FTS

Axiom

Smart Datalogger for Extreme Environments

Installation and Maintenance Guide

The Axiom Suite of Manuals

Axiom (F6/H2/H1) Overview
Axiom Configuration Reference
Axiom G5 Telemetry Reference
Axiom User Manual
Axiom Installation and Maintenance Guide
Axiom AirTalk Reference
Axiom RVT Reference

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Chapter 1   Installation

1.1 *Preparation*

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

Before you go

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

1. Develop a pre-trip checklist and a toolkit checklist and update the lists as necessary.

2. Develop an on-site activity checklist to ensure all tasks are completed. It is always easy to feel pressure to complete on-site work as quickly as possible (i.e. a helicopter is waiting, light is fading, weather is coming, etc.), an on-site checklist will help ensure that, in the rush, nothing was forgotten.

3. Record the site's magnetic declination as this information is required for antenna and sensor orientation.

4. If you are installing a datalogger with a GOES transmitter (internal or external), ensure you have the required GOES parameters for your assignment (NESID, channel number, East or West satellite, transmit interval, and transmit offset).

5. Unpack and inspect the equipment for obvious mechanical damage (i.e. was it damaged during shipping).

6. Power the datalogger and confirm the datalogger's configuration and operation. When possible, attach a full suite of sensors and telemetry devices and then call/monitor the datalogger through the attached telemetry (i.e. monitor a few GOES transmissions to confirm operation). This will help you ensure that all the required cables and equipment has been identified and that the datalogger, sensors, and telemetry are configured and are operational and are working to your expectations.

7. Record the model and serial numbers of your datalogger and other equipment that will be field deployed and enter the serial numbers of the equipment into the datalogger's serial number table. Also record the software version in each device. Contact FTS if you suspect or are unsure if a software upgrade is required for a particular device.

8. If deploying the datalogger to an existing site, check the condition of the site's battery. Check the battery install date to see if the battery is due for replacement and examine existing battery data to check the condition of the unit.

9. After your office testing is complete, pack the datalogger and other equipment appropriately for transport to the field site.

10. Check forecasted weather for the site.

11. Arrange for standby personnel to check/verify telemetry transmissions while you are on-site.

12. Update your checklists with any of your findings

1.2   At the site

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

1.2.1   Unpacking

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

1.2.2   FTS enclosure mounting

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

Connect one of the green grounding wires from the mounting plate to the datalogger ground stud.
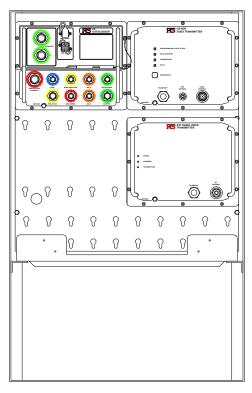
Figure 1-1: Keyway Enclosure

1.2.2.1 Other enclosures

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

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

1.2.2.2 Grounding

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

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

1.2.3   Sensor and telemetry connections

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

1.2.3.1   *Connecting dedicated sensors*

Some Axiom datalogger models have dedicated connector inputs for a variety of sensors:

- Wind speed (red)
- Wind direction (yellow)
- Air temperature and humidity (red)
- Rain (blue)
- Fuel Stick moisture and temperature (yellow)

These sensors (when purchased from FTS) are supplied with a colour coded, military style connector which plug in to the matching connector on the datalogger.

1.2.3.2   *Connecting SDI sensors*

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

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

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

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

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

1.2.3.3   *Connecting telemetry*

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

defined in the Specification section of the specific Axiom Model Overview Manual (ie: Axiom F6 Overview Manual, Axiom H2 Overview Manual etc.).

1.2.3.3.1   Existing telemetry devices

When upgrading a site from an FWS-12S to an Axiom model datalogger, telemetry devices existing at the site should remain powered from the battery and have their military connector connected to an Axiom front panel **TELEMETRY** port. Directly powering the telemetry device from the battery and then connecting it to the Axiom datalogger will not cause any damage as the Axiom datalogger has blocking diodes on all Telemetry ports to isolate telemetry port power.

1.2.3.3.2   New telemetry devices

Newly manufactured telemetry devices for use with the Axiom datalogger no longer need to be directly connected to a battery as these telemetry products are powered by the Axiom datalogger through the military connector.

1.2.4   Power connections

As previously mentioned, power connections for Axiom dataloggers can be **BATTERY** input, or **BATTERY** input with **SOLAR PANEL** input. The **BATTERY** input is the power source for the datalogger while the **SOLAR PANEL** input is used by the internal power management system to charge the connected 12V battery.

1.2.4.1   *Battery connection*

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

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

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

1. Connect the battery cable to the battery by bolting each of the cable ring terminals to the appropriate battery terminal. The ring terminal with the red wire and the fuse holder goes to the positive (+) side of the battery. The other ring terminal with the black and white wires goes to the (-) side of the battery. Contact FTS to discuss cabling considerations for the parallel connection of batteries if dual batteries are required at the site.

2. Mount the temperature sensor to the battery by taping it to the top of the battery using foam tape or duct seal putty. The sensor is mounted between the two battery posts.

3. Route the cable around behind the shelf above the battery, and plug the cable's military connector into the datalogger's **BATTERY** input. The datalogger backlight should illuminate and the datalogger will start-up (note that the datalogger requires about 90 seconds to start). Verify that the battery is connected properly by observing the battery voltage reading on the datalogger GUI. If the backlight does not come on and the datalogger does not start, then

disconnect the battery power connector from the datalogger front panel and check the battery cable fuse and connections.

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

Additionally, solar panel interconnect cables are available from FTS if upgrading an existing FWS-12S installation, please contact FTS to discuss your requirements.

1.2.4.2   Datalogger power cycling sequence

The power source for the datalogger is the battery that is connected to the datalogger's front panel **BATTERY** input. For datalogger models which have **SOLAR PANEL** input, it is possible to power the datalogger from the datalogger's front panel **SOLAR PANEL** input. However, this practice is not advisable as power from the solar panel is intermittent.

For those models which have both **BATTERY** and **SOLAR PANEL** inputs which can power the datalogger, there is a proper procedure for power cycling the datalogger to ensure proper start-up and shutdown.

1.2.4.2.1   For models with BATTERY input only

1.2.4.2.1.1   Start-up Power Sequence

The correct power on sequence for the datalogger is:

1. Ensure the battery cable is properly connected to the battery.

2. Connect the battery cable to the datalogger's **BATTERY** input.

1.2.4.2.2   Shutdown power sequence

The correct power off sequence for the datalogger is:

1. Disconnect the battery cable from the datalogger's **BATTERY** input.

2. If power cycling the datalogger, wait a minimum of 5 seconds before reconnecting the datalogger's **BATTERY** input.

1.2.4.2.3   For models with BATTERY and SOLAR PANEL input

1.2.4.2.3.1   Start-up Power Sequence

The correct power on sequence for the datalogger is:

1. Ensure the battery cable is properly connected to the battery.

2. Connect the battery cable to the datalogger's **BATTERY** input.

3. Connect the solar panel cable to the datalogger's **SOLAR PANEL** input.

1.2.4.2.4   Shutdown power sequence

The correct power off sequence for the datalogger is:

1. Disconnect the solar panel cable from the datalogger's **SOLAR PANEL** input.

2. Disconnect the battery cable from the datalogger's **BATTERY** input.

3. If power cycling the datalogger, wait a minimum of 5 seconds before reconnecting the datalogger's **BATTERY** input. Then reconnect the **SOLAR PANEL** input.

1.2.5   Operational check

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

1. Check to confirm that the datalogger's date and time is correct.

2. Read each of the sensors by observing their displayed sensor reading.

3. Check to ensure data is being logged by observing logged data in the data table.

4. Perform a telemetry test to ensure each telemetry device is functional.

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

Chapter 2   Maintenance

2.1 *General*

Very little maintenance is required for the Axiom F6 datalogger. Do not remove the front panel as there are no user serviceable parts inside the datalogger. All software upgrades can be performed externally using the datalogger's **USB HOST** ports. The user should ensure that the battery is in good condition and that the touchscreen is free of debris.

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

2.1.1 Battery type

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

2.1.2 Touchscreen care

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

2.1.3 Touchscreen recalibration

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

2.1.4 Datalogger shipping

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

2.2   *Datalogger update*

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

2.2.1 Application

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

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

2.2.2 Sensor extensions

Each Sensor Extension provides advanced set-up functionality for a specific sensor. For example, the sensor extension for Forest Technology System's SDI-AM 4 channel analog module provides a convenient set-up GUI which allows the user to configure the sensor without needing to learn the module's low level SDI-12 commands. Sensor extensions are automatically installed on the datalogger during an application update; sensor extensions can also be added incrementally as they are developed.

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

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

2.3   Site visit

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

2.3.1 Site visit procedure

For a detailed description of common Site Visit tasks and the associated datalogger functions to perform them, refer to the Axiom User Manual.

The following procedure is recommended when visiting the site:

1. Survey the site to ensure the site is safe - check the site for obvious hazards and deal with them appropriately.

2. Survey the equipment for any malfunctions or incorrect sensor or antenna orientations and record your findings.

3. Insert your memory stick into one of the datalogger's **USB HOST** ports.

4. Go to the **Visit Report** screen (**Home > Service > Visit Report**), enter your name in the technician box and press the **Start Visit** button. This will record the station's current operating state.

5. Perform the required service work and have a colleague at the office ensure telemetry transmissions are functional.

6. Update the Serial Number Table in the datalogger (**Home > Service >Serial # Table**) to accurately reflect the equipment installed on the site.

7. Go to the **Visit Report** screen (**Home > Service > Visit Report**) and press the **End Visit** button. This will record station's operating state at the end of your visit.

2.3.2 Serial number table

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

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

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

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

2.3.3 Visit report

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

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

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

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

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

2.3.3.1 Start/end visit

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

2.3.3.2 Technician

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

2.3.3.3 Trip number

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

Chapter 3   Checklists and Forms

To ensure a smooth site installation or maintenance visit, you should prepare the following checklists and information forms before you go into the field.

Examples of each checklist or form are given. They are meant to be used as a guide, and may not be comprehensive for all circumstances.

3.1 Example pre-departure activity

- ☐ Check received system for shipping damage and for presence of all correct parts
- ☐ Contact FTS if you suspect or are unsure if a software upgrade is required for a particular device (e.g., datalogger, sensor)
- ☐ Power the datalogger and confirm the datalogger's configuration and operation.
- ☐ Attach a full suite of sensors and telemetry devices and then call/monitor the datalogger through the attached telemetry (i.e. monitor a few GOES transmissions to confirm operation)
- ☐ Enter serial numbers of other equipment (sensors, etc.) in datalogger's serial number table
- ☐ Pack datalogger system
- ☐ Pack laptop with StreamTrac software and USB-datalogger cable
- ☐ Pack other equipment
- ☐ Pack materials for building/installing enclosure mount
- ☐ Pack materials for installing solar panel
- ☐ Pack materials for installing GOES antenna / other telemetry antenna
- ☐ Pack toolkit (see checklist)
- ☐ Arrange for standby personnel to check/verify telemetry transmissions while you are on-site
- ☐ Check weather forecast for site date(s)

3.2 *Example toolkit checklist*

User Guides and Manuals

- ☐ Axiom Installation and Maintenance Guide
- ☐ Axiom User Guide
- ☐ Sensor user manuals (e.g. DTS-12, stage sensor, wind sensor)

For equipment inside enclosure

- ☐ Liquid wrench/oil (for lock maintenance)
- ☐ 3/8" socket driver or wrench
- ☐ 10 mm socket driver or wrench (for battery terminals)
- ☐ small crescent wrench
- ☐ #2 Phillips head screwdriver
- ☐ #3 Phillips head screwdriver
- ☐ #2 slot head screwdriver
- ☐ Wire strippers and crimpers

For building/installing enclosure mount

- ☐ 7/16" combination wrench (for enclosure mounting bolts)
- ☐ Drill with batteries/drill bits (if required for installation plan)
- ☐

For installing solar panel (refer to your solar panel instructions)

- ☐
- ☐

For installing GOES antenna (other than FTS Eon GOES) (refer to the antenna instructions)

- ☐
- ☐
- ☐
- ☐
- ☐

3.3 *Example pre-departure information recording form*

Site information

- ☐ Magnetic declination at site _____
- ☐ Latitude at site _____
- ☐ Solar panel tilt angle = [lat x 0.9] + 30 deg _____

GOES Information

- ☐ GOES NESID _____
- ☐ GOES channel number _____
- ☐ GOES satellite   East / West (circle one)
- ☐ GOES transmit interval _____
- ☐ GOES transmit offset _____

Equipment and model numbers (MN), serial numbers (SN), and software versions (SWV)

- ☐ Datalogger
  - ☐ MN _____
  - ☐ SN _____
  - ☐ SWV _____

- ☐ Sensor_____
  - ☐ MN _____
  - ☐ SN _____
  - ☐ SWV _____

- ☐ Sensor_____
  - ☐ MN _____
  - ☐ SN _____
  - ☐ SWV _____

- ☐ Sensor_____
  - ☐ MN _____
  - ☐ SN _____
  - ☐ SWV _____

- ☐ Sensor_____
  - ☐ MN _____
  - ☐ SN _____
  - ☐ SWV_____

- ☐ External telemetry device
  - ☐ Manufacturer _____
  - ☐ MN _____
  - ☐ SN _____
  - ☐ SWV _____

3.4 Example on-site activity checklist

Arrival

☐ Check site for safety hazards and mark or eliminate them

☐ Check equipment for damage sustained in transport

Installation

☐ Build/install enclosure mount

☐ Install enclosure on mount

☐ Install equipment in enclosure – DO NOT connect battery power leads yet

☐ Install solar panel (if applicable)

☐ Install GOES antenna

☐ Install sensors

System Testing

☐ Confirm the datalogger's configuration and operation.

☐ When possible, call/monitor the datalogger through the attached telemetry (i.e. monitor a few
  GOES transmissions to confirm operation)

Departure

☐ Record site visit information in site book

☐ Pack up tools

☐ Pack up remaining materials and equipment

☐ Lock up enclosure

Revision History

Revision	Date	Description	Comments
Original	2014, 30Oct	Updated with AS 3.1.1.165	Extract of 700-F6 Datalogger Rev 12, 01 May 2013 prior to archiving