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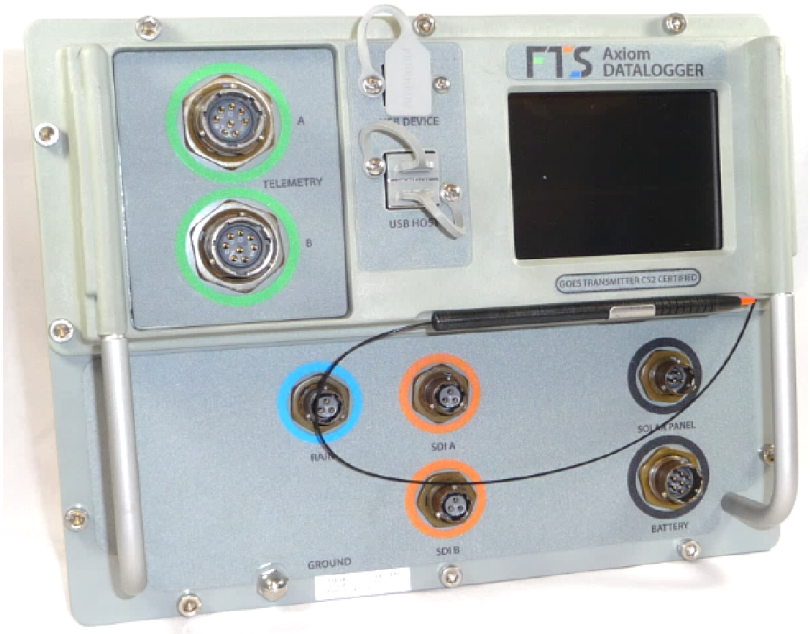

AXIOM H1

Smart Datalogger for Extreme Environments

Overview and Quick Start Guide

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700-Axiom – H1 Overview Rev. 7 03 Aug 2017

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The Axiom Suite of Manuals

Axiom (F6/H2/H1) Overview	Description, Quick Start Guide, General Operating Instructions, Specifications
Axiom G6 Configuration Reference	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 Telemetry functions including message formatting.
Axiom Field Reference and 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 Description

1.1 General

The FTS Axiom H1 Datalogger is a robust weatherproof Datalogger with a built-in power management system, support for a variety of sensors and telemetry devices, an industrial grade colour touchscreen display, and standard USB ports.

The Axiom H1 employs the FTS Quick Touch System™ which combines a graphical user interface (GUI) with a colour touchscreen display and USB ports for easy operation. On-site data retrieval, Datalogger parameter optimization, and performance information are simple and intuitive.

The Datalogger can store multiple Datalogger configurations as well as several years of typical environmental data. Data in the Axiom H1 is stored in a circular buffer in non-volatile memory with time tags on each record. The time tags have a resolution of one second and correctly account for leap years. Non-volatile memory ensures that data is preserved through power cycles and the circular buffer ensures that the oldest data is overwritten by the newest data when the memory fills.

The Datalogger is watertight, even without connectors attached. Device connectors (sensors and telemetry) are circular metal shell, bayonet, military style connectors which are uniquely keyed and colour coded to minimize erroneous connections. The Datalogger supports SDI-12 sensors as well as an FTS Rain Gauge.

Some models have a built-in power management system which integrates a SOLAR PANEL input and a BATTERY input to provide a method of regulating and maintaining the optimal battery charge condition.

Support for two independent telemetry devices is standard with each Datalogger. The Axiom H1 Datalogger can be ordered with two external telemetry ports or with an internal FTS G6 transmitter with one external telemetry port. See Figure 1 for the available configurations. The Axiom H1 automatically synchronizes with UTC time if an FTS G6 transmitter is connected either externally or internally to the Datalogger. The Datalogger can be set to any time zone offset.

Ports/Inputs / Model	Independent External DB9 Ports	Internal G6 Connection	External Telemetry Port	Independent SDI-12 Sensor	Dedicated Rain Sensor	Battery Input	Solar Input
H1-DB9-2	2			2		1	
H1-G6-DB9	1	1		2		1	
H1-G6-TLM		1	1	2		1	
H1R-G6-TLM		1	1	2	1	1	
H1S-G6-TLM		1	1	2		1	1
H1RS-G6-TLM		1	1	2	1	1	1
H1-TLM-2			2	2		1	

Figure 1: Axiom H1 configurations

Figure 1 identifies the components of the Axiom H1 Datalogger front panel. The front panel is divided into four functional locks:

Power Connections	**SOLAR PANEL** and **BATTERY** inputs
Sensor Inputs	colour coded sensor inputs
Telemetry Panel	dual **TELEMETRY** or internal G6 with single **TELEMETRY**
User Interface	touchscreen, stylus, and USB ports

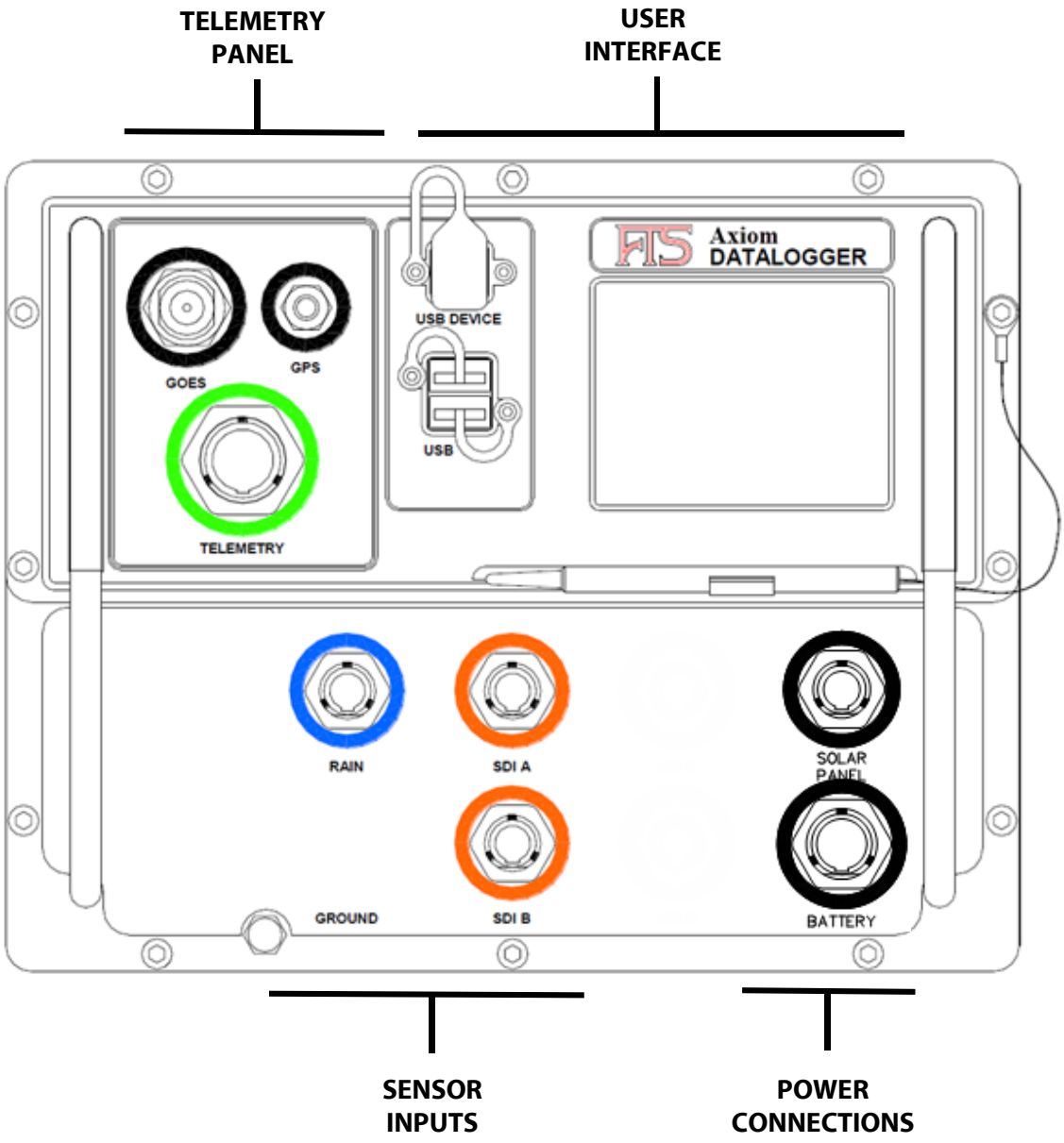


Figure 2: Axiom H1 Datalogger front panel (H1RS-G6-TLM model shown)

1.2 Power connections

Power connections for the Axiom H1 Datalogger comprise the **SOLAR PANEL** input and the **BATTERY** input. The **BATTERY** input is the power source for the Datalogger while the **SOLAR PANEL** input is used by the internal power management system to charge the 12-volt battery.

1.2.1 **Solar panel**

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

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

1.2.1.1 Solar charge operation

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

1.2.2 **Battery**

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

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

1.3 Sensor inputs

The Axiom H1 Datalogger has two independent SDI-12[1] connection ports, as well as several internal sensors. Some models have a dedicated rain sensor.

1.3.1 **SDI ports**

The Axiom H1 Datalogger has two fully independent front panel SDI-12 ports (SDI A and SDI B). The SDI ports are special dedicated sensor connectors as the SDI-12 is a multi-drop interface (more than one

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

sensor can be connected to a single SDI bus). Two independent SDI ports allow sensors which require a long time to return data to be placed on a separate bus from quicker SDI sensors. Dual ports also offer protection against a damaged sensor disrupting communications to all SDI sensors as the sensors can be split between two buses.

The Axiom H1 is the master all four SDI ports and fully supports the SDI protocol (currently version 1.3).

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

Normally SDI sensors are provided by FTS with the appropriate mating connector. Details for the SDI port connections can be found in the Specifications section of this manual

1.3.1.1 Optional SDI-AM analog expansion module

An optional SDI-AM expansion module for general purpose analog inputs is available for use with the Axiom H1 Datalogger. The SDI-AM is an SDI-12 module designed to provide easy connection to legacy analog sensors through spring clamp terminal strips. The SDI-AM connects to the Axiom H1 on either of the Datalogger's SDI ports. The module provides four configurable analog input channels; two switched 12 V power supply outputs; two excitation voltage outputs; and a general purpose counter input.

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

1.3.2 **Dedicated rain sensor**

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

Rain sensing on the Axiom H1 Datalogger is accomplished by counting the number of tips of a calibrated tipper bucket and then converting the number of tips to a specific rainfall amount.

Normally Rain Gauges are provided by FTS with the appropriate mating connector. Details for the **RAIN** input connection can be found in the Specifications section of this manual.

1.3.3 **Internal sensors**

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

1.3.3.1 Battery

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

1.3.3.1.1 Battery voltage

Battery voltage is measured in Volts.

1.3.3.1.2 Battery current

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

1.3.3.1.3 Battery temperature

Battery temperature can be measured in Celsius or Fahrenheit.

1.3.3.2 Solar panel

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

1.3.3.2.1 Solar panel voltage

Solar panel voltage is measured in Volts.

1.3.3.2.2 Solar panel current

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

1.3.3.3 Case temperature

The case temperature sensor measures the temperature internal to the Axiom H1 Datalogger. Case temperature can be reported in Celsius or Fahrenheit.

1.3.3.4 Location

Three internal location measurements are available in the Datalogger. Elevation, latitude, longitude are automatically populated if there is a G6 transmitter connected to the Datalogger (obtained from the GPS connected to the transmitter). If the Datalogger is using telemetry other than an FTS G6 transmitter, these three values can be manually entered through the user interface (on the **Site** tab of the **Station** screen).

1.3.3.4.1 Elevation

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

1.3.3.4.2 Latitude and longitude

Latitude and Longitude are automatically reported if there is an FTS G6 transmitter connected with a GPS fix or they can be manually entered in degrees-minutes-seconds (dms) format on the Datalogger touchscreen. However; when these parameters are logged, they are stored in decimal format.

1.3.3.5 Telemetry specific

Additional internal sensors may be available to the user depending on the telemetry device attached to the Datalogger (e.g., Forward Power if a G6 transmitter is used as a telemetry device). Refer to the Telemetry Reference manual appropriate to your Telemetry device.

1.4 Telemetry panel

The telemetry panel on the Axiom H1 Datalogger allows for factory configuration of the telemetry device connections. The Axiom H1 supports the connection of two telemetry devices. The devices can

both be external to the Datalogger (dual external telemetry panel) or one device can be externally connected and a G6 transmitter can be internal to the Axiom H1 (single external telemetry panel with built-in G6). A standard DB9 female connector or the standard FTS telemetry military style connector can be used for connection to a computer or external telemetry device.

External **TELEMETRY** connectors on the Axiom H1 Datalogger are colour coded on the telemetry panel with a green ring around the connector. The connector is an eight terminal, pin (male), bayonet, military style connector which is compatible with existing FTS telemetry devices.

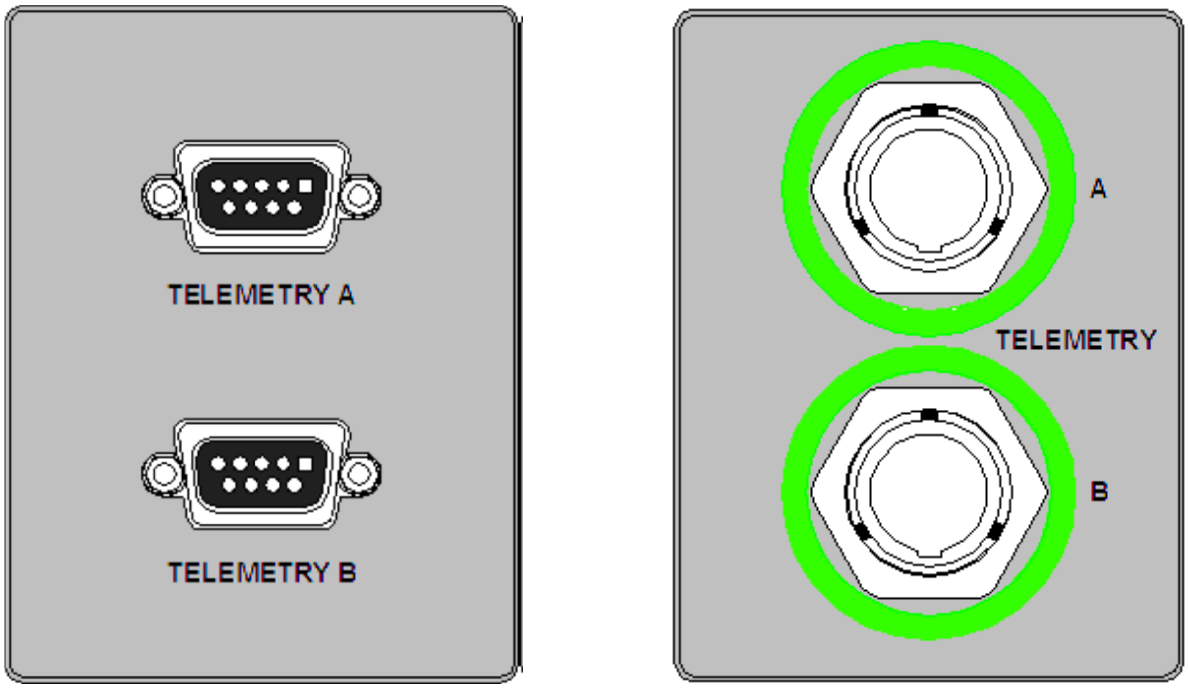
Normally telemetry devices are provided by FTS with the appropriate mating connector. Details for the **TELEMETRY** connector can be found in the Specifications section of this manual.

1.4.1 Telemetry options

There are two telemetry panel options with two different connector types which can be selected at the time of order: dual external telemetry (DB9 or military-style connectors), and internal G6 transmitter with external telemetry (DB9 or military-style connector).

1.4.1.1 Dual external telemetry

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



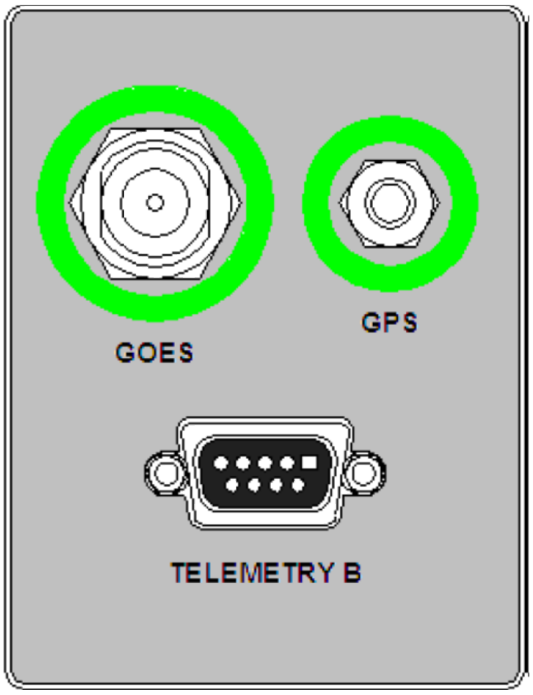
DB9 Connectors FTS military-style connectors

Figure 3: Dual External Telemetry Panel

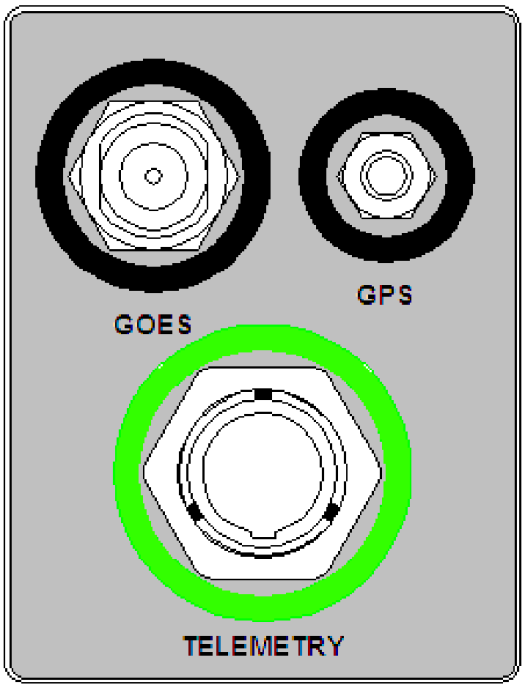
1.4.1.2 Internal G6 transmitter with external telemetry

This telemetry panel option has the upper telemetry port replaced with two RF connectors: an N-type connector and an SMA connector. The N-type connector is used for the internal FTS G6 transmit antenna connection while the SMA connector is the FTS G6 transmitter's GPS connection. The internal

FTS G6 transmitter is defined as Telemetry Port A while the lower telemetry connector remains defined as Telemetry Port B.



DB9 Connector



FTS military-style connector

Figure 4: Internal FTS G6 Transmitter with Single External Telemetry Panel

1.4.1.2.1 GPS connection

The GPS connector on the telemetry panel shown in Figure 4 is used by the internal FTS G6 transmitter. The FTS G6 transmitter uses the GPS signal to synchronize its clock to UTC time. The Axiom H1 Datalogger is in turn synchronized with UTC time from the FTS G6 transmitter and can be set to any time zone offset. The Axiom H1 Datalogger also obtains position information (latitude, longitude, and elevation) from the FTS G6 transmitter

1.5 User interface

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

1.5.1 Touchscreen

The display used in the Axiom H1 Datalogger is a high visibility, industrial grade, 3.5" colour LCD module with quarter VGA resolution and a built-in touch panel. The display is backlit and is bright and clear even in direct sunlight. A tethered stylus is supplied with each Datalogger for use with the touchscreen although most icons are large enough to be operated with a bare finger.

1.5.1.1 Backlight

The touchscreen's backlight turns on when the touchscreen is touched and automatically turns off after 10 minutes of non-use (no touches on the touchscreen).

1.5.2 USB ports

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

1.5.3 GUI Home screen

The **Home** screen (Figure 5) is the top-most screen in the graphical user interface (GUI), and is the screen which appears when the Datalogger has completed powering up. Information on the current state of the Datalogger is provided through the Home screen status indicators. From the **Home** screen the user can navigate to the desired location or perform the desired action by pressing the appropriate icon.

For detailed directions on each of the home screen icons and their functions, refer to the **Axiom Configuration Reference.**

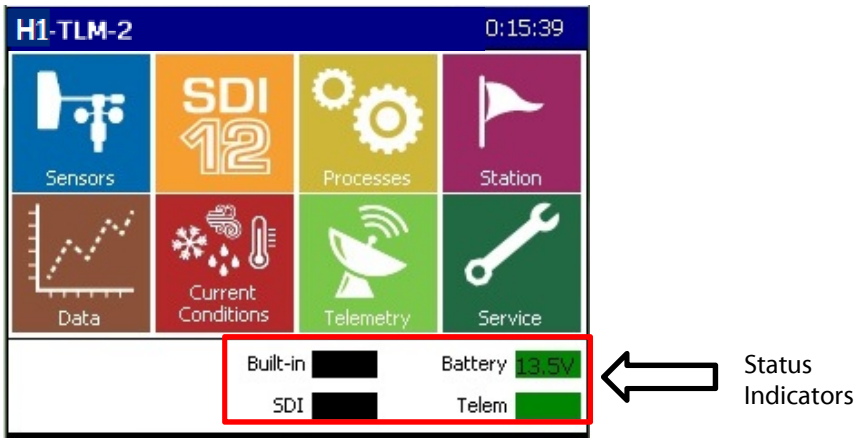


Figure 5: Home screen

1.5.3.1 Status indicators

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

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

1.5.3.2 Station Icon

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

1.5.3.3 Sensors icon

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

Refer to the Operation section of this manual for details on sensor monitoring.

1.5.3.4 SDI-12 icon

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

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

1.5.3.5 Processes icon

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

1.5.3.6 Current Conditions icon

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

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

1.5.3.7 Telemetry icon

The **Telemetry** icon accesses screens that allow the user to configure the telemetry port for a specific telemetry device and to retrieve status information from the device. The options are: **G6** (FTS G6 satellite transmitter); **RVT** (FTS Radio Voice Transmitter); **AirTalk** (the successor to **RVT**); **DB9** (simple serial communications); **FTS** (all other telemetry types); and **None** (disabled).

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

1.5.3.8 Service icon

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

Chapter 2 Quick start guide

2.1 Configuring the Datalogger

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

There are three ways to configure a Datalogger:

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

2.1.1 **Load and Modify an existing Configuration/Template File**

A basic guide to configure the Datalogger is outlined in the steps below. Details on configuration specifics can be found in the Axiom Configuration Reference.

1. Power the Datalogger
    a. Attach the battery to the power cable.
    b. Plug the power connector into the Datalogger.
2. Set the Datalogger's date, time, and time zone:
    a. Press **Service.**
    b. Press **Set Date/Time.**
    c. Enter date, time, and time zone values.
    d. Press **OK** and then **Home** when you are finished.
3. Set the station name and description:
    a. Press **Station** and select the **Site** tab.
    b. Press **Edit.**
    c. Enter your station name and description
    d. Press **OK** when you are done.
4. To configure the Datalogger from an existing template or configuration file:
    a. On the **Home** screen, press **Station.**
    b. Select the **Setup** tab on the **Station Set-up** screen.
    c. Press **Load Configuration.**
    d. Select the template or configuration file.

e. After the Datalogger has loaded the desired configuration go to Step 9 to configure/confirm the telemetry settings. Otherwise press **Home** and continue with the steps below.

2.1.2 Configure dedicated and internal sensors

1. To configure the dedicated and internal sensors:
   a. On the **Home** screen, press **Sensors**.
   b. Press **Add** to create the desired sensor and then enter the appropriate parameters.
   c. Press **OK**.
   d. Press **Home**.
2. To configure the SDI sensors:
   a. On the **Home** screen, press **SDI-12**.
   b. SDI sensors connected to the Datalogger can be automatically detected by pressing **Detect**. This will return each sensor's SDI address as well as information about the sensor (manufacturer, model, serial number).
   c. Press **New** in the Defined Name column to configure each SDI sensor.
   d. Return to the **Home** screen when you are finished.

2.1.3 Configure mathematical calculations and program scripts

1. To configure mathematical calculations and program scripts (e.g., averages, minimum or maximum values, custom calculations etc.):
   a. On the **Home** screen, press **Processes**.
   b. Use **Add** to create the desired process and then enter the appropriate parameters.
   c. Press **Home** when you are finished.

2.1.4 Log Data

1. To log data from each sensor:
   a. On the **Home** screen, press **Data** and then the **Setup Cog**.
   b. If the logger was programmed at our factory, there will already be a defined **Logging Interval** configuration. To view configuration details, press the icon.
   c. If a new logging interval is required:
      i. Press **Add** and then press **Edit**.
      ii. Select a variable name or sensor name and add this to the Logged Variables list on the right-hand side.

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

iv. Choose a logging interval time

v. Press **OK** to save.

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

2.1.5 Display or Configure Telemetry port settings

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

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

    b. Setup is required only for G6 transmitter. If the Datalogger is connected to a G6 transmitter (internally or externally):

        i. Press the port's **Status** button to display a summary status screen for the G6 transmitter.

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

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

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

        v. Next, select the desired message format and then press **Set Message** to configure the data transmitted on each G6 transmission.

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

2.1.6 Confirm Station Operation

1. Confirm proper station operation:

    a. On the **Home** screen, press **Current Conditions**

    b. Press the **Setup Cog** and choose which Datalogger parameters to monitor. Press **OK** when finished.

    c. Press **Refresh** on the **Current Conditions** screen to update the display with the latest sensor readings.

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

2.1.7 Save Configuration to USB

1. For your records, save the Datalogger's configuration to your USB memory stick:

    a. Plug your memory stick into one of the Datalogger's **USB HOST** ports.

    b. On the **Home** screen, press **Station** and then select the **Set-up** tab.

    c. Press **Save Configuration** and then press **OK** to save the Datalogger's configuration to the USB memory stick.

If desired you can also save a template of the Datalogger's configuration to the USB memory stick (refer the Operation section of this manual for the difference between templates and configurations).

2.1.8 Graph and View Data

1. To graph data:
    a. On the **Home** screen, press **Data.**
    b. Press **Graph**.
    c. Press the **Setup Cog** to configure the graph.
2. To view data:
    a. On the **Home** screen, press **Data.**
    b. Press **Table**.

2.1.9 Export Data to USB

1. To export data to your USB memory stick:
    a. Plug your memory stick into one of the Datalogger's **USB HOST** ports.
    b. On the **Home** screen, press **Data.**
    c. Press **Download**.
    d. Select the desired date range and then press **Download** to download the data.
    e. Note that the export process can require some time if a large data range is selected.

Chapter 3 Operating Instructions

3.1 General

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

3.1.1 **Mouse and keyboard connection**

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

3.1.2 **Password protection**

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

3.1.2.1 User level

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

3.1.2.2 Tech level

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

3.1.2.3 Logout

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

3.1.3 **Datalogger time**

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

3.1.3.1 Setting the time

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

3.1.3.2 Operation with a G6 G6 transmitter

When the Datalogger is connected to a G6 G6 transmitter, the Datalogger's time automatically synchronizes with the high-accuracy, GPS-synchronized clock in the G6 transmitter. Clock synchronization occurs the first time the G6's time is synchronized. Clock synchronization also occurs before each test or self-timed G6 transmission and every 24 hours after power on but only if there is a time difference greater than one second between the Datalogger and G6 transmitter. Although the Datalogger is synchronized with the G6's time, the time zone setting of the Datalogger is unaffected. If you want the Datalogger time to match the G6 transmitter time, set the Datalogger's time zone to the UTC setting and do not select the **Enable Daylight Savings** checkbox.

3.1.4 **Using template and configuration files**

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

3.1.4.1 Configuration files

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

3.1.4.2 Template files

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

3.1.5 **USB connection to a PC**

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

3.1.5.1 Windows XP

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

3.1.5.1.1 Activesync

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

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

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

3.1.5.1.2 Remote Display

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

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

3.1.5.2 Windows 7

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

3.1.5.2.1 Windows Mobile Device Center

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

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

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

3.1.5.2.2 No Windows 7 equivalent of Remote Display

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

3.1.6 Touchscreen considerations

3.1.6.1 Temperature

When the Datalogger is operated at low temperatures (lower than -20 Celsius), the display responds more slowly than it does at room temperature. Also, the display becomes faint or has low contrast. This is normal for the display. Although the official specification for low temperature operation of the display is -20 Celsius, we have found that typically the display remains readable until approximately -30 Celsius. When performing a site visit at temperatures colder than -20 Celsius, the user should bring along a laptop computer so that they can remotely connect to the Datalogger. Note that although the display becomes unreadable at cold temperatures, this does not affect the Datalogger's operation. The Datalogger continues to log the required data and as the temperature rises, the Datalogger display once again becomes readable.

3.1.6.2 Touch

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

3.1.6.3 Screen calibration

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

3.1.7 Telemetry connection to a PC

The Datalogger can be connected to a PC's RS-232 port using a CBL-F6H1-TLM-CP cable (available from FTS) to establish a serial connection (9600 baud, no parity, 8 data bits, 1 stop bit) to the Datalogger's **TELEMETRY** port. The serial connection can be used by FTS software (i.e. AutoCaller, StreamTrac, etc.) or by terminal software (i.e. HyperTerminal) to retrieve data from the Datalogger. The **TELEMETRY** port connection is not intended for Datalogger maintenance (i.e. uploading of Datalogger configurations or application software). The primary purpose of the **TELEMETRY** port is for telemetry device connections.

3.1.7.1 ASCII data download

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

Example 1 – mm/dd/yyyy format

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

Example 2 – yyyy/mm/dd format

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

Notes

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

3.2 USB memory stick information

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

3.2.1 **Requirements**

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

3.2.2 File structure

The Axiom H1 Datalogger uses a defined file structure on the memory stick to help with file housekeeping. The memory stick file structure used by the Axiom H1 Datalogger is shown in Figure 6.

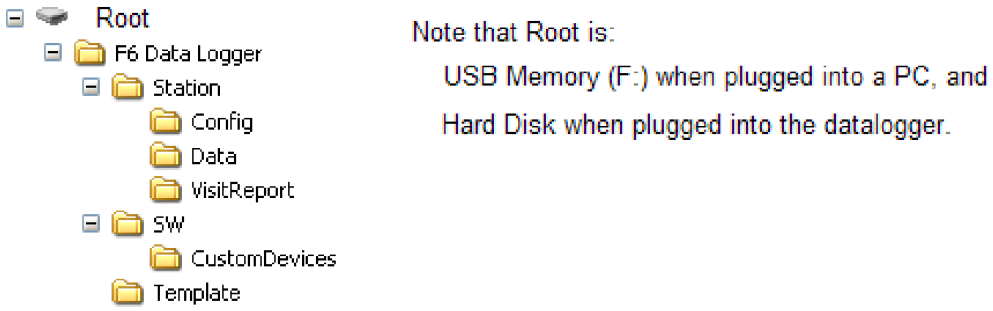


Figure 6: Memory Stick File Structure

3.2.2.1 H1 Data Logger folder

The H1 Data Logger folder in the root of the USB memory is the folder in which all Axiom H1 Datalogger information is stored.

3.2.2.2 SW folder

The SW (software) folder is the folder the Datalogger examines when the user updates the Datalogger's application software. A typical application update file would be named H1_v229.CAB.

3.2.2.2.1 Custom devices

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

3.2.2.3 Template folder

The Template folder is the directory used by the Axiom H1 Datalogger when saving or loading template files from a USB memory stick. A typical default name for a template file is Template-2014-4-9-15-28.xml (format Template-YYYY-MM-DD-hh-mm); however, the user can specify a filename during the save template process.

3.2.2.4 Station folder

The station folder is the default folder used by the Axiom H1 Datalogger if the Datalogger's Station name has not been specified (i.e. the Station field on the **Site** tab on the **Station Set-up** screen is blank). This means that the default station folder could contain data from several stations (i.e. data from every Datalogger whose Station name has been left blank). If the Datalogger has been assigned a Station name, then the Datalogger creates a folder on the memory stick with the same name as the Datalogger's Station name. This way every named Datalogger site has its own station folder in the main Axiom H1 Data Logger folder.

3.2.2.4.1 Config folder

The Config (configuration) subfolder is the directory used by the Axiom H1 Datalogger when saving or loading configuration files from a USB memory stick. A typical default name for a configuration file is

Configuration-2014-4-9-15-28.xml (format Configuration-YYYY-MM-DD-hh-mm); however, the user can specify a filename during the save configuration process.

3.2.2.4.2 Data folder

The Data subfolder is the directory used by the Axiom H1 Datalogger when exporting data, audit logs, and G6 transmission history files to a USB memory stick. Default file names are as follows:

Audit Logs:	AuditLog-YYYY-MM-DD-hh-mm.txt
G6 Tx History	TelemA- YYYY-MM-DD-hh-mm.txt
Exported Data	<Station Name>-YYYY-MM-DD-hh-mm.csv

3.2.2.4.3 Visit Report folder

The Visit Report subfolder is the directory used by the Axiom H1 Datalogger for storing site visit reports and configuration summary reports to a USB memory stick. Typical file names are as follows:

Start Visit:	StartVisitReport_2014-4-9-13-28.txt
End Visit:	EndVisitReport_2014-4-9-13-57.txt
Configuration Summary:	ConfigSummary_2014-8-19-14-47.csv

Note: timestamp format is YYYY-MM-DD-hh-mm format. E.g., 2014-4-9-13-28 denotes April 9, 2014 at 13:28

3.3 Datalogger status

The Axiom H1 Datalogger's Quick Touch System™ allows the user to quickly assess the Datalogger. Status indicators on the **Home** screen provide a snapshot of Datalogger's current operating state. The **Home** screen also provides easy access to more detailed Datalogger status information such as data point values (sensor readings and processing calculations), as well as an audit log file. Additionally, the Datalogger time is always displayed in the upper right corner of the touchscreen to show that the Datalogger is functioning.

3.3.1 Home screen status indicators

Home screen status indicators provide information such as sensor activity, transmitter status, battery voltage, and battery state to allow the user to make a quick assessment as to how the Datalogger is operating. The four status indicators at the bottom of the **Home** screen are: **Built-in**, **SDI**, **Battery**, and **Telem** (see Figure 5).

3.3.1.1 Built-in

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

3.3.1.2 SDI

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

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

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

3.3.1.3 Battery

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

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

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

3.3.1.4 Telem

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

Colour	Meaning
Green	Datalogger is supplying power to the telemetry port
Red	port power is turned off (due to a power cycle schedule)
Black	power to the port is disabled (eg: Telem is set to "none" for that port)

For the H1-DB9-2 model Datalogger, this indicator will always be black as power is not supplied through the DB9 connector. The **Telem** indicator on the H1-G6-DB9 model will display green in the left half when power to the internal G6 transmitter is enabled.

3.3.2 **Data point values**

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

3.3.2.1 Current Conditions

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

3.3.3 Audit log

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

3.4 Data status

To access the **Data Status** screen (Figure 7) press **Data** on the **Home** screen.

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

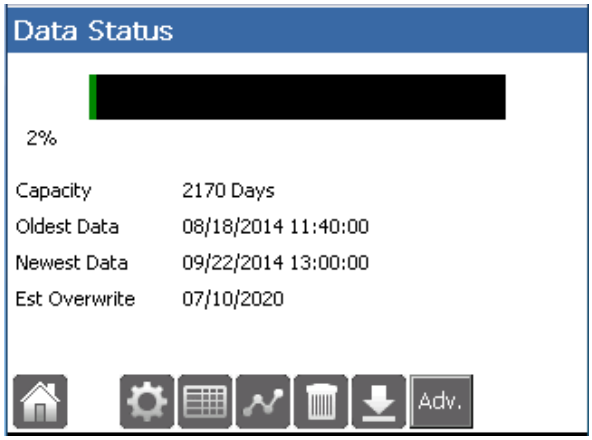


Figure 7: Data Status screen

3.4.1 Data storage information

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

3.4.1.1 Percentage full

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

3.4.1.2 Capacity

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

3.4.1.3 Oldest data

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

3.4.1.4 Newest data

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

3.4.1.5 Estimated overwrite date

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

3.4.2 **Data viewing**

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

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

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

3.4.2.1 Graph view

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

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

3.4.2.2 Table view

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

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

3.4.3 **Data operations**

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

3.4.3.1 Downloading stored data

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

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

3.4.3.2 Deleting stored data

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

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

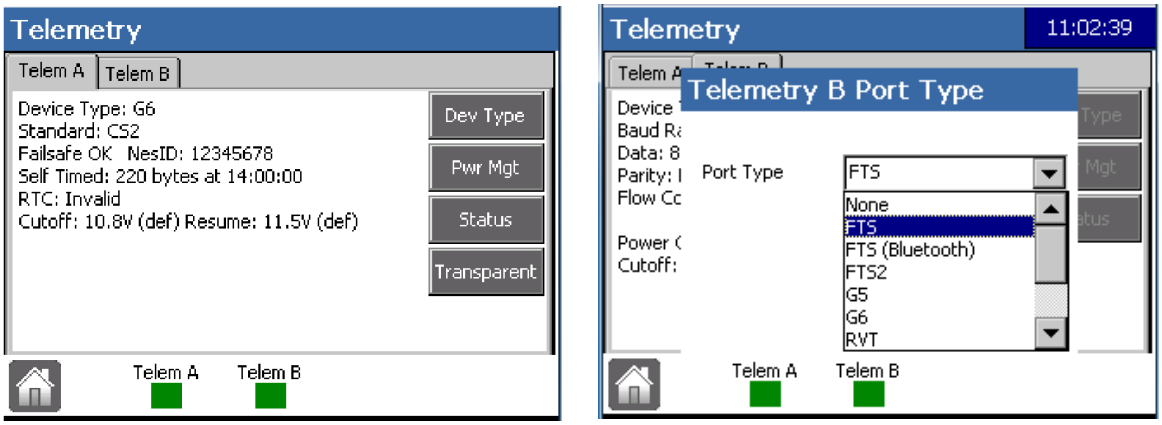
3.4.4 Remote Datalogger communication

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

3.5 Telemetry Devices

The datalogger has two Telemetry ports (A and B) which support simultaneous connection of two telemetry devices. For datalogger models with an internal G6 transmitter, Telemetry A is automatically assigned Device Type: G6.

For datalogger models with external telemetry ports, determine to which telemetry port the device is connected and select the corresponding Telemetry tab. Press on the **Dev Type** button and select the appropriate Device Type from the droop down menu.



Internal G6 Transmitter | Assigning a Telemetry Device

Figure 8: Telemetry screen

The Device Type selections are:

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.

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.

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 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. See Chapter 4 for configuration details.

Modbus: The Modbus device type is specific to and should only be used with the Modbus compatible devices.

Ubicom: The Ubicom device type is specific to and should only be used with the FTS Ubicom Transmitter.

3.5.1 **Telemetry Status**

To view a summary of a telemetry device status, use the **Telemetry** screen (**Home > Telemetry>Status**). The displayed status depends on the telemetry port's Device Type setting.

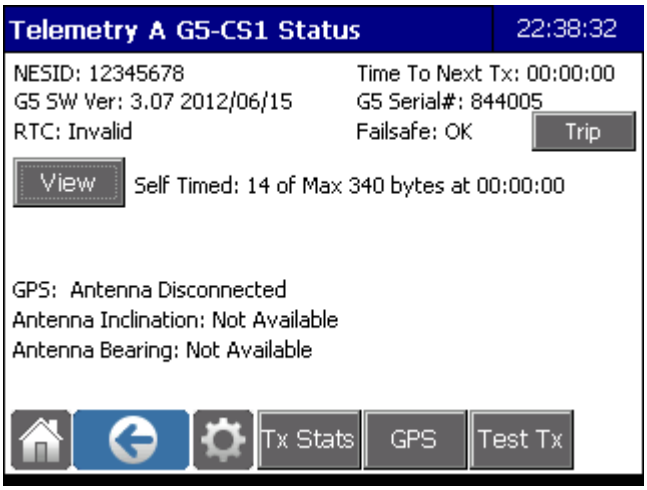


Figure 9: Example Telemetry Status screen

Chapter 4 DB9 telemetry reference

4.1 Configuring DB9/DB9-P

To configure DB9/DB9-P serial communications, press the **Status** button associated with the DB9 telemetry port.

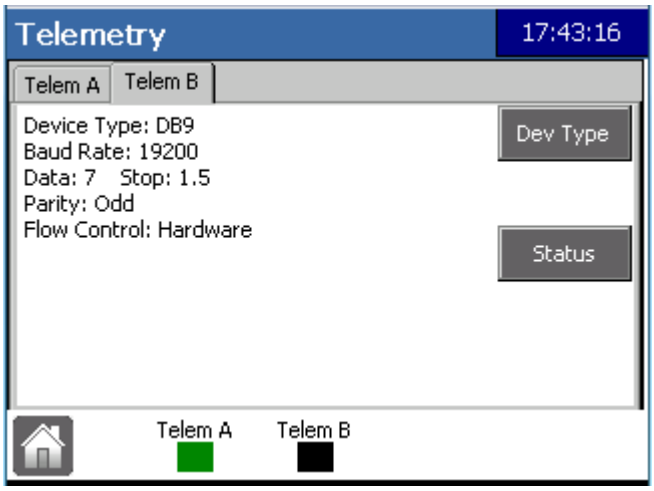


Figure 10: DB9 Telemetry Screen

4.1.1 **Port Settings Tab**

The port settings are user configurable. Default ports settings are 9600 baud with 1 stop bit, no parity, 8 data bits and no flow control. The Port status indicator will always be black for the DB9 device as power is not supplied through the DB9 connector; it will be green for DB9-P since power is supplied through the DB9-logger connection.

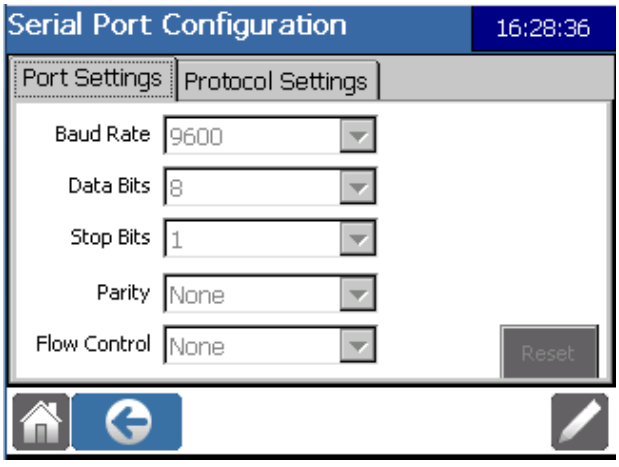


Figure 11: DB9 Serial Port Configuration

The serial port parameters shown are configurable as follows by using the Edit icon and using the drop down menus to input the desired values:

The serial port parameters shown are configurable as follows:

Baud Rate	configurable from 110 baud to 115k2 baud in standard baud rate increments
Data Bits	configurable for 7 or 8 data bits
Stop Bits	configurable for 1, 1.5, or 2 stop bits
Parity	configurable for None, Even, Odd, Mark, or Space parity
Flow Control	configurable for None, Hardware, and XonXoff

Reset: If Port Settings have been changed, they can be returned to the default settings by selecting the **Edit** icon and then the **Reset** button.

4.1.2 **Protocol Settings Tab**

The DB9/DB9-P protocols can be configured by using the Protocol Settings Tab.

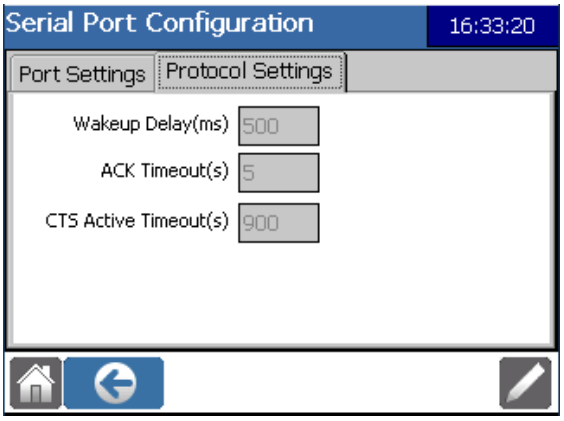


Figure 12: Protocol Settings Tab

Press **Edit** to change the default settings. The settings are explained in the following table.

Wakeup Delay	The period of time in microseconds that the device will wait for the Datalogger to respond to a wakeup command before sending another
ACK Timeouts	The period of time in seconds that the device will wait for the Datalogger to acknowledge a command before repeating it
CTS Active Timeouts	The period of time in seconds that the device will suspend receiving data from the Datalogger as it empties its buffer. Once the buffer is clear, it will continue to download data.

Chapter 5 Specifications

5.1 Datalogger

5.1.1 General

5.1.1.1 Protection

Inputs are lightning / static protected
Connectors are metal shell circular waterproof types
Built-in case temperature sensor

5.1.1.2 Physical

Size:	25 cm wide, 20 cm high. 15 cm deep (10" x 8" x 6")
Weight:	3.3 kgs (7.3 lbs) 4.2 kgs (9.2 lbs) with optional internal G6 G6 Transmitter

5.1.1.3 Environmental

Operating Temperature Range	-40 °C to 60 °C (refer to the display specification for the display's operating temperature range)
Storage Temperature Range	-50 °C to 70 °C
Enclosure	watertight, even without connectors attached

5.1.1.4 Power management

9.6 Vdc to 20 Vdc operating voltage
Internal solar panel voltage and current measurement
Internal battery voltage, current, and temperature measurement
Internal, temperature compensated battery charge regulator

5.1.1.5 Power consumption

State	Current draw	
	without internal G6 transmitter	**with internal G6 transmitter**
Idle	3 mA with)	8 mA
Active	10 mA	15 mA
Display On	60 mA	65 mA
Transmit	n/a	2.6 A max

5.1.1.6 Memory

RAM	64M
non-volatile flash storage	256M
memory allocations	14 MB circular memory file for data 20 kB circular audit log, transmit log 70 kB circular transmit log

5.1.1.7 Real time clock

Battery backed clock
Synchronized to optional GPS
Clock accuracy: ±1 second if connected to a G6 G6 transmitter.
Otherwise, maximum drift of 2 sec/day (room temperature).

5.1.2 **User interface**

5.1.2.1 Display / user interface

Display	Built-in quarter VGA colour display, 7 cm wide x 5.5 cm high (2.8" x 2.125") with touchscreen user interface.
Operating Temperature Range	-20 ºC to 60 ºC
Functions	System status; Stored data (tables and graphs); System configuration; Troubleshooting/diagnostics.

5.1.2.2 USB device port

1 waterproof front panel connector
USB (full-speed, 12Mbps)
Automatic PC detection

5.1.2.3 USB host ports

2 waterproof front panel connectors
USB (full-speed, 12Mbps)
Supports 1.5Mbps and 12Mbps USB devices including memory sticks, mouse and keyboard.

5.1.3 **Connectors**

The connectors used on the Datalogger are commercial versions of the MIL-C-26482 Series 1 family of connectors and are compatible with their military equivalents.

All pin-out diagrams on the following pages show the face of the chassis connector. This is the same as the back of the mating cable connector.

There are several different manufacturers of connectors that mates with the Datalogger connectors, but not all manufacturers make all of the pin-out variations. The part numbers we specify below are for Souriau connectors with solder cup connections. Crimp connections are also available, but do not order these unless you have the proper assembly tools.

Be particularly aware of problems in the 8-3 family, there are some variations that look like they should mate, but the pins are in slightly different positions.

There are several different styles of environmental sealing, depending on the type of wire used. The part numbers we have specified are for sealing to jacketed cables. There are also types that are for loose wire bundles and thus seal the individual wires, or are intended for potting. Not all manufacturers make all variations in sealing, so check the catalog very carefully before ordering a different brand. The true military equivalents usually do not seal to jacketed cable -- check with your supplier. Note that individual wire seals require wires of a specific diameter to work.

Delivery can be slow from the suppliers -- there are so many possible variations of these military style connectors that the suppliers often stock the raw parts and then assemble the ordered combination when they get an order.

> **WARNING !** If you are soldering wires to the connector, make sure you clean the flux off the connector after soldering. Any moisture present inside the connector will combine with the flux and cause corrosion eventually resulting in a connection failure.

Part number example

Part number: 851-06JC10-6PN50

851	Souriau series designation for this family of connectors
06	cable connecting plug (i.e., plugs into the Datalogger connectors)
JC	seals to jacketed cable, with cable clamp
10	shell size (connector diameter)
6	contact arrangement (6 pins in hexagon)
P	pins (as opposed to sockets)
N	normal - insert not rotated (this is left out of the part number)
50	Souriau series index

In general, all of the connectors is of the form 851-06JCxx-xxYN50 where xx-xx is the shell size and contact arrangement, and Y is the pin (P) or socket (S) descriptor. This cable end connector is equivalent to MS3116Fxx-xxYN except that the military has individual wire seals instead of sealing to jacketed cable. Check with your supplier to see if a jacket seal is available.

5.1.3.1 Battery

Mating Connector:	851-06JC10-7S50
FTS Part Number:	521-107S

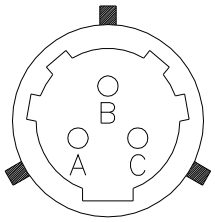
PIN	Function
A	Signal ground
B	Battery negative sense
C	Battery negative (Chassis ground)
D	Battery positive sense
E	Battery positive
F	Temperature input
G	Optional battery back-up input

Signal input

- 9.6 VDC to 20 VDC operating voltage
- Internal battery voltage, current (+ or -), and temperature measurement

5.1.3.2 Solar panel

Mating Connector:	851-06JC8-3AS50
FTS Part Number:	520-83AS



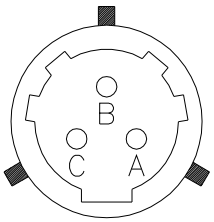
PIN	Function
A	Power positive
B	Power negative
C	Chassis ground

Signal input

- 100 W (25 Vdc, 7A) maximum input
- Internal solar panel voltage and current measurement
- Internal, temperature compensated battery charge regulator

5.1.3.3 Rain

Mating Connector:	851-06JC8-3AP50
FTS Part Number:	520-83AP



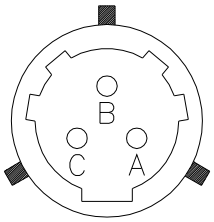
PIN	Function
A	Signal ground
B	Signal input
C	Chassis ground

Signal input

- Contact closure to ground or 0 to 3 V
- 10 kΩ pull-up to 3 Vdc internally
- 0 to-400 Hz at 50% duty cycle
- Minimum closure (low level) duration 1 ms
- Compatible with any tipping bucket rain gauge with contact closure.
- 53 bit counter (floating point, double precision)
- Configurable units and tip increment
- Optional reset date for automatic resetting of rain accumulation

5.1.3.4 SDI

Mating Connector:	851-06JC8-3AP50
FTS Part Number:	520-83AP



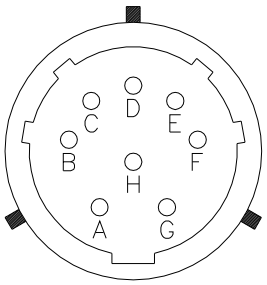
PIN	Function
A	SDI power out
B	SDI data
C	SDI ground

Signal input

- Two independent SDI-12 version 1.3 ports
- Supports M, C and R measurements with or without CRC error control.
- CMOS Signal Levels
- SDI over-voltage
- Current limited to approximately 750 mA. Short duration transients of higher current can be supplied without triggering the limit.

5.1.3.5 Telemetry

Mating Connector:	851-06JC12-8S50
FTS Part Number:	520-128S



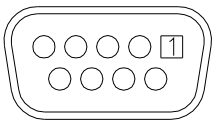
PIN	Function
A	CTS (to Datalogger)
B	Chassis ground
C	RXD (to Datalogger)
D	TXD (from Datalogger)
E	RTS (from Datalogger)
F	Signal ground
G	Power from Datalogger
H	Transmit enable

Signal input

- Two ports factory configured as either:
  - one internal G6 transmitter and one external connector, or
  - two external connectors
- Signal Levels: RS232C
- Flow control may be enabled, depending on port configuration
- Port settings are preserved through power failures

5.1.3.6 Telemetry – DB9

Mating Connector:	DB9 Male
FTS Part Number:	



PIN	Function
1	DCD (input to Datalogger)
2	RXD (input to Datalogger)
3	TXD (output from Datalogger)
4	DTR (output from Datalogger)
5	Ground
6	DSR (input to Datalogger)
7	RTS (output from Datalogger)
8	CTS (input to Datalogger)
9	RI (input to Datalogger)

Signal input

- Two ports factory configured as either:
    - one internal G6 transmitter and one external connector, or
    - two external connectors
- Signal Levels: RS232C
- Port configured for 9600 baud, no parity, 8 data bits, 1 stop bit, no flow control
- Port settings are preserved through power failures

5.2 Internal G6 transmitter (OPTIONAL)

5.2.1 Transmission data rates

- Meteosat/International - 100 BPS
- GOES - 300 and 1200 BPS
- Self-timed and Random transmissions

5.2.2 Output

- Antenna: 5.7 dBi, right hand circular polarization
- Connector: N-Type female
- RF Power:

Data rate	Power
100 BPS	14 W max
300 BPS	6.5 W max
1200 BPS	6.5 W max

5.2.3 Frequency range

- 401.701MHz – 402.09850 MHz

5.2.4 Frequency stability

- Initial Accuracy: ±20 Hz disciplined to GPS
- Short term drift: ±0.04 Hz/s
- Ageing: ± 0.1 ppm/year
- Vcc + Temperature: ± 0.1 ppm

5.2.5 Channel bandwidth

Data rate	Bandwidth
100 BPS	1.5 kHz
300 BPS	1.5 kHz
1200 BPS	3.0 kHz

5.2.6 Time keeping

- Setting Accuracy: +/- 100 us synchronized to GPS
- Drift: +/- 10 ms/day over operating temperature range.
- Transmission continuation without GPS fix: 28 days

5.2.7 GPS

- Antenna type: 3 V active
- Connector: SMA female
- Time synchronization / frequency correction schedule:
- - 1 fix at power up, 1 fix per day thereafter
-

REVISION HISTORY

Revision	Date	Description
1	30 Oct 2014	AS 3.1.1.165 and AS 3.1.2.1 (new H1-R, H1-S and H1-RSmodels). Extract of 700-H1 Datalogger Rev11, 01 May 2013 prior to archiving
2	17 Jun 2015	Updated for G6 and Ubicom. Initial Spanish Translation
3	17 Jul 2015	Updated for AS3.3.0.45
4	10 Aug 2015	Corrected figure alignment in Ch 5. Changed tagline.
5	15 Mar 2016	Corrected cover photo.
6	5 Oct 2016	Updated for AS 3.7.3.22. Added FTS (Bluetooth) telemetry device type.
7	3 Aug 2017	Corrected Pin labels in section 5.1.3.3