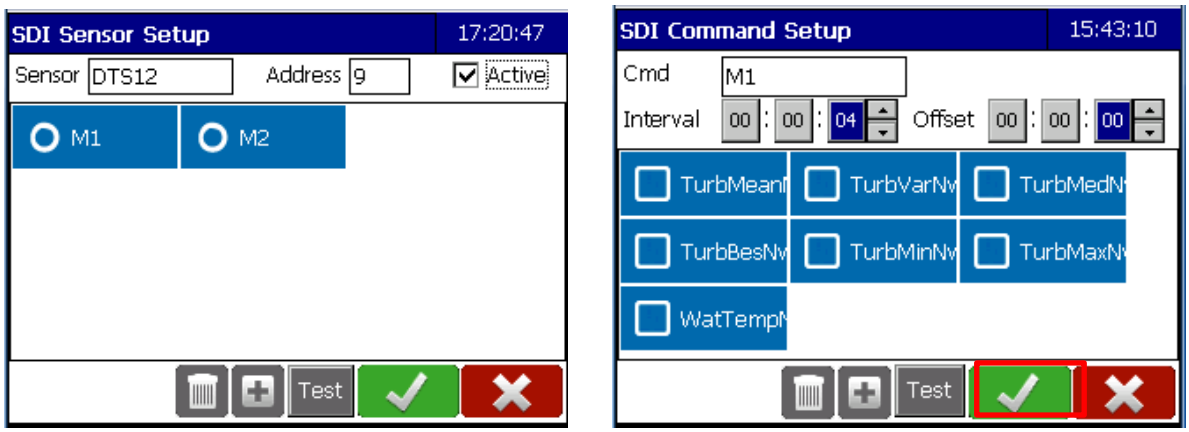


Figure 5-7: Setting M Command interval

Once done, select OK again to display the In-line Logging Setup page. Select **Edit**, and toggle the desired **Enable Logging** and **Add to Current Conditions** boxes. Select **OK.**

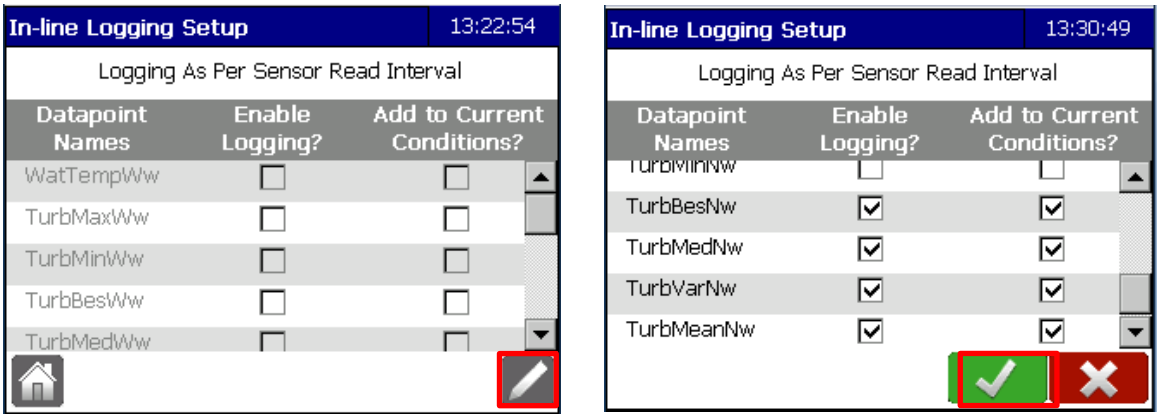


Figure 5-8:

Important! The In-line Logging screen displays all the data points available for all the M commands. Any of the **Enable Logging** and **Add to Current Conditions** boxes may be selected. However, only those data points for those SDI M Commands which have Intervals input will result in those data points being logged.

5.3 INTERNAL SENSOR SETUP

There are three physical sensors internal to the Axiom Datalogger used to measure solar panel parameters, battery parameters, and Datalogger temperature. The **Battery**, **TCase** (case temperature), and **Solar Panel** icons access screens to configure these measurements.

> **REMINDER!** Available sensors and sensor parameters vary with Datalogger model. Full functionality will be explained in this manual.

5.3.1 BATTERY

The **Battery Sensor Setup** screen shows measurable parameters for the battery. The parameters include battery voltage, current, temperature as well as the voltage of the optional battery back-up D-cell pack. The default names are shown in Figure 5-9. The names can be changed by pressing on the field and using the keyboard to input the desired name(s). 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.

Voltage is reported in volts (V) and Current in Amperes (A). Temperature is reported in Celsius (C) or Fahrenheit (F) in accordance with the selected Radio button.

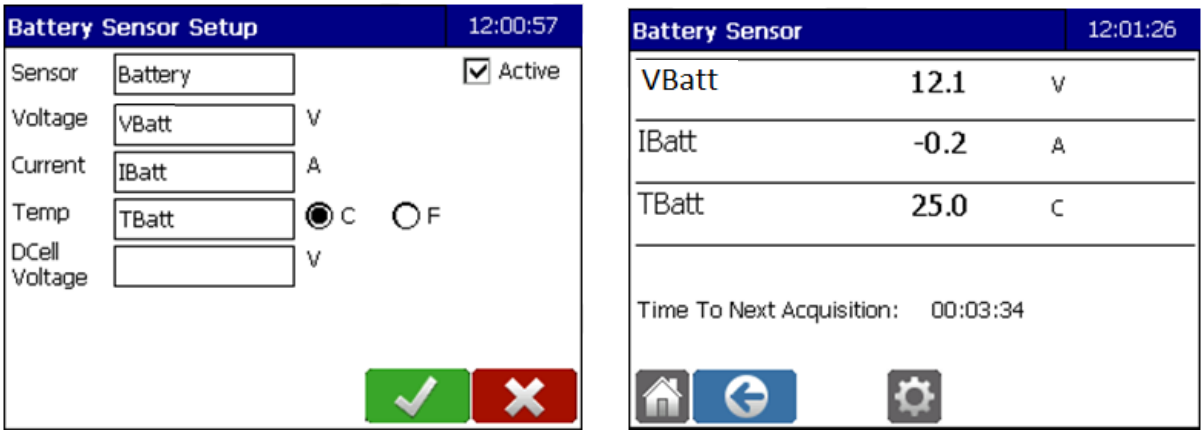


Figure 5-9: Battery Sensor Setup

5.3.2 SOLAR PANEL

The **Solar Sensor Setup** screen shows measurable parameters for the solar panel. Measurable parameters are the solar panel voltage and current. The default sensor names are shown in Figure 5-10. Voltage is reported in volts (V) and Current in Amperes (A). The value reported in solar panel voltage and solar panel current is an average value from the last 10 seconds.

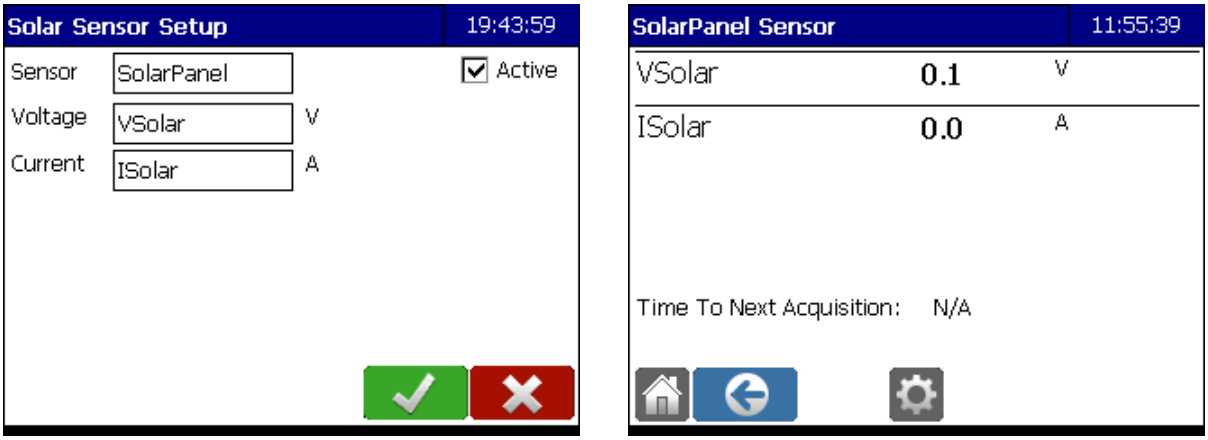


Figure 5-10

5.3.3 CASE TEMPERATURE(TCASE)

The **Case Temp Sensor Setup** screen shows the measurable parameter for the Datalogger's internal case temperature sensor. The default parameter name for this sensor is TCase and the temperature is reported in Celsius (C) or Fahrenheit (F) in accordance with the selected Radio button.

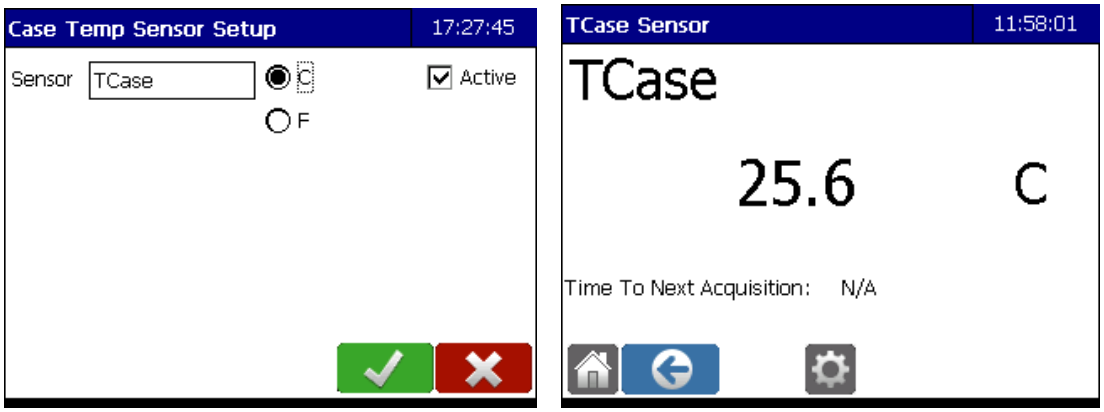


Figure 5-11

Select **OK**. If **In-line Logging** is enabled (see section 3.5.1), the In-line Logging Setup screen will be displayed from which you can enable logging and add to Current Conditions.

5.4 DEDICATED SENSORS

Dedicated sensors are sensors which have a specifically labeled Datalogger front panel connector (i.e., not the general orange SDI connector).

> **REMINDER!** Available sensors and sensor parameters vary with Datalogger model. Full functionality will be explained in this manual.

5.4.1 RAIN (RNIN)

Figure 5-12 shows the **Rain Sensor Setup** screen. The rain sensor provides rain fall measurements using a calibrated tipping bucket. The tip increment is the amount of rain measured by one rain gauge contact closure (0.01 of an inch – the default tip increment). Note that the precision of the rain sensor output will be the same as the precision of the tip increment. In Figure 5-12 the precision is two decimal places (Tip Increment = 0.01)

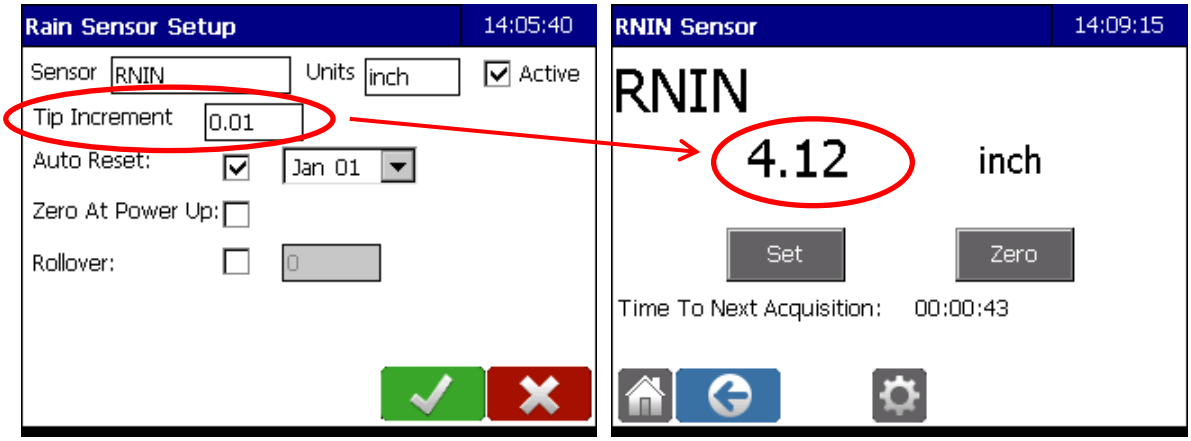


Figure 5-12: Rain Sensor screens

Edit the following fields by pressing on the box and entering the desired values:

Sensor: The default name for the sensor is RNIN. You can change this if desired.

Units: The default setting is inches; however, it can be any unit desired. Typically inches, mm, or counts are used.

Active: This box must be checked in order for the sensor to collect data

Tip Increment: This is the amount of rain measured by one tip of the rain gauge. The tip bucket is calibrated to tip at 0.01 of an inch (the default setting).

The precision (number of decimal places) of the rain gauge output will be the same as the precision of the tip increment. Trailing zeroes will not be recognized (ie: a tip increment of 0.01 and 0.010 will both render a precision of two decimal places).

IMPORTANT! Ensure the tip increment is converted to match the units selected for accurate measurements.

Units	Tip Increment
inches	0.01
cm	0.0254
mm	0.254
count	1

Auto Reset: if checked, allows the user to specify a rain counter reset date. The rain counter is reset at the beginning of the day specified using the drop down date box.

Zero At Power Up: if checked, causes the Datalogger to set the rain counter to zero every time the Datalogger is powered on.

Rollover: if checked, causes the Datalogger to reset the rain counter to zero once the rollover value is surpassed.

Select OK  . This brings up the In Line Logging Setup screen.

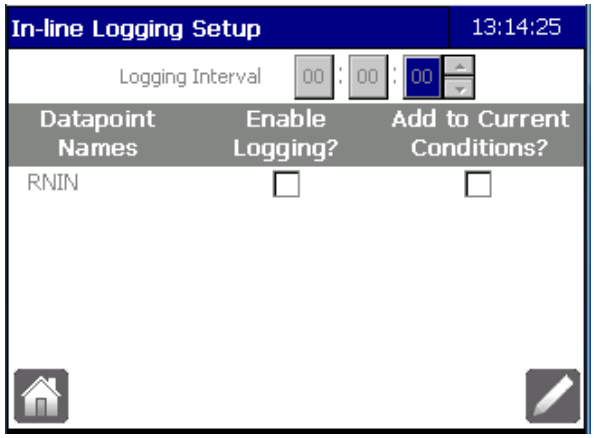


Figure 5-13: In-line Logging Setup

Select the **Edit** button  , then input the desired the **Logging Interval** (press on the hour, minute, or second box to highlight it in blue and use the arrows to select the value).

Check **Enable Logging** and if you want these values to be displayed in **Current Conditions**, check the **Current Conditions** box.

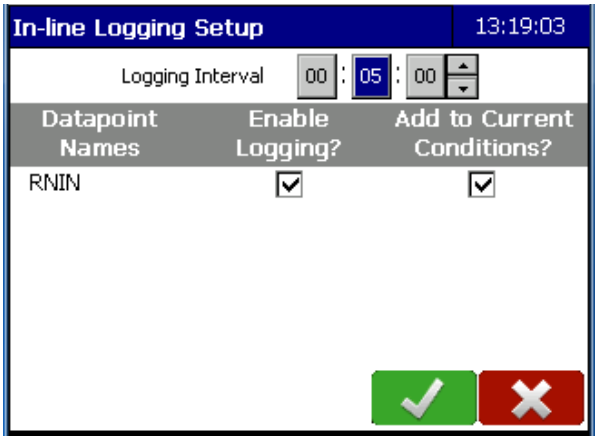


Figure 5-14: Enable Logging and Current Conditions

Select **OK**. Return to the Home Page

Figure 5-15 shows the **Rain Sensor** screen after the sensor has been configured. The rain counter is currently at 4.12 inches.

The **Set** and **Zero** buttons allow the user to either set a specific value at which the rain gauge will commence counting after tipping or to reset the counter to zero.

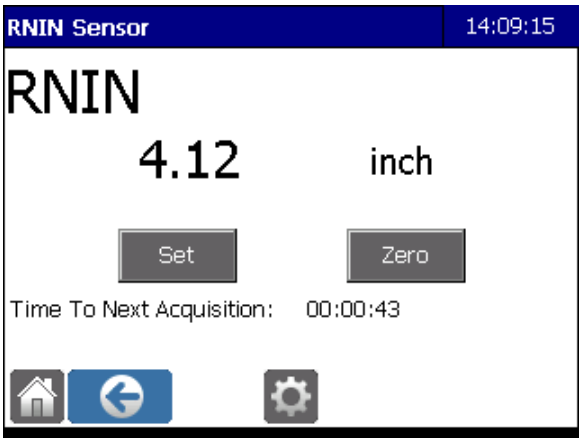


Figure 5-15: RNIN Sensor page

5.4.2 WIND

Figure 5-16 shows the **Wind Sensor Setup** screen for the Datalogger's **WIND DIRECTION** and **WIND SPEED** inputs with the default variable names. These can be changed if desired. Note that there are Sensor Extensions for the SDI-RMY and the SDI-UWS-Gill which should be used for those sensors. However, they can also be installed using the "Wind"sensor setup functions.

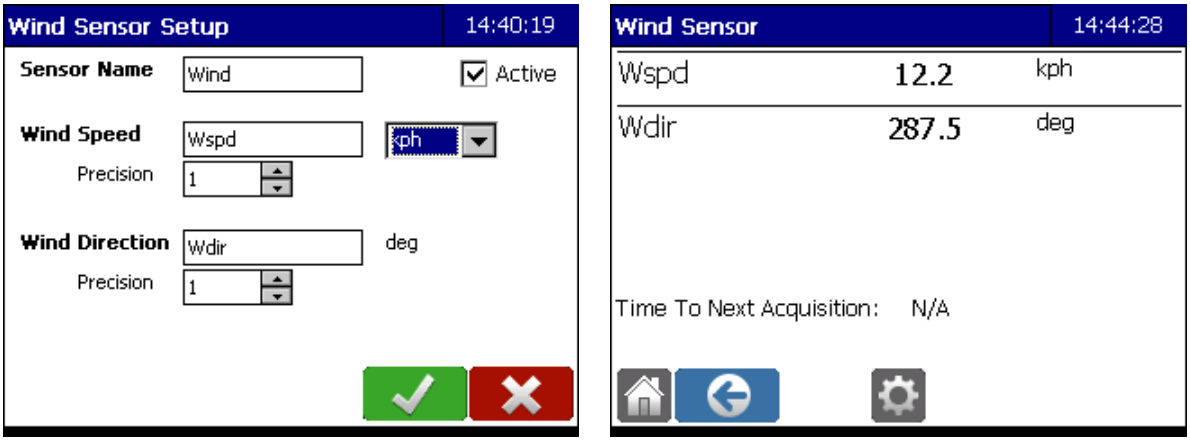


Figure 5-16: Wind Sensor screens

Wind Speed: The default name is Wspd and can be changed if desired. Use the drop down menu to select the units of measurement. The choices are:

Units	Meaning
kmh	kilometres per hour
kph	kilometres per hour
mph	miles per hour
kn	knots (nautical miles per hour)
m/s	metres per second

Wind Direction: This is measured in degrees.

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

5.4.3 AIR

Figure 5-17 shows the **Air Sensor Setup** screen for the Datalogger's **Temperature & Humidity (THS)** input with the default variable names. These can be changed if desired.

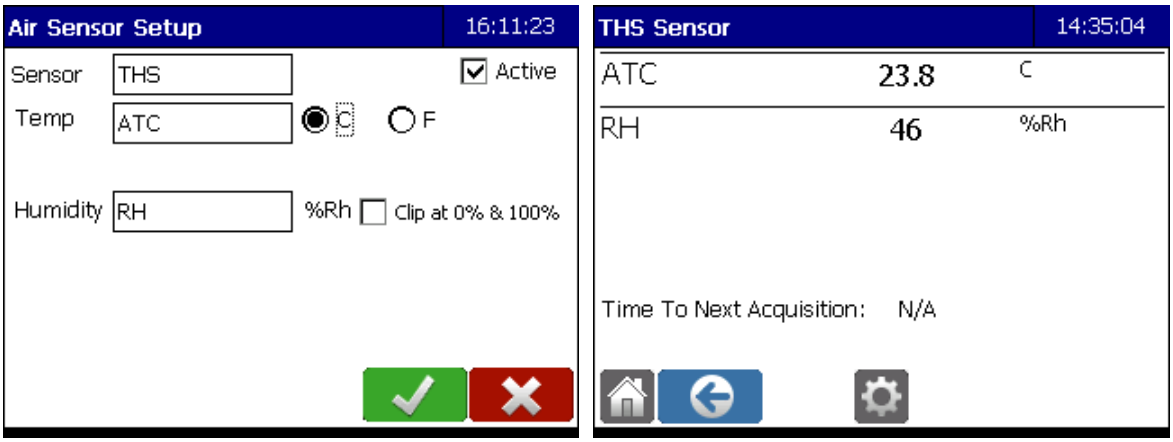


Figure 5-17: Air Sensor screens

Temp: Temperature values can be selected using the radio buttons. Either degrees Celsius (°C) or degrees Fahrenheit (°F).

Humidity: This is the Relative Humidity.

Clip at 0% & 100% checkbox: If checked, causes the Datalogger to limit humidity values read from the sensor to the range of 0 to 100%. That is, any air sensor humidity measurements above 100% (sensor output of 1V) are reported as 100% and any measurements less than 0% (sensor output of 0V) are reported as 0%. If the **Clip at 0% & 100%** is not enabled and the sensor reads outside of its range (higher than 117%) then an error (ERR) will be reported.

5.4.4 FUEL STICK

Figure 5-18 shows the **Fuel Sensor Setup** screen for the Datalogger's **FUELSTICK** input. The default names are shown but these can be changed as desired by pressing on the screen and using the keyboard to input the new name.

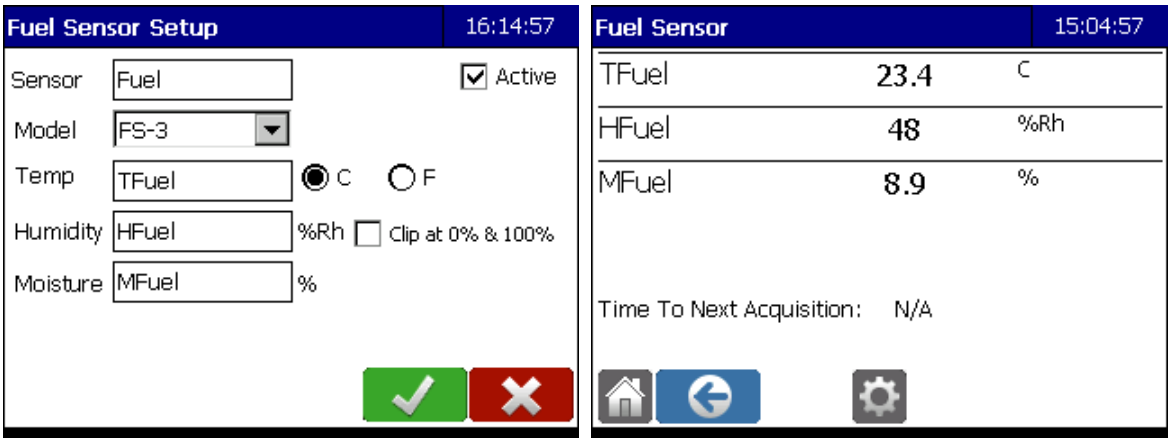


Figure 5-18: Fuel Sensor screens

Model: Use the drop down menu to select the model of the fuel stick in use. Only the default parameters supported by the selected sensor model will be displayed.

Temperature: Select the units - either degrees Celsius (ºC) or Fahrenheit (ºF).

Humidity: This is the relative humidity (Rh) of the fuel stick.

Clip at 0% & 100% checkbox: When checked, this causes the Datalogger to limit humidity values read from the sensor to the range of 0 to 100%. That is, any air sensor humidity measurements above 100% (sensor output of 1V) are reported as 100% and any sensor measurements less than 0% (sensor output of 0V) are reported as 0%. Limiting humidity values has the secondary effect of limiting moisture values as fuel humidity is used in the fuel moisture calculation. If the **Clip at 0% & 100%** is not enabled and the sensor reads outside of its range then an error (ERR) will be reported.

Moisture: This reports the fuel moisture levels. The Fuel moisture calculation for the FTS fuel stick is as follows:

For Humidity < 10%:

$$Fuel\ Moisture\ (\%) = 0.03229 + (Hum * 0.281073) - (Hum * Temp * 0.000578)$$

For (10% >= Humidity < 50%):

$$Fuel\ Moisture = 2.22749 + (Hum * 0.160107) - (Temp * 0.014784)$$

For Humidity >= 50%:

$$Fuel\ Moisture = 21.0606 + (Hum * Hum * 0.005565) - (Hum * Temp * 0.00035) - (Hum * 0.483199)$$

In which:

Hum (humidity) = %Rh, as seen on the Fuel Sensor Results screen
Temp (temperature) = Fahrenheit

Once all fields are completed, select **OK**.

5.5 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. The following sensor extensions are available and are added by selecting **Home>Sensors>Add** and using the drop down menu to select.

Figure 5-19: Sensor Extension Icons

SDI	a generic set-up for any SDI-12 sensor
Stage	a generic set-up useful for configuring a variety of stage sensors
Shaft	specifically designed for shaft encoder stage sensors
SDI-PT	specifically designed for the FTS SDI-PT pressure transducer
	NOTE: For the FTS SDI-PT-KEL pressure transducer use the **Stage** sensor extension
SDI-AM	specifically designed for the FTS SDI-AM 4 channel analog module
Tavis	specifically designed for the Tavis DISI-1200 Water Stage sensor
SDI-RMY	specifically designed for the FTS SDI-WS-RMY-1/2/3 wind sensor with smart SDI-12 interface
DigiTemp	specifically designed for the FTS DigiTemp SDI-12 submersible digital temperature sensor
SR50	specifically designed for the Campbell SR50 (Sonic Ranging)
WindSonic	specifically designed for the FTS UWS Gill Ultrasonic Wind Sensor
Radar	specifically designed for the FTS Radar Stage Sensor
Bubbler	specifically designed for the FTS Bubbler Sensor
SDI THS	specifically designed for the FTS SDI-THS sensor

IMPORTANT! Sensor extensions write configuration parameters to the attached sensor and any previously configured sensor parameters are overwritten.

5.6 CALCULATING INTERVAL AND OFFSET PRIOR TO DATA TRANSMISSION

In order to ensure the most current data is transmitted, users must calculate how much time it takes for the sensor to send the measurement command, take the measurement, log the data and send the data to the buffer two minutes prior to the scheduled transmission time.

> **IMPORTANT!** Information is emptied into the buffer approximately 2 minutes before transmission, so ensure the offset time is calculated to have completed reading, logging and processing at least two minutes before the transmission.

To determine measurement time, press the **Test** button. Measurement timings are specific to each sensor. Refer to the sensor's manual for details of measurements and measurement commands.

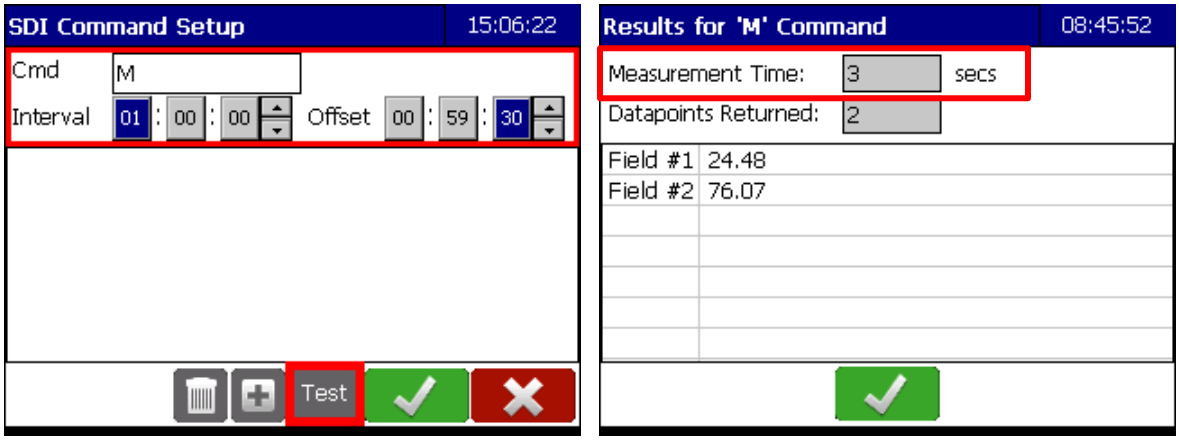


Figure 5-20: Command Setup and Test Example for a Generic SDI-12 sensor

Alternately, measurement time can be determined by entering Transparent Mode (Home>SDI-12> Refer to Chapter 6). Enter the correct port and sensor address and the desired SDI-12 measurement command (refer to your sensor's manual for measurement command details)

0 = device SDI address
003 = measurement delay in seconds
2 = number of measurements returned

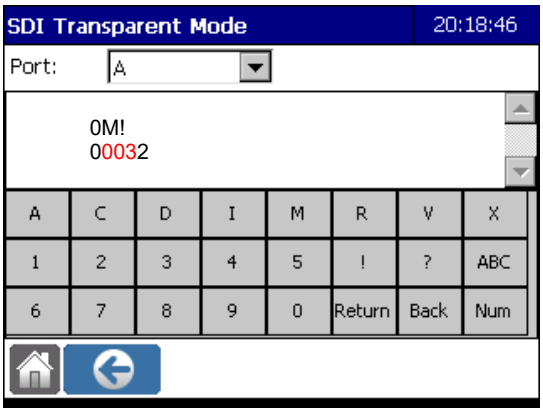


Figure 5-21: Example of a device on Port A at address 0 with a three second measurement time delay.

Interval and **Offset** specify the time the measurement command to the SDI-12 sensor is initiated.

The **Interval** is in hh:mm:ss format and specifies how often the specified command is sent to the sensor.

The **Offset** is also in hh:mm:ss format and specifies when the first command is sent to the sensor based on a starting time of 00:00:00. The **Offset** must be less than the **Interval**.

5.6.1 CALCULATION

Scheduled transmission time
– 2 minutes (buffer dump)
- measurement time
– 2 seconds (padding for logging and any calculations)
= Offset time

> **Example:** Scheduled transmission time is hourly at 10 minutes past the hour. The measurement time is three seconds.
>
> **00:10:00**
> **- 00:02:00**
> **- 00:00:03**
> **- 00:00:02**
> **00:07:55**
>
> Therefore, you want an **Interval** of 01:00:00 (hourly) and an **Offset** of 00:07:55.

5.7 SDI GENERIC SENSOR EXTENSION

Figure 5-19 shows the **SDI Sensor Setup** screen **(Home>Sensors>Sensor icon>Setup)**, 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.

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 Setup** screen 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.

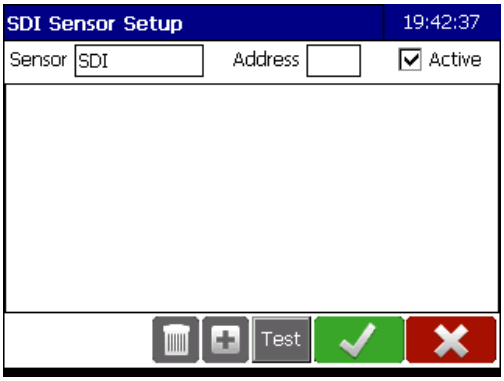


Figure 5-22: SDI Sensor Setup screen

The **Add** button on the **SDI Sensor Setup** screen (Figure 5-19) opens the **SDI Command Setup** screen (Figure 5-20).

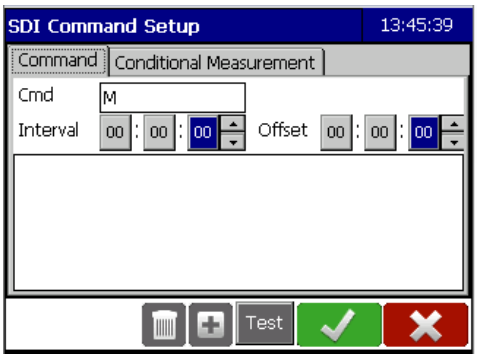


Figure 5-23: SDI Command Setup screen

5.7.1 COMMAND TAB

The **SDI Command Setup** screen is used 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 hh:mm:ss format and specifies how often the specified command is sent to the sensor. The **Offset** is also in hh:mm:ss 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

Example:

In this example a DigiTemp will be set-up as a SDI-Generic sensor. The sensor is set to address 7 and connected to SDI-A on the Axiom. Follow the steps in Figure 5-21 to initiate the setup (**Sensors > Add > SDI Generic> Set sensor name and address**).

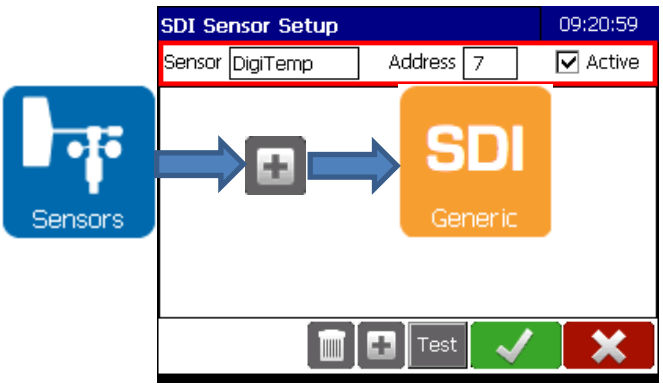
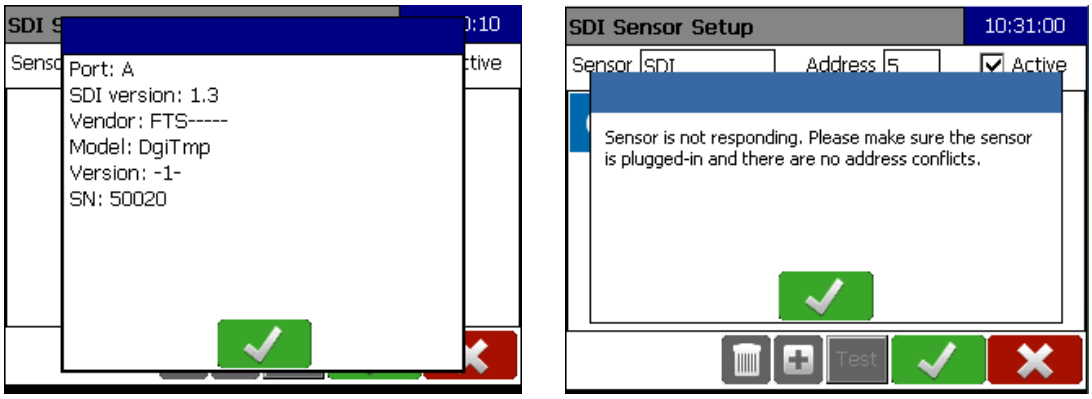


Figure 5-24: SDI Sensor Setup

To confirm correct sensor address entry press the **Test** button. If the sensor address matches the entered address you will be presented with basic sensor information (Figure 5-22). You will receive a **Sensor is not responding** message if the address does not match, the sensor is not correctly seated, or if there are technical problems with the sensor.



Successful Test Message Unsuccessful Test Message

Figure 5-25:

Press **Add** to advance to the **SDI Command Setup**. An **Interval** of 01:00:00 and an **Offset** of 00:59:30 is entered and 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. Enter the desired command in the **Cmd** box.

The **Test** button sends the specified command to the sensor and displays the returned fields (values). It also returns the Measurement Time, which can be used to confirm that the assigned offset time is sufficient to read, log, and process the data before transmission.

IMPORTANT! Remember that information is emptied into the buffer approximately 2 minutes before transmission, so ensure the offset time is calculated to have completed reading, logging and processing at least two minutes before the transmission.

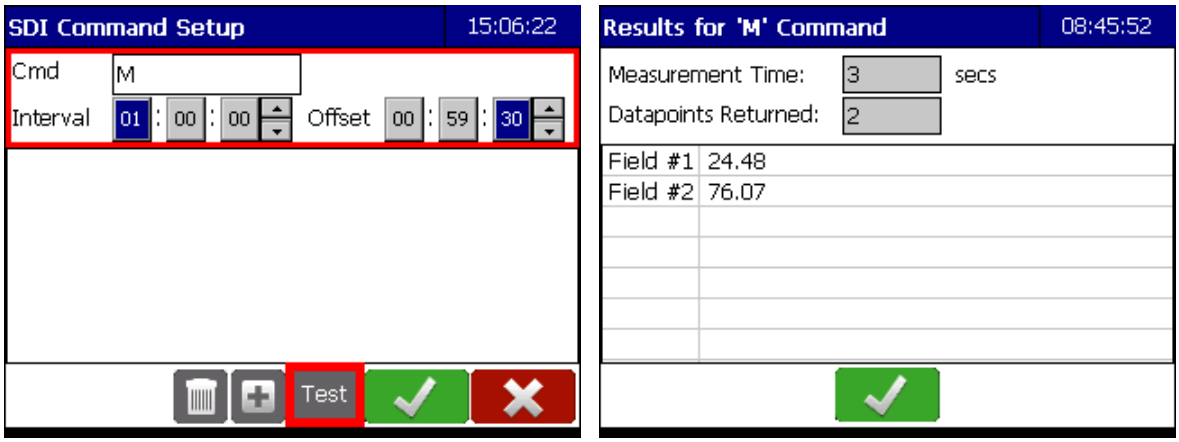


Figure 5-26: Command Setup and Test

The **Add** button on the SDI Command Setup Screen launches the **SDI Field Setup** Screen (Figure 5-24) which enables the user to define variables for the values returned by the command (unique field name for the field number, units and precision (number of decimals)). Multiple fields can be defined for each command as a single SDI command can return several values. 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 variables in the Datalogger.

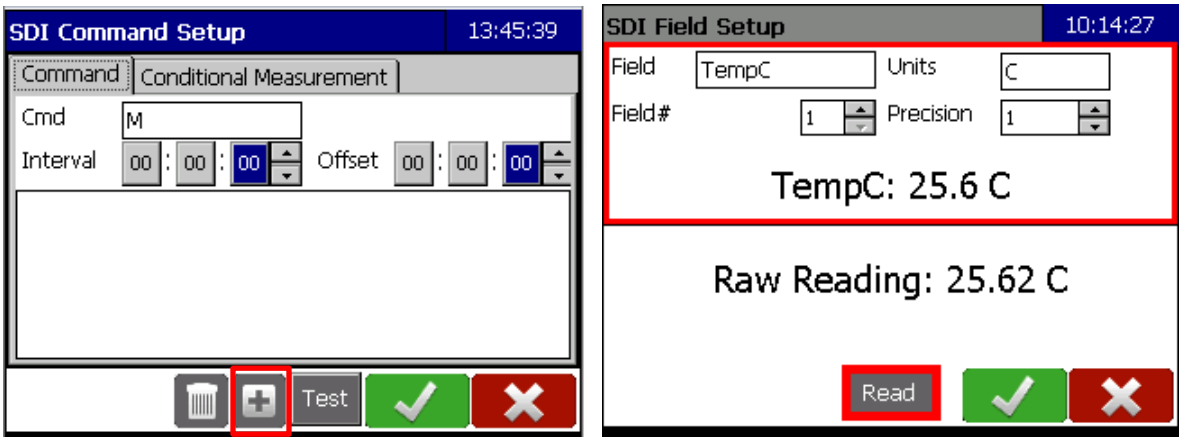
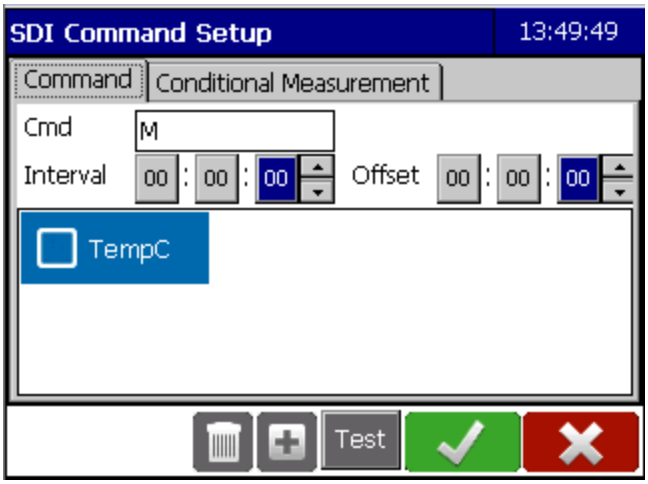


Figure 5-27: SDI Command Setup and SDI Field Setup screens

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

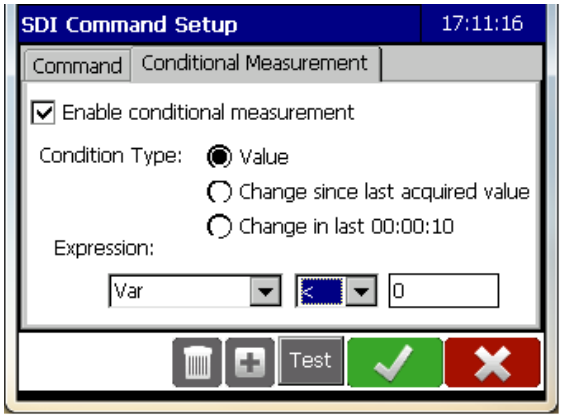
Enter your sensor- specific field information and select **Read** to confirm. Press **OK** to accept field setup and continue to add as many fields as desired. The SDI Fields will appear as blue bars.



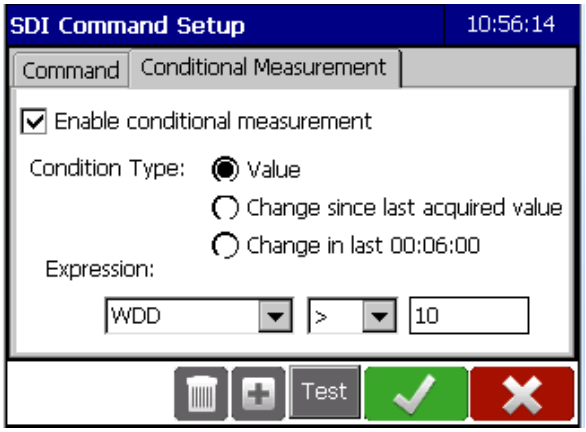
5.7.2 CONDITIONAL MEASUREMENT TAB

When conditional measuring is enabled, the Measurement Command (M command) will only be sent if the condition is true at the time of measurement.

Select **Home>Sensors>SDI>Setup>Conditional Measurement Tab**. Select the **Condition Type** using the radio buttons.

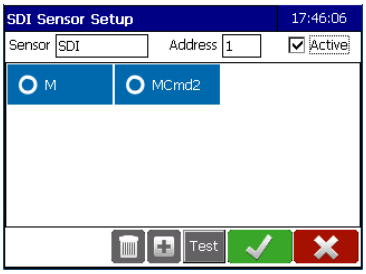


Value and **Change since last acquired value:** Enter the applicable **Expression** using the drop down arrows to select the desired variable, mathematical expression, and then enter the comparison value.



Change in last hh:mm:ss: The time appearing in this selection is the Command interval time entered in the Command tab. This condition is expressed by the formula:

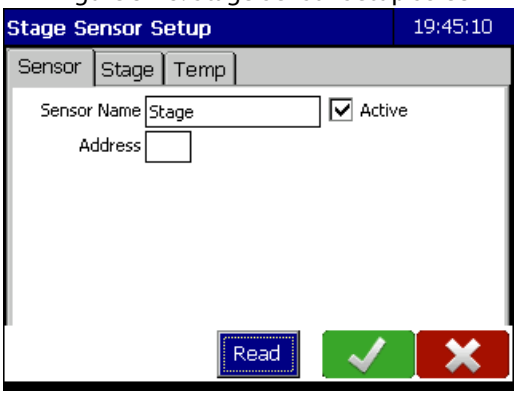
(V2-V1)/T in which **V2** is the previously measured value of the Expression variable
V1 is the latest measured value of the Expression variable
T is the Command interval time expressed in seconds

If the sensor has more than one Command, they will appear as blue bars on the Command screen. Pressing on the desired command (for example, M) will enable you to input the desired Interval for that Command. Subsequently selecting the Conditional Measurement Tab will enable you to set up the conditions for that Command.	

5.8 STAGE SENSOR EXTENSION

Figure 5-26 shows the **Stage Sensor Set-up** screen (**Sensor** tab), with default settings, that is provided by the Stage sensor extension. This extension predefines a stage variable of HG and an auxiliary water temperature variable 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.

Figure 5-28: Stage Sensor Setup screen



5.8.1 SENSOR TAB

Sensor Name: The default name is Stage. This can be changed if desired.

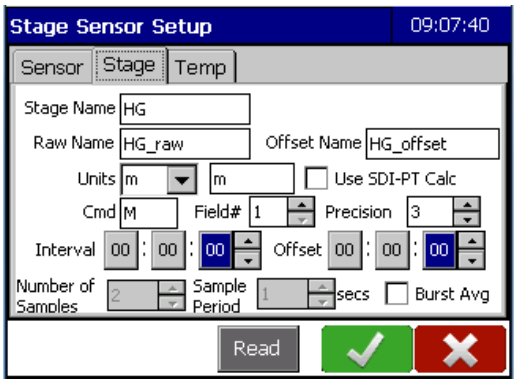
Address: Input the sensor's address.

Active: The Active box is checked by default. If this is not checked the sensor will not interact with the Datalogger.

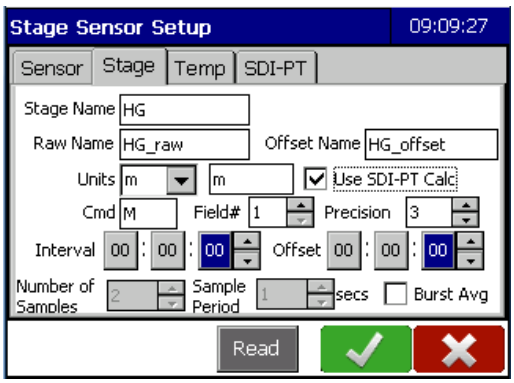
Read: Pressing on this will return the fields that will be read by the sensor and the length of time it takes to make a measurement.

5.8.2 STAGE TAB

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



Initial screen



With "Use SDI-PT Calc" checked (SDI-PT Tab present)

Figure 5-29: Stage Sensor Setup screens

Stage Name: Specifies the variable for the stage value returned by the sensor.

Raw Name: This is the distance from the sensor's depth to the surface. The combination of the raw measurement plus the offset should equal the actual depth. The default name is HG_Raw which can be changed if desired.

Offset Name: This is the depth below the sensor's position. The combination of the raw measurement plus the offset should equal the actual depth. The default name is HG_Raw which can be changed if desired

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

Units (drop down): A drop down menu of the units in which the sensor returns the stage values. The choices are m (metres), mm (millimetres), ft (feet), or in (inches).

Units (textbox): Specifies the units label used in displays of the stage values. Must be the equivalent of the units in the drop down menu. For example: The drop down unit is ft and feet is input as the display unit. Note that no conversion will take place so selecting ft from the drop down menu and inputting m (metres) as the display unit, will result in 3 ft being displayed as 3 m.

SDI-PT Calc: Specifies whether or not to enable the SDI-PT calculation which converts stage value from PSI to the units specified. If this is checked the SDI-PT tab (named after the FTS sensor) will become available (Figure 5-28).

SDI-PT Tab: Use this tab to input the water density and gravity for use in the SDI-PT Calc.

NOTE: The Unit Multiplier is based on the selected units in the drop down menu.

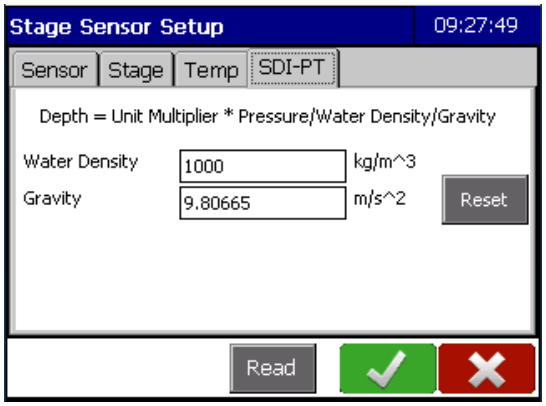


Figure 5-30: SDI-PT Tab

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

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

Interval: Specifies how often the stage readings are made

Offset: Specifies the schedule of stage readings on this sensor based on time after midnight. See section 5.6 for details of calculating Offset time.

Example: An interval of 00:15:00 and an offset of 00:10:00 means readings will be taken every 15 minutes commencing at 00:10:00, then 00:25:00, 00:40:00, etc.)

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

Number of Samples and **Sample Period:** These control burst averaging. They are enabled only when **Burst Avg** is selected. Use the drop down menus to input the desired number of samples and the desired sample period. Ensure sufficient time is provided for the sensor to take the required number of samples.

5.8.3 TEMP TAB (TEMPERATURE)

The Temp tab (Figure 5-29) allows the user to specify an auxiliary water temperature measurement.

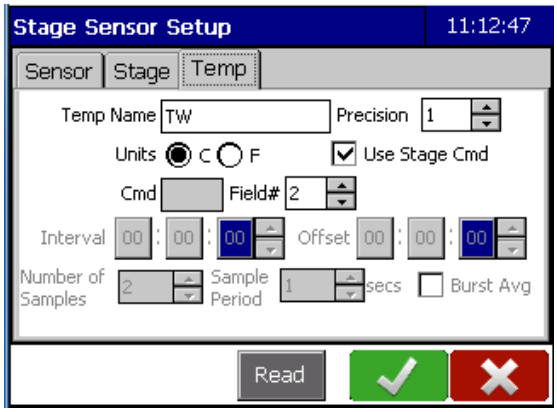


Figure 5-31: Temp Tab

Temp Name: Specifies the variable 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: Select the radio buttons to specify the units in which the sensor returns temperature values. Choices are C (degrees Celsius) and F (degrees Fahrenheit).

Use Stage Cmd: If selected, the water temperature measurement will use 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 **Interval, Offset** and **burst averaging** (see **Stage** tab, above) for the water temperature measurement can be specified.

5.8.4 STAGE SENSOR DISPLAY SCREEN

Once the Stage Sensor is set up, the Stage Sensor screen will display the current readings from the stage sensor (Figure 5-30).

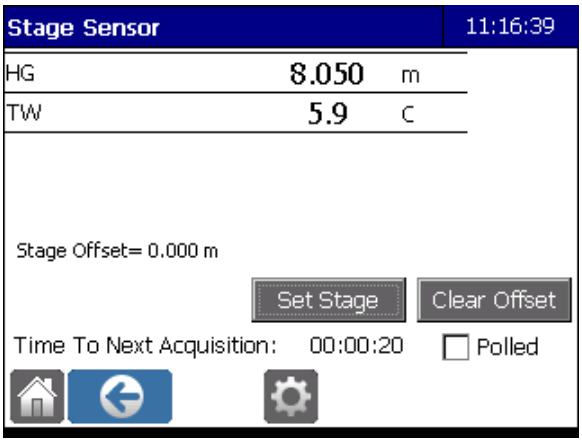


Figure 5-32:

Set Stage and **Clear Offset** enable the user to set and clear the stage offset value. They are present when a Stage variable is configured on the **Stage** tab.

5.8.5 SET STAGE/CLEAR OFFSET

Once the sensor has been configured and is operating, the Set Stage and Clear Offset buttons can be used. They are present only if a stage variable has been configured on the Stage tab.

There are two methods available for setting the stage offset in the Datalogger depending on if the staff gauge reading is known or not. If it is known use the **Set Stage** button. If it is not known, use the **Polled** feature.

5.8.5.1 *Staff Gauge Reading Known*

If the staff gauge reading is known, press **Set Stage**, enter the staff gauge value, and confirm the changes.

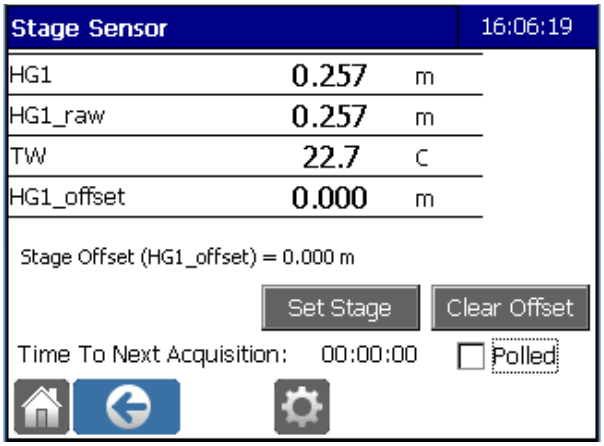


Figure 5-33: Set Stage

The Datalogger calculates the appropriate stage offset from the current stage sensor reading.

5.8.5.2 *Polling Stage Sensors*

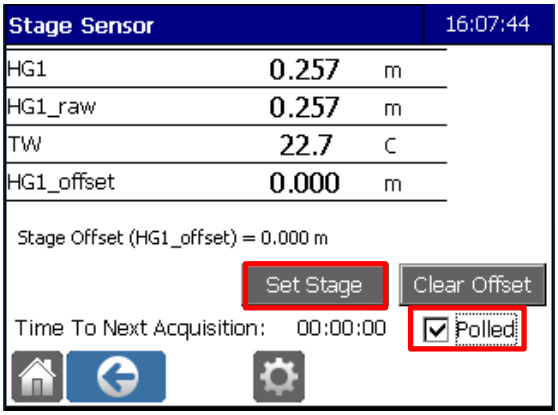
The polling option is meant as a temporary measure to confirm stage sensor operations and any data collected during the polling will not be recorded by the Datalogger. It will also not affect the Stage Setup values. That is to say, once polling is stopped, interval values will revert to those originally input in the Stage Setup Screen.

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.

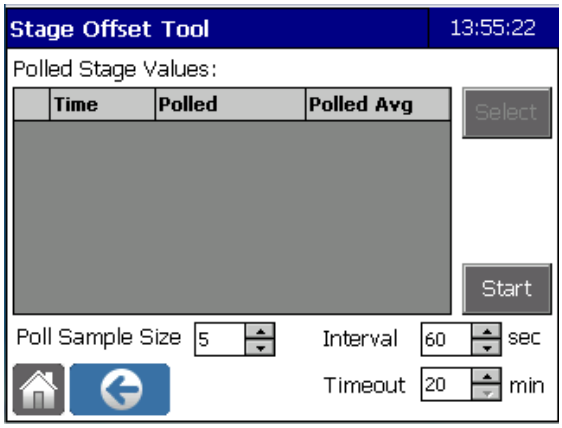
The stage reported in on the Display screen and in the Stage Offset Tool screen will use the units that the user has selected during the setup process (SDI-PT calc will be applied if selected).

The steps to set up polling follow.

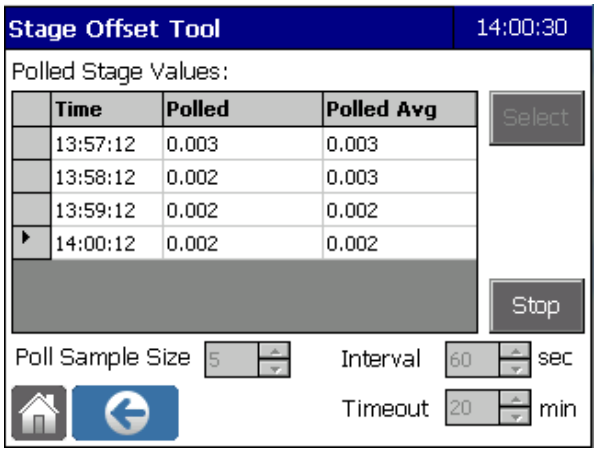
1. Select **Home>SDI-12**. From the list of mapped sensors, select the sensor you wish to poll and tap the **Polled** box, then select **Set Stage**.



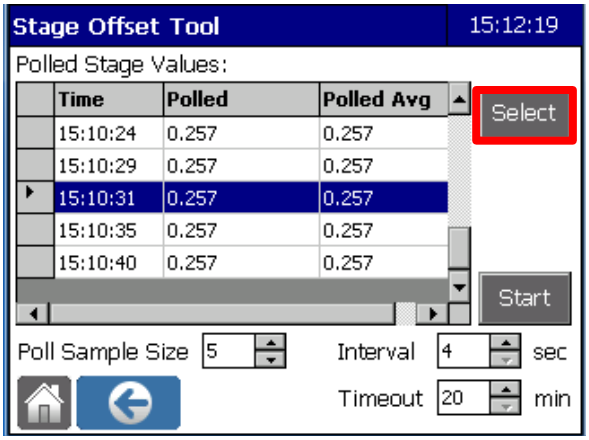
2. The **Stage Offset Tool** screen is displayed. Enter the desired **Interval** and **Timeout** times, Interval being the polling interval and Timeout being the period of time over which polling will take place. The **Poll Sample Size** refers to how many readings will be averaged per interval.



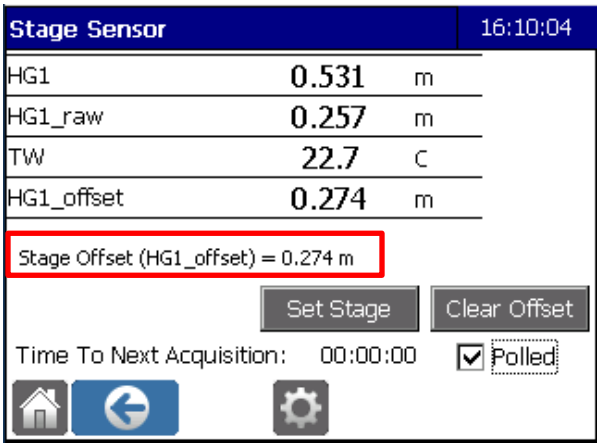
3. Synchronize your timepiece to the Datalogger and select **Start**. The screen is displayed in view only mode and polling commences. Polling values will be displayed until the **Stop** button is selected.



4. Go read the staff gauge. Note the time and the Staff Gauge value. When you return to the Datalogger select STOP, scroll through the stage sensor readings and tap on the time that corresponds to your reading of the staff gauge. Press **Select**.



5. The **Enter Staff Gauge Value** screen appears. Enter the observed value and confirm. The new Stage Offset will be calculated.



6. De-select the **Polled** box.

7. Press **Clear Offset** to return the Stage Offset to zero.

5.9 SHAFT ENCODER SENSOR EXTENSION

Figure 5-32 shows the **Shaft Encoder Set-up** screen (**Sensor** tab), with default settings, that is provided by the Shaft (shaft encoder) sensor extension. This extension predefines a stage variable of HGShaft. 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.

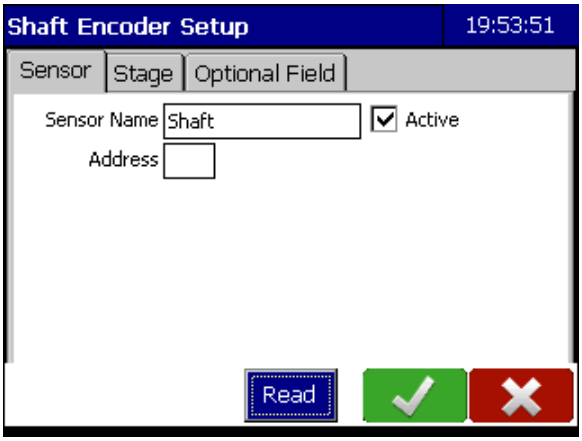


Figure 5-34

5.9.1 SENSOR TAB

The Sensor tab contains basic information about the sensor (Figure 5-32).

Sensor Name: The default name is Shaft. This can be changed if desired.

Address: Input the sensor's address.

Active: The Active box is checked by default. If this is not checked the sensor will not interact with the Datalogger.

Read: Pressing on this will return the fields that will be read by the sensor and the length of time it takes to make a measurement.

5.9.2 STAGE TAB

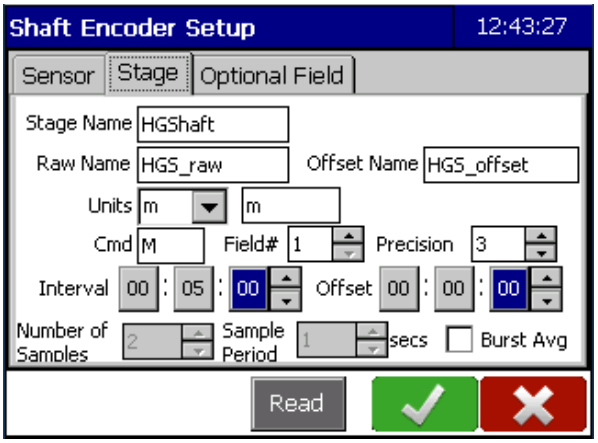


Figure 5-35

Stage Name: Specifies the variable for the stage value returned by the sensor. The default name is HGShaft. This can be changed if desired.

Raw Name: This is the distance from the sensor's depth to the surface. The combination of the raw measurement plus the offset should equal the actual depth. The default name is HGS_Raw which can be changed if desired.

Offset Name: This is the depth below the sensor's position. The combination of the raw measurement plus the offset should equal the actual depth. The default name is HGS_Raw which can be changed if desired

Units (drop down): A drop down menu of the units in which the sensor returns the stage values. The choices are m (metres), mm (millimetres), ft (feet), or in (inches).

Units (textbox): Specifies the units label used in displays of the stage values. Must be the equivalent of the units in the drop down menu. For example: The drop down unit is ft and feet is input as the display unit. Note that no conversion will take place so selecting ft from the drop down menu and inputting m (metres) as the display unit, will result in 3 ft being displayed as 3 m.

Cmd: Specifies the sensor's stage SDI command. Input the Command used by the sensor (M,C, or R) available from the sensor's manual

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

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

Interval: Specifies how often the stage readings are made

Offset: Specifies the schedule of stage readings on this sensor based on time after midnight. See section 5.6 for details of calculating Offset time

Example: An interval of 00:15:00 and an offset of 00:10:00 means readings will be taken every 15 minutes commencing at 00:10:00, then 00:25:00, 00:40:00, etc.)

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

Number of Samples and **Sample Period:** These control burst averaging. They are enabled only when **Burst Avg** is selected. Use the drop down menus to input the desired number of samples and the desired sample period. Ensure sufficient time is provided for the sensor to take the required number of samples.

5.9.3 OPTIONAL FIELD TAB

The **Optional Field** tab enables the user to define a Datalogger variable for any field returned by the shaft encoder (Figure 5-34). A typical use is to collect the error code from measurement responses.

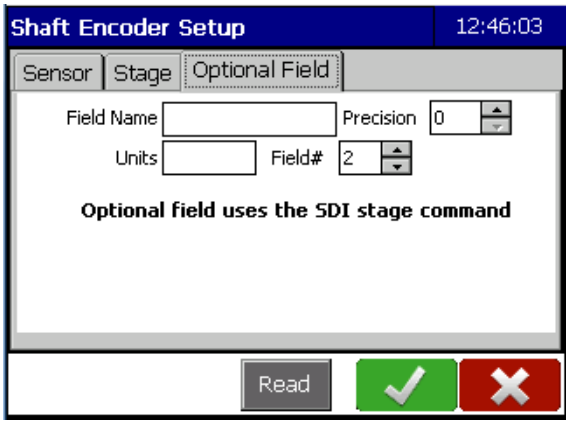


Figure 5-36

Field Name: Input the desired variable name.

Precision: Specifies the precision (number of decimal places) in the field value to be used in computations and displays. Use the drop down menu to set the precision.

Units: Specify the units in which the sensor returns the field value.

Field #: Specify the field number from which to extract the data returned by the sensor.

5.9.4 SHAFT SENSOR DISPLAY SCREEN

Once the Shaft Sensor is set up, the Shaft Sensor screen will display the current readings from the stage sensor (Figure 5-35).

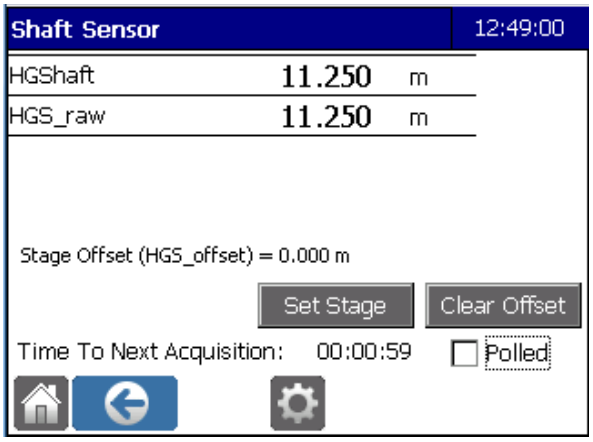


Figure 5-37

Set Stage and **Clear Offset** enable the user to set and clear the stage offset value. They are present when a Stage variable is configured on the **Stage** tab.

There are two methods available for setting the stage offset in the Datalogger depending on if the staff gauge reading is known or not. If it is known use the **Set Stage** button. If it is not known, use the **Polled** feature.

5.9.5 SET STAGE/CLEAR OFFSET

Once the sensor has been configured and is operating, the Set Stage and Clear Offset buttons can be used. They are present only if a stage variable has been configured on the Stage tab.

There are two methods available for setting the stage offset in the Datalogger depending on if the staff gauge reading is known or not. If it is known use the **Set Stage** button. If it is not known, use the **Polled** feature.

5.9.5.1 *Staff Gauge Reading Known*

If the staff gauge reading is known, press **Set Stage**, enter the staff gauge value, and confirm the changes.

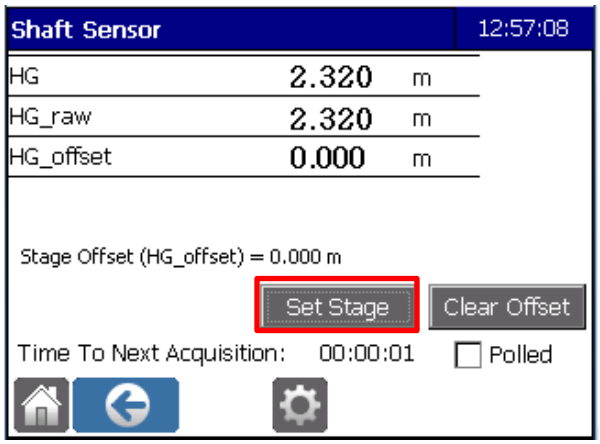


Figure 5-38: Shaft Sensor Display Screen

The Datalogger calculates the appropriate stage offset from the current stage sensor reading.

5.9.5.2 *Polling*

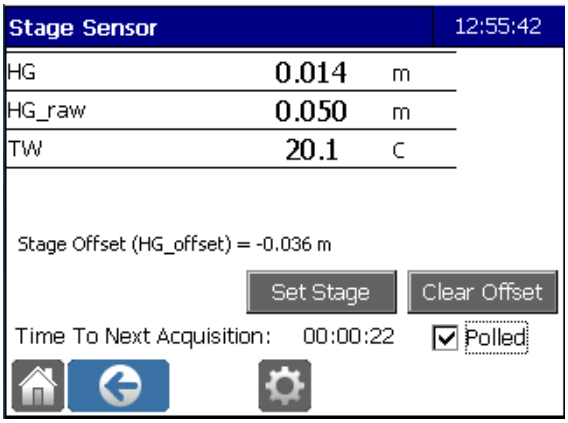
If the staff gauge The polling option is meant as a temporary measure to confirm stage sensor operations and any data collected during the polling will not be recorded by the Datalogger. It will also not affect the Stage Setup values. That is to say, once polling is stopped, interval values will revert to those originally input in the Stage Setup Screen.

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.

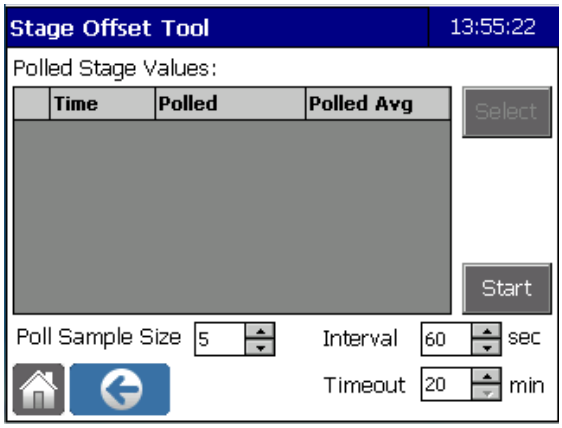
The stage reported in on the Display screen and in the Stage Offset Tool screen will use the units that the user has selected during the setup process.

The steps to set up polling follow.

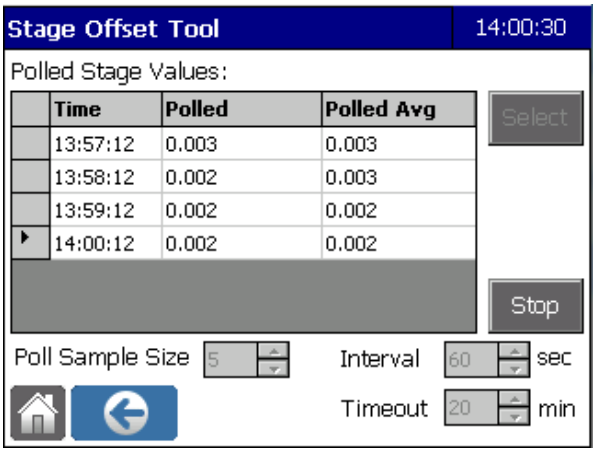
1. Select **Home>SDI-12**. From the list of mapped sensors, select the sensor you wish to poll and tap the **Polled** box, then select **Set Stage**.



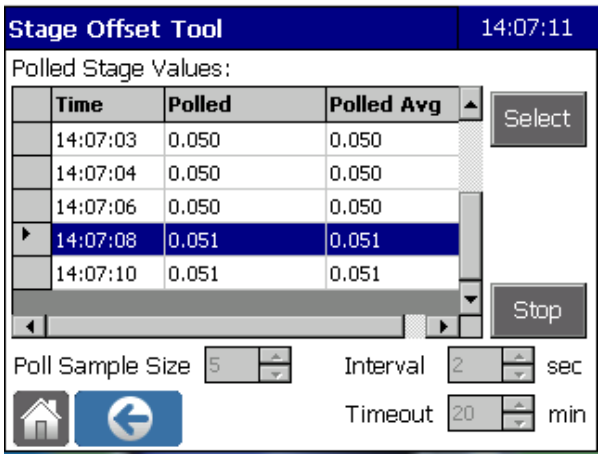
2. The Stage Offset Tool screen is displayed. Enter the desired Interval and Timeout times, Interval being the polling interval and Timeout being the period of time over which polling will take place. The Poll Sample Size refers to how many readings will be averaged per interval.



3. Synchronize your timepiece to the Datalogger and select Start. The screen is displayed in view only mode and polling commences. Polling values will be displayed until the Stop button is selected.



4. Go read the staff gauge. Note of the time and the Staff Gauge value. When you return to the Datalogger, scroll through the stage sensor readings and tap on the time that corresponds to your reading of the staff gauge. Press **Select**.



5. The **Enter Staff Gauge Value** screen appears. Enter the observed value and confirm. The new Stage Offset will be calculated.

6. Return to the **Sensor** screen and de-select the **Polled** box.

7. Press **Clear Offset** if you wish to return the Stage Offset to zero.

5.10 SDI-PT SENSOR EXTENSION (FTS PRESSURE TRANSDUCER)

Figure 5-37 shows the **FTS Pressure Transducer Sensor Setup** screen (**Sensor** tab), with default settings, that is provided by the SDI-PT sensor extension. This extension predefines a stage variable of HG and an auxiliary water temperature variable of TW. The SDI-PT extension is specific to the FTS SDI-PT. Refer to the sensor's operating manual for sensor command and data details.

IMPORTANT: If using the FTS SDI-PT-KEL, use the Stage Sensor Extension.

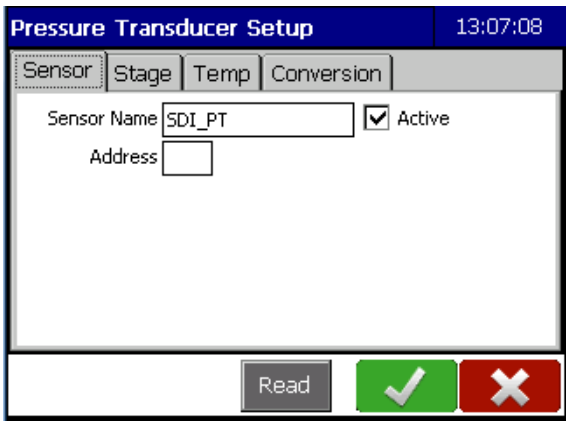


Figure 5-39

5.10.1 SENSOR TAB

The **Sensor** tab contains basic information about the sensor.

Sensor Name: The default name is SDI_PT. This can be changed if desired.

Address: Input the sensor's address.

Active: The Active box is checked by default. If this is not checked the sensor will not interact with the Datalogger.

Read: Pressing on this will return the fields that will be read by the sensor and the length of time it takes to make a measurement.

5.10.2 STAGE TAB

The Stage tab controls the stage function of the sensor.

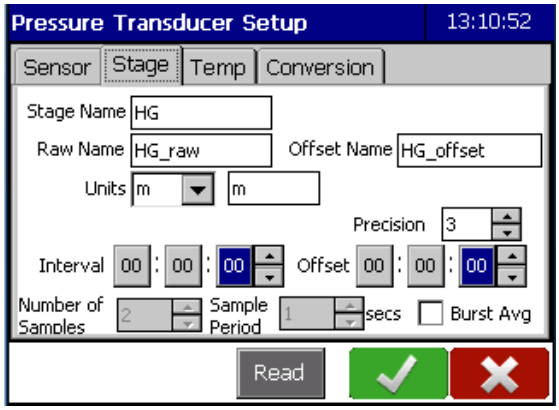


Figure 5-40: Pressure Transducer Stage Tab

Stage Name: specifies the variable for the stage value returned by the sensor.

Raw Name: This is the distance from the sensor's depth to the surface. The combination of the raw measurement plus the offset should equal the actual depth. The default name is HGS_Raw which can be changed if desired.

Offset Name: This is the depth below the sensor's position. The combination of the raw measurement plus the offset should equal the actual depth. The default name is HGS_Raw which can be changed if desired

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

Units (dropdown): Specifies the units in which the stage values will be displayed (Datalogger will convert the measured stage values of PSIG to the selected display units).

Units (textbox): Specifies the units label used in displays of the stage values. The input unit must be the equivalent of the units in the drop down menu. For example: The drop down unit is ft and feet is input as the display unit. Note that no conversion will take place so selecting ft from the drop down menu and inputting m (metres) as the display unit, will result in 3 ft being displayed as 3 m.

Interval: Specifies how often the stage readings are made

Offset: Specifies the schedule of stage readings on this sensor based on time after midnight. See section 5.6 for details of calculating Offset time.

Example: An interval of 00:15:00 and an offset of 00:10:00 means readings will be taken every 15 minutes commencing at 00:10:00, then 00:25:00, 00:40:00, etc.)

Burst Avg: This activates the burst averaging feature for stage values. A burst average is formed at each measurement event by collecting the indicated **Number of 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.

5.10.3 TEMP TAB

The **Temp** tab allows the user to specify an auxiliary water temperature measurement.

Temp Name specifies the variable 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.

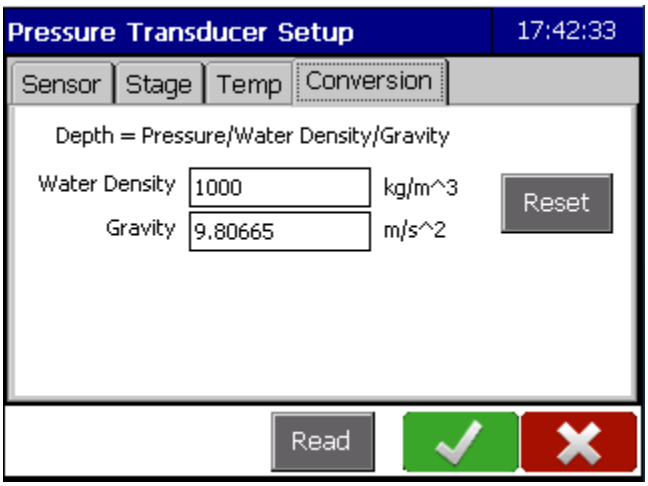


Figure 5-41 Pressure Transducer – Temp Tab

5.10.4 CONVERSION TAB

The **Pressure Transducer Set-up** screen – **Conversion** tab sets up the equation used to convert measured water pressure to estimated water depth. This is the value given to the Raw Name measurement variable defined on the **Stage** tab.

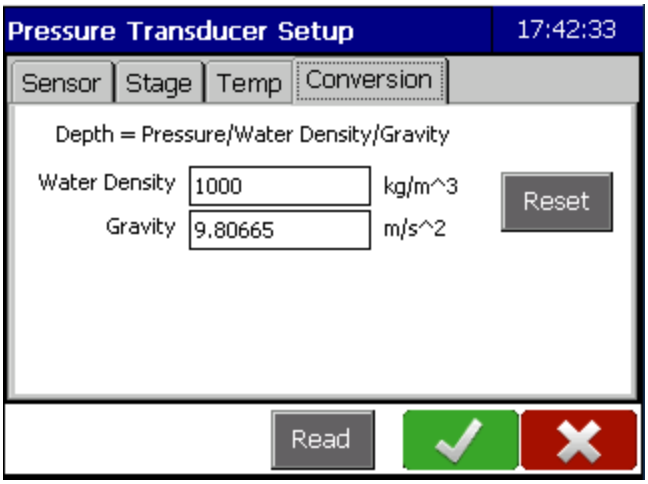


Figure 5-42: Pressure Transducer – Conversion Tab

The conversion equation used is:

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

Where:

d is estimated water depth (meters),

p is measured water pressure (Pa),

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

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

The conversion equation of pressure in Pascal to PSI is:

$$1Pa = 1N/m^2 = 1kg/ms^2 \ = 0.000145038\ psi$$

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

Read: When pressed, the sensor will take a reading.

5.10.5 SDI-PT SENSOR DISPLAY SCREEN

Once all fields for the tabs screens have been setup, select **OK**. Pressing on the SDI-PT icon will display the SDI-PT Sensor Screen.

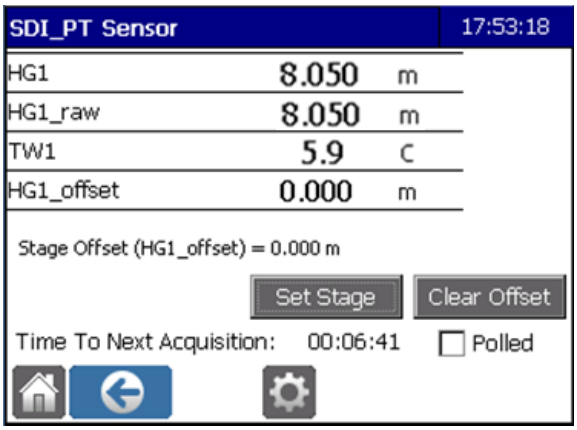


Figure 5-43: Configured SDI-PT Sensor Screen

Once the sensor has been configured and is operating, the **Set Stage** and **Clear Offset** buttons can be used. They are present only if a stage variable has been configured on the **Stage** tab.

Set Stage and **Clear Offset** enable the user to set the stage offset value. They are present when a Stage variable is configured on the **Stage** tab.

There are two methods available for setting the stage offset in the Datalogger depending on if the staff gauge reading is known or not. If it is known use the **Set Stage** button. If it is not known, use the **Polled** feature.

5.10.6 SET STAGE VALUES

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

5.10.6.1 *Staff Gauge Reading Known*

If the staff gauge reading is known, press **Set Stage**, enter the staff gauge value, and confirm the changes.

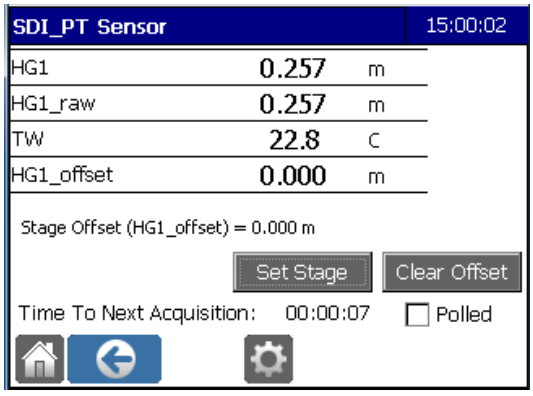


Figure 5-44: Set Stage

The Datalogger calculates the appropriate stage offset from the current stage sensor reading.

5.10.6.2 *Polling*

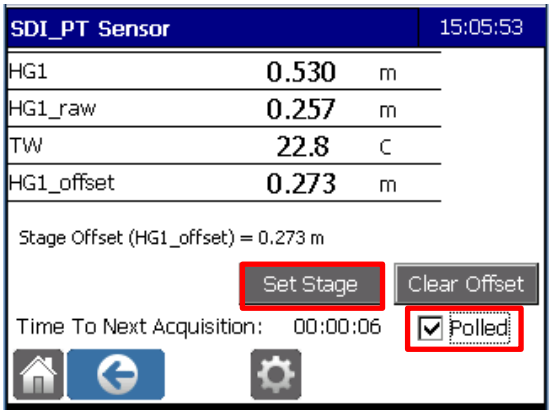
The polling option is meant as a temporary measure to confirm stage sensor operations and any data collected during the polling will not be recorded by the Datalogger. It will also not affect the Stage Setup values. That is to say, once polling is stopped, interval values will revert to those originally input in the Stage Setup Screen.

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.

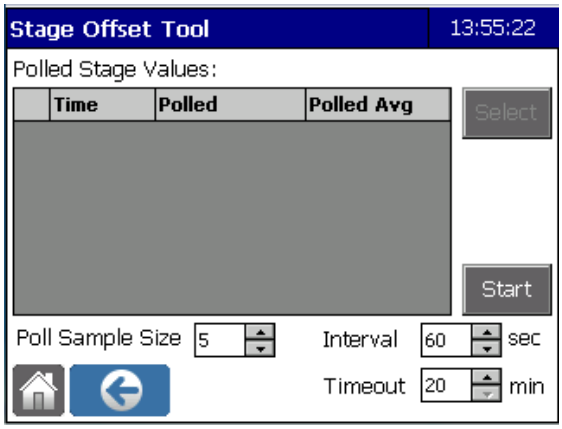
The stage reported in on the Display screen and in the Stage Offset Tool screen will use the units that the user has selected during the setup process (SDI-PT calc will be applied if selected).

The steps to set up polling follow.

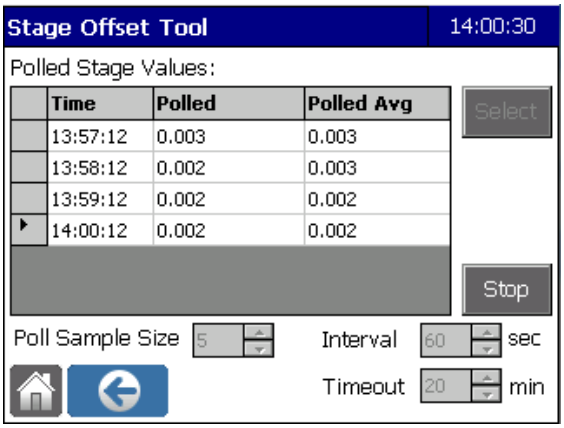
1. Select **Home>SDI-12**. From the list of mapped sensors, select the sensor you wish to poll and tap the **Polled** box, then select **Set Stage**.



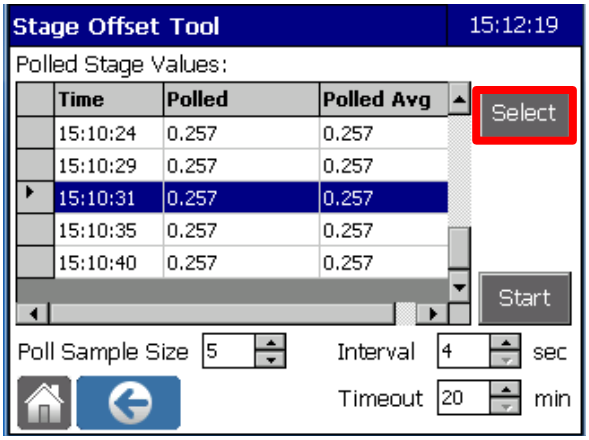
2. The **Stage Offset Tool** screen is displayed. Enter the desired **Interval** and **Timeout** times, Interval being the polling interval and Timeout being the period of time over which polling will take place. The **Poll Sample Size** refers to how many readings will be averaged per interval.



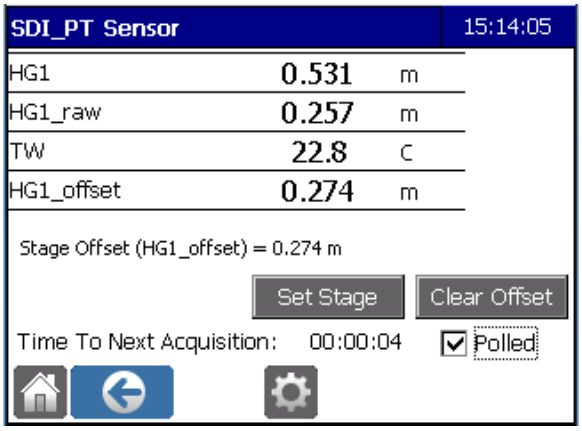
3. Synchronize your timepiece to the Datalogger and select **Start**. The screen is displayed in view only mode and polling commences. Polling values will be displayed until the **Stop** button is selected.



4. Go read the staff gauge. Note the time and the Staff Gauge value. When you return to the Datalogger select STOP, scroll through the stage sensor readings and tap on the time that corresponds to your reading of the staff gauge. Press **Select**.



5. The **Enter Staff Gauge Value** screen appears. Enter the observed value and confirm. The new Stage Offset will be calculated.



6. Return to the **Sensor** screen and de-select the **Polled** box.

7. Press **Clear Offset** to return the Stage Offset to zero.

5.11 SDI-AM SENSOR EXTENSION

Figure 5-43 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. 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, for SDI-AM operating details.

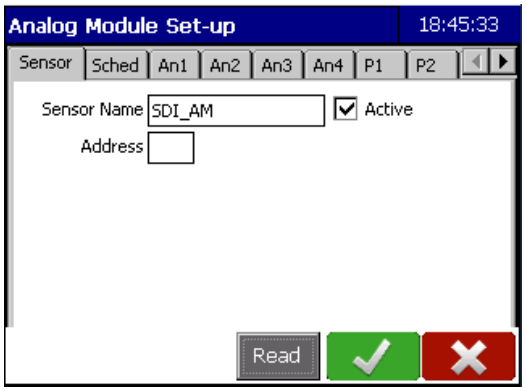


Figure 5-45: Analog Module Set-up – Sensor Screen

5.11.1 SENSOR TAB

The **Sensor** tab contains basic information about the sensor.

Sensor Name: The default name is SDI_AM. This can be changed if desired.

Address: Input the sensor's address.

Active: The Active box is checked by default. If this is not checked the sensor will not interact with the Datalogger.

Read: Pressing on this will return the fields that will be read by the sensor and the length of time it takes to make a measurement.

5.11.2 SCHED TAB

This tab controls the schedule of sensor readings.

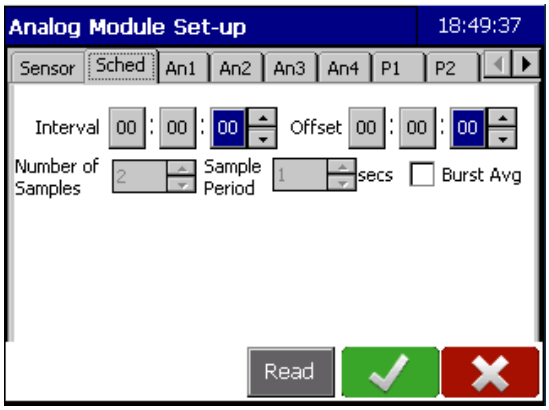


Figure 5-46: Analog Module Set-up – Sched Tab

Interval: Specifies how often the stage readings are made

Offset: Specifies the schedule of stage readings on this sensor based on time after midnight

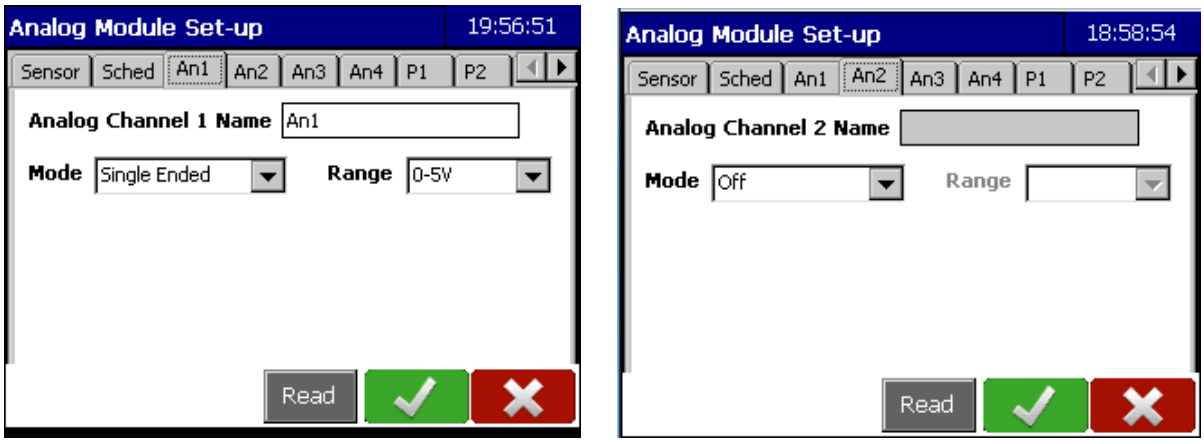
> Example: An interval of 00:15:00 and an offset of 00:10:00 means readings will be taken every 15 minutes commencing at 00:10:00, then 00:25:00, 00:40:00, etc.)
>
> See section 5.6 for details of calculating Offset time

Burst Avg: This activates the burst averaging feature. A burst average is formed at each measurement event by collecting the indicated **Number of 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.

5.11.3 ANALOG INPUT SETTINGS

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. 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 variable in the Datalogger.



An1 Tab An2 Tab

Figure 5-47: Analog Module Set-up – Analog Channel Tab

Analog Channel X Name: An1 has a default name of An1. This can be changed if desired. The other channel have no default name and one must be entered

Mode: Use the drop down menu to select the mode used by the sensor. The choices are **Off, Single ended, Differential,** or **Current**.

Range: Analog channel values are reported in millivolts (mV) or milliamps (mA) depending on the channel's **Mode** setting. The Range drop down selection will reflect the selected Mode parameters.

5.11.4 POWER OUTPUT SETTINGS

On the **Analog Module Setup** screen, two tabs – **P1** and **P2** – are used to configure the module's two power outputs. The two tabs are only used to configure the SDI-AM module power outputs – the power outputs do not appear as variables in the Datalogger.

There are four power output options:

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**

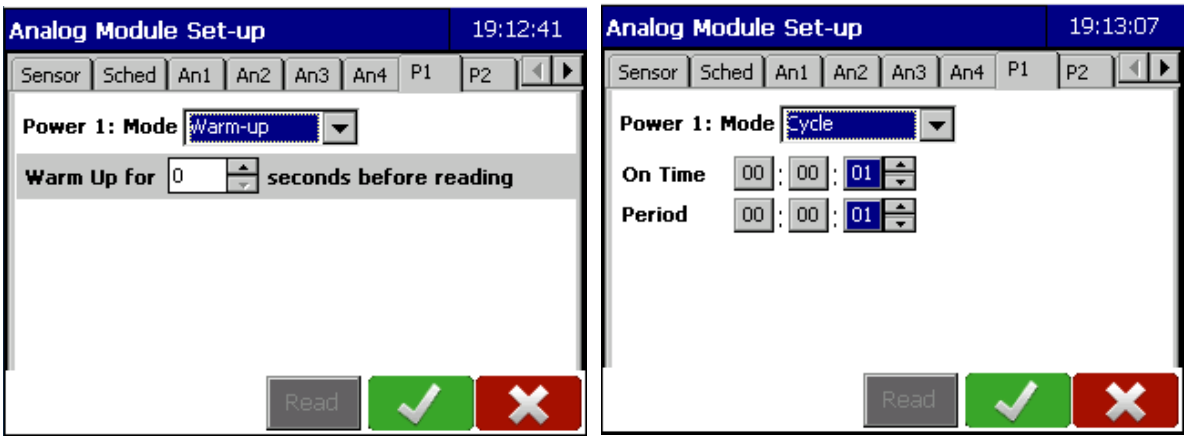


Figure 5-48: Analog Module Set-up – Power Output Tabs

Warm-up Mode: Input the desired warm up time. This allows the instrument time to warm up before taking a measurement. Ensure sufficient time is given for a full warm-up.

Cycle Mode: Will continually power cycle in accordance with the **On Time** and **Period.**

On Time: This is the length of time for which the instrument will be turned.
Period: This is how often the power will cycle.

For Example: An On Time of 2 minutes and a Period of 2 hours means the instrument will turn on for 2 minutes every two hours.

5.11.5 EXCITATION OUTPUT SETTINGS

On the **Analog Module Setup** screen, two tabs – **Ex1** and **Ex2** – are used to configure the module's two excitation outputs. The two tabs are only used to control the SDI-AM module excitation outputs – the excitation outputs do not appear as variables in the Datalogger.

The voltage of each excitation output is independently set from the following options:

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

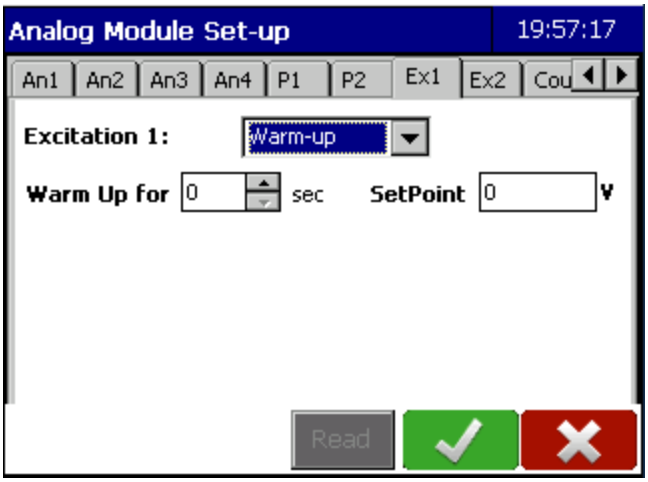


Figure 5-49: Excitation Output Tab – Warm-up option

Warm-up: When the Warm-up option is selected you must input the warm-up time.

SetPoint: Specifies the excitation output voltage (range of 0.000 to 5.000 Volts).

5.11.6 COUNTER SETTINGS

The **Count** tab is used to configure the module's counter input.

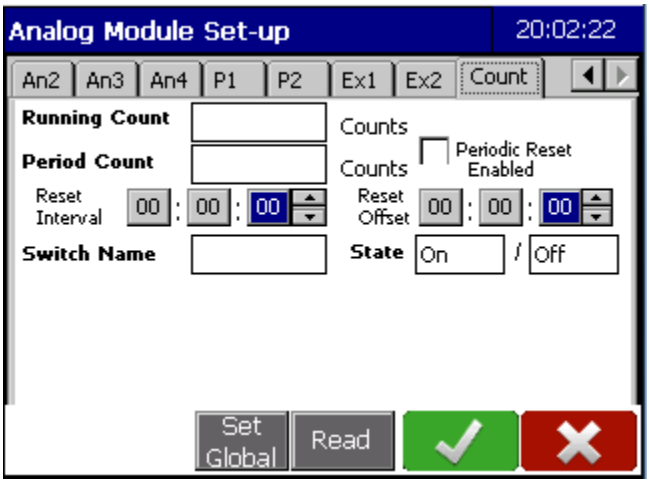


Figure 5-50: Count Tab

Running Count: Enter a unique name in the text box to enable the running counter as a variable in the Datalogger.

Period Count: Enter a unique name in the text box to enable the periodic counter as a variable in the Datalogger.

Periodic Reset Enabled Checkbox: When selected, the Periodic Counter will periodically be set back to zero at the specified **Reset Interval** and **Reset Offset** times.

Reset Interval: The frequency of the Periodic Reset. Input the desired value.

Reset Offset: Specifies the schedule of the reset interval based on time after midnight

Example: A Reset Interval of 01:00:00 and an offset of 00:10:00 means the Periodic Counter will reset hourly at 10 minutes after the hour (at 00:10:00, then 01:00:00, 02:10:00, etc.)

Switch Name: Enter a unique name in the text box to enable a Counter Input State variable in the data logger.

State: The default units for the "Switch Name" variable are "On" for a high level of '1' (3 V) and "Off" for a low level of '0' (0 V).

Set Global: This button is used to set the Running Counter to an absolute value.

5.11.7 DISPLAY SCREEN

Once all tabs have been configured, select **OK**. Pressing on the SDI-AM icon will display its current readings. Note that only configured analog input and count variables are displayed. Power and Excitation configurations are not displayed as they are not Datalogger variables.

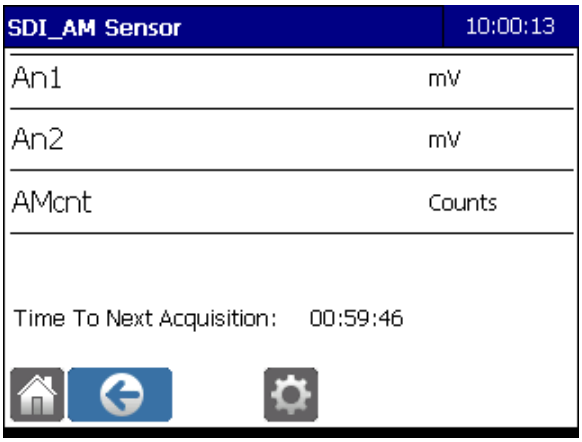


Figure 5-51: Configured SDI-AM Sensor Screen

5.12 TAVIS SENSOR EXTENSION

Figure 5-50 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.

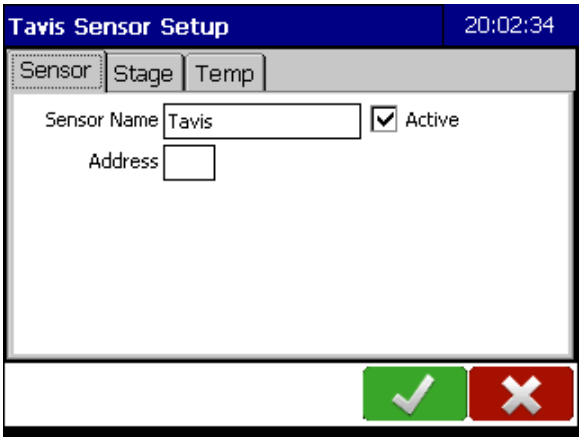


Figure 5-52: Tavis Sensor Setup Screen

5.12.1 SENSOR TAB

Sensor Name: The default name is Tavis. This can be changed if desired.

Address: Input the sensor's address.

Active: The Active box is checked by default. If this is not checked the sensor will not interact with the Datalogger.

5.12.2 STAGE TAB

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

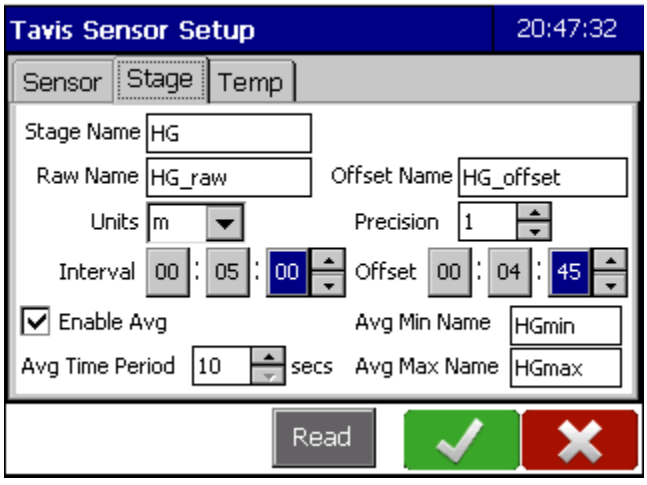


Figure 5-53:

Stage Name: Specifies the variable for the stage value returned by the sensor. The default name is HG. It can be changed by pressing on the text box and using the keyboard to enter the desired name.

Raw Name: This is the distance from the sensor's depth to the surface. The combination of the raw measurement plus the offset should equal the actual depth. The default name is HGS_Raw which can be changed if desired.

Offset Name: : This is the depth below the sensor's position. The combination of the raw measurement plus the offset should equal the actual depth. The default name is HGS_Raw which can be changed if desired

Units: Use the drop down menu to select the units in which the sensor returns the stage values.

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

Interval: Specifies how often the stage readings are made

Offset: Specifies the schedule of stage readings on this sensor based on time after midnight

Example: An interval of 00:15:00 and an offset of 00:10:00 means readings will be taken every 15 minutes commencing at 00:10:00, then 00:25:00, 00:40:00, etc.)

See section 5.6 for details of calculating Offset time

Enable Avg Checkbox: : This 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. The command that is sent when Enable Avg is selected is **aLttt!** (where 'a' is the address and 'ttt' is the interval in seconds).

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 variable. The default name is HGmin and can be changed if desired.

Avg Max Name: Specifies the name for the maximum value variable. The default name is HGmax and can be changed if desired.

Read: Pressing on this will return the fields that will be read by the sensor and the length of time it takes to make a measurement.

5.12.3 TEMP TAB

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

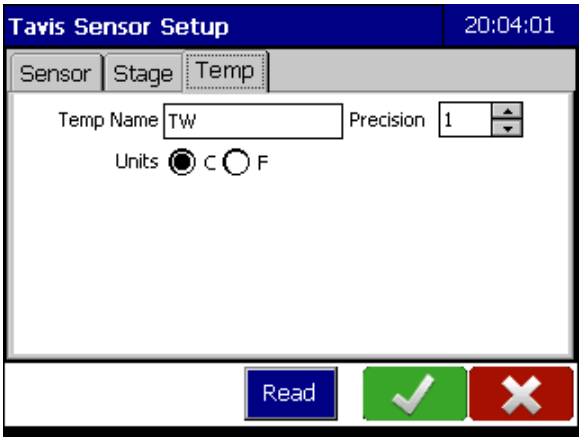


Figure 5-54: Temperature Tab

Temp Name: Specifies the name of the variable for temperature values from the sensor. The default name is TW and can be changed if desired.

Precision: Specifies the number of decimal places used to display temperature values and in calculations and other processes.

Units Specifies the units used to measure temperature values.

5.12.4 DISPLAY SCREEN

Once all tabs are configured, press **OK**. Pressing on the Tavis con will display its current readings.

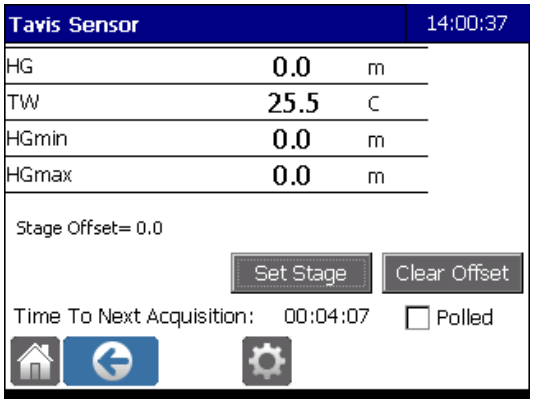


Figure 5-55: Tavis Sensor Display Screen

5.12.5 SETTING STAGE OFFSET VALUES

Once the sensor has been configured and is operating, the **Set Stage** and **Clear Offset** buttons can be used. They are present only if a stage variable 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. There are two methods available for setting the stage offset in the Datalogger.

5.12.5.1 *Staff Gauge Reading Known*

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

Confirm the changes.

5.12.5.2 *Polling*

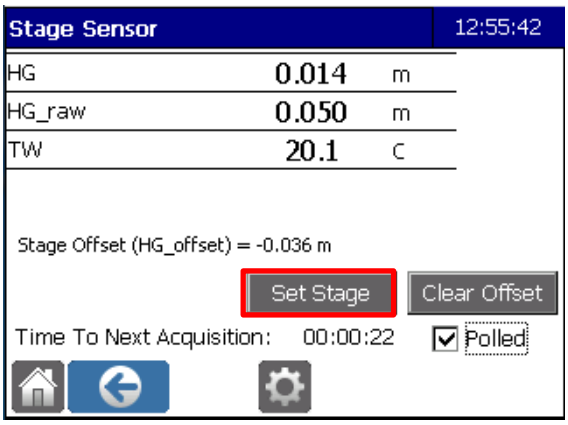
The polling option is meant as a temporary measure to confirm stage sensor operations and any data collected during the polling will not be recorded by the Datalogger. It will also not affect the Stage Setup values. That is to say, once polling is stopped, interval values will revert to those originally input in the Stage Setup Screen.

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.

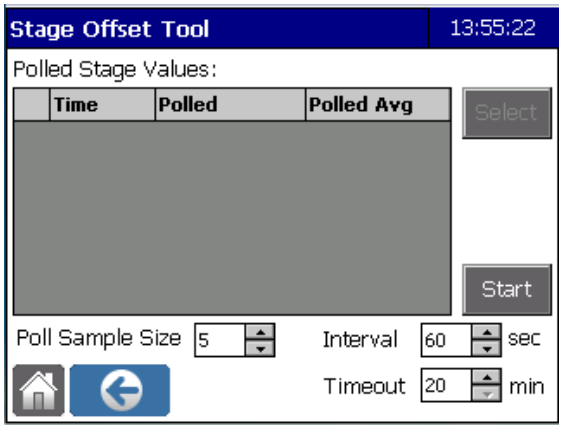
The stage reported in on the Display screen and in the Stage Offset Tool screen will use the units that the user has selected during the setup process (SDI-PT calc will be applied if selected).

The steps to set up polling follow.

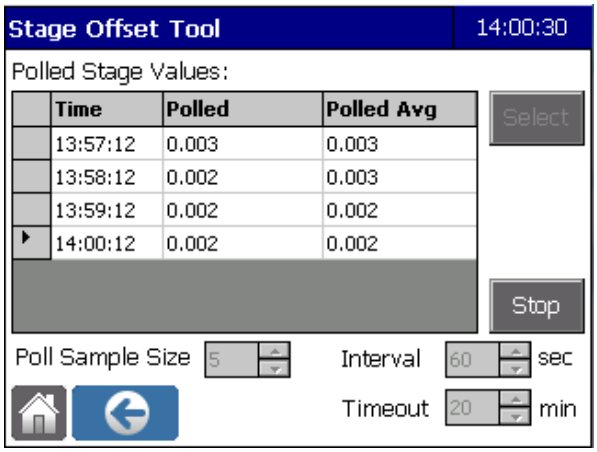
1. Select **Home>SDI-12**. From the list of mapped sensors, select the sensor you wish to poll and tap the **Polled** box, then select **Set Stage**.



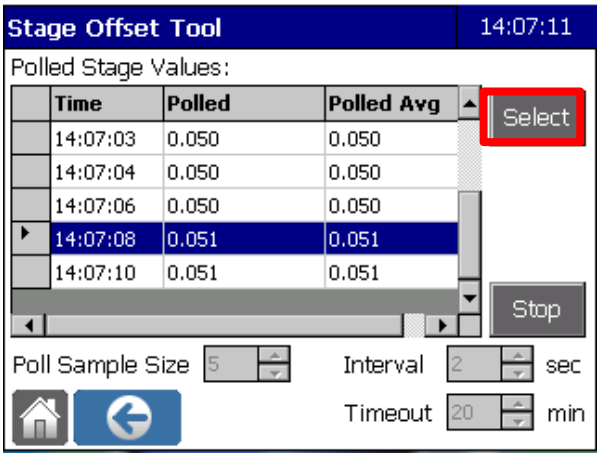
2. The **Stage Offset Tool** screen is displayed. Enter the desired **Interval** and **Timeout** times, Interval being the polling interval and Timeout being the period of time over which polling will take place. The **Poll Sample Size** refers to how many readings will be averaged per interval.



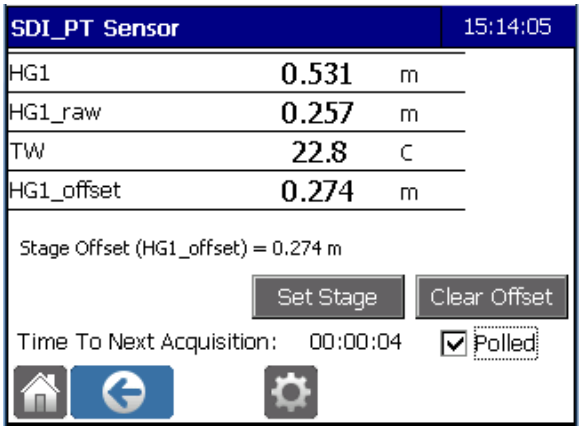
3. Synchronize your timepiece to the Datalogger and select **Start**. The screen is displayed in view only mode and polling commences. Polling values will be displayed until the **Stop** button is selected.



4. Go read the staff gauge. Note of the time and the Staff Gauge value. When you return to the Datalogger, scroll through the stage sensor readings and tap on the time that corresponds to your reading of the staff gauge. Press **Select**.



5. The **Enter Staff Gauge Value** screen appears. Enter the observed value and confirm. The new Stage Offset will be calculated.



6. De-select the **Polled** box.

7. Press **Clear Offset** to return the Stage Offset to zero.

5.13 SDI-RMY SENSOR EXTENSION

Figure 5-54 shows the **SDI-RMY Sensor Setup screen** for the FTS SDI-WS-RMY wind sensor with smart SDI-12 interface.

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.

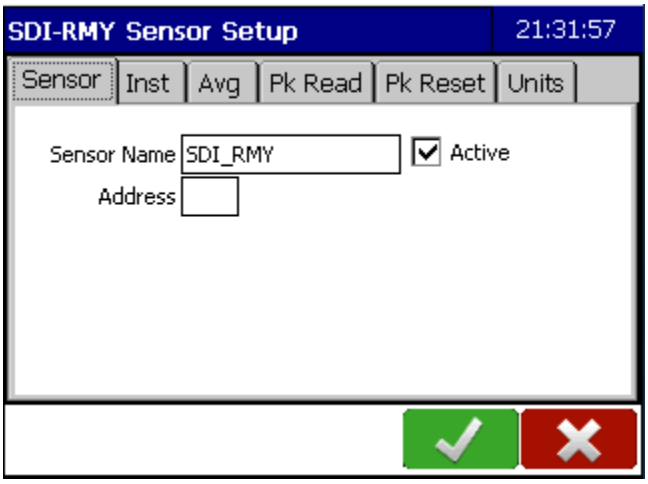


Figure 5-56: SDI-RMY Sensor Setup

5.13.1 SENSOR TAB

The **Sensor** tab contains basic information about the sensor.

Sensor Name: The default name is SDI-RMY. This can be changed if desired.

Address: Input the sensor's address.

Active: The Active box is checked by default. If this is not checked the sensor will not interact with the Datalogger.

5.13.2 INST TAB (INSTANTANEOUS WIND SPEED AND DIRECTION)

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

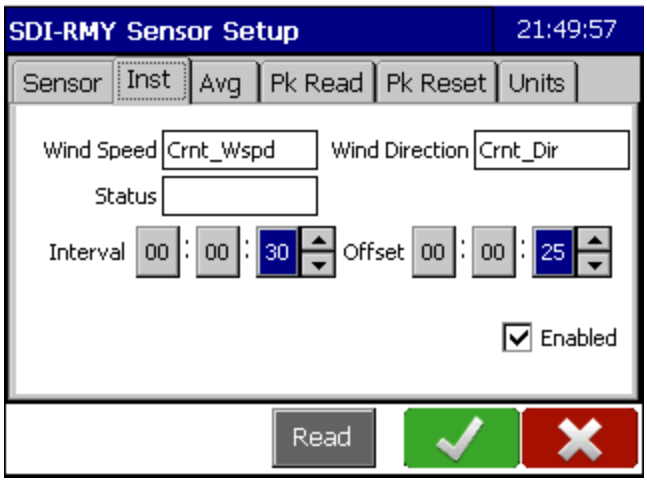


Figure 5-57: SDI_RMY Sensor Setup Screen

Wind Speed: Specifies the variable name for the current wind speed. The default name is Crnt_Wspd and can be changed if desired.

Wind Direction: Specifies the current wind direction in degrees. The default name is Crnt_Dir and can be changed if desired.

Status: A numerical code which indicates the status of the measurements. The status codes are as follows:

Status code	Meaning
• 0	• Measurement OK
• 1	• Wind direction is suspect
• 2	• RESERVED FOR FUTURE USE (Wind speed is suspect)
• 3	• RESERVED FOR FUTURE USE (Both speed and direction are suspect)
• 128	• Averaging algorithm is still in startup phase. The averaged result has been calculated with less samples than configured.

Interval: Specifies how often the instantaneous wind readings are made. The default setting is 30 seconds.

Offset: Specifies the schedule of instantaneous wind readings on this sensor based on time after midnight. The default setting is 00:00:25.

Example: An interval of 00:00:30 and an offset of 00:00:25 means readings will be taken every 30 seconds commencing at 25 seconds after the hour (at 00:00:25, 00:00:50, 00:01:25, 00:01:55 etc.).

See section 5.6 for details of calculating Offset time

Enabled Checkbox: This must be check for Instantaneous wind Readings to be taken.

5.13.3 AVG TAB (SCALAR AND/OR VECTOR AVERAGING SETTINGS)

The sensor can compute scalar and vector average wind speeds.

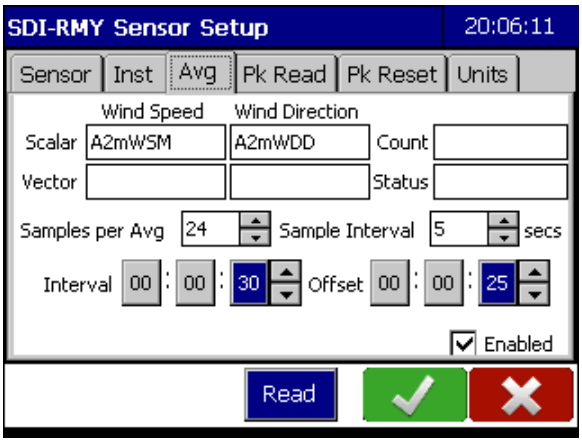


Figure 5-58: SDI_RMY Sensor – Avg Tab

Scalar: This specifies the Scalar **average**measurements for Wind Speed and Wind Direction. The default names are A2mWSM (Scalar Wind Speed) and A2mWDD (Scalar Wind Direction).

Vector: This specifies the vector measurements for Wind Speed and Direction. Input the desired variable name.

Count: This shows the number of samples taken. It will reset to zero once the Samples per Average value has been reached.

Status: A numerical code which indicates the status of the measurements. The status codes are the same as in the **Inst Tab**.

Samples per Average: Input the desired number. The default is 24. Valid range is from 1-720 samples.

Sample Interval: This specifies the period of time over which the samples will be taken**.** Input the desired sample interval time. Valid range is from 1-10 seconds. The default setting is 5 seconds.

Interval: Specifies how often the samples are made. The default setting is 30 seconds.

Offset: Specifies the schedule of samples based on time after midnight. The default setting is 00:00:25.

Example: An interval of 00:00:30 and an offset of 00:00:25 means readings will be taken every 30 seconds commencing at 25 seconds after the hour (at 00:00:25, 00:00:50, 00:01:25, 00:01:55 etc.).

See section 5.6 for details of calculating Offset time

Enabled Checkbox: This must be check for averaging samples to be taken.

5.13.4 PK READ TAB (PEAK READING)

The sensor can calculate and return two different values for peak wind speed and 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 with the corresponding direction).

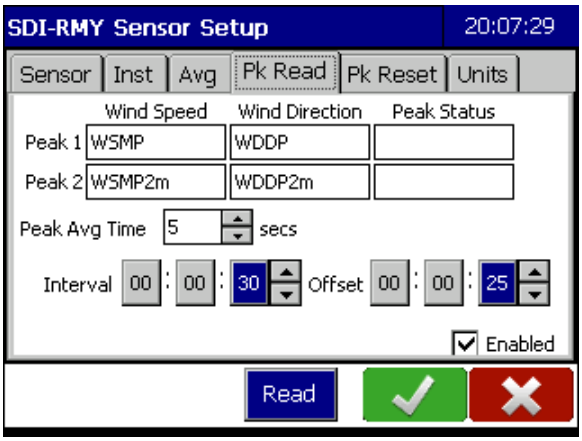


Figure 5-59: SDI-RMY – Peak Read Tab

Peak 1: This specifies the Wind Speed, Wind Direction and Peak Status. The default names are WSMP (Wind Speed) and WDDP (Wind Speed).

Peak 2: This specifies the second Wind Speed, Wind Direction and Peak Status. The default names are WSMP2m (Wind Speed) and WDDP2m (Wind Speed).

Peak Status: A numerical code which indicates the status of the measurements. The status codes are the same as in the **Inst Tab**.

Peak Average Time: This specifies the time over which the peak average will be measured. Valid range is form 0-10 seconds. If a duration of 0 is set any single wind speed sample might be registered as the peak value.

Interval: Specifies how often the readings are made. The default setting is 30 seconds.

Offset: Specifies the schedule of readings based on time after midnight. The default setting is 00:00:25.
Example: An interval of 00:00:30 and an offset of 00:00:25 means readings will be taken every 30 seconds commencing at 25 seconds after the hour (at 00:00:25, 00:00:50, 00:01:25, 00:01:55 etc.).

See section 5.6 for details of calculating Offset time

Enabled Checkbox: This must be check for averaging samples to be taken.

5.13.5 PK RESET TAB (PEAK RESET INTERVAL SETTINGS)

Computations for the two peak values can be reset to zero on independent schedules.

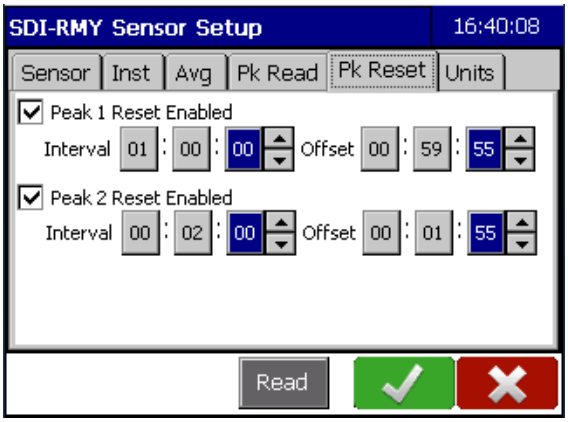


Figure 5-60: SDI-RMY – Pk Reset Tab

Peak 1/2 Reset Enabled Checkboxes: This must be selected for the selected Peak Reset to occur.

Interval: Specifies how often the peak readings will be reset in hh:mm:ss format . The default setting for Peak 1 Reset is 1 hour (01:00:00) and for Peak 2 it is 2 minutes (00:02:00).

Offset: Specifies the schedule of peak resets based on time after midnight. The default setting for Peak 1 is 00:59:55 and for Peak 2 it is 00:01:55.

Example: The Peak 1 default settings means Peak 1 will reset every hour at 59 minutes and 55 seconds after the hour (at 00:59:55, 01:59:55, 02:59:55, etc.).

See section 5.6 for details of calculating Offset time

5.13.6 UNITS TAB

The units tab provides the ability to set both the internal and display units for Wind Speed and Direction.

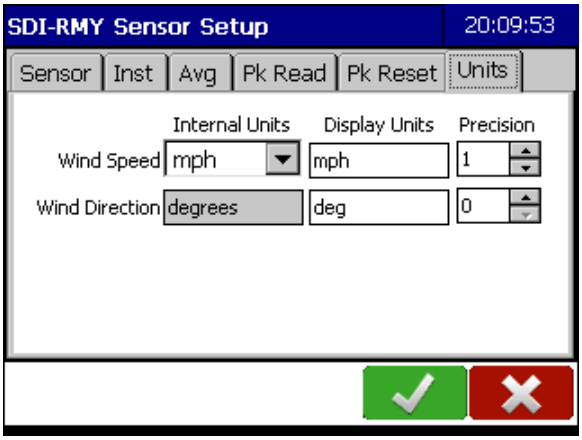


Figure 5-61: SDI-RMY – Units Tab

Wind Speed – Internal Units: Use the drop down menu to select the desired internal units. The choices are m/s (metres per second), kph (kilometres per hour), mph (miles per hour), and knots (nautical miles per hour).

Wind Speed - Display Units: Press on the text box and use the keyboard to enter the desired display unit name.

For example: mph may be displayed for internal units but you desire the displayed units to be mi/hr.

Wind Speed – Precision: Use the arrows to select the desired precision (number of decimal places) of wind speed readings. Valid range is from 0-7.

Wind Direction – Internal Units: The only available internal unit is degrees.

Wind Direction – Display Units: Press on the text box and use the keyboard to enter the desired display unit name.

Wind Direction – Precision: Use the arrows to select the desired precision (number of decimal places) of wind direction readings. Valid range is from 0-7.

5.13.7 SDI-RMY SENSOR DISPLAY SCREEN

Once all tabs have been configured, select **OK** (on any tab) to save the configuration. When the SDI-RMY icon is pressed the SDI-RMY Sensor screen will be displayed.

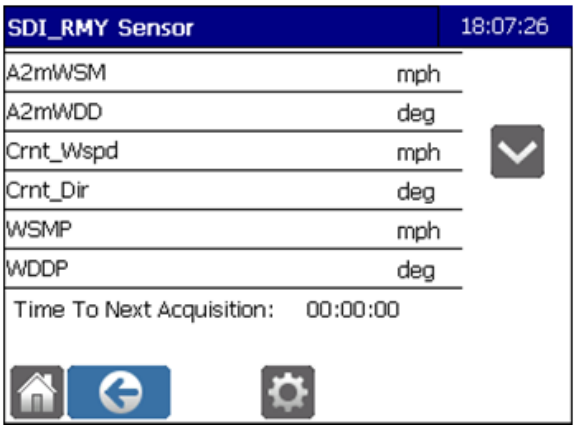


Figure 5-62: SDI-RMY Sensor Screen

Use the arrow to scroll through the variables which often extend beyond the screen display.

Press the Setup cog to make any amendments to the configuration.

5.14 DIGITEMP SENSOR EXTENSION

Figure 5-61 shows the DigiTemp Sensor Setup screen (Sensor tab), with default settings, that is provided by the FTS DigiTemp (Digital Temperature Sensor) sensor extension. This extension predefines a water temperature variable of TW. Refer to the sensor's operating manual for sensor command and data details.

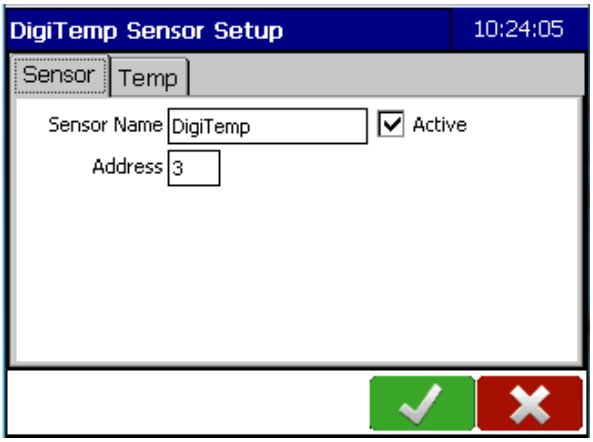


Figure 5-63: DigiTemp Sensor Setup Screen

5.14.1 SENSOR TAB

The **Sensor** tab contains basic information about the sensor:

Sensor Name: The default name is DigiTemp. This can be changed if desired.

Address: Input the sensor's address.

Active: The Active box is checked by default. If this is not checked the sensor will not interact with the Datalogger.

5.14.2 TEMP TAB (TEMPERATURE TAB)

The **Temp** tab allows the user to specify a water temperature measurement.

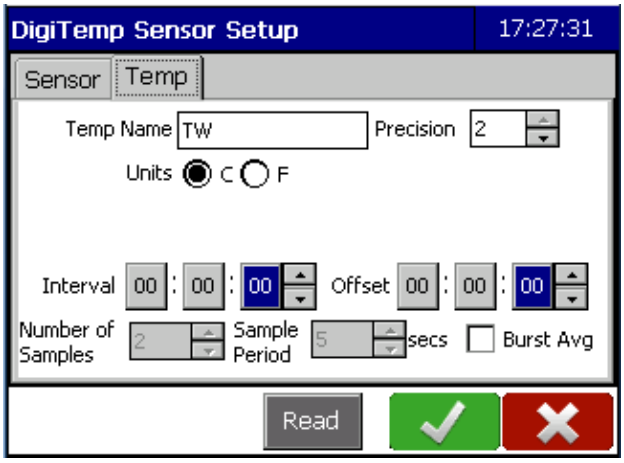


Figure 5-64: DigiTemp – Temp Tab

Temp Name: Specifies the variable name for the temperature value returned by the sensor. The default name is TW and can be changed if desired. If no temperature measurement is desired, **Temp Name** should be blank.

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

Units: Specifies the units in which the sensor returns temperature values. Select the desired radio button: C for degrees Celsius and F for degrees Fahrenheit.

Interval: Specifies how often the temperature readings are made

Offset: Specifies the schedule of temperature readings based on time after midnight

Example: An interval of 00:15:00 and an offset of 00:10:00 means readings will be taken every 15 minutes commencing at 00:10:00, then 00:25:00, 00:40:00, etc.)

See section 5.6 for details of calculating Offset time

Burst Avg Checkbox: This must be selected to activate the burst averaging feature. A burst average is formed at each measurement event by collecting the indicated **Number of Samples** at intervals specified by **Sample Period**, and taking the average.

Number of Samples: This is enabled only when **Burst Avg** is selected. Use the arrows to input the desired number of samples. Valid range is from 2-99.

Sample Period: This is enabled only when **Burst Avg** is selected. Use the arrows to input the desired number of samples. Valid range is from 5-60.

Note: The DigiTemp sensor always uses the “M” measure command.

5.14.3 DIGITEMP SENSOR DISPLAY SCREEN

This screen displays the current readings from the DigiTemp sensor.

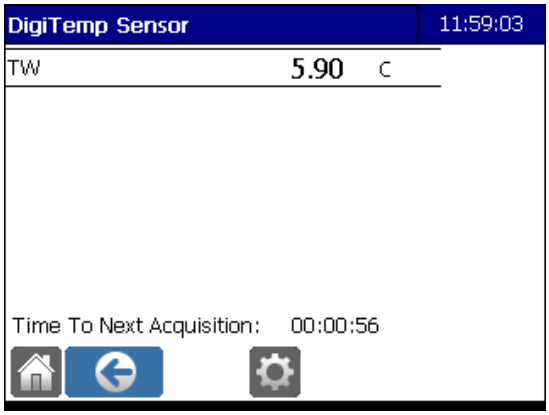


Figure 5-65: DigiTemp Sensor Screen

5.15 SR50 SENSOR EXTENSION

The Campbell SR50 sonic ranging sensor is commonly used to measure snow depth. Figure 5-64 shows the Snow Depth Sensor Setup screen (Sensor tab) with default Sensor Name settings which can be changed if desired. Refer to the sensor’s operating manual for sensor command and data details.

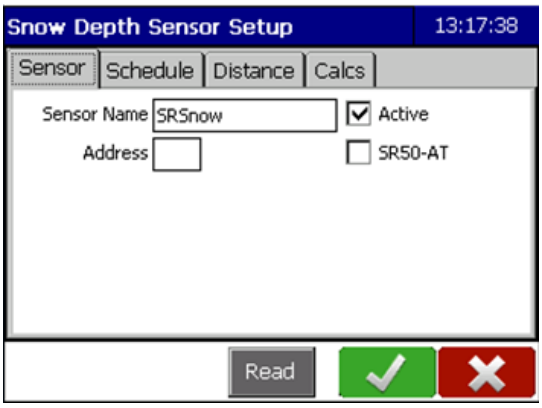


Figure 5-66: Snow Depth Sensor Setup

5.15.1 SENSOR TAB

The **Sensor** tab contains basic information about the sensor.

Sensor Name: The default sensor is the SR50-A and the default name is SRSnow.

Address: Input the sensor’s address.

Active: The Active box is checked by default. If this is not checked the sensor will not interact with the Datalogger.

SR50-AT Checkbox: If the attached sensor is model SR50-AT this box must be checked to ensure the sensor interacts with the Datalogger.

5.15.2 SCHEDULE TAB

This tab specifies the schedule of the readings and sample details.

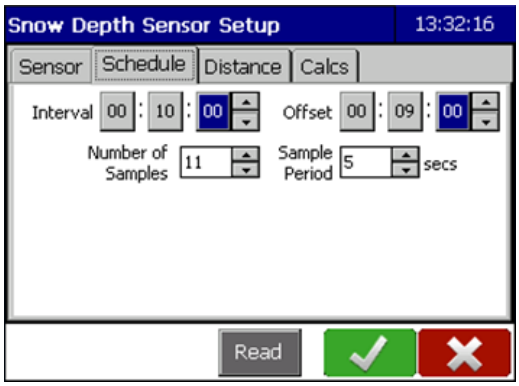


Figure 5-67: Snow Depth Sensor – Schedule Tab

Interval: Specifies how often the readings are taken

Offset: Specifies the time after the top of the hour the readings will be taken.

Example: An interval of 00:15:00 and an offset of 00:10:00 means readings will be taken every 15 minutes commencing at 00:10:00, then 00:25:00, 00:40:00, etc.)

See section 5.6 for details of calculating Offset time

Number of Samples: Specifies the number of samples which will be taken during the sample period

Sample Period: Specifies the time period over which the samples will be taken

> **NOTE!** The default Sample Number (11) and Sample Period (5 secs) are in accordance with the manufacturer recommended settings for best results.

5.15.3 DISTANCE TAB

This tab defines the distance measured by the sonic rangefinder (ie: snow depth).

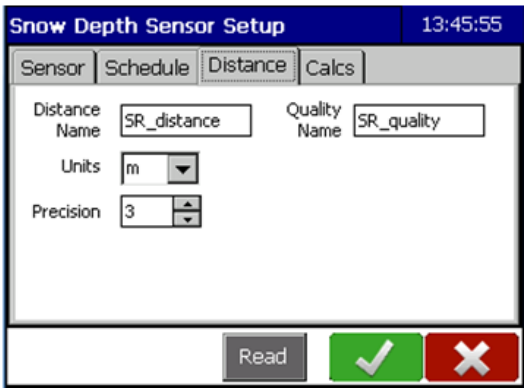


Figure 5-68: Snow depth Sensor – Schedule Tab

Distance Name: This is the name assigned to the data field returning the measured distance. The default name is SR-distance and can be changed if desired.

Quality Name: This is the name assigned to the data field returning the quality of the measurement.

Quality Number Range	Quality Range Description
0	Not able to read distance
152-210	Good measurement quality numbers
210-300	Reduced echo signal strength
300-600	High measurement uncertainty

NOTE! The Quality Name field cannot be left blank. If it is left blank, a dialog box prompting it to be filled in will be displayed.

Units: use the drop down menu to select the desired units of measurement. Choices are m (metres), cm (centimetres), mm (millimetres), ft (feet), and in (inches).

Precision: indicates the number of decimal places to which the measurements will be made. Valid range is 0-4.

5.15.4 CALCS TAB (CALCULATIONS)

This tab displays the selected calculations which will be run using the measured data. Calculations are run after every sample period using the number of samples taken during that interval.

Fields are populated with the default variable names (see Figure 5-67). The names can be changed if desired. If a field is left blank, it will not return a calculation.

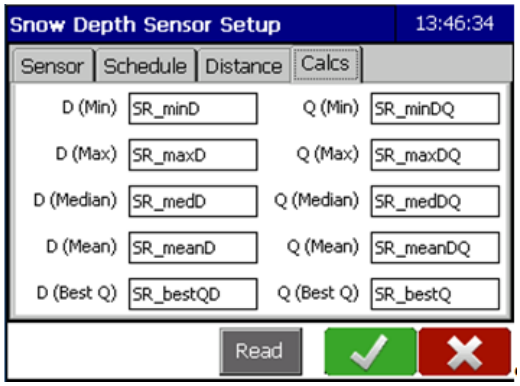


Figure 5-69: Snow Depth Sensor – Calcs Tab

The following table defines the calculation names:

D(Min): minimum returned distance (depth)	**Q(Min):** quality of the D(Min)
D(Max): maximum returned distance (depth)	**Q(Max):** quality of the D(Max)
D(Median): median retuned distance (depth)	**Q(Median):** quality of the D(Median)
D(Mean): mean returned distance (depth)	**Q(Mean)**: quality of the D(Median)
D(Best Q): best quality distance (depth)	**Q(Best Q):** quality of the D(Best Q)

5.15.5 SR SNOW SENSOR SCREEN

Once all the tabs have been configured, select **OK** on any tab to save the configuration.

Selecting the SR50 icon will display the SRSnow Sensor screen.

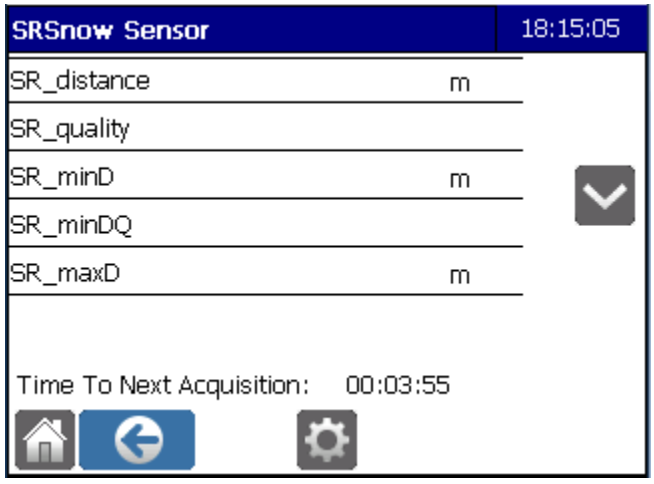


Figure 5-70: SRSnow Sensor Screen

Use the arrow to scroll through the variables which often extend beyond the screen display.

Press the Setup cog to make any amendments to the configuration.

5.16 WINDSONIC SENSOR EXTENSION

This extension is for use with the SDI-UWS-GILL ultrasonic wind speed and direction sensor. Figure 5-69 shows the WindSonic Sensor Setup screen (Sensor tab) with default Sensor Name settings. Refer to the sensor's operating manual for sensor command and data details.

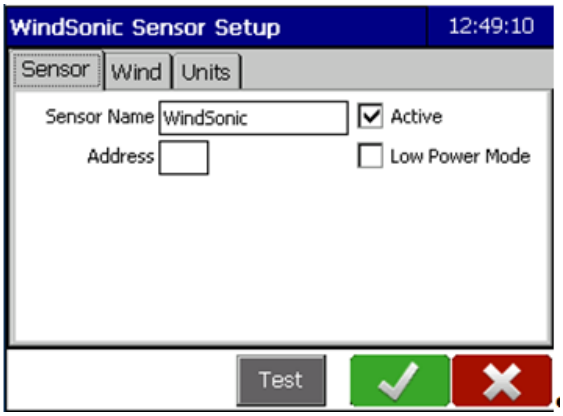


Figure 5-71: WindSonic Sensor Setup Screen

5.16.1 SENSOR TAB

The **Sensor** tab contains basic information about the sensor.

Sensor Name: The default sensor is WindSonic. This can be changed if desired.

Address: Input the sensor's address.

Active: The Active box is checked by default. If this is not checked the sensor will not interact with the Datalogger.

Low Power Mode: Select this check box to use less power. When selected, calculations will take a few seconds longer to run.

> IMPORTANT! Older model WindSonic sensors can lock up when operating in low power mode, so leave the power mode checkbox blank.
>
> WindSonic models with Gill serial numbers 15020045 and higher can be operated in either power mode.
>
> NOTE: If you require low power mode and are unsure if your WindSonic will support this, contact FTS for verification

5.16.2 WIND TAB

The Wind Tab defines the data fields for the raw wind speed and direction. Figure 5-70 shows the Wind Tab variables and their default names. Default names can be changed if desired.

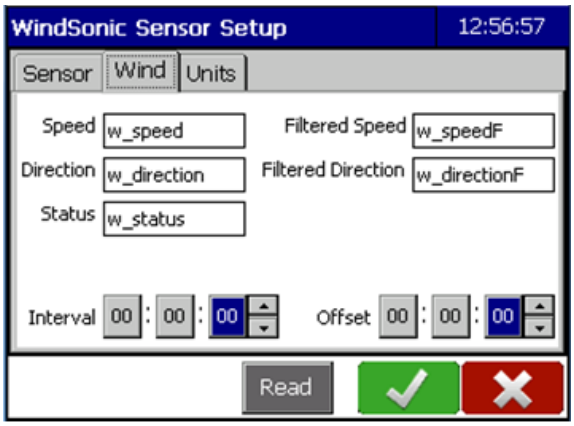


Figure 5-72: WindSonic Sensor Setup – Wind Tab

Speed: This provides the raw wind speed.

Direction: This provides the raw wind direction

Status: This provide the status of the sensor using a numerical code. The codes are outlined below. Refer to the Gill Windsonic User Manual for a detailed explanation of the codes

Code	Status	Condition
00	OK	Sufficient samples in the average period
01	Axis 1 failed	Insufficient samples in average period on U axis
02	Axis 2 failed	Insufficient samples in average period on V axis
04	Axis 1 and 2 failed	Insufficient samples in average period on both axes
08	Non Volatile Memory (NVM) error	NVM checksum failed
09	Read Only Memory (ROM) error	ROM checksum failed
A	-	NMEA data acceptable
V	-	NMEA data void

Filtered Speed: The Datalogger program automatically assigns erroneous wind readings an unrealistic wind speed value of 9999. When this field is named, these values will be filtered and replaced with "Err". If there is no filter in place, the 9999 value will cause data spikes and a cluttered data plot. Additionally, the 9999 value will be used in calculations which can lead to false positives and warnings being issued for non-existent high winds.

Filtered Direction: As for filtered speed, if this field is named, erroneous wind reading's directions will not be displayed on the data plot.

Interval: Specifies how often the readings are made.

Offset: Specifies the schedule of readings based on time after midnight

Example: An interval of 00:15:00 and an offset of 00:10:00 means readings will be taken every 15 minutes commencing at 00:10:00, then 00:25:00, 00:40:00, etc.)

See section 5.6 for details of calculating Offset time

5.16.3 UNITS TAB

This tab is used to input the units of measurement and the precision of the measurements.

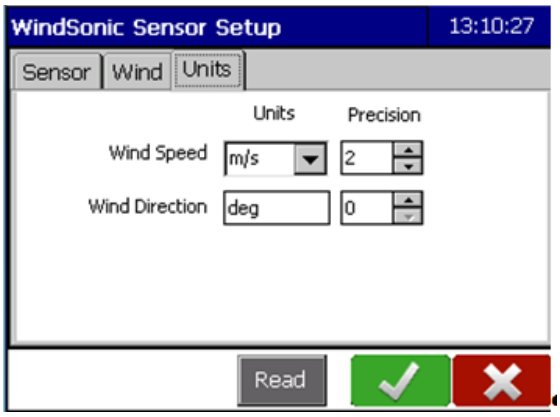


Figure 5-73: WindSonic Sensor Setup – Units Tab

Wind Speed: Use the drop down menu to select the desired units. Choices are:

m/s	metres per second
km/h	kilometres per hour
kph	kilometres per hour
mph	miles per hour
kn	knots (nautical miles per hour)

Wind Direction: Wind direction is measured in degrees.

Precision: This indicates the number of decimal places to which the measurements will be made. The maximum number is four decimal places.

5.17 RADAR STAGE SENSOR – SENSOR EXTENSION

This extension is for use with the FTS Radar Stage Sensor. Figure 5-72 shows the Radar Sensor Setup screen (Sensor tab) with default Sensor Name settings. Refer to the sensor's operating manual for sensor command and data detail

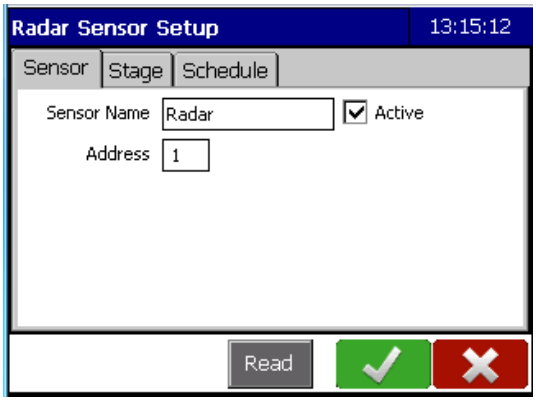


Figure 5-74: Radar Sensor Setup screen

Read: The read button appears on all tabs and will trigger a sensor reading and return the measured values for the fields (sends the "M1" Command – returns Stage, distance, quality metric, and internal temperature in °C).

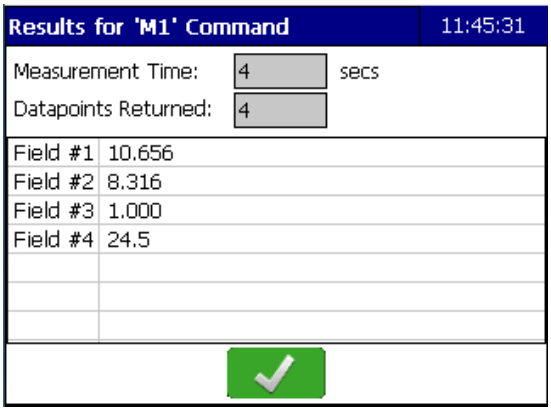


Figure 5-75: "M1" Commands read results

5.17.1 SENSOR TAB

This tab displays basic information about the sensor (Figure 5-72).

Sensor Name: The default sensor name is Radar. This can be changed if desired.

Address: This displays the sensor's address.

Active: The Active box is checked by default. If this is not checked the sensor will not interact with the Datalogger.

5.17.2 STAGE TAB

The Stage Tab defines the data fields for the Stage name and stage details. Figure 5-73 shows the StageTab variables and their default names. Default names can be changed if desired.

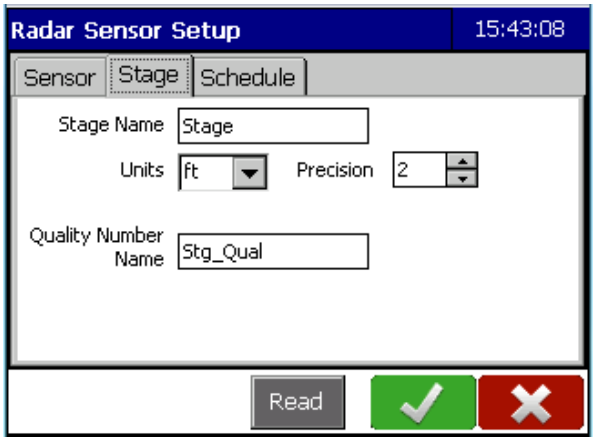


Figure 5-76: Radar Sensor Setup – Stage Tab

Stage Name: The default name is Stage. This can be changed as desired.

Units: Use the drop down menu to select the desired measurement units. The choices are ft (default units), m, or mm.

Precision: This specifies the precision (number of decimal places) in the value to be used in computations and displays. The range is from 0-7.

Quality Number: The default name is Stg_Qual. This can be changed as desired. Internal to the sensor is an algorithm which uses specific criteria to determine if a reading is reliable or not. Any reading which does not meet these criteria is discarded. The quality numbers are in decimal format and indicate the percentage of the samples taken within the sampling period which met the criteria. The numbers range from Zero (0 = no samples taken within the sampling period met measuring criteria) to One (1.0 = 100% of the samples taken met measuring criteria).

5.17.3 SCHEDULE TAB

This tab is used to setup how often samples are taken and averaged, and how long the averaging duration lasts.

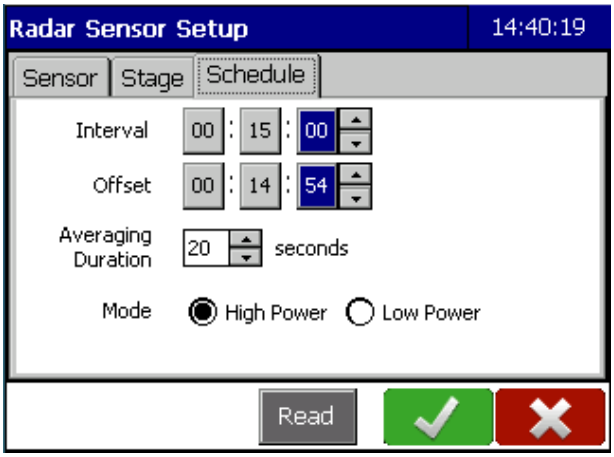


Figure 5-77: Radar Sensor Setup – Schedule Tab

Interval: This is how often the radar will take a series of samples to average to determine water depth.

Offset: This is the time after midnight that the measurement ("M1") command will be sent. The actual measurement will be taken in the amount of time returned by the "Read" button (see Figure 5-73).

> Example: Using the example of 4 seconds, an Interval of 15 minutes, and an Offset of 00:14:54, the measurement command is sent at 00:14:54. It takes four seconds to return a value, plus we added 2 second padding to ensure the returned values are available and all logging takes place by the fifteen minute mark. Subsequent measurement commands will be sent at 00:29:54, 00:44:54, etc.
>
> See section 5.6 for details of calculating Offset time

Averaging Duration: Samples taken over this duration will be used in the average. Note whether the radar is in high or low power mode. Durations of 1 to 60 seconds can be entered with the default being 20 seconds.

Mode: There are two modes:

> **High Power:** In high power mode, one sample is taken every second, continuously. These are stored in the buffer. When the scheduled time arrives (based on the input interval and offset times), the most recent samples taken will be used for the average in accordance with the Averaging Duration (ie: an averaging duration of 20 seconds will use the last 20 samples in the buffer).
>
> **Low Power:** In Low Power mode the radar "wakes up" when it is time to take samples in accordance with the schedule set using the Interval and Offset function. It then starts taking samples at the rate of one sample per second for the prescribed Averaging Duration, and then returns to the dormant state. The warming up cycle takes 65 seconds, so sampling will commence 65 seconds after the Interval/Offset time.

Once all parameters on the three tabs have been input, select **OK.**

5.18 BUBBLER SENSOR EXTENSION

This extension is for use with the FTS Bubbler. Figure 5-76 shows the Bubbler Sensor Setup screen (Sensor tab) with default Sensor Name settings. Refer to the sensor's operating manual for sensor command and data details.

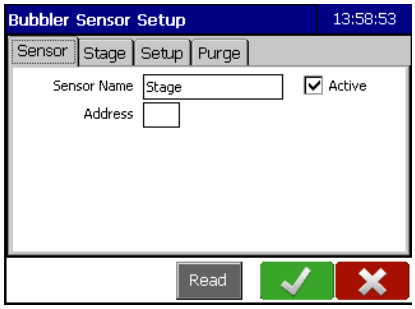
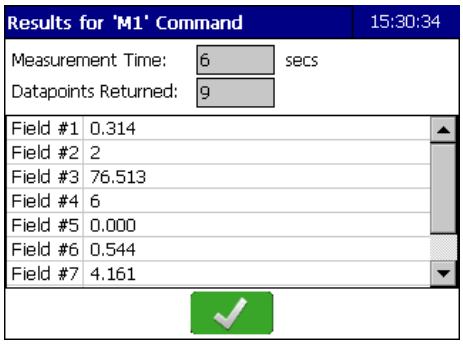
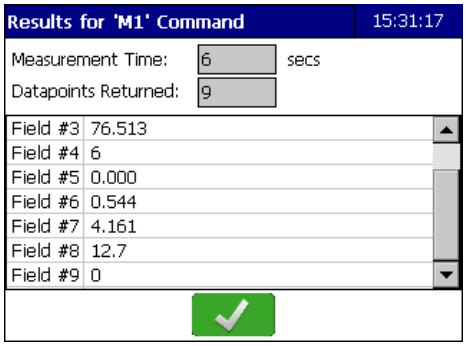


Figure 5-78: Bubbler Sensor Setup Screen

Read: The read button appears on all tabs and will trigger a sensor reading and return the measured values for the fields (sends the "M1" Command – returns Stage, units of stage, temperature, units of temperature, Offset, line pressure, tank pressure, battery voltage, and health status).

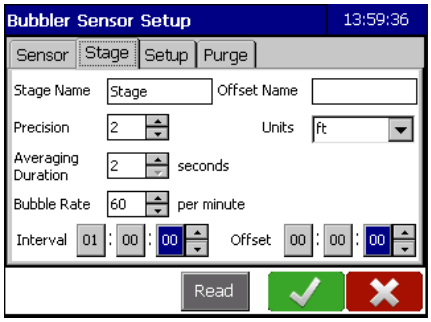




5.18.1 SENSOR TAB

Displays the default sensor name and Address of the Bubbler. See Figure 5-7.

5.18.2 STAGE TAB



Stage Name: This is the name of the data point. Stage is the default name and can be changed if desired.

Offset Name: Input the desired name for the Stage Offset data point. This must be filled in to display the offset data point in the Bubbler Sensor screen. The offset is calculated automatically by the Datalogger but will only be displayed on the main Bubbler Sensor screen if the Offset Name field is populated. For information on how to set the offset, refer to section 5.17.7.

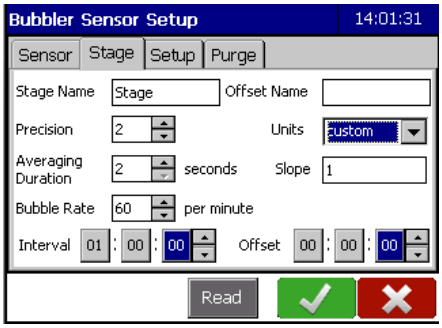
Precision: This indicates the number of decimal places to which the reading will be displayed. The maximum number is three.

Units: Select the desired units of measurement using the drop-down menu. The choices are

- m (metres)
- mm (millimetres)
- cm (centimetres)
- ft (feet)
- in (inches)
- custom

5.18.2.1 *Setting Custom Unit (Slope)*

Select Custom to input a slope. Once Custom is selected in the drop-down menu, a blank field will appear in which the desired slope can be input.



Averaging Duration: The period of time over which the samples taken will be used to calculate the displayed stage value. It takes approximately 2 seconds to take a sample. The average duration range is from 2-60 seconds.

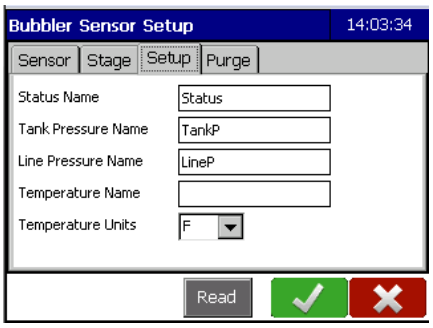
Bubble Rate: This determines the number of bubbles per minute which will be released. The rate can be set from 30-120 bubbles per minute.

Interval: This is how often a measurement will be taken. It is in HH:mm:ss format.

Offset: This determines the starting time the measurement will be taken based on time after midnight. See section 5.6 for details of calculating Offset time

For example: An interval of 01:00:00 and an offset of 00:15:00 means a measurement will be taken every hour commencing at 15 minutes after midnight (00:15:00, 01:15:00, 02:15:00, etc.).

5.18.3 SETUP TAB



Status Name: The default name is Status and can be changed if desired.

Tank Pressure Name: The default name is TankP and can be changed if desired. Units are in PSI.

Line Pressure Name: The default name is LineP and can be changed if desired. Units are in PSI.

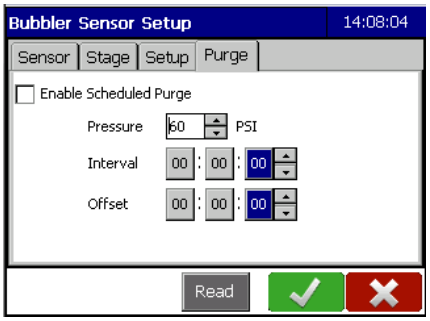
Temperature Name: Insert the desired name for the temperature variable.

Temperature Units: Select either C (Celsius) or F (Fahrenheit).

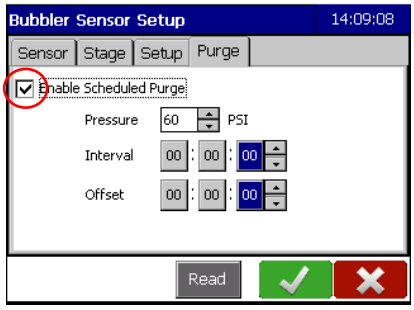
5.18.4 PURGE TAB

The Datalogger can initiate purges on a regular schedule to clear the hose outlet of silt or debris which may be blocking it. The frequency of the purges and the PSI used to conduct them are dependent on the environment and conditions of the site.

IMPORTANT! Purges will only be initiated by the Datalogger if Enable Scheduled Purge is selected. The default is to have Scheduled Purges disabled.



Purge Tab – default



Purge Tab showing Scheduled Purge enabled

Scheduled Purge: For a scheduled purge, select the **Enable Scheduled Purge** checkbox.

Select the desired pressure at which to conduct the purge. The pressure range is from 20-90 PSI. The default value is 60 PSI.

Interval: The interval is how often the purge will occur and is in HH:mm:ss format. The minimum purge interval is 10 minutes (00:10:00).

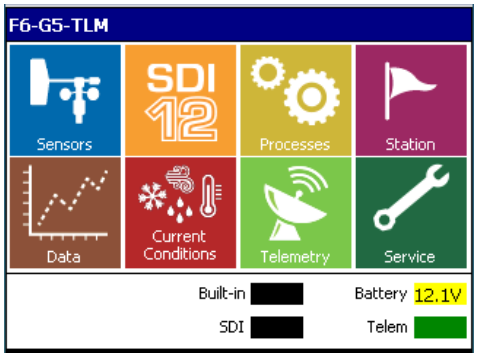
Offset: Optional. This determines the starting time the purge will commence based on time after midnight. See section 5.6 for details of calculating Offset time.

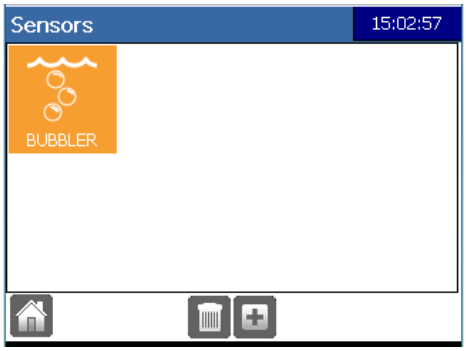
For example: An interval of 24:00:00 and an offset of 10:15:00 means the purge will take place daily at 10:15 a.m.

Once all tabs have been completed, select the OK checkmark on any tab.

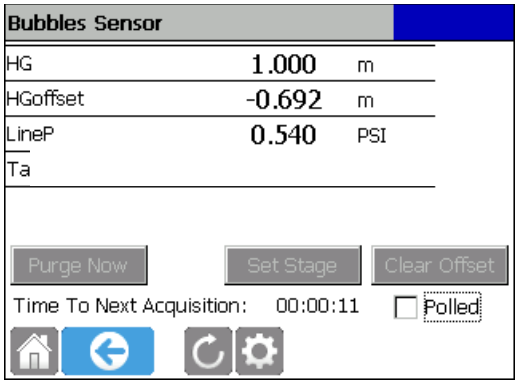
5.18.5 BUBBLER SENSOR SCREEN

From the home screen select the Sensors icon and then the Bubbler icon. Note that the name on the icon will be the same as the Sensor Name input on the Sensor tab. This example retains the default name.



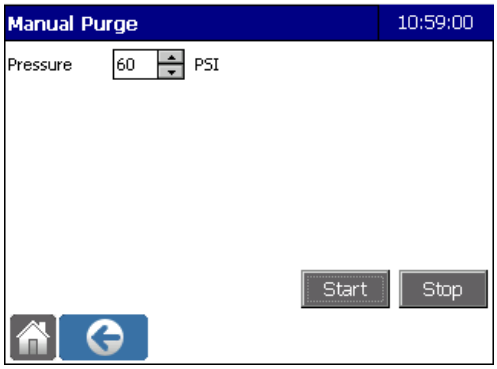


All defined data points defined in the Bubbler Sensor Setup tabs will be displayed with the latest measured values. Use the setup cog to display and edit the Bubbler Sensor Setup screen.

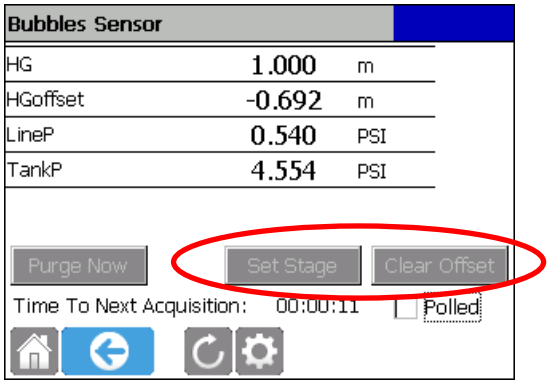


5.18.6 CONDUCT A MANUAL PURGE

Purge Now: Select this to conduct a purge. Input the desired pressure. The Purge PSI will remain at this value until changed.



5.18.7 SET STAGE AND CALCULATE/CLEAR OFFSET



Set Stage and **Clear Offset** enable the user to set and clear the stage offset value. They are present when a Stage variable is configured on the **Stage** tab. Once the stage is set, the Datalogger will automatically calculate and display the Stage Offset. The Stage Offset will be displayed as a data point if the Offset Name field was populated in the Stage Tab.

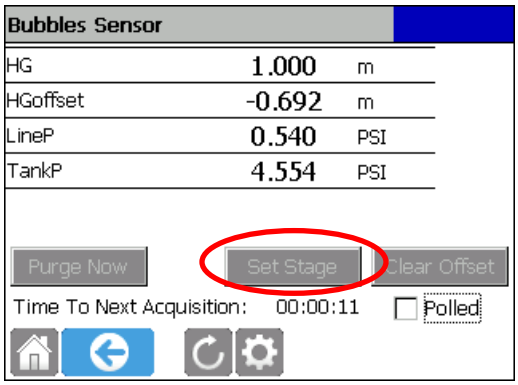
5.18.7.1 *Set Stage*

Once the sensor has been configured and is operating, the Set Stage and Clear Offset buttons can be used. They are present only if a stage variable has been configured on the Stage tab.

There are two methods available for setting the stage offset in the Datalogger depending on if the staff gauge reading is known or not. If it is known use the **Set Stage** button. If it is not known, use the **Polled** feature.

5.18.7.2 *Staff Gauge Reading Known*

If the staff gauge reading is known, press **Set Stage**, enter the staff gauge value, and confirm the changes.



The Datalogger calculates the appropriate stage offset from the current stage sensor reading.

5.18.7.3 *Polling*

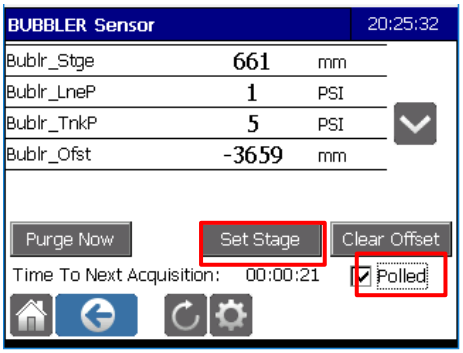
The polling option is meant as a temporary measure to confirm Bubbler operations and any data collected during the polling will not be recorded by the Datalogger. It will also not affect the Bubbler Setup values. That is to say, once polling is stopped, interval values will revert to those originally input in the Bubbler Setup Screen.

The user can select the Polled checkbox and then press Set Stage to begin a series of Bubbler 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 Bubbler reading and then enter the staff gauge value so that the Datalogger can calculate the appropriate stage offset.

The stage reported on the Display screen and on the Stage Offset Tool screen will use the units that the user has selected during the setup process.

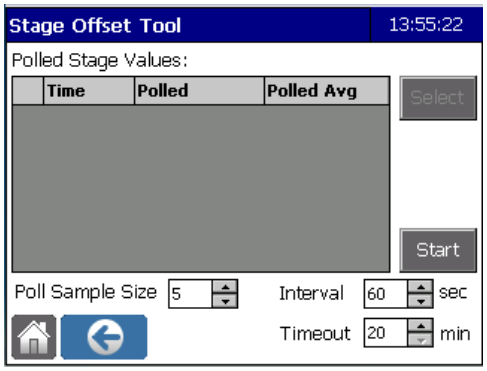
The steps to set up polling follow:

1. Tap the **Polled** box, and then select **Set Stage**.



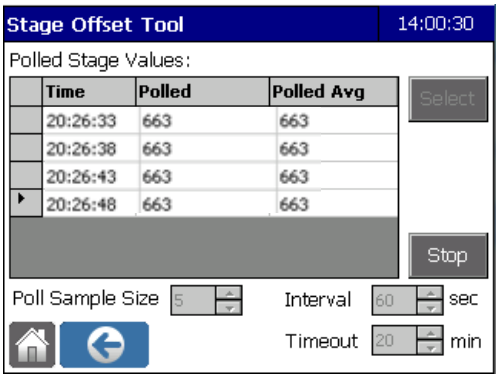
2. The **Stage Offset Tool** screen is displayed. Enter the desired **Interval** and **Timeout** times.

   Interval is the polling interval and Timeout is the period of time over which polling will take place. The **Poll Sample Size** refers to how many readings will be averaged per interval.



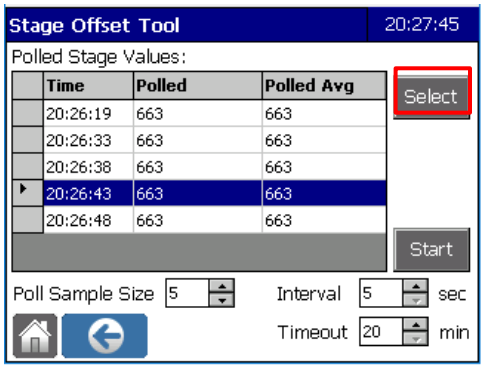
3. Synchronize your timepiece to the Datalogger and select **Start**.

   The screen is displayed in view only mode and polling commences. Polling values will be displayed until the **Stop** button is selected.

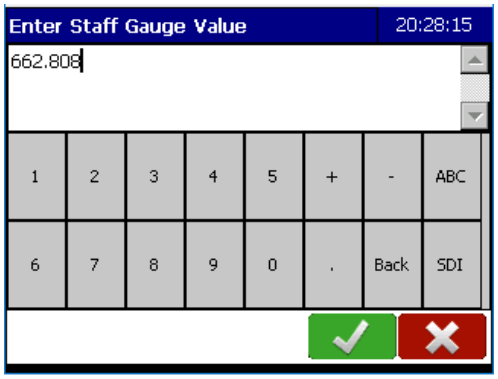


4. Go read the staff gauge. Note the time (hour, minute and second) and the observed Staff Gauge value.

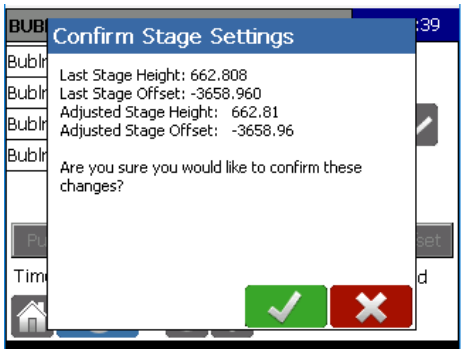
5. When you return to the Datalogger select STOP, scroll through the stage sensor readings and tap on the time that corresponds to your reading of the staff gauge. Press **Select**.



6. The **Enter Staff Gauge Value** screen appears. Enter the observed value.



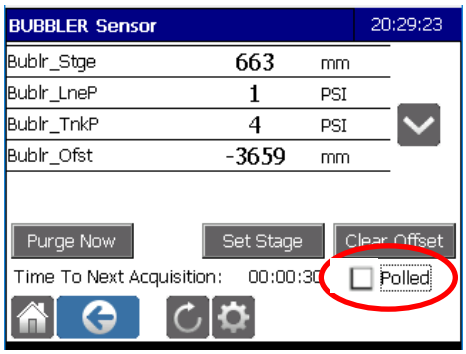
7. Confirm the new stage settings.



8. De-select the **Polled** box. The new Stage Offset will be calculated

9. De-select the **Polled** box

IMPORTANT! You MUST de-select the polled box for the stage calculation to be implemented.



To return the Stage Offset to zero, press **Clear Offset**.

5.19 SDI-THS SENSOR EXTENSION

This extension is for use with the FTS SDI-THS (Temperature and Humidity Sensor, Temperature sensor, or Fuel Stick). Figure 5-77 shows the SDI-THS Sensor Setup screen (Sensor tab) with default Sensor Name settings. Refer to the sensor's operating manual for sensor command and data details.

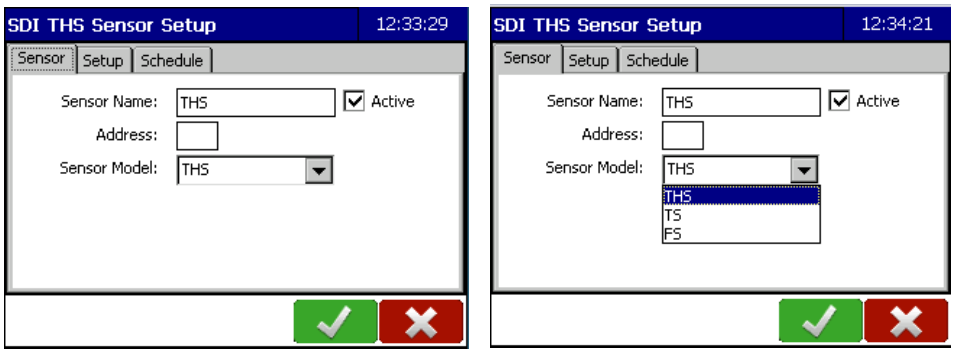


Figure 5-79

5.19.1 SENSOR TAB

The **Sensor** tab contains basic information about the sensor.

Sensor Name: The default name for the sensor is THS. You can change this if desired.

Active: This box must be checked in order for the sensor to collect data

Address: Displays the sensor's address once it is defined and mapped

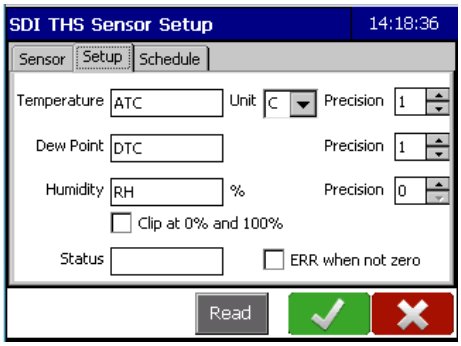
Sensor Model: Select the model from the drop down menu

THS = temperature and humidity sensor

TS = temperature sensor

FS = fuel stick

5.19.2 SETUP SCREEN



This screen displays the three data points measured (Temperature, Dew Point, and Humidity) with their default variable names displayed (ATC,DTC, and RH). The names can be changed if desired.

Units: The default temperature unit of measurement is Celsius (C). Use the drop down menu to select Fahrenheit(F).

Clip at 0% & 100%: If selected this causes the Datalogger to limit humidity values read from the sensor to the range of 0 to 100%. That is, any air sensor humidity measurements above 100% are reported as 100%.

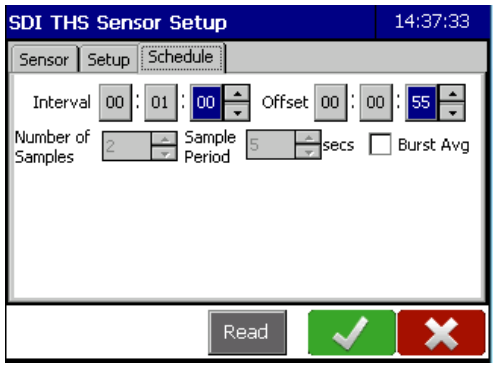
If not selected, an error (ERR) will be reported if the sensor reads outside of its range (higher than 117%).

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

Status: If you want to display or log the Sensor Status Indicator (refer to section 4.5.1.1) input a variable name here.

ERR when not zero: Check the box if you want the Status variable to display the message ERR instead of one of the three error Status Indicators. If this is selected, the Status will indicate 0 for operating correctly, or ERR if one of the three error states is detected.

5.19.3 SCHEDULE SCREEN



Use this screen to input the measurement schedule.

Read: This returns the time it takes to take a measurement and the data points read

Interval: Specifies how often the readings are made

Offset: Specifies when the readings will occur and are typically used to ensure measurements are taken and the data is ready prior to the scheduled transmission time. See section 5.6 for details of calculating Offset time

Example: An interval of 00:01:00 and an offset of 00:55:00 means readings will be taken every minute at the 55 second mark (eg: at 00:10:55, 00:11:55, 00:12:55, etc.). In this example, the specified offset ensures a measurement has been made and is available for logging on the minute mark.

Burst Avg Checkbox: This must be selected to activate the burst averaging feature. A burst average is formed at each measurement event by collecting the indicated **Number of Samples** at intervals specified by the **Sample Period**, and taking the average.

5.20 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. Select the sensor to delete. The user is prompted to confirm the deletion of the sensor.

Figure 5-80: Deleting Sensors

CHAPTER 6 SDI 12 FUNCTIONS

Axiom Dataloggers have a variety of ports which are unique to each model. Some ports are labelled for specific sensors (ie: Temperature and Humidity, Rain, Wind Direction, Fuel Stick etc.) and have unique connectors. Other SDI sensors can be connected to the datalogger using the SDI ports. These ports are orange and labelled alphabetically (SDI A, SDI, B, etc.). Once the SDI sensor is connected it must be mapped and configured.

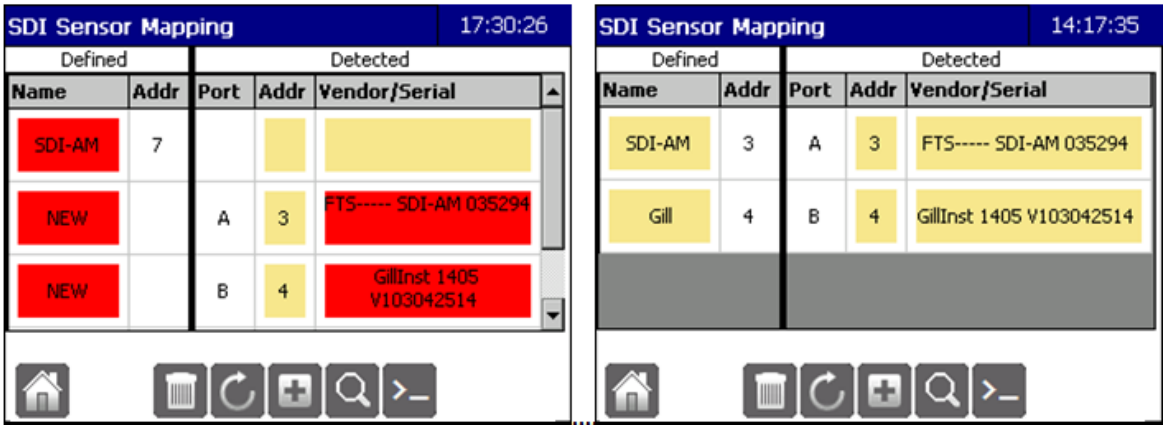
Although each SDI port can be configured for over 20 sensors, it is recommended to keep the list of defined sensors to a minimum because when several SDI-12 sensors are defined, mapping can take a considerable time.

> WARNING! Configuration files with a large number of disconnected sensors (20 or more) can result in extremely long mapping times (30+ minutes) or even cause the datalogger to crash.

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. 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.

Mapping is complete for the sensor when its defined and detected columns are populated and no longer highlighted in red.

> IMPORTANT! Every time a sensor is installed or swapped, it MUST be mapped. Until sensors are mapped, the Datalogger will be unable to communicate with them.



Incomplete Mapping Complete Mapping

Figure 6-1: Sensor Mapping

6.1 DEFINED SENSORS

A sensor is defined once it has been added to the Datalogger, configured and saved. Normally, the sensor is attached and then configured through the Sensors icon (see Chapter 5). A sensor's configuration can also be saved to the Datalogger without the sensor being attached using the Sensor Setup Screens.

A sensor can also be defined through the SDI Sensor Mapping screen. This process is explained in Section 6.4.

> **IMPORTANT!** Each SDI sensor connected to the Datalogger MUST have a unique SDI address.

6.2 DETECTING SDI SENSORS

Once SDI sensors are connected to the Datalogger, press **Detect** on the **SDI Sensor Mapping** screen (**Home > SDI-12**) to begin the sensor mapping process.

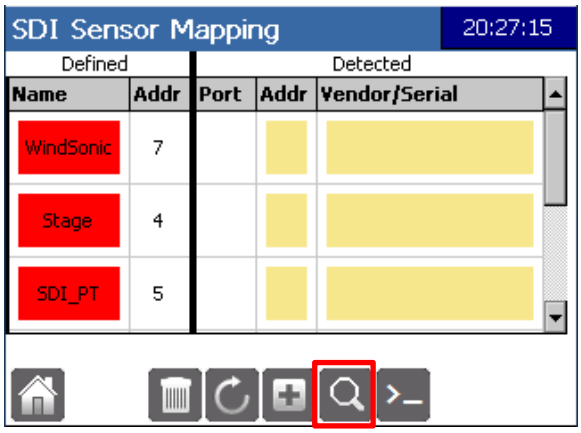


Figure 6-2: Detecting Sensors

Detection automatically determines whether SDI sensors are connected. The Datalogger will look for any defined sensor and determine if it is attached or not.

When **Detect** is pressed, the **SDI Detect** dialog box appears. Select **OK**.

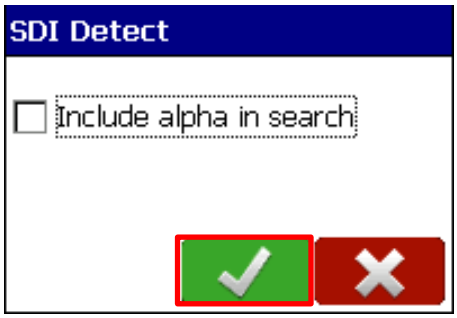


Figure 6-3: SDI Detect Dialog

Include alpha in search check box : This 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).

For each detected SDI sensor, the Datalogger displays on which independent SDI port the sensor was detected (**SDI A**, **SDI B, SDI C, SDI D**), the sensor's address, and the information string returned from the sensor.

6.3 SDI SENSOR ADDRESSES

Every SDI sensor must have a unique address. Each SDI Port has 10 addresses, numbered 0-9, which can be assigned to sensors. If you try to assign an address which is already in use, a prompt will inform you to select a different address. SDI sensors can have the same address as long as these sensors are mapped to a different SDI port.

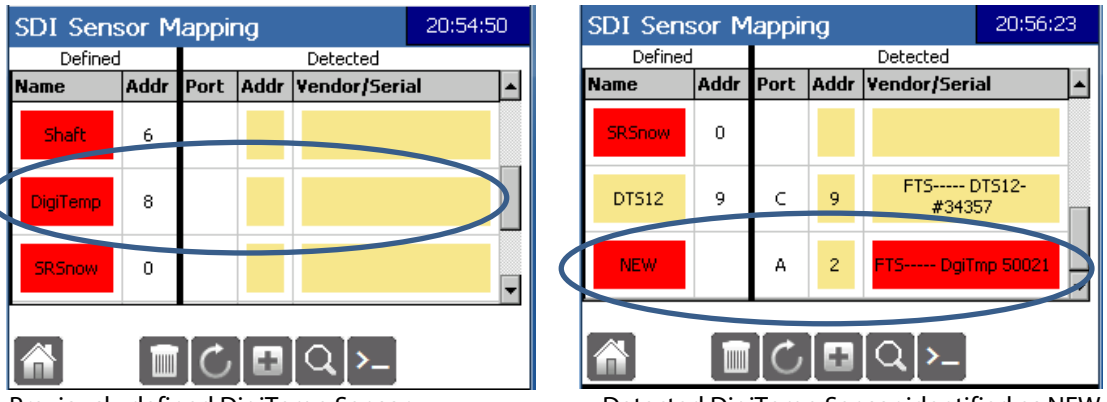
6.4 MAPPING SDI SENSORS

A sensor that has any defined or detected field in red is unmapped. To map the sensor you have three choices:

1. Map the NEW sensor to a previously defined sensor.
2. Create a definition for the NEW sensor
3. Add a sensor and map to it

6.4.1 MAPPING A SENSOR TO A PREVIOUSLY DEFINED SENSOR

If a sensor of the same type had already been defined in the Datalogger, its name will appear in the **Name** column. However, when Detect is completed, the same sensor is identified as NEW. Be sure to scroll through the entire list so that a previously defined sensor is not missed.



Previously defined DigiTemp Sensor Detected DigiTemp Sensor identified as NEW

Figure 6-4: Mapping to a previously defined sensor

For example, in Figure 6-4, a DigiTemp sensor has been previously defined, and a NEW DigiTemp has been detected.

a. Press on the **Vendor/Serial** field of the detected sensor. The Sensor Mapping dialogue box will appear.

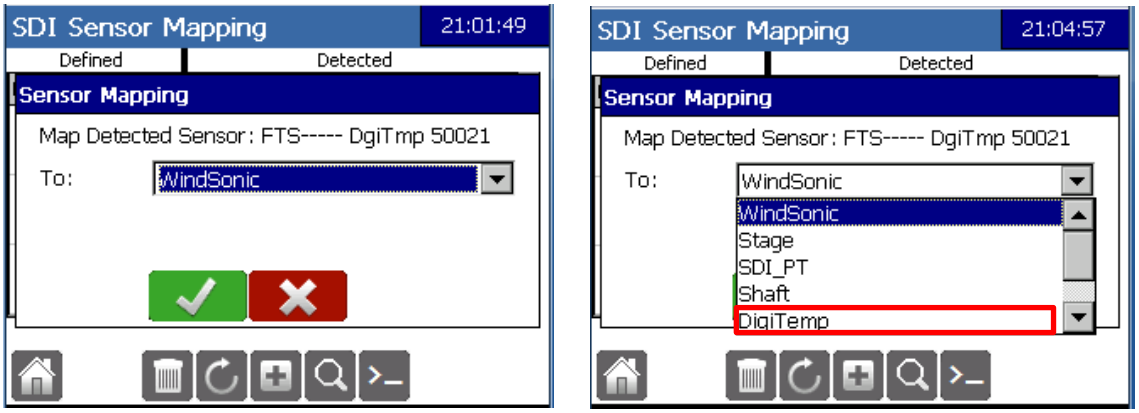


Figure 6-5: Sensor Mapping dialogue box

b. Use the drop down menu to select the sensor (DigiTemp in the example). Select **OK.**

c. The sensor is mapped.

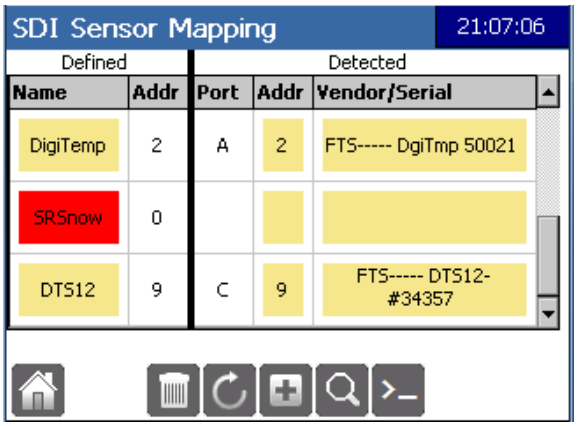


Figure 6-6: Mapped Sensor

6.4.2 CREATE A DEFINITION FOR A NEW SENSOR

If the Datalogger detects a sensor that was not previously defined, it will identify it as **NEW**.

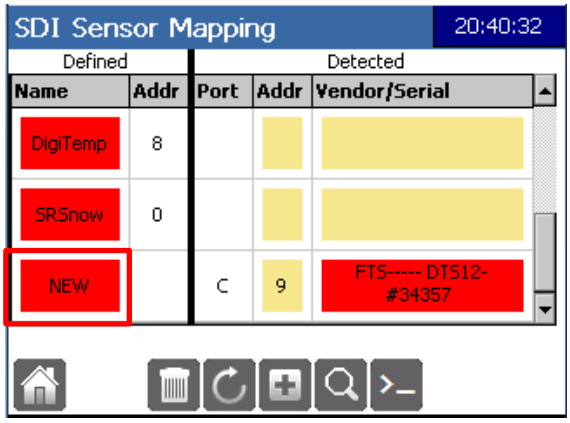


Figure 6-7: Mapping a NEW sensor

a. Click the red **NEW** box in the defined column. Pressing **NEW** causes different responses depending on whether the sensor is 'recognized' by the Datalogger.

b. The **Sensor Setup Screen** appears (unique to each sensor). Define the sensor name, address, schedule and any other sensor specific parameters. See Chapter 4 for details Select **OK**.

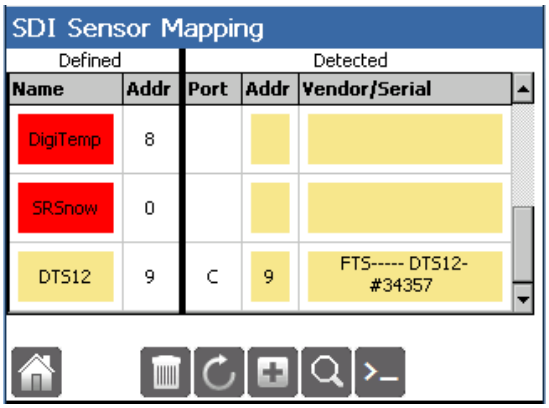


Figure 6-8: NEW sensor mapped

c. The **NEW** Sensor (re-named DTS 12 in step b) is no longer highlighted in red and is mapped.

6.4.3 ADD SENSOR AND MAP TO IT

When there is no associated detected sensor, create a new sensor by selecting the **Add** button.

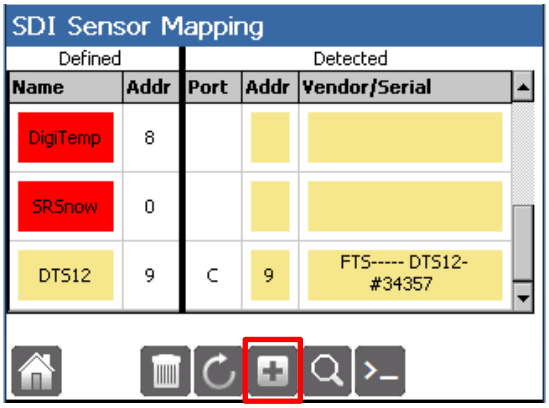


Figure 6-9: Adding a sensor

a. Select the sensor type, either the generic SDI type sensor or one of the built in sensor extensions depending on the attached sensor (the example will use the SDI Generic))

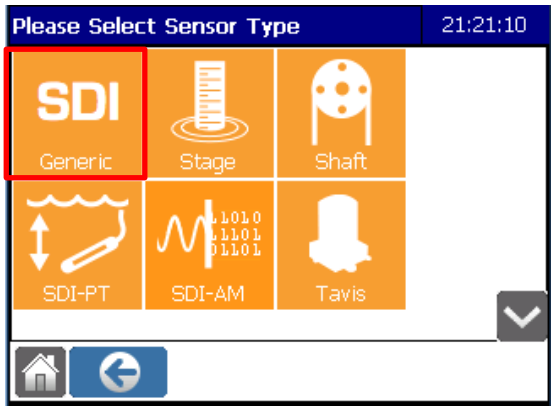


Figure 6-10: Sensor Type Menu

b. The Sensor Setup Screen appears (unique to each sensor). Define the sensor name, address, schedule and any other sensor specific parameters. See Chapter 4 for details. Select **OK**.

c. You will be returned to the SDI Sensor Mapping Screen where the newly added sensor will appear, but mapping is not yet complete (Figure 6-11).

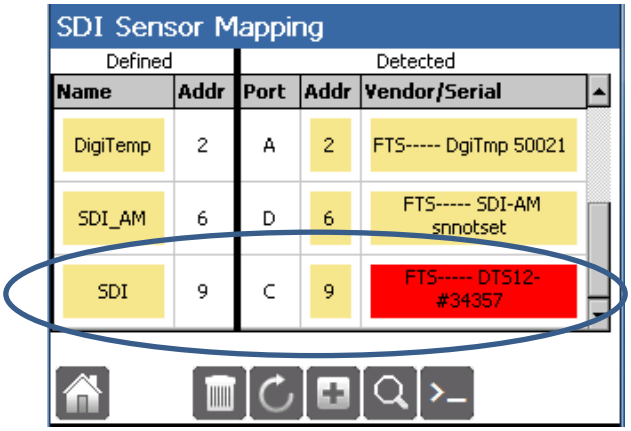


Figure 6-11: Added sensor – mapping incomplete

d. Press on the red Vendor/Serial field of the added sensor and use the drop down menu to select the Sensor type, and then **OK**.

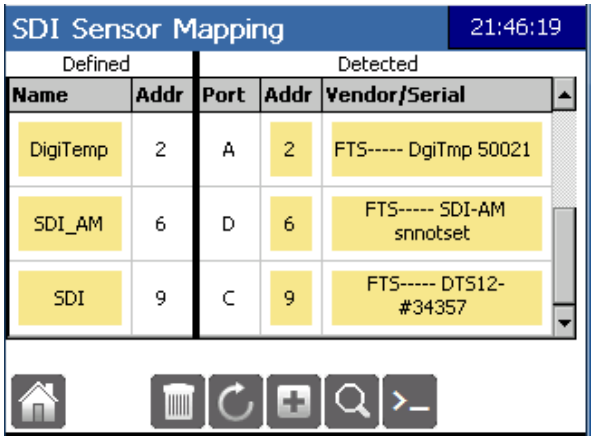


Figure 6-12

e. The sensor is mapped.

6.5 CHANGING AN SDI SENSOR ADDRESS

Each sensor must have its own address. If detected sensors have the same address, as shown in Figure 6-13, this must be rectified. There are also some circumstances which require a defined sensor to have a different address – usually to accommodate the addition of a sensor with specific address needs.

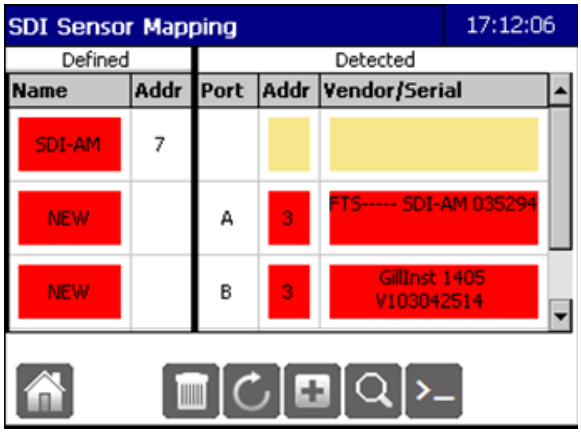


Figure 6-13: Detected Sensors showing the same address

To change an SDI sensor address press the **Addr field** in the detected column and then enter the desired address. Select **OK**.

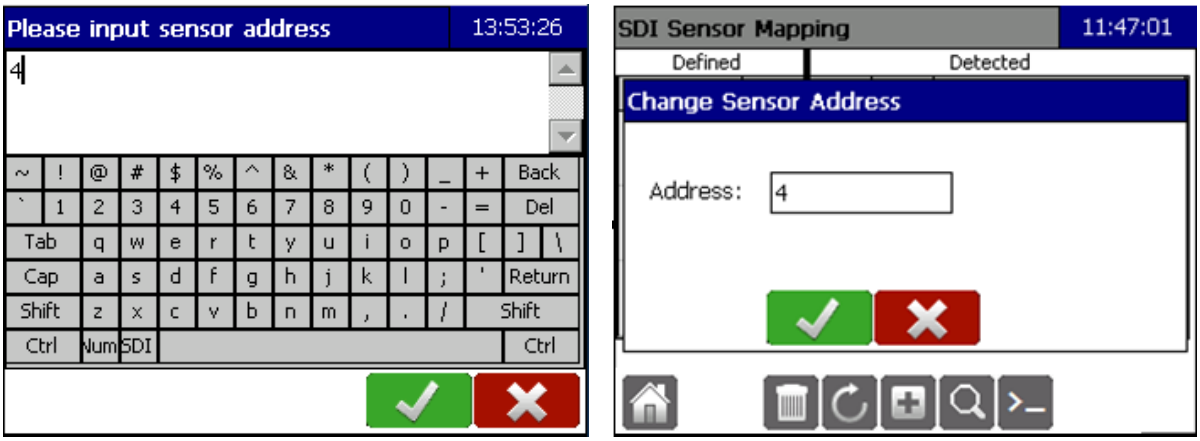


Figure 6-14: Changing Sensor Address

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. The address can also be changed via **Transparent Mode** using SDI-12 commands.

6.6 SDI TRANSPARENT MODE

The **Transparent** button  at the bottom of the **SDI Sensor Mapping Screen** allows the user to send SDI commands on the Datalogger's SDI ports. 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.

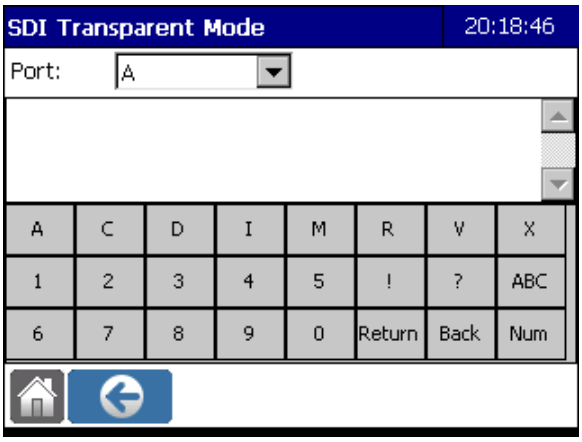


Figure : SDI Transparent Mode

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.

6.6.1 NOTATION FOR SDI COMMANDS

SDI commands are 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 mono-spaced 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*

6.6.2 COMMON SDI COMMANDS

Address Query

This command requests the address of the SDI sensor.

Command(Cmd)/ Response(Resp)	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

Acknowledge Active

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

Command(Cmd)/ Response(Resp)	String	Note
Cmd	**0!**	request the device at address 0 to confirm it is active
Resp	**0**	a device is active at address 0

Change Address

This command changes a sensor's SDI address.

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

Send Identification

This command requests detailed identification information from the addressed sensor.

Command(Cmd)/ Response(Resp)	String	Note	
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

Measurement command

Measurement, or "M," commands (**M**, **M1**, **M2**, …, **M9**) are used to trigger a measurement on the addressed sensor. The sensor does not 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

Command(Cmd)/ Response(Resp)	String	Note	
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

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:

8 data points are expected from the Send Data command

Command(Cmd)/ Response(Resp)	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

CHAPTER 7 **PROCESSES**

The **Processes** icon accesses screens that enable the user to define mathematical calculations and custom scripts to manipulate sensor measurements or other processes. The screenshot below shows the **Processes** screen for a blank Datalogger (no sensors configured) and the **Processes** screen for a configured Datalogger. .

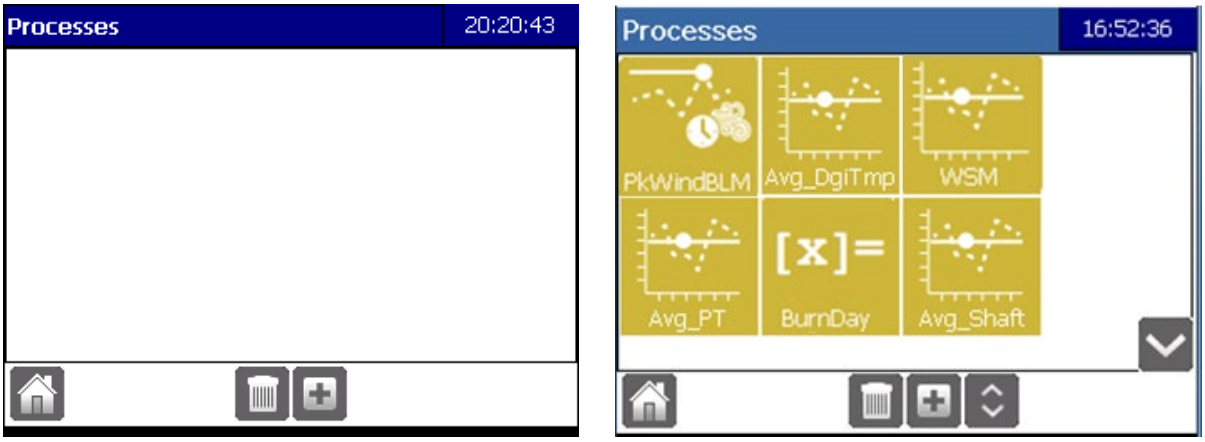


Figure 7-1: Processes screens

Pressing the **Add** button allows the user to configure a new process for the Datalogger. The following **Processes** are available:

Figure 7-2: Available Processes

The Process icons display the default names. However, once a process is setup, the name will be the same as the name entered Process Name field in the setup screen. Note that all the available processes in Figure 7-2 reflect the default names.

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 data point in the Datalogger.

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 read less frequently than the process is calculated, the process will be using the same data until a new SDI reading is taken. For example, if an SDI reading is taken every 10 minutes, but the process is calculated every minute, the same input value from that SDI sensor will be used for ten consecutive calcualtions.

7.1 ORDERING PROCESSESS

Processes will be displayed in the screen in the order they were added. However, the order can be arranged as desired.

Press on the **Order** icon to display the **Processes Order** screen.

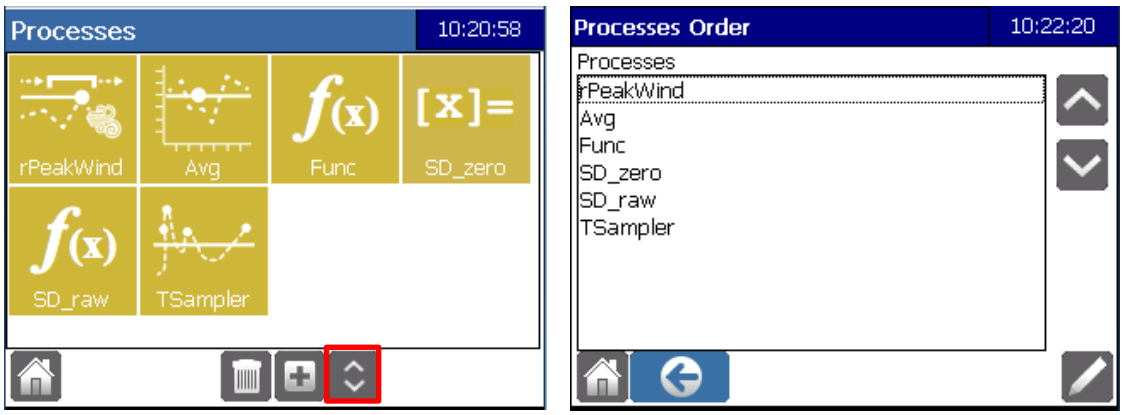


Figure 7-3: Processes Order Screen

Press the **Edit** Icon then select the Process you wish to move and use the scroll arrows to position it in the list. Do this for all desired Processes. Once the list is ordered as desired, select **OK**. The Processes and their results will be displayed in that order.

Processes will be ordered as follows:

- Initially, in the same order they are created
- In the order they are assigned by using the Order feature on the Processes screen
- If a new process is added after ordering is complete, it will be added to the top of the Process list and subsequent new processes will be added in sequence after the first new one.

For Example: The Processes Avg, Max Min, and TSampler were created (see picture). Then they were ordered to be Tsampler,Avg, MaxMin,

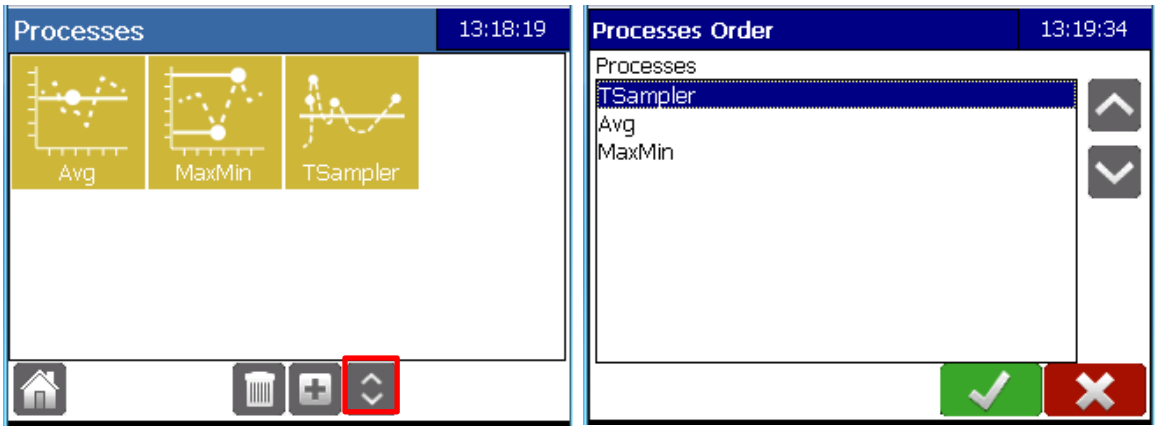


Figure 7-4: Ordering Processes

Then two new Processes were created: TempAvg and tPeakWind.

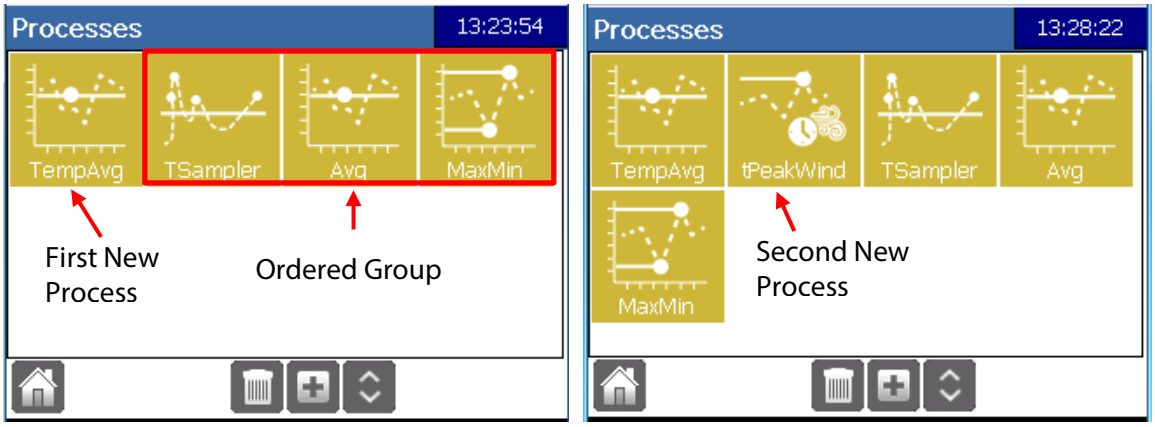


Figure 7-5: Adding new processes after ordering

7.2 BUILT-IN DATA POINTS

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

M Data point name	Description
t_dd	Day of month
t_doy	Day of year (Julian calendar)
t_HH	Hours (24 hour clock)
t_mm	Minutes
T_MM	Months
t_ss	Seconds
t_TZ	UTC time offset (eg. Pacific = -8)
t_yyyy	Year
Lat	Latitude
Long	Longitude
Elev	Elevation

If the Datalogger is operating with a G6 transmitter, the following additional built-in data points will be available:

M Data point name	Description
Serial Number	G6 serial number
YB	Power Supply during transmission
YF	Forward Power
YR	Reflected Power
SWR	Standing Wave Ratio
VLoad	

7.3 RESTRICTIONS ON PROCESS (DATA POINT) NAMES

The same restrictions that apply to sensor data point names apply to process data point names. These names must conform to the following rules:

- The name must contain only upper or lowercase letters, digits, or the underscore character ("_").
- There can be no spaces.
- The name must start with a letter.
- The name cannot be any of the following reserved names (reserved names are case sensitive):

○ ABS	○ IF	○ SteinhC	○ t_dd
○ ACOS	○ INT	○ SWR	○ t_doy
○ ASIN	○ LN	○ t_DySince	○ t_HH
○ AT	○ Lat Long	○ t_DySYr	○ t_mm
○ ATAN	○ MAX	○ t_HrSince	○ t_MM
○ CMD	○ MIN	○ t_HrSYr	○ t_ss
○ COS	○ MOD	○ t_IsLeap	○ t_TZ
○ Elev	○ PI	○ t_MnSince	○ t_yyyy
○ ELSE	○ POW	○ t_MnSYr	○ YB
○ ERR	○ SIN	○ t_SeSince	○ YF
○ EXP	○ SQRT	○ TAN	○ YR
○ FRAC			

7.4 MAXIMUM AND MINIMUM PROCESS

The **Max/Min** process calculates the maximum and minimum value of the selected input. Data points 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

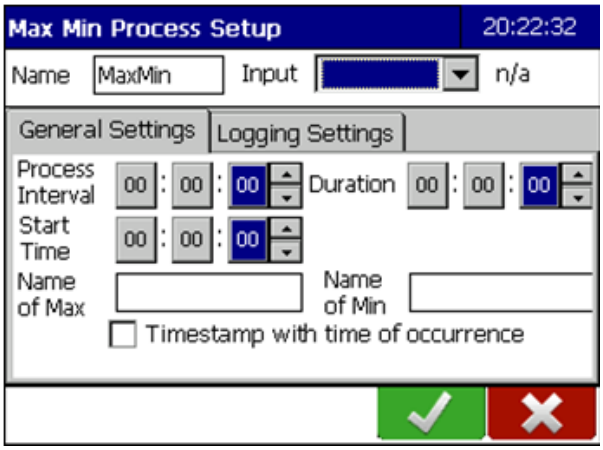


Figure 7-6: Max Min Process Setup Screen

7.4.1 GENERAL SETTINGS TAB

Name: This specifies a name for the process, which must be unique amongst processes. The default name is MinMax, but can be changed if desired. The name is valid for the General and Logging tabs. Changing the name in one tab will change it in the other.

Input: This specifies which of the available data points is to be the subject of the max-min computation in this process. Use the drop down menu to select the input data point. The Input is valid for the General and Logging tabs. Changing the data point in one tab will change it in the other.

Process Interval: This 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. It is in hh:mm:ss format.

For example, with a **Duration** of one hour (01:00:00), 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.

Duration: This specifies the length of time over which the maximum and minimum are calculated.

For example, if the **Duration** is one hour, then the process calculates the maximum and minimum of the **Input** value over 60-minute blocks of time.

Start Time: This specifies the offset of the **Duration** cycles from midnight (00:00:00). 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**.

For example, if the **Duration** is one hour (01:00:00), and the Start Time is fifteen minutes (00:15:00), then the first computation block will be at 00:15:00, then at 01:15:00, 02:15:00 etc..

Name of Max and **Name of Min**, when filled in, specify the names of data points that are created in the Datalogger to hold the latest computed maximum and minimum values respectively. These data points are available just like any other data point in the Datalogger, and can be used for logging, telemetry, further process computations, and other purposes.

Timestamp with time of occurrence: If this is 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 will be logged with the time of the end of the process interval.

Once the Setup screen is filled in, select **OK.**

Figure 7-7 shows how these three parameters determine the sample sets over which minimum and maximum values are computed.

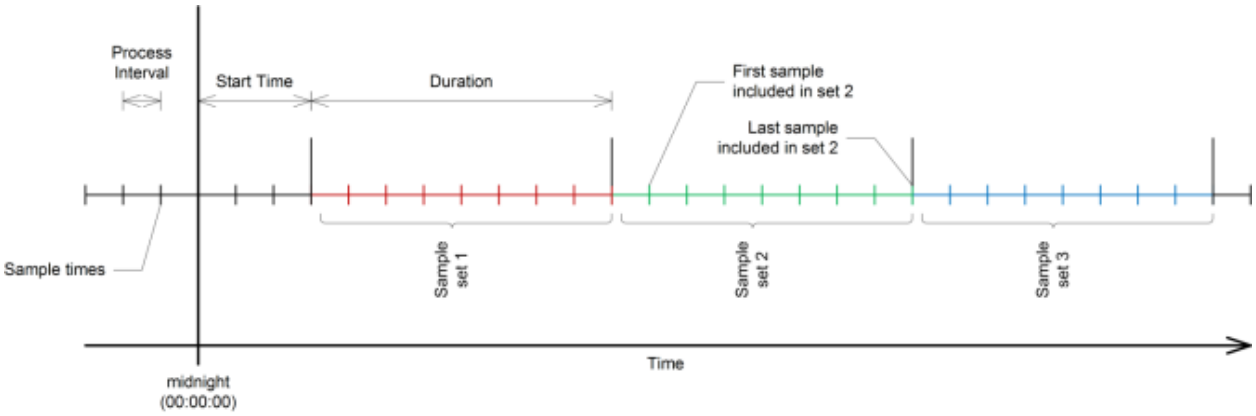


Figure 7-7: MaxMin Process Sample Set Timings

In the above diagram:

1 A "sample set" is a set of values over which one maximum and/or minimum is calculated.

2 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**,

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

3 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**.

7.4.2 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.

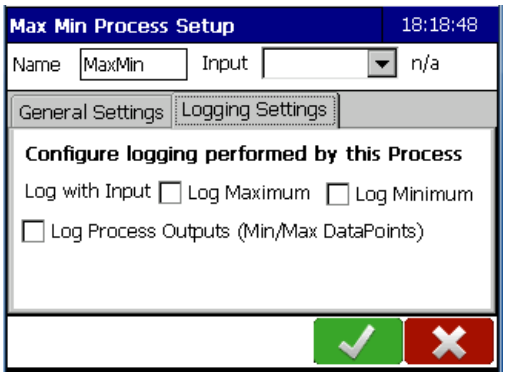


Figure 7-8: Max Min Process – Logging Settings

Name: This is Name of the MaxMin log. The default name is Max.Min and can be changed if desired. The name is valid for the General and Logging tabs. Changing the name in one tab will change it in the other.

Input: This specifies which of the available data points is to be the subject of the MaxMin logging in this process. Use the drop down menu to select the input data point. The Input is valid for the General and Logging tabs. Changing the data point in one tab will change it in the other.

Log with Input checkboxes: These 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.

Log Process Outputs checkbox: This determines whether the maximum and minimum data points specified on the General Settings tab are logged. If checked, these max/min data points are written to the log at the end of each **Duration** period.

Once the Setup screen is filled in, select **OK.**

7.4.2.1 *Max/Min Process Example*

The following example 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 in line with the **TCase** values. Also, a

maximum case temperature data point (**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.

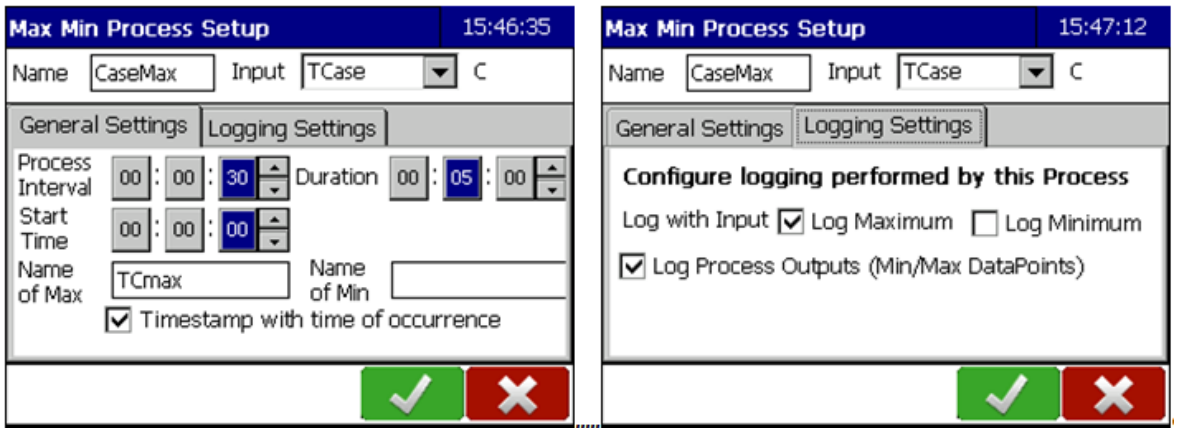


Figure 7-9: Max Min Process Example

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		

7.5 PEAK WIND PROCESSES

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.

For example:

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 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, data points for the **Peak Speed** and **Peak Direction** can be created (default names of tPeakSpeed and tPeakDirection).

The user must select the desired input and specify the input's **Process Interval** (i.e., how often the input is 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**.

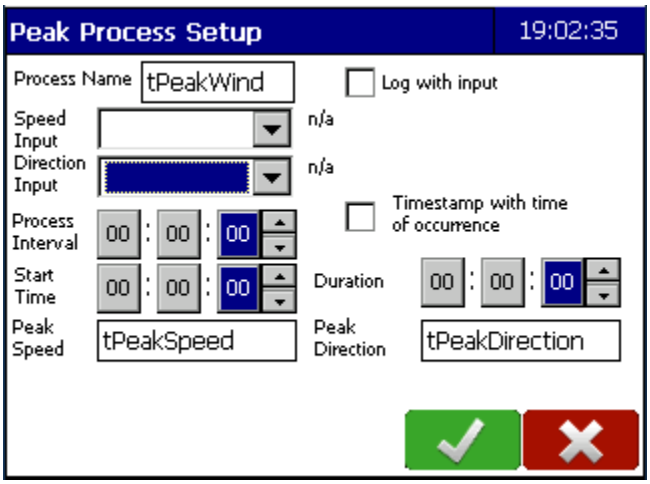


Figure 7-10: Peak Process Setup

Process Name: The default name is **tPeakWind.** This can be changed if desired.

Log with Input checkbox: If checked, it enables the peak values to be logged as entries with the selected input's data.

Speed Input: Use the drop down menu to select the available data point to be used as the speed input of the **Timed PeakWind** process.

Direction Input: Use the drop down menu to select the available data point to be used in the direction input of the **Timed PeakWind** process.

Process Interval: This specifies how often the **Input** value is examined (sampled) to compute the **Peak Wind** . 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. It is in hh:mm:ss format.

For example, with a **Duration** of one hour (01:00:00), 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.

Duration: This specifies the length of time over which the maximum and minimum are calculated.

For example, if the **Duration** is one hour, then the process calculates the maximum and minimum of the **Input** value over 60-minute blocks of time.

Start Time: This specifies the offset of the **Duration** cycles from midnight (00:00:00). 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**.

For example, if the **Duration** is one hour (01:00:00), and the Start Time is fifteen minutes (00:15:00), then the first computation block will be at 00:15:00, then at 01:15:00, 02:15:00 etc..

Peak Speed and Peak Direction: These specify the names of data points that are created in the Datalogger to hold the latest computed Peak Speed and Peak Direction respectively. These data points are available just like any other data point in the Datalogger, and can be used for logging, telemetry, further process computations, and other purposes.

Timestamp with time of occurrence: If this is checked, the calculated Peak Wind values are stamped with the time they occurred. If the checkbox is not selected, then the values will be logged with the time of the end of the process interval.

Once the Setup screen is filled in, select **OK.**

7.6.1 EXAMPLE TIMED PEAK PROCESS SETUP

Figure 7-11 shows a Timed Peak Process (named PKWindBLM) set-up to produce a timed peak speed reading (WSMP) and a timed peak direction reading (WDDP) at the top of each hour (no start time offset in example). The input variables (Crnt_Wspd and Crnt_Dir) are read every 5 seconds and the output variables are updated every 5 seconds, so there will be 720 different peak input comparisons over the hour long duration before each reset (5 seconds * 720 samples = 1 hr duration). The peak direction output is the direction at the time of the peak speed.

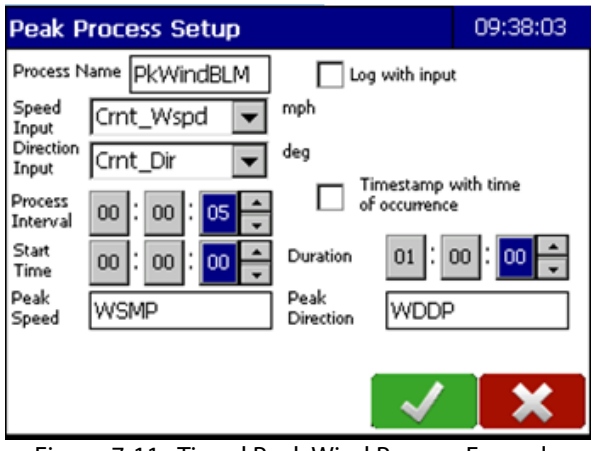


Figure 7-11: Timed Peak Wind Process Example

7.7 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. It uses a running "window" which discards old values to make room for new, but is never reset. If desired, data points for the **Peak Speed** and **Peak Direction** can be created (default names of rPeakSpeed and rPeakDirection).

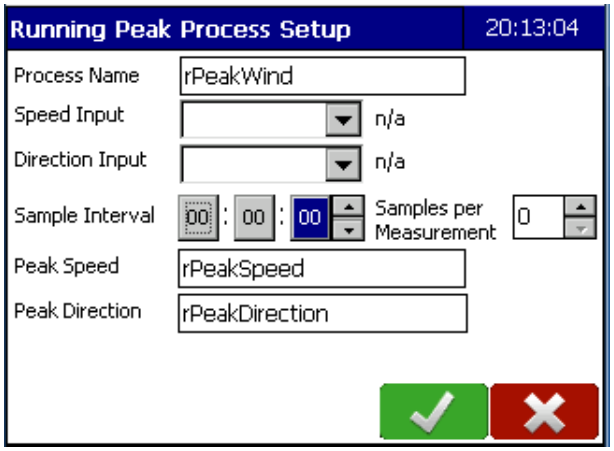


Figure 7-12: Running Peak Process Setup Screen

Process Name: The default name is **rPeakWind.** This can be changed if desired.

Speed Input: Use the drop down menu to select the available data point to be used as the speed input of the **Running PeakWind** process.

Direction Input: Use the drop down menu to select the available data point to be used in the direction input of the **Running PeakWind** process.

Sample Interval: This specifies how often the **Input** value is read (sampled).

Samples per measurement: This specifies how many samples will be taken and used for the process. This is the number of samples which will be in the "running" window.

Peak Speed and Peak Direction: These specify the names of data points that are created in the Datalogger to hold the latest computed Peak Speed and Peak Direction respectively. These data points are available just like any other data point in the Datalogger, and can be used for logging, telemetry, further process computations, and other purposes.

Once the Setup screen is filled in, select **OK.**

7.7.1 RUNNING PEAK PROCESS EXAMPLE

Figure 7-13 shows a Running Peak Process (named Pk2mWind) set-up to produce a running peak speed reading (WSMP2m) and a running peak direction reading (WDDP2m) over the last 2 minutes from the current time with a resolution of 5 seconds. The input variables (Crnt_Wspd and Crnt_Dir) are read every 5 seconds, and at any given time the running peak will display the peak value over the last 24 samples or 2 minutes. Every 5 seconds a sample is taken. It will take 2 minutes to take 24 samples (5 seconds X 24 samples = 120 seconds =2 minutes), at which time the process cycle will be reset. The peak direction output is the direction at the time of the peak speed.

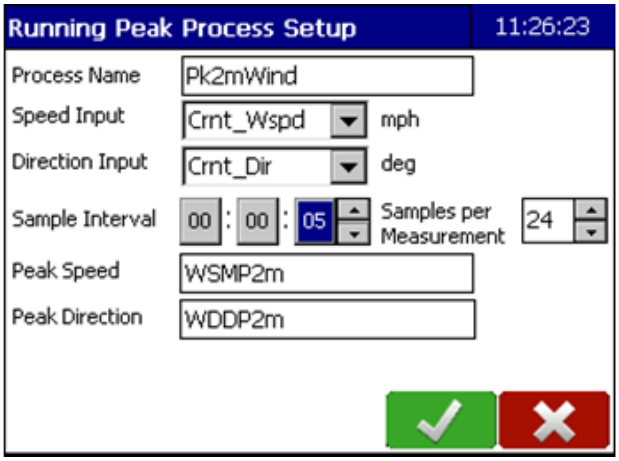


Figure 7-13: Running Peak Process Example

7.8 DELTA

The Delta process calculates the difference of the selected Input's value over a specified time period. The user selects the desired input and specifies the input's **Process Interval** (how often the input is 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**.

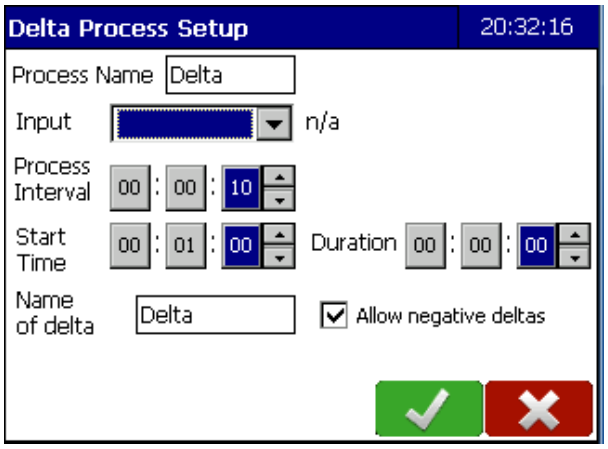


Figure 7-14: Delta Process Setup Screen

Process Name: This is the name given to the process. The default name is Delta. This can be changed if desired.

Input: Use the drop down menu to select the available data point to be used as the input for the Delta process.

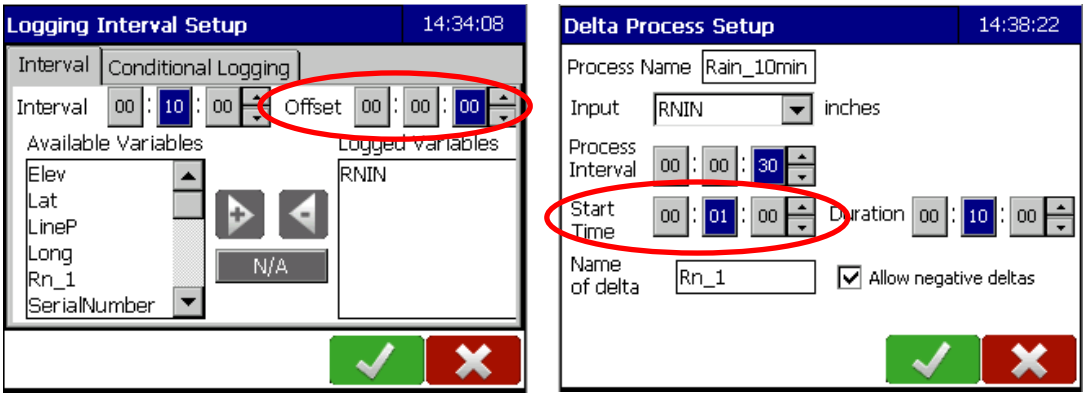
Process Interval: This specifies how often the **Input** value is read.

Start Time: This specifies the offset of the **Duration** cycles from midnight (00:00:00). The first cycle starts at midnight + **Start Time** each day, regardless of whether **Duration** is a whole fraction of 24 hours or not.

For example, if the **Duration** is one hour (01:00:00), and the Start Time is one minute (00:01:00), then the first computation block will be at 00:01:00, then at 01:01:00, 02:01:00 etc..

NOTE: The Input data point and the Process must have the same Offset/Start Time input for cumulative comparisons to be accurate.

The data shown in Figure 7-15 illustrates this. The Input (Rain) is taken hourly, but the Delta Process, Rain_10min, has a Start time of 1 minute. As a result, although Rain was measured every 10 minutes, and Rain_10min displays the change in rain over 10 minutes, discrepancies are seen because the two variables are measuring rainfall over different ten minute intervals.



Input (RNIN) – no offset

Process (Rain_10min) – I minute start time

Rain Inches	Rain_10min Inches	Incremental "Rain" (diff b/t timestamps) Derived from "Rain"
9.87	0	0
9.88	0.01	0.01
9.88	0	0
9.88	0	0
9.93	0.05	0.05
9.96	0.02	0.03
9.98	0.02	0.02
9.99	0.01	0.01
9.99	0	0
9.99	0	0
9.99	0	0
10.11	0.12	0.12
10.16	0.03	0.05
10.16	0	0

Discrepancies in cumulative values due to one minute difference in start-stop times of measured values for the two data points

Figure 7-15

Duration: This specifies the length of time over which the Delta is calculated.

For example, if the **Duration** is one hour, then the process calculates the Delta of the **Input** value over 60-minute blocks of time.

Name of Delta: This specifies the name of the data point that is created in the Datalogger to hold the latest computed difference in the Input value. This data point is available just like any other data point in the Datalogger, and can be used for logging, telemetry, further process computations, and other purposes.

Allow negative deltas checkbox: When checked, negative deltas will be recorded.

Once the Setup screen is filled in, select **OK.**

7.8.1 DELTA PROCESS EXAMPLE

Figure 7-16 shows a Delta Process (named Rain1Hr) set-up to produce an hourly rainfall delta (Rn_1) at the top of each hour (no start time offset present). The output (Rn_1) will show a cumulative delta where the input (RNIN) is read every 5 seconds over the duration of the hour and reset at each start time.

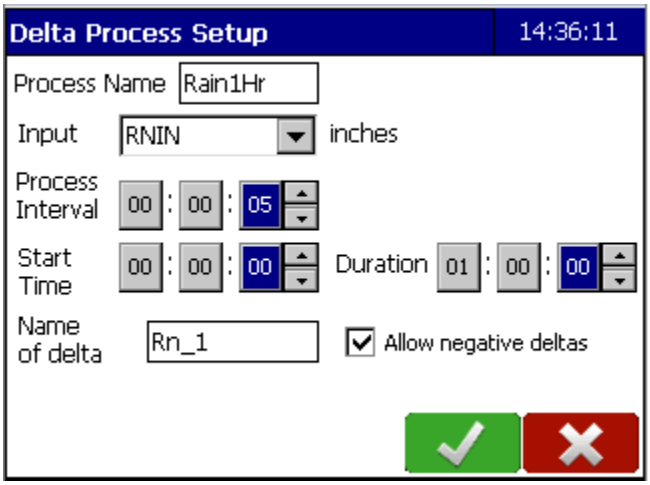
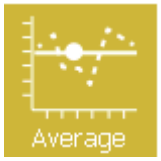


Figure 7-16: Delta Process Setup Example

7.9 AVERAGE PROCESS



The Average process calculates the mean, standard deviation (SD), median, running maximum, and running minimum value of the selected input. Note that the fields must have a variable name input in order for that data point to be calculated.

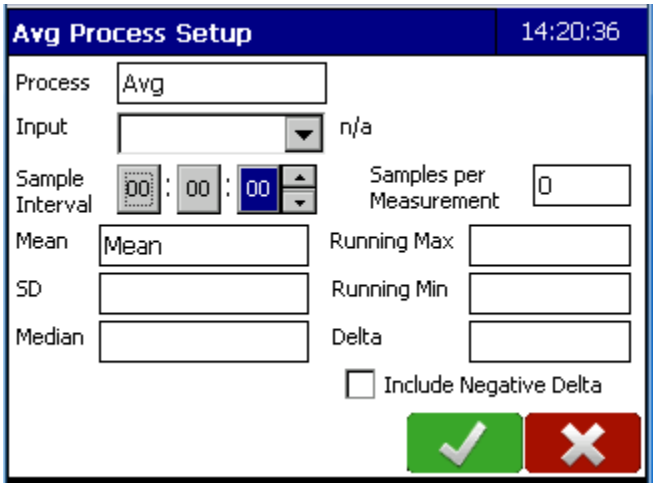


Figure 7-17: Average Process Setup Screen

Process: This is the name given to the process. The default name is Avg. This can be changed if desired.

Input: Use the drop down menu to select the available data point to be used as the input for the Avg process

Sample Interval: This specifies how often the **Input** value is read (sampled).

Samples per measurement: This specifies how many samples will be taken and used for the process.

Mean/SD (standard deviation)/Median/Running Max/Running Min/Delta: When populated, these fields specify the names of the data points that are created in the Datalogger to hold the associated latest calculations. If the field is left blank, there will be no calculation made. These data points are available just like any other data point in the Datalogger, and can be used for logging, telemetry, further process computations, and other purposes.

Once the Setup screen is filled in, select **OK.**

7.9.1 AVERAGE CALCULATIONS.

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:

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

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

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

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:

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

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

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

7.9.2 AVERAGE EXAMPLE

Figure 7-17 shows the Average process (named CaseAvg) set-up for a five minute case temperature (TCase) average (TCavg). A TCase sample is taken every 10 seconds. It will take 300 seconds (5 minutes) for 30 samples to be taken (10 seconds X 30 samples = 300 seconds = 5 minutes). Then the process cycle starts again.

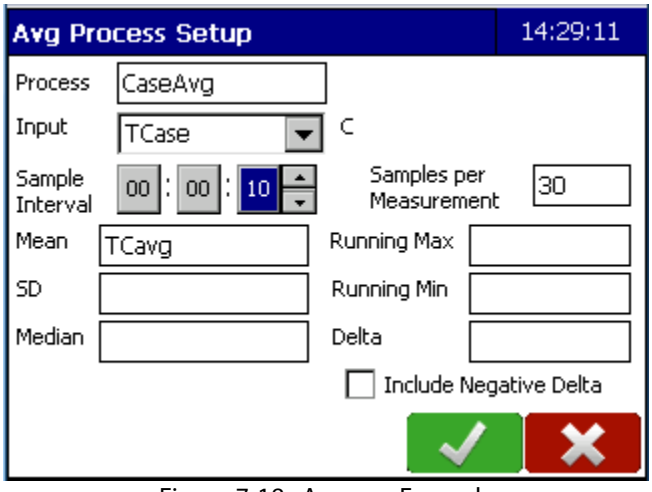


Figure 7-18: Average Example

7.9.3 RUNNING DELTA CALCULATIONS

The running Delta calculation takes the values from the edges of the sample window and performs a delta calculation on them. It is important to note that unlike the average process and the other calculations performed on that page, the delta uses a true time 0 for this calculation. That is to say, the values are taken from the point in time that the sample measurement window count starts, rather than from the first measurement in the sample.

7.9.4 RUNNING DELTA EXAMPLE

In this example there are 5 samples taken in the measurement and a sample is taken every minute. Figure 7-19 shows the example process and the assigned variable names for the different components. Looking at the period of time between 14:30 and 14:35 (Figure 7-19) , note that that the sample taken at the 14:30 mark is not included in the Maximum and Minimum (var_mx and var_mn) calculations. Rather, these variables take the next 5 samples AFTER the commencement of the window. Note the var_mn shows 9 (the first sample taken after 14:30) and the difference between var_mx and var_mn is 4 (13-9=4). The Delta (var_delta) includes the sample taken at the commencement of the 5 minute sample window (8) so includes the measurement taken at 14:30 for a Delta (var_delta) of 5 (13-8=5).

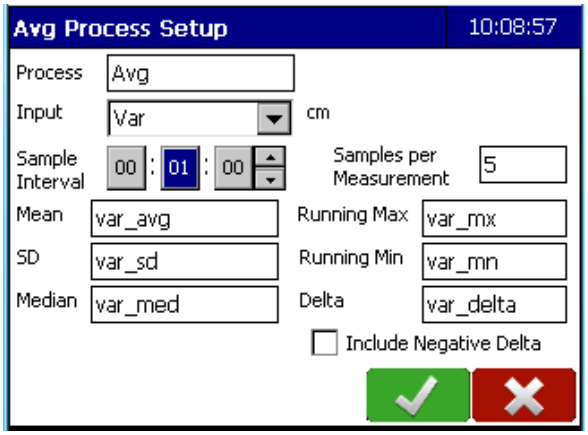


Figure 7-19: Avg Process Setup screen

DateTime	Var	var_avg	var_med	var_sd	var_mx	var_mn	var_delta
YYYY/MM/DD HH:MM:SS	cm	cm	cm		cm	cm	cm
2015/12/01 14:28:00	6	4	4	1.581	6	2	5
2015/12/01 14:29:00	7	5	5	1.581	7	3	5
2015/12/01 14:30:00	8	6	6	1.581	8	4	5
2015/12/01 14:31:00	**9**	**7**	**7**	**1.581**	**9**	**5**	**5**
2015/12/01 14:32:00	**10**	**8**	**8**	**1.581**	**10**	**6**	**5**
2015/12/01 14:33:00	**11**	**9**	**9**	**1.581**	**11**	**7**	**5**
2015/12/01 14:34:00	**12**	**10**	**10**	**1.581**	**12**	**8**	**5**
2015/12/01 14:35:00	**13**	**11**	**11**	**1.581**	**13**	**9**	**5**
2015/12/01 14:36:00	14	12	12	1.581	14	10	5
2015/12/01 14:37:00	15	13	13	1.581	15	11	5
2015/12/01 14:38:00	16	14	14	1.581	16	12	5
2015/12/01 14:39:00	17	15	15	1.581	17	13	5

Figure 7-20: Avg Process Data

7.10 WEIGHTED AVERAGE PROCESS

The Weighted Average process calculates the sliding average of the selected input.

The weighted average differs from the standard average as follows:

Running Average:	Weighted Average
$Y_n = (y_n + y_{n-1} + \ldots + y_m) / N$ Where, - **Y_n** is the next average, - **y_n** is the new sample, - **y_{n-1}** to **y_m** are previous samples, - **N** is the number of samples to be added together.	$Y_n = [1 - \exp(-3t / T)] \times (y_n - Y_m) + Y_m$ Where, - **Y_n** is the next average, - **Y_m** is the current average, - **t** is the sample interval, - **T** is the average interval, - **y_n** is the new sample value.

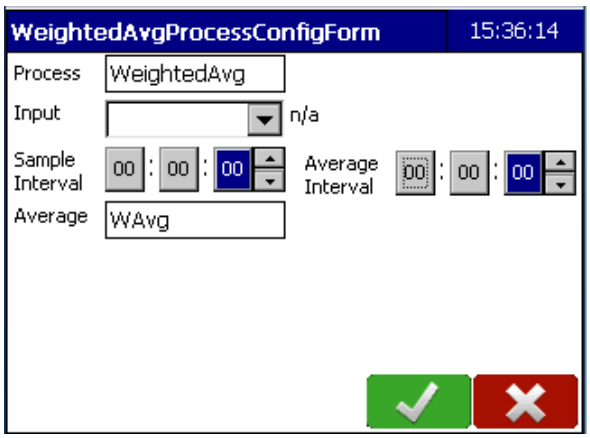


Figure 7-21: Weighted Average Configuration Form

Process: This is the name given to the process. The default name is WeightedAvg. This can be changed if desired.

Input: Use the drop down menu to select the available data point to be used as the input for the process.

Sample Interval: This specifies how often the **Input** value is read (sampled).

Average Interval: This specifies the timing of how often the average calculation is made.

Average: This is the name given to the weighted average calculation. The default name is WAvg and can be changed if desired.

7.10.1 WEIGHTED AVERAGE EXAMPLE

Figure 7-19 shows the Weighted Average process (named Case_WAvg) set-up for a three minute case temperature (TCase) weighted average (TC_WCavg). TCase is sampled every 1 minute.

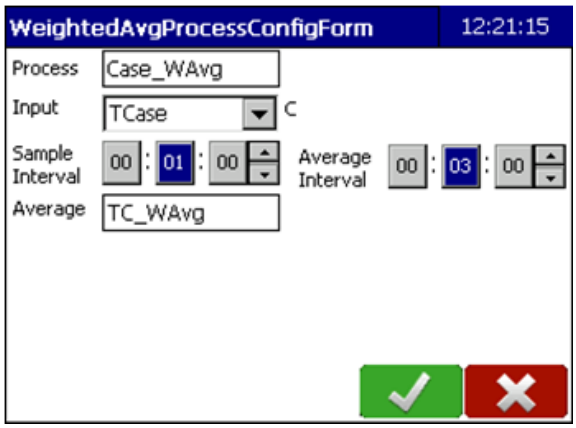


Figure 7-22: Weighted Average Example

7.11 USER VARIABLE PROCESS

User variables are data points which can be assigned values (either manually or by the script process). A User Variable must be created before it can be referenced in another process (i.e. a script or a function) or output.

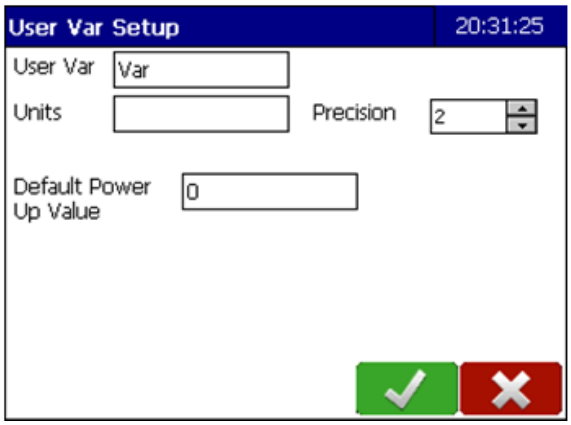


Figure 7-23: User Variable Setup Screen

User Var: This specifies the name of the User Variable. The default name is Var but can be changed if desired.

Units: Input the desired units. The equals (=), backslash (/) and comma (,) symbols are valid characters and can be used in the units name.

Precision: Use the arrows to specify the precision (number of decimal places) the variable is to display.

Default Power Up Value: This is the value which will be set initially and after the Datalogger power cycles.

7.11.1 USER VARIABLE EXAMPLE

Figure 7-21 shows the **UserVar Setup**-screen for a user variable named Test_Var with units of ft 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.

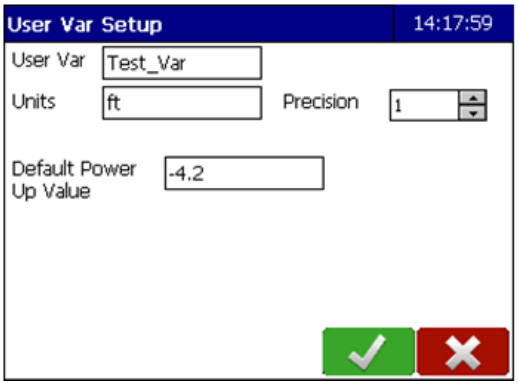


Figure 7-24: User Variable Example

7.12 SCRIPT PROCESS

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

> IMPORTANT: The script does not create any new data points – all data points used in a script must already exist in the Datalogger.

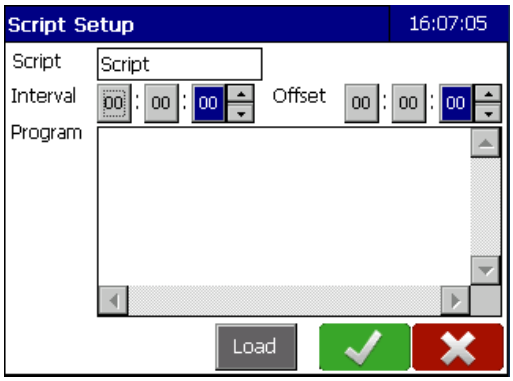


Figure 7-25: Script Setup Screen

Script: This specifies the name given to the script. The default name is Script and can be changed as desired.

Interval: This specifies how often the script is run. The minimum interval is one minute (00:01:00).

Offset: This specifies at what time the script is run based on midnight.

For example: A script with an interval of 10 minutes (00:10:00) and an offset of 00:05:00 will be run every ten minutes commencing at 5 minutes after midnight (00:05:00, 00:15:00, 00:25:00 etc.).

Program: Use this field to input the script program using the logical operators.

Load: Pressing this allows the user to load a script from the Datalogger's internal memory or from a USB memory stick. It will open up the browsing window through which you can select the file.

7.12.1 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).

7.12.2 SCRIPT EXAMPLES

Example 1: IncCount (Increment Count)

Figure 7-23 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.

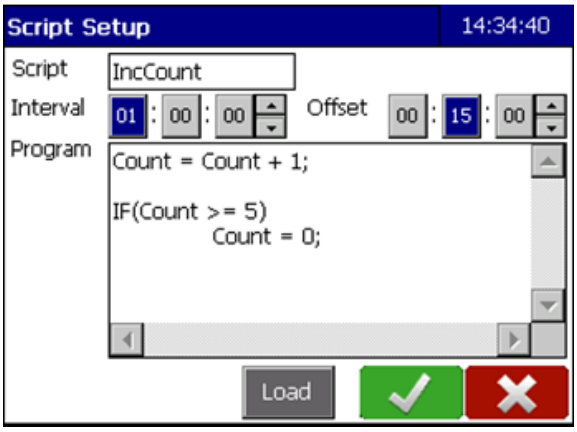


Figure 7-26: Script Example

Example 2: RNIN Script

Figure 7-24 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.

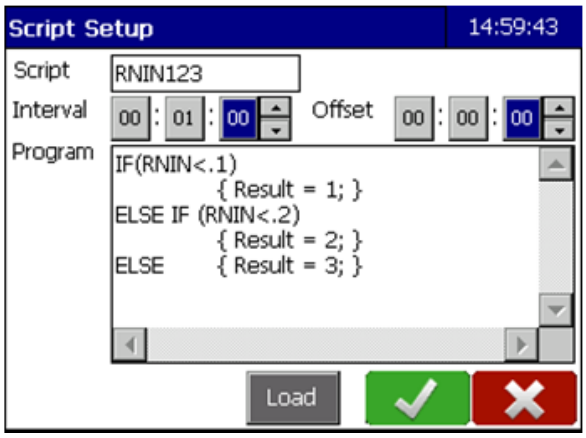

Script Setup
14:59:43
Script
RNIN123
Interval
00 : 01 : 00
Offset
00 : 00 : 00
Program
IF(RNIN<.1)
{ Result = 1; }
ELSE IF (RNIN<.2)
{ Result = 2; }
ELSE { Result = 3; }
Load

Figure 7-27:

7.13 FUNCTION PROCESS

A Function process evaluates a single-valued function expression. The function name is also used as a data point 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).

IMPORTANT: All data points used in a function script must already exist in the Datalogger.

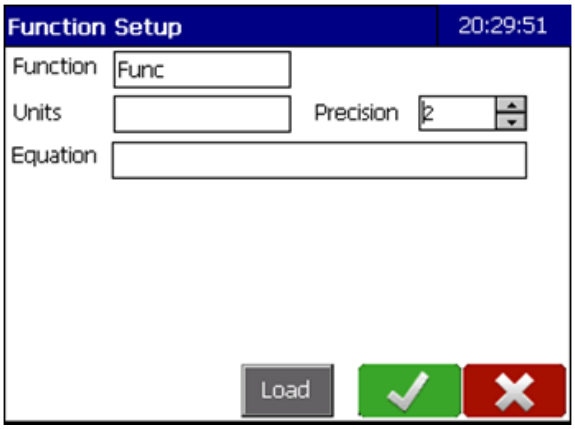


Figure 7-28: Function Setup Screen

Function: This specifies the name given to the function. The default name is Func and can be changed if desired.

Units: Input the desired units to be used in the function.

Precision: Use the arrows to specify the precision (number of decimal places) the function is to display.

Equation: Input the equation here using the mathematical operators.

Load: Pressing this 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. It will open up the browsing window through which you can select the file.

7.13.1 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

7.13.2 FUNCTION EXAMPLE

Figure 7-26 shows a Function Process (SD_comp) set-up to compensate the SR50A's (snow depth sensor) distance reading.

The units and precision are set as desired and the equation is entered: *SD_raw*SQRT((Tair+273.15)/273.15)).* The variables Tair (air temperature in Celsius from defined THS3 sensor) and SD_raw (raw distance reading from snow depth sensor) must already be defined in the Datalogger in order to be used in the equation.

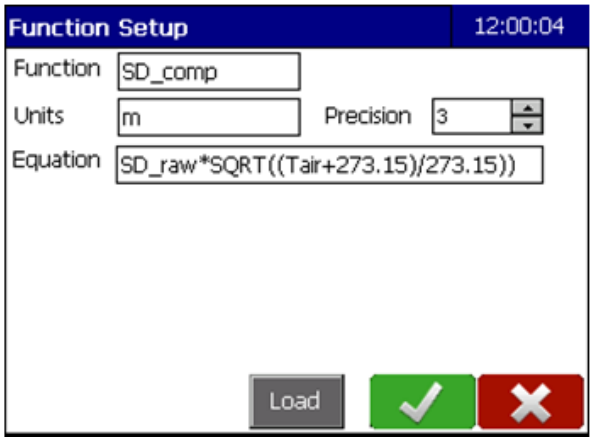


Figure 7-29: Function Example

7.13.3 LOADING FROM AN XML FILE

The **Load** button is used o 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 data points 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 data point 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>
```

7.14 THRESHOLD SAMPLING PROCESS (TSAMPLER)

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. **Select Home>Processes>Setup.** A series of Tabs are available for the user to input the necessary information. Also, more than one Threshold Sampling Process can be generated by providing each data point with a unique identifier. This is particularly useful in storm water applications.

NOTE: This feature is not available for Axiom H1 Datalogger models

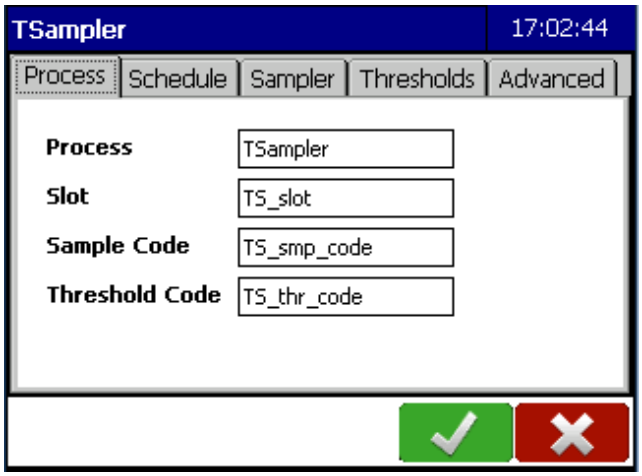


Figure 7-30: TSampler Setup Screen

7.14.1 PROCESS TAB

Figure 7-27 shows the Process Tab with the default names. The default names can be changed if desired by pressing on the field and using the keyboard to enter the new name.

Process: This specifies the name given to the Threshold Sampling Process.

Slot: This is the variable name given to slot number from which the sample was taken. Numbers preceded by a negative sign indicate a problem with the sample. See the following table for an explanation of the codes.

Sample Code: This is the variable name given to the Sample Code. The default name is TS_smp_code. This will return a code from 0-5 describing the type of sample collected. See the following table for an explanation of the codes.

Threshold Code: This is the variable name given to the Threshold Code. It will return a code from 0-3 describing the type of trigger value. See the following table for an explanation of the codes.

7.14.1.1 *Threshold Sampling Process Variables Codes*

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

Variable name	Value	Meaning
Sample bottle number (TS_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
Sampling code (TS_smp_code)	1	No sample collected
	2	Threshold sample
	3	Depth-integrated sample (DI)
	4	Auxiliary sample (AUX)
	5	Start-up sample
		Overflow sample, turbidity above maximum; samples every third interval
Threshold code (TS_thr_code)	0	Baseflow
	1	Rising trigger value
	2	Falling trigger value
	3	Unknown trigger value, not yet defined as rising or falling

7.14.2 SCHEDULE TAB

This tab is used to set the schedule for the Threshold Sampling Process

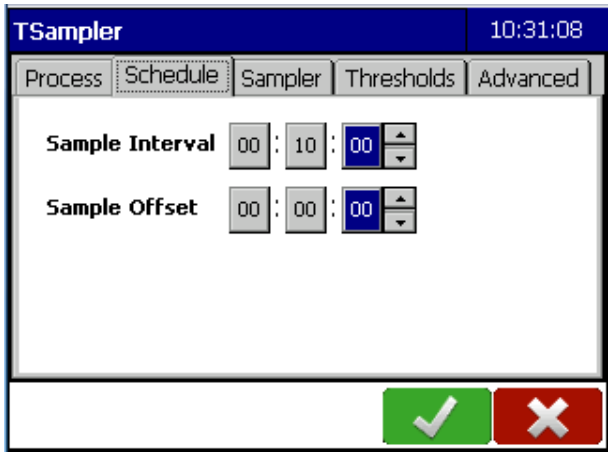


Figure 7-31: TSampler – Schedule Tab

Sample Interval: This specifies how often a Threshold Sample is taken.

Sample Offset: This specifies at what time the Threshold Sample is taken run based on midnight.

For example: A Threshold Sample with an interval of 10 minutes (00:10:00) and an offset of 00:05:00 will be run every ten minutes commencing at 5 minutes after midnight (00:05:00, 00:15:00, 00:25:00 etc.).

7.14.3 SAMPLER TAB

Use this tab to identify 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)

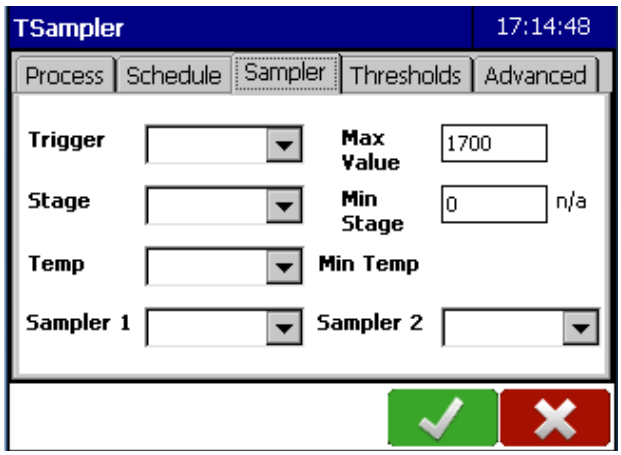


Figure 7-32: TSampler – Sampler Screen

Trigger: Use the drop down menu to select the variable to be used as the Trigger input. The hysteresis values as well as the minimum interval settings for the Trigger sensor can be set using the Advanced Tab.

Stage: Use the drop down menu to select the Stage variable to be used in the process.

Temp: Use the drop down menu to select the temperature variable to be used in the process.

Sampler 1: Use the drop down menu to select the sensor which will be used for Sample 1.

Sampler 2: Use the drop down menu to select the sensor which will be used for Sample 2.

7.14.4 THRESHOLDS TAB

Samples can be triggered by rising or falling Turbidity Threshold Values. Default settings are shown below.

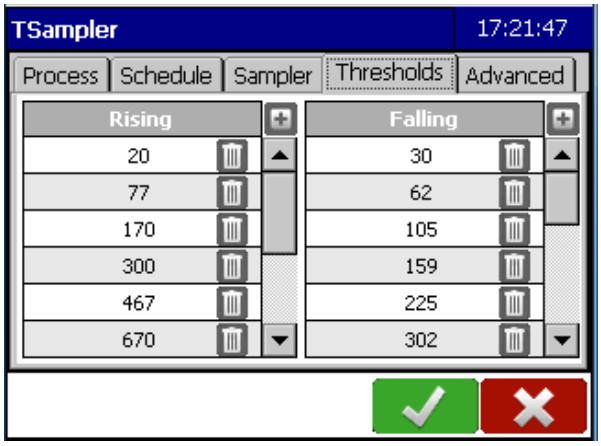


Figure 7-33: TSampler – Thresholds Tab

Modify the Turbidity Threshold Sample (TTS) values directly from this tab through the **Edit** function. On initial setup the screen will already be in edit mode as shown in Figure 7-30.

To change a value, select the field you want to change and type in the desired value when the keyboard screen is displayed. Select **OK**. The changed value will be displayed and automatically ordered in the ascending scale.

To add a value, select the **Add** icon from the desired column and type in the desired value when the keyboard screen is displayed. Select **OK**. The changed value will be displayed and automatically ordered in the ascending scale.

To delete a value, select the **Delete** icon beside the value you wish to delete. You will be prompted to confirm the deletion. Select **OK**.

7.14.5 ADVANCED TAB

The Advanced tab on the TSampler screen displays the advanced settings used for the **Trigger** sensor. These settings outline the hysteresis for the thresholds as well minimum interval settings. Default settings are shown below.

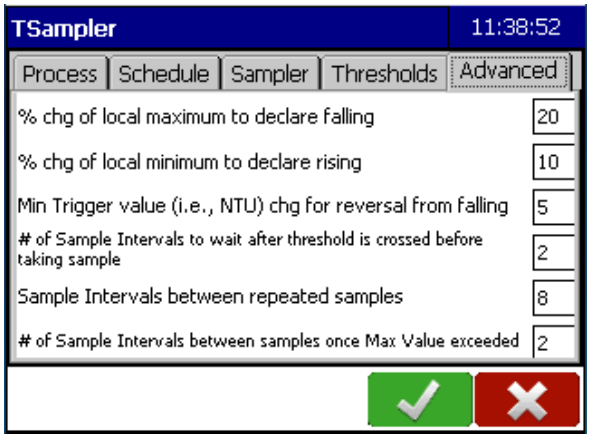


Figure 7-34: TSampler – Advanced Tab

7.14.6 TSAMPLER DISPLAY SCREEN

Once the Threshold Sampling process is defined, the TSampler Display screen shows current readings for the process and allows the user to suspend sampling (**Disable** button) or manually trigger a water sample.

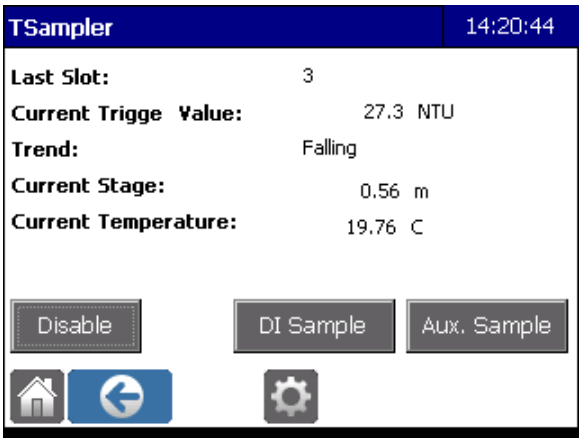


Figure 7-35: TSampler Display Screen

Disable/Enable: Pressing this will suspend sampling. A confirmation prompt will be displayed. Once disabled, the button will become and Enable button. Pressing Enable will recommence sampling.

Two types of water samples can be triggered; a Depth Integrated Sample (DI Sample) or an Auxiliary Sample (Aux. Sample). In both cases a water sample is taken but the samples are tagged differently in the TS_smp_code variable.

DI Sample: Press this to manually trigger a Depth Integrated Sample (DI Sample). 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.

Aux. Sample: Press this to manually trigger an Auxiliary Sample (Aux. Sample). 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.

7.14.7 DEFINING ADDITIONAL THRESHOLD SAMPLE PROCESSES

Additional Threshold Sample Processes can be defined as long as they have a unique identifiable name which follows these rules:

1) The name must start with a letter followed by an alphanumeric character;
2) Spaces and reserved keywords are not allowed; and
3) The name cannot be the same as another Process name.

An error dialogue box will appear if the chosen name does not meet the above criteria.

To add a Threshold Sample Process, select **Home>Processes>Add>Threshold.**

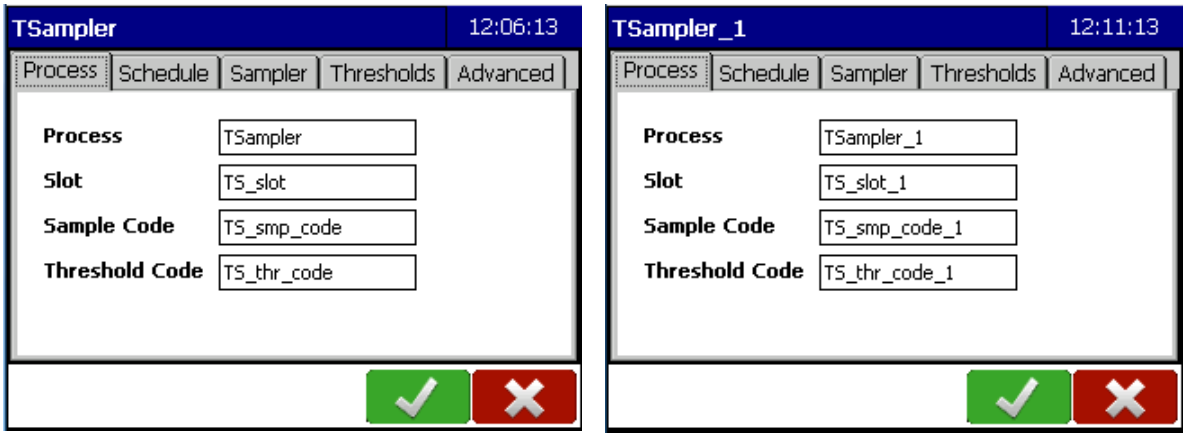


Figure 7-36: Adding Additional TSampler Processes

Change the default names of the four fields. If you do not change all the names prior to selecting OK, an error dialogue box will appear, thus preventing inadvertent twinning of names and potential interface conflicts. Once all the Process Tab fields have been changed, define the process using the TSampler Tabs as shown previously in this section. All TSampler Processes will be displayed when **Home>Processes** are selected.

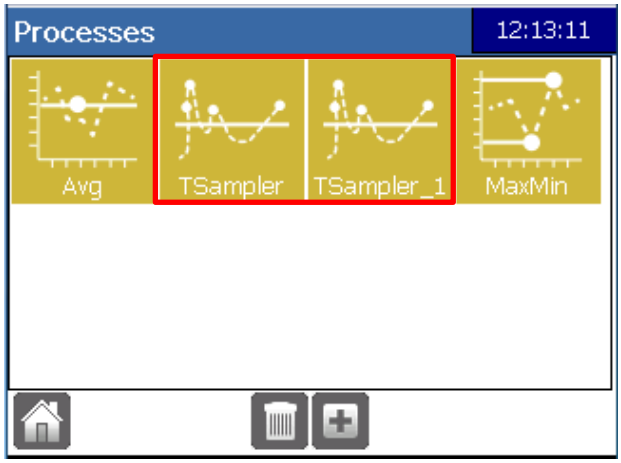


Figure 7-37: Processes Screen showing two TSampler Processes

7.15 Discharge Process

This process is specific to USGS (United States Geological Survey) operations and is used to convert a Stage Sensor's readings to flow rate based. It will return the shift value along with a volume rate of water flow (discharge) from a specially formatted text file which defines a stage-discharge rating table. If the shift value falls outside of the loaded table, the Shift value will display "Error".

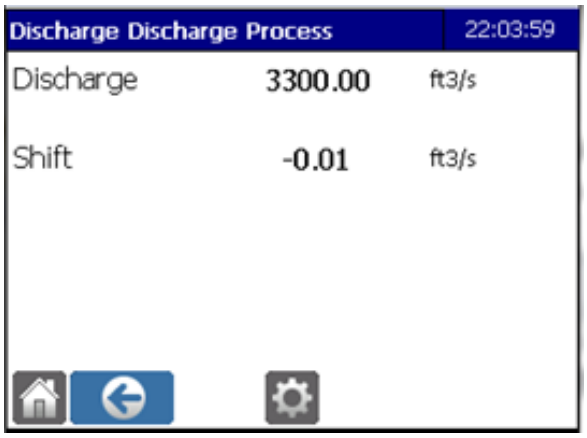


Figure 7-38: Discharge Process Screen

Select **Home>Processes>Add** and then scroll to and select the **Discharge** icon. You will then be presented with the **Discharge Configuration** screen:

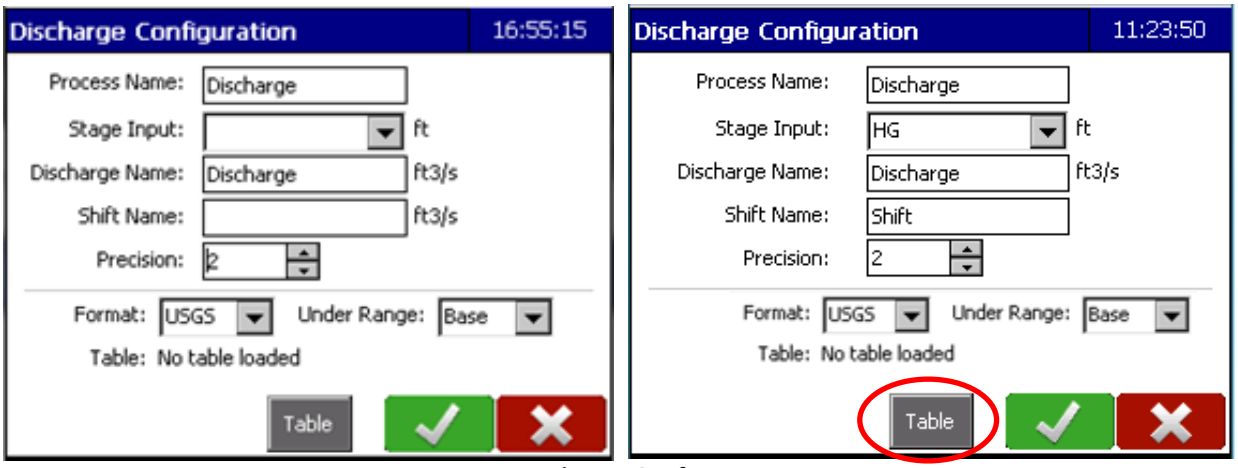


Figure 7-39: Discharge Configuration screen

Process Name: The default name of Discharge appears. This can be changed by tapping on the field and entering the desired name using the pop-up keyboard.

Stage Input: Use the alphabetical drop down menu to select the Stage Name variable to be used. This is the Stage Name given in the Stage Tab when setting up the relevant Stage Sensor. See Chapter 5 – Sensor Extensions. The default name is HG. If the Stage Sensor was given a unique Stage Name, ensure the correct name is selected. This example uses the Stage Sensor default name of HG.

IMPORTANT! Discharge Configuration Stage Input and Discharge units are only in feet and ft3/s (cubic feet per second) respectively. The relevant Stage Sensor **MUST HAVE** feet selected in the Sensor Stage Setup page (Stage Tab) for an accurate conversion to take place.

Discharge Name: the data point default name is Discharge. This can be changed if desired. Discharge will be measured in cubic feet per second (ft3/s).

Shift Name: Input the desired data point name here.

Precision: Use the arrows to specify the precision (number of decimal places) the function is to display.

Format: Use the drop down menu to select the format. Currently, USGS is the only format supported.

Under Range: Used to report Stage levels that are less than the starting table value. The drop down menu has three reporting flow options: Base, Err (error), and zero.

Table: Once all the fields are input, select the Table button to load the discharge table.

7.15.1 LOADING THE DISCHARGE TABLE

A discharge table must first be created and copied to a USB stick. To load a table file, select the **Table Button** (see Figure 7-38) to display the Discharge Table screen.

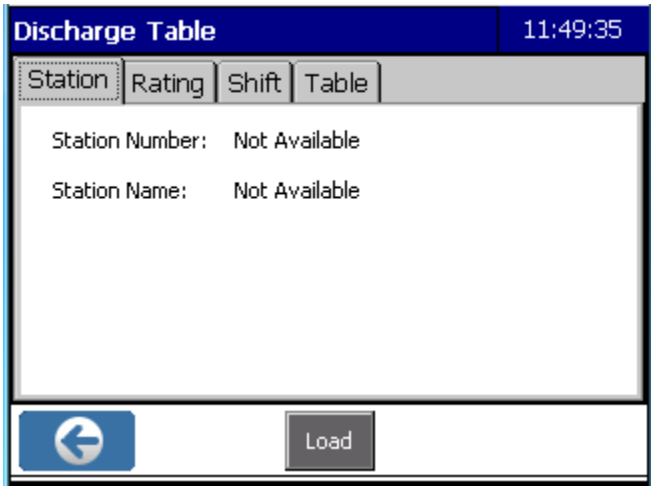


Figure 7-40: Loading the Discharge Table

The Station, Rating, and Shift tabs show information contained in the comment block of the file. The Table tab displays the contents of the table.

NOTE: If loading the form for the first time (creating a new process) or if the file does not abide by the correct format, this information will be shown as Not Available.

Place the USB stick in the USB Host port on the Datalogger, and select **Load**. Scroll to the desired table and select OK.

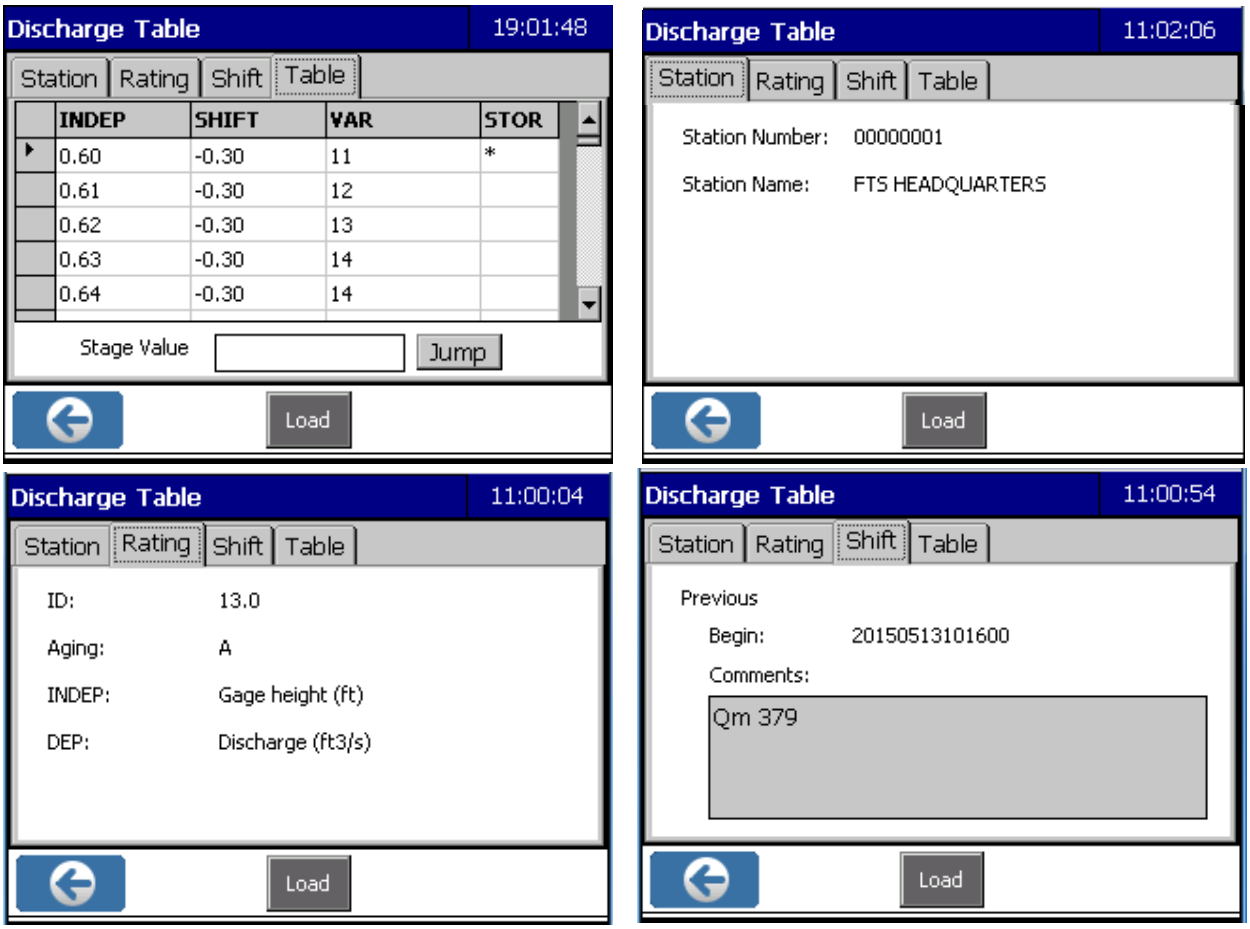
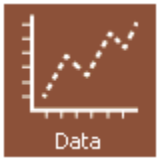


Figure 7-41 Discharge Table Tabs after loading a Table

Once a table has been loaded, the information in the Station, Rating, and Shift tabs will be auto-populated as shown in Figure 7-40.

CHAPTER 8 - DATA FUNCTIONS



The **Data Status** screen displays data storage information and is used to configure data logging, as well as download and delete data, or examine the Datalogger's recorded data.

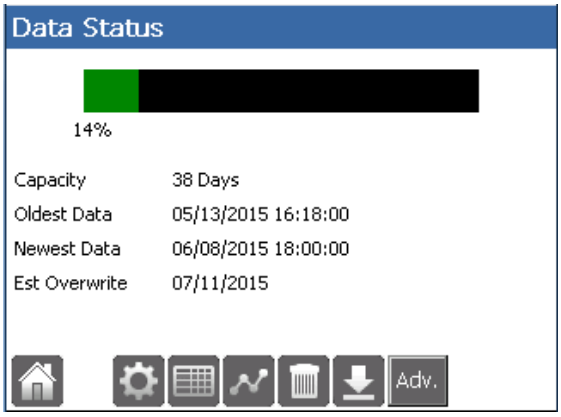


Figure 8-1: Data Status Screen

A series of Action Icons appears at the bottom of the screen.

 Home

 Setup Cog

 Table View

 Graph View

 Delete

 Download

Advanced

8.1 SETUP LOGGING

Data logging is configured through the **Setup Cog**. Figure 8-2 shows the **Logging** screen for a blank Datalogger (no data logging intervals configured) and a Datalogger with logging intervals configured. Logging intervals created through the Data functions, as described here, are displayed in blue. Logging intervals created using the In-line Logging feature are displayed in green.

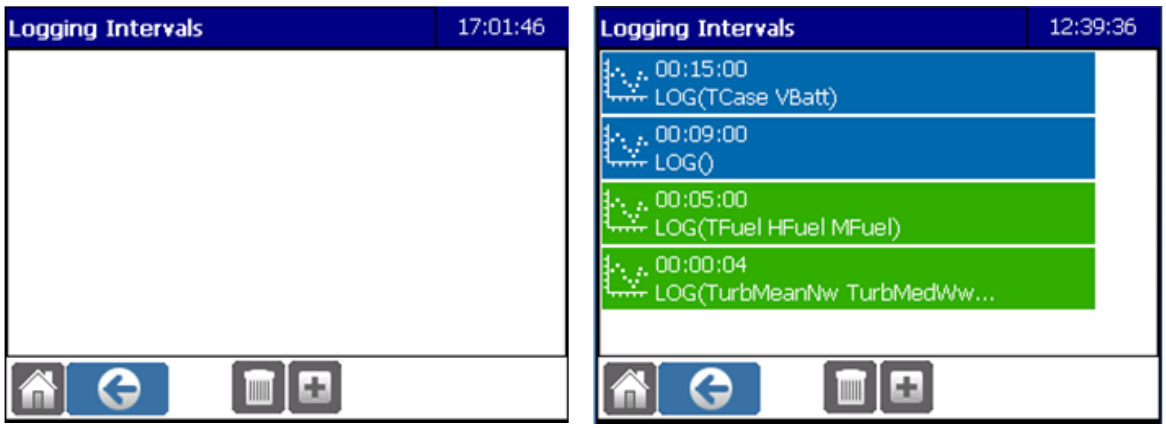


Figure 8-2: Logging Intervals Screens

To view Logging Interval details, press on the desired bar.

> NOTE: In-line logging intervals cannot be edited from the **Data** functions, only through the Sensor Setup screen.

Press **Add** to configure a logging interval. After a Logging Interval is configured, it appears on the **Logging Intervals** screen. Multiple Logging 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.

> NOTE: Deleting a Logging Interval does not delete the data stored in the Datalogger.

8.1.1 CONFIGURING A LOGGING INTERVAL

To configure a Logging Interval, the user must set how often and when the data is logged, and specify what data is to be stored. Press **Data>SetUp** and then press **Edit** (See Figure 8-2) to display the **Interval Tab**.

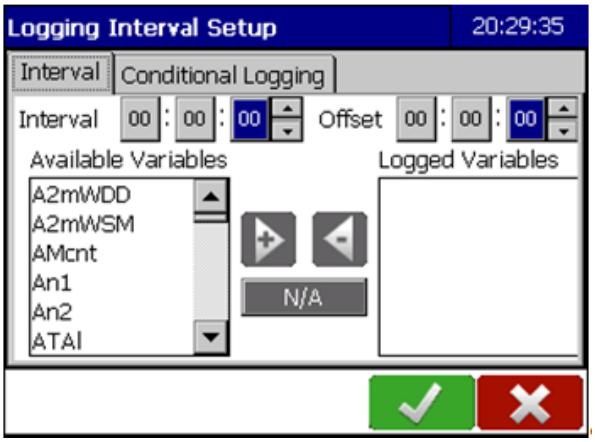


Figure 8-3:

A list of all **Available Variables** is displayed. Select the **Available Variable(s)** you wish to log, then press the **Move Right Arrow** to shift it to the **Logged Variable** field. Similarly use the **Move Left Arrow** to shift a variable from the **Logged Variables** field to the **Available Variables** field.

Interval: This specifies how often the data from the selected variables is logged.

Offset: This specifies at what time the data is logged based on midnight.

> For example: An interval of 10 minutes (00:10:00) and an offset of 00:05:00 will log the data every ten minutes commencing at 5 minutes after midnight (00:05:00,

00:15:00, 00:25:00 etc.).

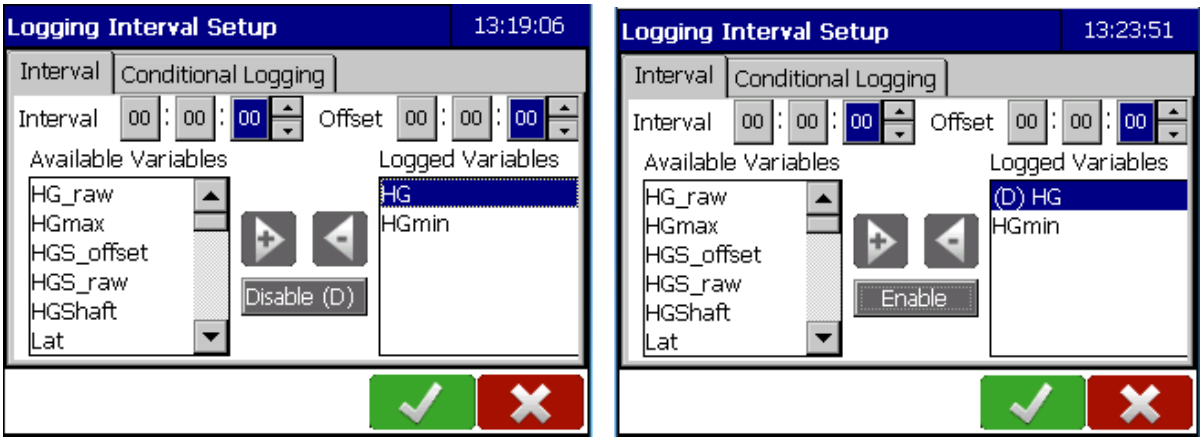


Figure 8-4: Logging Interval Setup – Enable/Disable logging

Once a variable has been selected to be logged as a data point, logging can be disabled. When a data point in the **Logged Variables** is selected (highlighted in blue), the grey **N/A** field displays a **Disable(D)** command. Pressing on the Disable button will disable the selected variable which will then be shown with a (D) preceding its name. The right hand screen in Figure 8-4 shows that the HG variable logging has been disabled.

To enable logging of a disabled variable, press on the variable and the Enable button will be displayed. Pressing on it enables the variable as seen by the (D) no longer appearing before the variable name.

8.1.1.1 *Conditional Logging*

Conditional Logging will log the variables selected in the Logging Interval when the defined conditions are met.

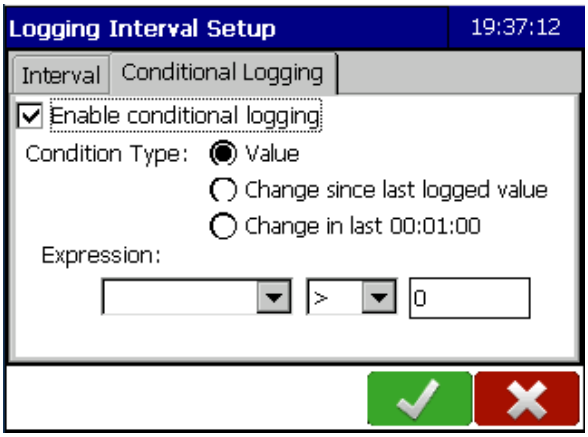


Figure 8-5: Conditional Logging Setup

Enable Conditional Logging Checkbox: This must be checked for Conditional Logging to take place.

Condition Type: Select the type of condition to be defined.

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. Note that once this radio button is selected, the default time of 00:00:00 will change to reflect the Interval time input in the **Interval** tab.

Expression: 1)Use the drop down menu to select the variable upon which the condition rests.

2) Use the drop down menu to select the mathematical operator. Valid operators are:

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

3) Input the desired value.

Once all Conditional Logging fields have been filled in, select **OK**.

8.2 DOWNLOAD DATA

The **Download** button on the **Data Status** screen is used to export data to a USB memory stick.

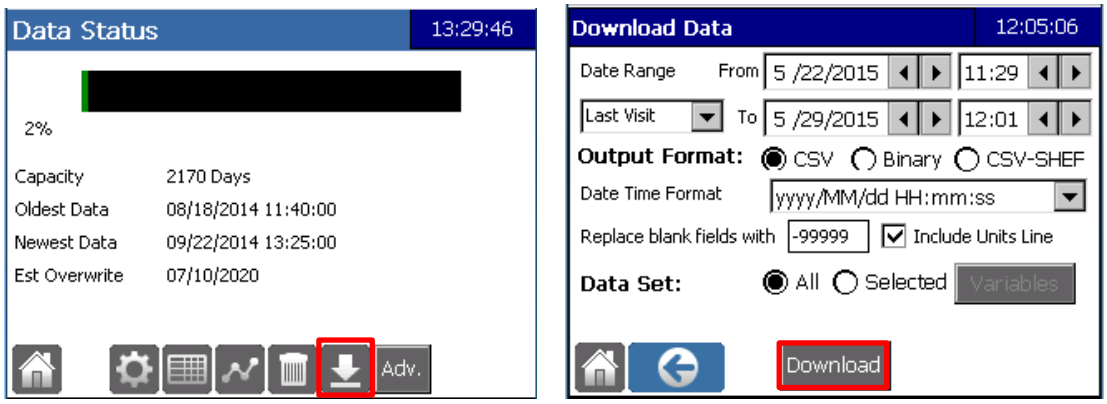


Figure 8-6: Download Data

Date Range: Use the down arrows in the **Date Range** to display and select the options. In the **Date Range** field, selecting **Last Day, Last Week, Last Month**, or **All** will automatically adjust the dates in the **From and To** fields. The time will reflect the current time. The **Date Range** selection will remain persistent after restarts and are saved to the configuration file.

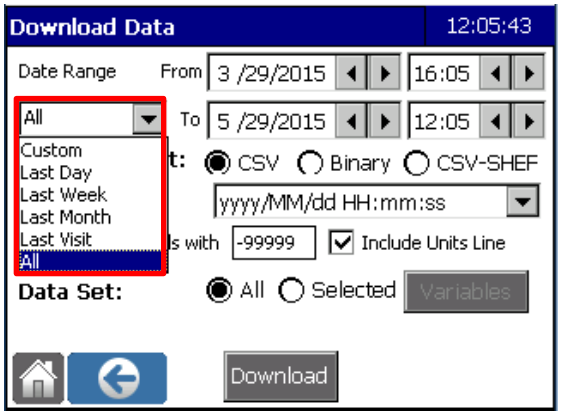


Figure 8-7: Date Range Options

Custom: Dates and times can be individually adjusted by selecting the individual elements of the **mm/dd/yyyy** and **hh/mm** fields, and using the left and right arrows to adjust accordingly.

Last Visit: When this is selected, it will save the time stamp of when data was downloaded. Subsequent downloads using the **Last Visit** option will be referenced from that time stamp, preventing duplicate data from being downloaded.

Output Format: There are three formats to export data. Use the radio buttons to specify the desired format.

Format	Meaning
CSV	The exported file to be written in standard ASCII text **C**omma-**S**eparated **V**alue format.
Binary	This 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.
CSV-SHEF	The exported file to be written in a CSV-like format based on the **S**tandard **H**ydrologic **E**xchange **F**ormat.

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

Date Time Format: If CSV or CSV-SHEF is selected, use the down arrow to view and select the desired **Date Time Format** to appear on your data sheet. Note that this will not affect the **Date Time Format** of the time stamp of the downloaded data.

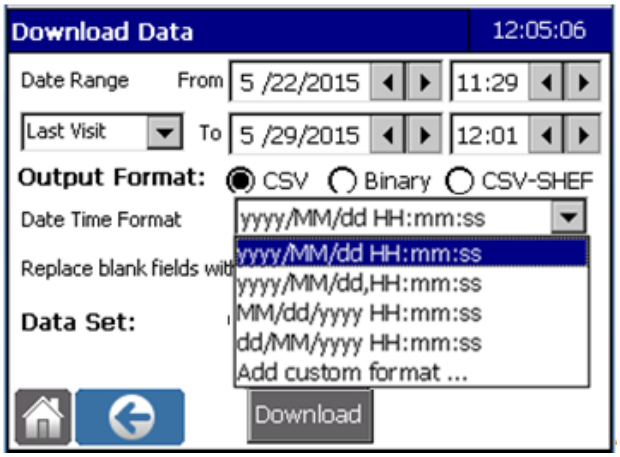


Figure 8-8: Date Time Formats

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

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

Replace blank fields with: Missing data fields will be filled in using the input figure. The default setting is -99999. To change it tap on the field and input the desired value using the keyboard. Select **OK**.

Include Units Line Checkbox: When checked units will be included in the data sheet.

Data Set: This feature is used to select and order the variables to download. The default selection is **All**. When selected, the **Data Set** will consist of all the variables and the data will be downloaded in the order of the data store index unless ordered. To create a smaller Data Set made of specific variables, press on the **Selected** radio button, then the **Variables** button. To adjust the download order of the variables in the Data Set, see section 7.2.1. The **Data Set** choice (whether **All** or **Selected Variables**) will remain persistent after restarts and is saved to the configuration file.

Variables: Select the variables to export by pressing the **Select** radio button and then **Variables**. Press on the desired variable(s) and use the arrows to build the list. The variables will be downloaded in the order they appear in the list unless ordered (see following section).

8.2.1 CREATING AN ORDERED DOWNLOAD LIST OF VARIABLES

If the variables need to be downloaded, but in a different order than they appear in the data store index, their order can be adjusted. Press on the **Selected** radio button and then the **Variables** button to display the **Select Variables** screen. Select **Edit.**

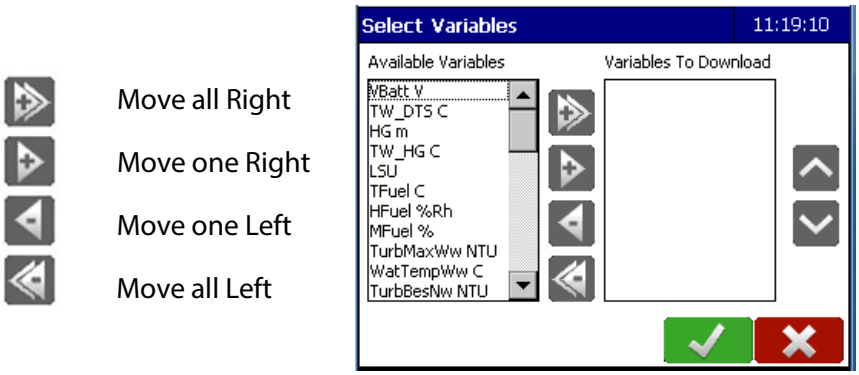


Figure 8-9: Select Variable to Download

Move the desired variables from the **Available Variables** column to the **Variables to Download** column using the arrows. All the variables or select variables can be moved.

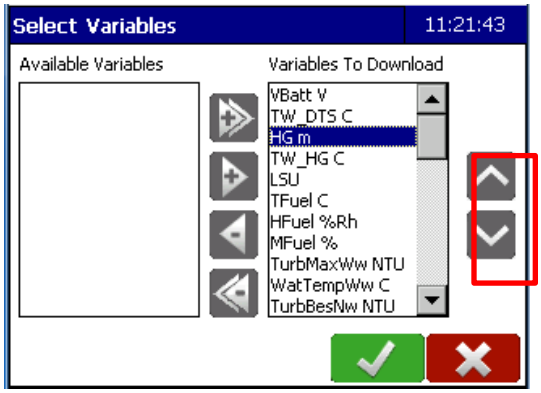


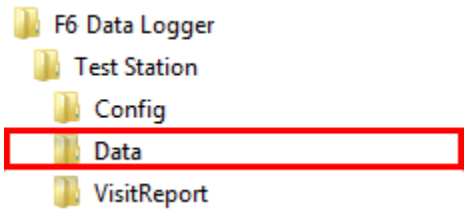
Figure 8-10: Ordering All Variables

Adjust the order of the download list by pressing on a variable and using the up and down arrows to place it.

Once the download variable list is complete, select **OK.**

Download Button: Once all desired options in the Download Data screen have been filled in, press on the Download button.

The downloaded data will appear in the following file structure on the USB memory stick.



The downloaded data file is time-stamped and has the following naming format: station name-yyyy-mm-dd-hh-ss with either a .csv or .bin extension.

8.3 DATA ERRORS AND ERROR CODES

The Datalogger recognizes data errors arising from different sources. Should an error state be detected, the data for the affected variable will be replaced with one of the following error codes:

0 no errors

1 sensor error (responded, but incorrectly)

2 missing sensor

3 under range value

4 over range value

5 division by zero

6 other errors

The error codes are organized in order of priority, with 0 being the highest priority. If there are multiple errors, the highest priority error will be used.

The Axiom F6 Datalogger can detect a missing sensor for:

- wind direction
- air temperature
- fuel temperature
- any SDI sensor that is not responding

However, the Axiom F6 Datalogger it cannot detect a missing sensor for:

- wind speed
- rain
- air humidity
- fuel humidity

The Axiom H series Dataloggers can detect any SDI sensor that is not responding; however, they cannot detect a missing dedicated rain sensor.

In the case of SDI sensors, it is not possible to detect if two sensors are set to the same address and are connected on the same datalogger SDI port. The error returned for each sensor when two sensors are set to the same address and connected on the same port will depend on the operation of the individual sensors. With SDI sensors, some sensors return unusual readings as error indicators. These will often be caught by the Over range and Under range messages. This behavior depends on the sensor manufacturer.

8.3.1 ERRORS AND INTERMEDIATE CALCULATIONS

Detected data errors are carried through to intermediate calculations which use the affected data point.

Example: You have a variable, **Temp**, from an air temperature sensor which measures in degrees Celsius. You have a calculation to convert the readings from degrees Celsius to degrees Fahrenheit, **FTemp=(Temp*9/5)+32.** If the air temperature sensor is removed, when the data point **FTemp** is logged, error code 2 (Missing sensor) will be stored in place of the data.
To determine if a datapoint has valid data, the Axiom datalogger has an error operator which can be used in a script to test the validity of a datapoint. The error operator can also be used in a Function to report the error status of the datapoint.

The error function has the format: **ERR(datapoint)**

An example of the ERR function used in a script is:

```
IF(ERR(datapoint)==0)     // Checking validity of datapoint
{
 // This code is executed if datapoint has no errors  -  i.e. is code 0 (zero)
}
ELSE
{
 // This is executed if datapoint has an error  -  i.e. is not code 0 (zero)
}
```

The error codes returned are defined as follows:

0 no errors
1 sensor error (responded, but incorrectly)
2 missing sensor
3 under range value
4 over range value
5 division by zero
6 other errors

8.4 DELETE DATA

The **Delete Data** button on the **Data Status** screen permanently deletes all data stored in the Datalogger. After the **Delete Data** button is pressed, the user is prompted to confirm the delete operation.

IMPORTANT! Once deleted, the data cannot be recovered.

Data is not deleted when loading a new configuration, when updating the Application or when updating the Operating System. The only way to delete data is to push the **Delete Data** button.

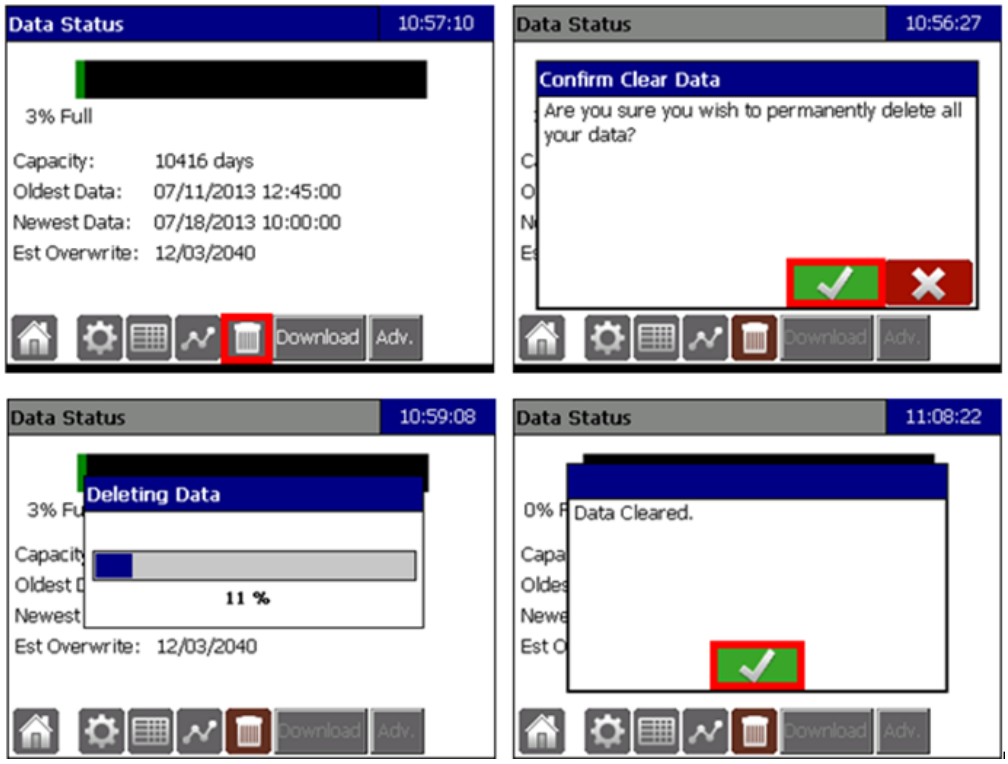


Figure 8-11: Deleting Data Sequence

8.5 DATA GRAPH VIEW

A graph of logged data can be created and viewed through **Graph Data** 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. The graph below shows a graph of the RNIN sensor over a two hour period.

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

The left and right arrow 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 is displayed in grey.

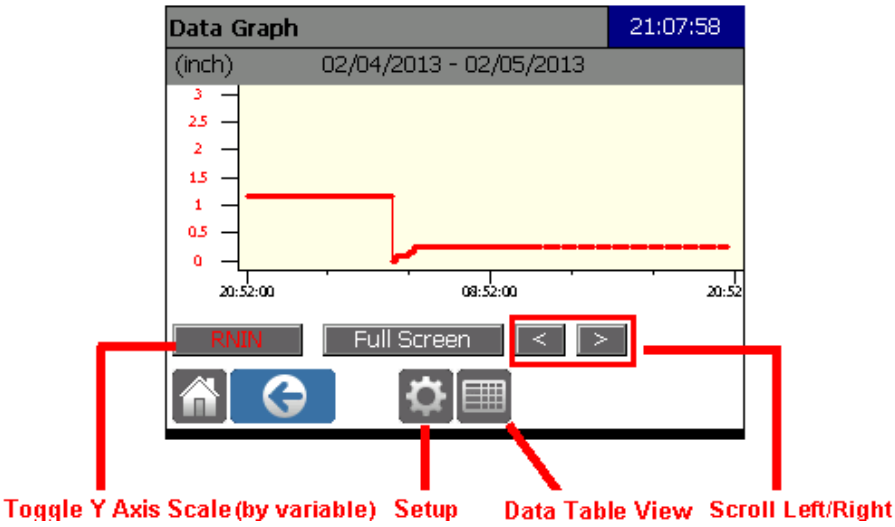


Figure 8-12: Data Graph Screen

8.5.1 GRAPH SETUP

Use the Setup cog to bring up the Graph Setup screen.

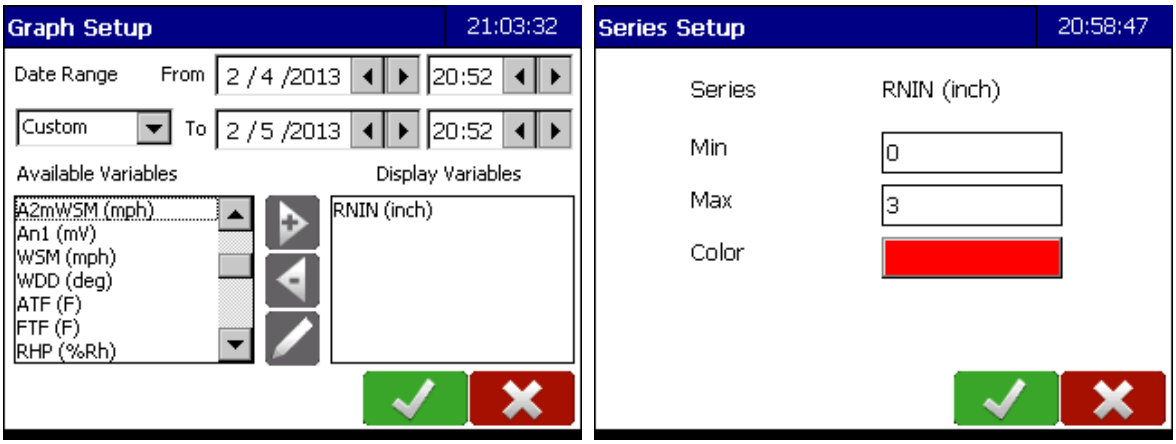


Figure 8-13: Graph Setup Screens

Date Range: Use the down arrows in the **Date Range** to display and select the options. In the **Date Range** field, selecting **Last Day, Last Week, Last Month**, or **All** will automatically adjust the dates in the **From and To** fields. The time will reflect the current time. Dates and times can be individually adjusted by selecting **Custom**, then selecting the individual elements of the **mm/dd/yyyy** and **hh/mm** fields, and using the left and right arrows to adjust accordingly.

Display variables: A list of all **Available Variables** is displayed. Select the **Available Variable(s)** you wish to display on the graph, then press the **Move Right Arrow** to shift it to the **Displayed Variable** field. Similarly use the **Move Left Arrow** to shift a variable from the **Displayed Variables** field to the **Available Variables** field.

Series Setup: When a variable is moved to the Available Variables column, a Series Setup Screen will appear (see Figure 8-13). Select the colour

Min: This is the minimum value to be displayed on the y-axis. Press on the field and use the keyboard to input the desired value.

Max: This is the maximum value to be displayed on the y-axis. Press on the field and use the keyboard to input the desired value.

Color: Tap on the color field to select the color to be used for the variable. Choices are red, orange, yellow, green, blue, violet and brown.

Select **OK.**

Edit: Use this to edit the Series Setup of a variable. Select the variable then press Edit.

8.6 DATA TABLE VIEW

A table of logged data can be created and viewed through **Table** on the **Data Status** screen or similarly from the **Data Graph** screen.

The **Data Table** 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. Use the arrows and scroll bars to view the data.

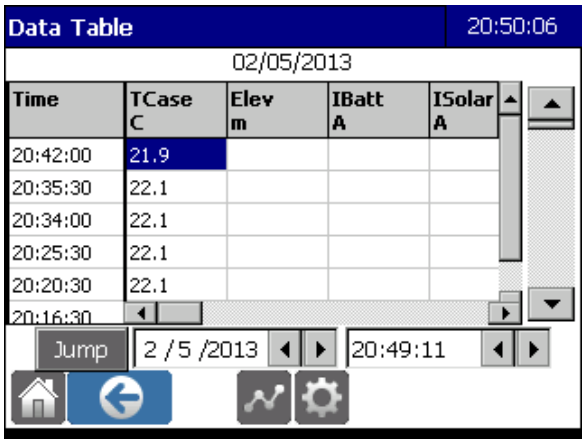


Figure 8-14: Data Table Screen

Jump: The **Jump** button will display the specified time 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).

To set the Jump time, use the Setup Cog to display the Table Setup Screen (Figure 8-15). Press on the individual elements of the date (mm/dd/yyyy format) and time and use the arrows to select the desired values. Press **OK**.

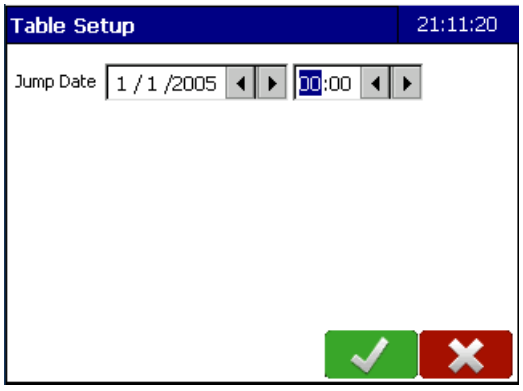


Figure 8-15: Setting the Jump Date

8.7 ADVANCED

Advanced logging options are configured through the **Adv** button  on the **Data Status** screen. To change the advanced data setup, press the **Edit** button on the screen. The **Data Advanced Setup** screen allows the user to select the following two options:

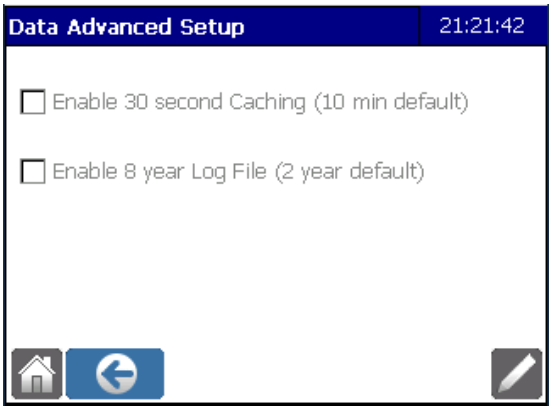


Figure 8-16: Data Advanced Setup

Enable 30 Second Caching (10 minute Default): When checked, this decreases 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): When checked, this increases 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.

CHAPTER 9 - CURRENT CONDITIONS

The **Current Conditions** icon displays a set of user selected variables for easy monitoring of a specified set of data. The **Current Condition** screen is not automatically updated by the Datalogger. Variables selected for the **Current Conditions** display can be **manually or automatically (timed) refreshed.** Built-in and analog sensors are read every time a manual or automatic refresh event occurs.
However, 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. A process returns the current value of the process at the time the refresh was selected. 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.

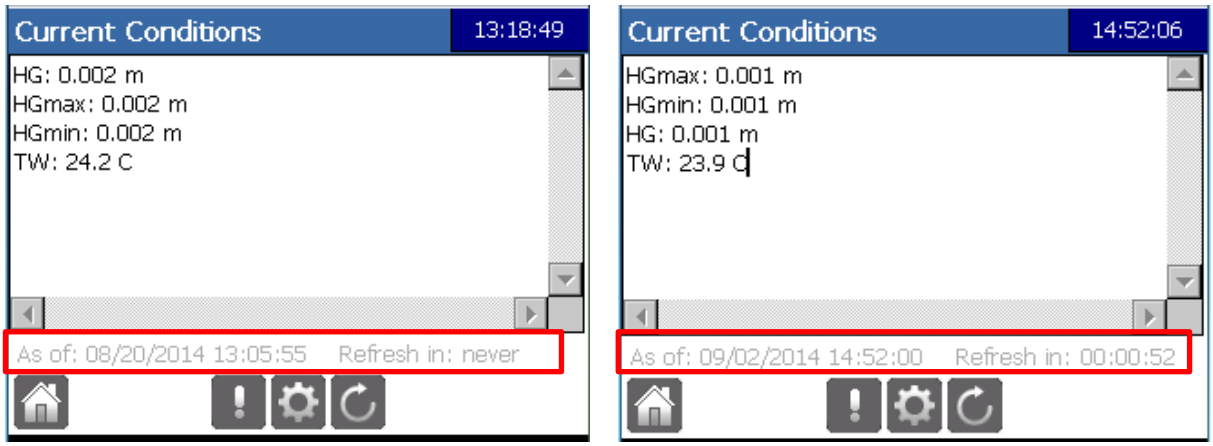


Figure 9-1: Current Conditions Screens

If timed Refresh is not enabled, the time of the last SDI sensor reading is displayed at the bottom of the screen in the following format: "As of: mm/dd/yyyy hh/mm/ss", and the Refresh message reads "Refresh in: never". If Timed Refresh is enabled, the time of the last Timed Refresh is displayed in the "As of" message and the count down time until the next refresh will be displayed in the "Refresh in:hh:mm:ss" message.

9.1 CURRENT CONDITIONS SETUP

The **Setup** button provides access to configure the data displayed on the **Current Conditions** screen. To build a list of **Current Condition** variables, select **Current Conditions> Setup> Edit.** A series of variables will be displayed in the **Available** column. This list will vary depending on the SDI sensors mapped to the Datalogger and their configuration.

Note that the following built-in sensors' variables will always be displayed in the **Available** column:

t_dd	Lat
t_doy	Long
t_HH	Elev
t_mm	YB
T_MM	YF
t_ss	YR
t_TZ	SWR
t_yyyy	

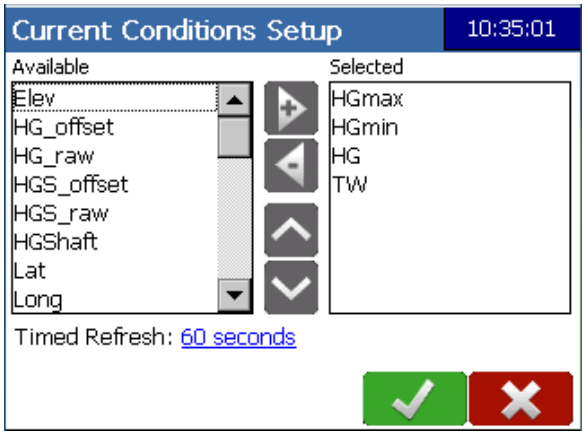


Figure 9-2: Selecting Current Conditions VAriables

Variables can be individually selected and shifted between the **Available** and **Display** columns by using the **Move Right** and **Move Left** arrows

The order of the variables in the **Selected** column can be arranged by selecting the variable and then using the scroll up and down arrows to move it to its desired position. Once the **Selected** list is complete, select **OK**. The variables will be displayed in that order in the Current Conditions screen

9.2 CURRENT CONDITIONS REFRESH

There are two ways to refresh the Current Conditions screen: manually and timed refresh. The Current Conditions screen can be manually updated by selecting the **Refresh** icon . This will refresh the Current Conditions screen once.

If there is a need to continually review Current Conditions over a short period of time, an alternative to manually refreshing the screen is to place the Datalogger in **Timed Refresh** mode. When in **Timed Refresh** the Current Conditions screen is refreshed at selected time intervals for a maximum of 60 minutes. The default value is every 60 seconds.

> **IMPORTANT!** Manual and Timed refresh do not trigger a new set of readings from SDI sensors or Process outputs. SDI sensors will continue to display the last value read from the sensor in accordance with its configured reading interval, so it may be several minutes or hours old.

9.2.1 TIMED REFRESH

To enable the Timed Refresh function, select **Current Conditions> Setup > Edit**. The Timed Refresh indicator is highlighted in blue. Press the blue portion to bring you to the **Current Conditions Refresh Settings** screen.

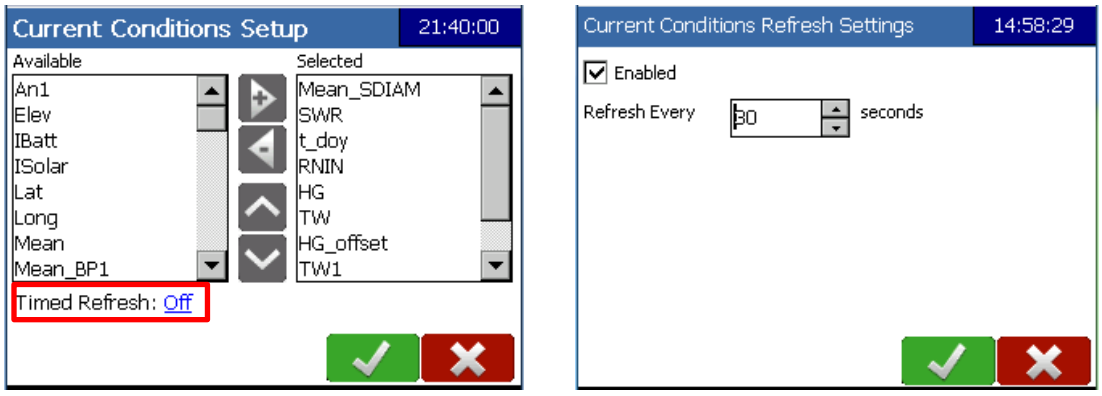


Figure 9-3: Current Conditions Refresh Settings

Select the **Enabled** box, then use the arrows to set the desired refresh interval. Time intervals from 5-120 seconds can be set. Select **OK>OK** to return to the **Current Conditions** screen.

Timed Refresh information is now displayed in the **Current Conditions Setup** (Timed Refresh: 30 seconds) and **Current Conditions** screens (Refresh in: hh:mm:ss). To turn Timed Refresh off, follow the same steps and toggle the **Enabled** box to remove the check mark.

9.2.2 TRIGGERING AN SDI READ

An **SDI Read** (Forced Read) differs from the refresh functions in that it will return a read from ALL sensors (including SDI sensors) at the time of the forced read.

To force a read of the sensors, select **Current Conditions > SDI Read Trigger** . A warning dialog will appear. If a read is forced at the same time as a scheduled read, the scheduled read data may not be saved. Select **OK** and then the forced read data will be displayed

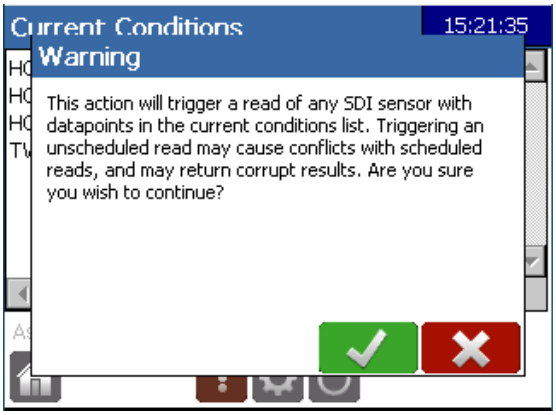


Figure 9-4: SDI Read Warning dialog

NOTE! Any data read during a forced read will not be saved to the data store and may cause conflict with scheduled reads.

CHAPTER 10 - TELEMETRY

The **Telemetry** screen displays the configuration of the Datalogger's two telemetry ports. Detailed explanation of Telemetry screens and message formats can be found in the Axiom Telemetry Reference. This manual will provide a brief overview.

Once the Telemetry icon is selected, the **Telem A** and **Telem B** tabs will be displayed. For Datalogger models with an internal GOES transmitter, Telemetry A is automatically assigned Device Type: G6 or G5 (dependent on the Datalogger model).

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

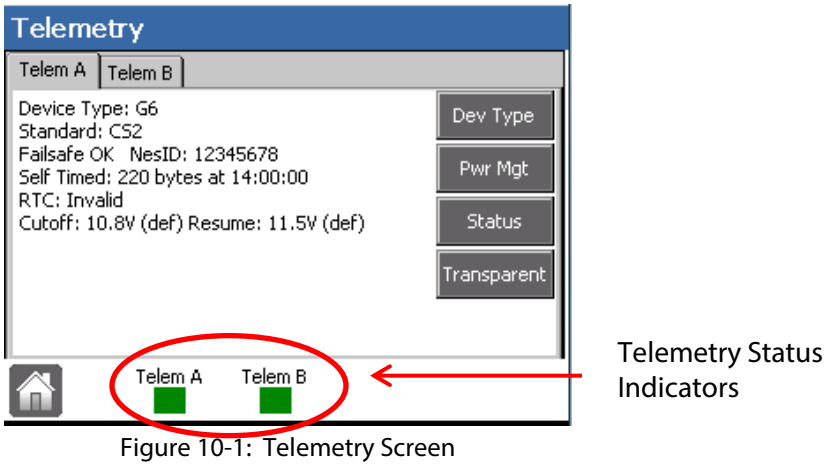


Figure 10-1: Telemetry Screen

10.1 TELEMETRY STATUS INDICATORS

The telemetry status indicators are colour coded to indicate the status of the port:

For G5/G6 telemetry:

Colour	Meaning
Black	G5/G6 status not available
Red	No G6 transmissions have occurred
Green	Data loaded into the G6 transmit buffer (black text on green background indicates the combined number of bytes loaded for self-timed and random transmissions)

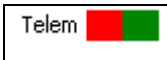
For other telemetry devices:

Colour	Meaning
Black	Port not in use
Red	The port is configured for use with a device but not powered
Green	Power supplied to the port

For WRLS-AXIOM-PC telemetry, in addition to the indications for other telemetry devices:

Colour	Meaning
Blue	Ready to connect to PC.
Blue with W	Waiting. Has established connectivity and waiting for commands.
Blue with A	Active. Actively transmitting/receiving information.

Examples:

<table>
<tr><td> 
</td><td>Port A in power saving mode
Port B has power supplied</td><td> 
</td><td>Port A has power supplied
Port B not in use</td></tr>
<tr><td> 
</td><td colspan="3">Port A is operating with a WRLS-AXIOM-PC and is actively transmitting / receiving information.
Port B has power supplied</td></tr>
</table>

10.2 MIGRATING A PREVIOUS G5 CONFIGURATION TO A G6 DATALOGGER

Upgrading from a Datalogger with an internal G5 Telemetry Port to one with an internal G6 Telemetry Port can be done without re-configuring the new Datalogger. Simply load a configuration containing the previous G5 set up to the new G6 Datalogger (see Chapter 3 Section 3.3 – Load Configuration). The settings from the G5 will be migrated to the G6 with no additional steps.

Customers upgrading from an external G5 device to a new external G6 can also migrate settings, but an additional step is required. The user must choose G6 as their Port Type by selecting it in the Telemetry screen (**Telemetry> Telem A or B Tab >Dev Type>G6**).

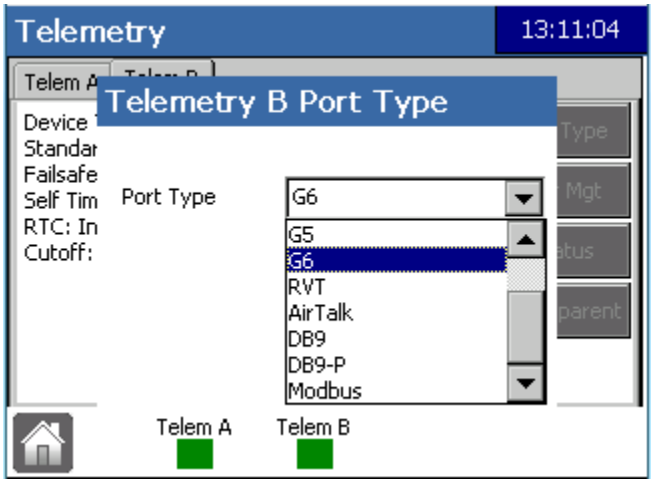


Figure 10-2: Migrating a Datalogger with an external G5 device to one with an external G6 device

NOTES:

1) The new G6 device must be on the same port as the G5 device was, in order for the migration to occur.

2) This fix will only support an upgrade from G5 to G6 and cannot be used to downgrade the G6 to a G5.

3) To use G6 specific features such as METEOSAT and International satellite networks the user must manually select these options from the G6 Configuration screen.

10.3 DEVICE TYPE

The **Dev Type** (Device Type) button is used to configure the Datalogger for the device attached to the associated telemetry port. There are 11 selections which can be made.

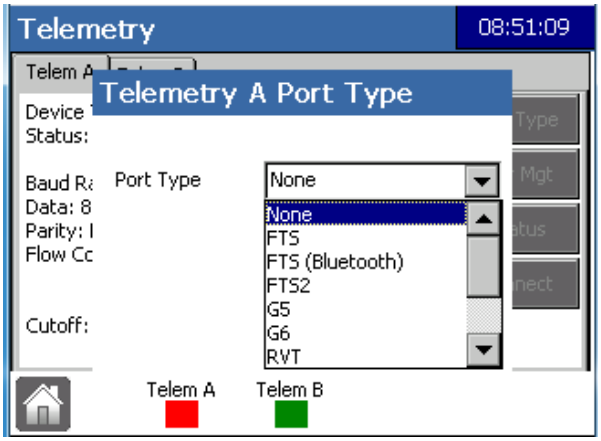


Figure 10-3: Device Type Menu

None	disables the Telemetry port
FTS	for use with telemetry devices which use FTS protocols
FTS (Bluetooth)	Specific for use with the FTS WRLS-AXIOM-PC device
FTS2	extended FTS protocols specific to FTS Ubicom 2-way satellite (Iridium) transceiver
G5	specific for the FTS G5 GOES Transmitter
G6	specific for the FTS G6 GOES Transmitter
RVT	specific for the FTS Radio Voice Transmitter (version 1)
AirTalk	specific for AirTalk (FTS Radio Voice Transmitter version 2)
DB9 / DB9-P	generic port setting, simple serial communications
Modbus	generic port setting for Modbus telemetry devices

None: 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.

FTS: FTS indicates that FTS protocols must be used. This is for use with commercial devices (ie: non-FTS). In order for full functionality with the Datalogger, these devices must use FTS protocols. This includes IP modems, radio modems, and Globalstar modems.

FTS (Bluetooth): This is an extended version of FTS protocols which are specific to and should only be used with the FTS WRLS-AXIOM-PC device.

FTS2: This is an extended version of FTS protocols which are specific to and should only be used with the FTS Ubicom Transmitter. There are two options from which to select:

Ubicom – this is the option which should be selected by most customers

UbicomDoD - specific to Ubicoms operated by the U.S. Department of Defense.

Refer to the Axiom Telemetry Reference for detailed Ubicom setup instructions.

G5: The G5 device type is specific to and should only be used with the FTS G5 GOES Transmitter.

G6: The G6 device type is specific to and should only be used with the FTS G6 GOES Transmitter. G6 status information reported on the **Telemetry** screen includes:

NesID	the G6's current NESDIS identification number
Failsafe	the state of the G6's failsafe circuit
Timed Tx Info	the number of bytes to be sent at the next timed transmission time
RTC	the status of the G6's real time clock
Standard	the standard (CS1 or CS2) that the G6 implements
Cut-off/Resume	the station power management cut-off and resume voltages

Section 10.2 provides a brief look at G6 configuration. Refer to the Axiom Telemetry Reference Manualfor detailed G6 configuration instructions.

RVT: 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 Manual for detailed RVT configuration and status information provided by **Status**.

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

Refer to the Air Talk Telemetry Reference Manual for detailed configuration instructions and for status information provided by **Status**.

DB9/DB9-P: The DB9/DB9-P device type is for simple serial communication. The port settings are user configurable.

Refer to the Axiom Telemetry Reference for detailed DB9/DB9-P configuration instructions.

Modbus: The Modbus device type is specific to and should only be used with the Modbus compatible devices.

10.4 SETTING UP G6 TELEMETRY

This section provides a brief overview of setting up G6 telemetry. Detailed instructions can be found in the Axiom G6 Telemetry Reference.

Select **Telemetry>Telemetry A**[1]**>Status>Setup** . Select **Edit** to input the fields. Once Edit is selected, you can remain in that mode to move between the **Setup** tabs and make changes. When done, selecting OK in any tab will save the changes made in all **Setup** tabs, or you can chose to select OK on each tab after changes are input.

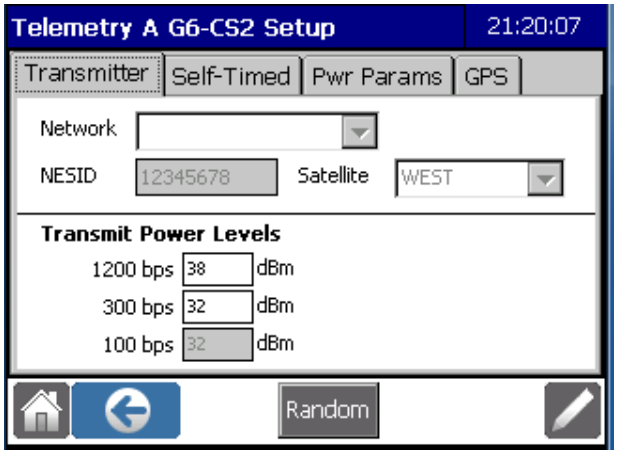


Figure 10-4: G6-CS2 Setup screen

Network: This drop down menu is used to select the satellite network the Datalogger will be transmitting on. The choices are GOES[2], METEOSAT_SRD, and INTERNATIONAL.

NESID: Enter the unique hexadecimal alpha-numeric identifier assigned by NOAA/EUMETSAT.[3]

Satellite: Use this drop down menu to select the satellite with which the Datalogger will be communicating. The choices are West, East, and Central.

Transmit Power Levels: You can set the **Transmit Power Levels** for each available data rate. Only those data rates available for the selected Network will be editable. Power levels should be in accordance with DCPRS Effective Isotropic Radiated Power (EIRP)[4].

---

[1] or Telemetry B if that is the port to which an external transmitter is attached

[2] Geostationary Operational Environmental Satellite system operated by NOAA

[3] The NOAA uses the term NESID (National Environmental Satellite Identification). The equivalent EUMETSAT term is DCPID (Data Collection Platform Identification) or DCP Address. This document and the Datalogger use NESID.

[4] NOAA: GOES Data Collection Platform Radio Set (DCPRS) CERTIFICATION STANDARDS, NOAA/NESDIS, June 2009; http://www.noaasis.noaa.gov/DCS/docs/DCPR_CS2_final_June09.pdf; Section 4.1.1.
EUMETSAT: TD-16 – Meteosat Data Collection and Distribution Service v2, 19 November 2013; Section 5.1.4

The G6 is capable of transmitting in the following ranges:

	100 bps	300 bps	1200 bps
Transmit Power Levels (dBm)	26 - 40.5	26-38.5	26-38.5

Clear Button: When in edit mode, a **Clear** button will appear on the bottom of the screen. Pressing the button will set all G6 parameters back to the default settings. This includes the message format.

Random Button: If transmitting in Time Ordered, WSC, Pseudo Binary or USGS-PB message, transmit parameters for random transmissions can be configured from the Transmitter tab by pressing the Random button on the bottom of the screen. Details of setting up random transmissions are found in the Axiom G6 Telemetry Reference.

10.4.1 MESSAGE FORMATS

NOTE: A detailed explanation of each message format can be found in the Axiom Telemetry Reference.

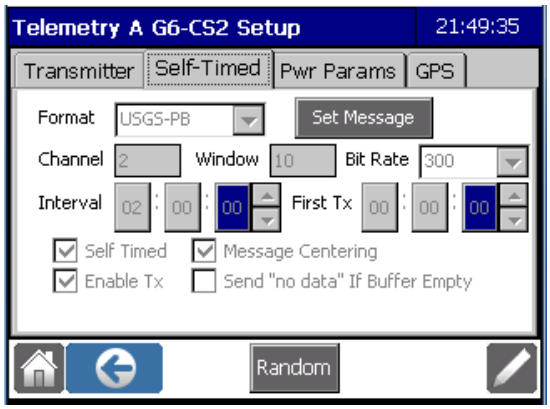


Figure 10-5: G6 setup – Self-Timed Tab

Message format, transmit parameters, and other message determiners are entered from the Self-Timed tab. There are five message format types in the **Format** drop down menu: BLM, Time Ordered, WSC, Pseudo Binary, and USGS-PB .

Transmit Parameters: Input your assigned Transmit Parameters in the following fields:

Channel	: Your assigned PRIME CHANNEL
Window	: Your assigned TRANSMIT (XMT) WINDOW
Bit Rate	: Your assigned platform baud rate
Interval	: Your assigned PERIOD (how often transmissions will be made)
First Tx	: Your assigned FIRST TRANSMISSION time

Index

E

F

G

I

L

M

N

O

P

Q

R

S

T

V

W

DOCUMENT REVISION HISTORY

Revision	Date	Description
1	17 Jul 2015	Original release based on Rev 6 of G5 Config Ref. AS ver 3.2.2 Renamed to replace the Configuration Reference
2	05 Oct 2015	Updated for AS 3.3.2 and AS 3.4.0.18. Auto-fill measurement time and Radar Sensor Extension added.
3	10 Dec 2015	Updated for AS 3.5.1.1. New Visit Report screens, running delta field in Avg Process.
4	04 Feb 2016	Updated for AS 3.7.0.13. New features in Discharge Process
5	11 Mar 2016	Updated for AS 3.7.2.8. SDI Generic Conditional Measurement Tab.
6	21 Sep 2016	Updated for AS 3.7.3.22. Added Telemetry type FTS (Bluetooth).
7	15 Jun 2017	Updated for AS 3.7.4.3. Added Ubicom DoD Device Type information
8	9 May 2018	Added Bubbler and SDI-THS sensor extensions, error codes, explanation of Delta Processes total differences (DL-2399), p. 150-151.
9	22 Oct 2018	Clarified which sensor extension to use with the SDI-PT-KEL (sections 5.5 and 5.9)(RDG-130). Corrected default sensor names for DigiTemp and SDI-RMY (DL-2203).
10	15 Jul 2019	Updated Bubbler Extension information/screenshots (AS 3.12.0.14)
11	15 Apr 2021	Added section 5.6 for details of calculating Offset time (DL-2488).