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Axiom Telemetry Reference

Configuration and Use of GOES and Other Telemetry Devices

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The Axiom Suite of Manuals

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

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PART 1: INTRODUCTION

PART 1
INTRODUCTION

Chapter 1 GENERAL

This manual provides detailed instructions on using the telemetry functions of Axiom Dataloggers. All functions described in this manual are valid for Dataloggers equipped with the G5 and G6 GOES transmitters (either built-in or external). Because most functions are identical for both the G5 and G6 transmitters, this manual will use the term transmitter to encapsulate both models (G5 and G6). Features which are specific to just one model will be prefixed by either G5 orG6 transmitter, as appropriate.

Axiom Dataloggers have a variety of physical configurations consisting of a variety of telemetry ports. The variety of telemetry options are:

1. Single built-in (internal) transmitter, no additional telemetry port;
2. Single built-in (internal) transmitter, single external telemetry port
3. Dual external telemetry ports (normally one will have an external transmitter attached)

The built-in (internal) transmitter will always be Telemetry A.

Part 2 details all aspects of the transmitter functions. Part 3 details all other telemetry Device Types which can be used with the Datalogger via one of the telemetry ports.

1.1 SCREENS AND ICONS

All screens are accessed from the Datalogger's home page by selecting the Telemetry Icon.

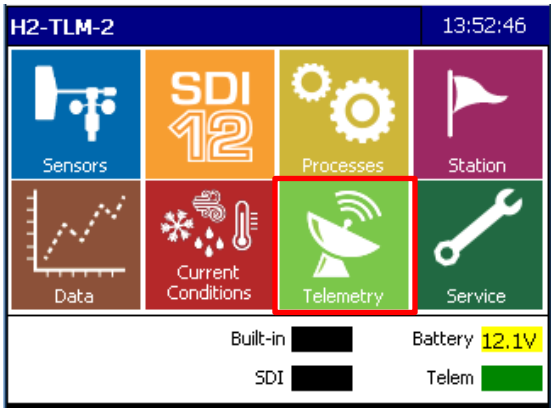


Figure 1-1: Home Screen – Telemetry Icon

Subsequent screens can contain a variety of **Tabs, Information Fields**, and **Buttons**, depending on the function. A variety of **Action icons** may be displayed on the bottom of some screens. This selection varies according with the functions available on the screen.

Selections are made by tapping the desired portion of the screen with the stylus or your finger tip. After 10 minutes of inactivity the Datalogger screen times out from the current session and the screen goes dark. Touching the screen will "wake up" the Datalogger.

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

1.1.1 ACTION ICONS

The action icons and their functions are outlined below.

 Home	 Add	 Move Up	 Move Right	 OK
 Setup	 Delete	 Move Down	 Move Left	 Cancel
 Edit	 Save			 Back

Figure 1-2: Action icons and functions

1.1.2 HOME PAGE TELEMETRY STATUS INDICATORS

The status of the telemetry device is indicated both on the home page and on the individual Telemetry screens. On the Home page the Telem icon is actually two indicators in one, split left and right, for the Telemetry A and Telemetry B ports respectively. On the Telemetry page, the indicator displays the status for that specific port (Telem A or Telem B).

For G5/G6 telemetry:

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

For other telemetry devices:

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

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

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

Examples:

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

1.2 GOES AND EUMETSAT SRD[1] STANDARDS

The U.S. National Oceanographic and Atmospheric Administration (NOAA) operates the GOES (Geostationary Operational Environmental Satellite) system, and sets the communications standards, known as CS2, which is in the process of phasing out its predecessor, CS1. Key dates in the replacement process are:

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

Key differences between the CS1 and CS2 standards are:

	CS1	**CS2**
Channel numbers	1-266	1-266, 301-566
Bit rates (bps)	100, 300, 1200	300, 1200 (no 100)
Bit rate/channel restrictions	100 bps, channels 1-266	100 bps not permitted
	300 bps, channels 1-266	300 bps, channels 1-266 and 301-566
	1200 bps, channels 1-133	1200 bps, every third channel from 3-264 (i.e., 3,6,9...264) and from 301-565 (i.e., 301,304,...565)
RF power level	fixed	26–38.5 dBm, variable

The European equivalent is the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), and it sets the communication standards for the METEOSAT satellite system.

[1] Standard Rate Data

Channels available for the systems are outlined below.

	METEOSAT-SRD[2]	INTERNATIONAL[3]	GOES[4]	GOES[4]
Bit rates	100 bps	100 bps	300	1200
Channel numbers	1-289	1-11	1-266 301-566	3-264 and 301-565 Restricted to every THIRD channel: i.e.: 3,6,9.....264 301,304,.307....565

Table 1-1: Satellite Channels and Bit Rates

1.3 G5 VS G6 OPERATIONAL STANDARDS

G5 transmitters operate with the GOES system at either the CS1 or the CS2 standard. All G6 Transmitters can operate with either the GOES system at CS2 standard or the METEOSAT system. The Standard will be displayed on the main Telemetry Tab.

1.4 MIGRATING A PREVIOUS G5 CONFIGURATION TO A G6 DATALOGGER

Upgrading from a Datalogger with an internal G5 Telemetry Port to one with an internal G6 Telemetry Port can be done without re-configuring the new Datalogger. Simply load a configuration containing the previous G5 set up to the new G6 Datalogger (see Chapter 3 Section 3.3 – Load Configuration). The settings from the G5 will be migrated to the G6 with no additional steps.

Customers upgrading from an external G5 device to a new external G6 can also migrate settings, but an additional step is required. The user must choose G6 as their Port Type by selecting it in the Telemetry screen (**Telemetry> Telem A or B Tab >Dev Type>G6**).

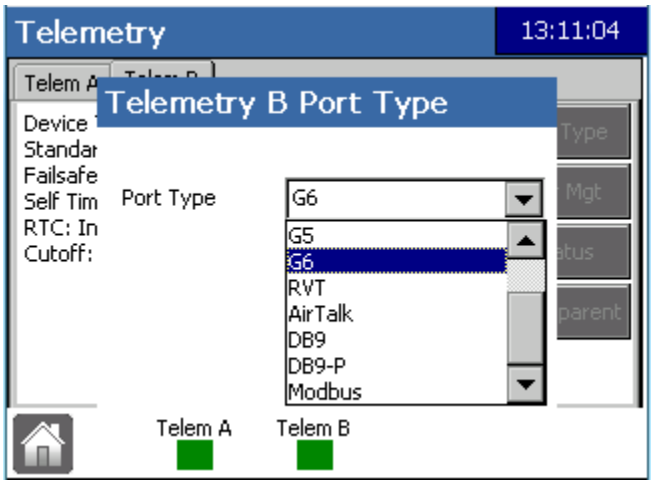


Figure 1-3: Migrating a Datalogger with an external G5 device to one with an external G6 device

[2] In accordance with TD-16 – Meteosat Data Collection and Distribution Service v2, 19 November 2013; Section 7 – DCP Frequency Allocation Plan

[3] In accordance with IDCS USERS' GUIDE Issue 10, Version 1, October 2009 , Table 4-1 http://www.eumetsat.int/website/home/Data/TechnicalDocuments/index.html Data Collection Services

[4] In accordance with http://www.noaasis.noaa.gov/DCS/docs/DCPR_CS2_final_June09.pdf

NOTES:

1) The new G6 device must be on the same port as the G5 device was, in order for the migration to occur.

2) This fix will only support an upgrade from G5 to G6 and cannot be used to downgrade the G6 to a G5.

3) To use G6 specific features such as METEOSAT and International satellite networks the user must manually select these options from the G6 Configuration screen.

PART 2

G5/G6 TRANSMITTER TELEMETRY

Chapter 2 MAIN TELEMETRY SCREEN

2.1 DETERMINING THE TELEMETRY PORT AND ITS STATUS

Once the Telemetry icon is selected the **Telem A** and **Telem B** tabs will be displayed. For Datalogger models with an internal transmitter, Telemetry A is automatically assigned. The Device Type field will identify the transmitter type.

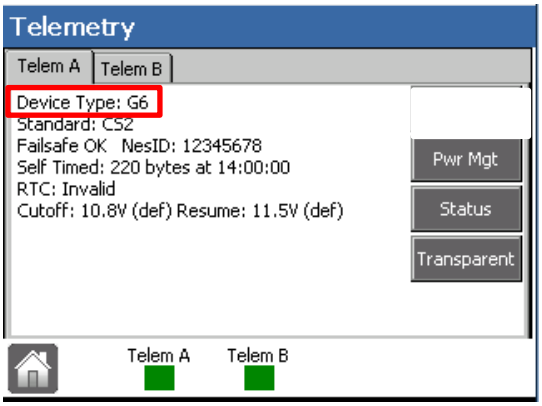


Figure 2-1: Telemetry A screen – Internal G6 transmitter

For Datalogger models with external telemetry ports, determine to which telemetry port the transmitter is connected and select the corresponding Telemetry tab. Press on the **Dev Type** button and select the appropriate transmitter (either G5 orG6) from the drop down menu.

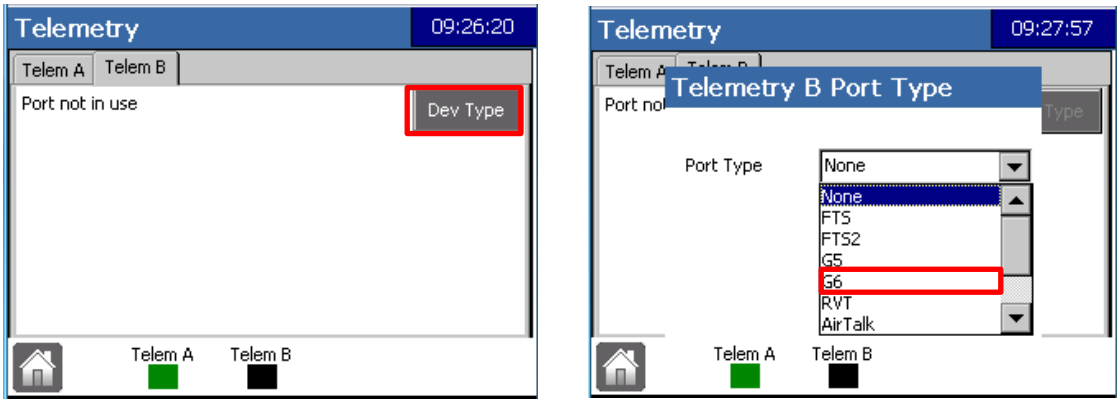


Figure 2-2: Assigning G6 Device to a Telemetry Port

2.1.1 G5/G6 TELEMETRY STATUS INDICATORS

The telemetry status indicators are found at the bottom of the screen and are colour coded as follows:

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

2.2 POWER MANAGEMENT

The Power Management (Pwr Mgt) button permits the user to regulate the power supply by setting Cutoff and Resume parameters in order to conserve batteries and allow them time to recharge (usually when in use with solar panels). The default Cutoff and Resume power levels are 10.8 volts and 11.5 volts respectively.

If you wish to adjust those parameters, select **Edit,** tap on the field you wish to adjust and input the desired value on the displayed keyboard. Select **OK**.

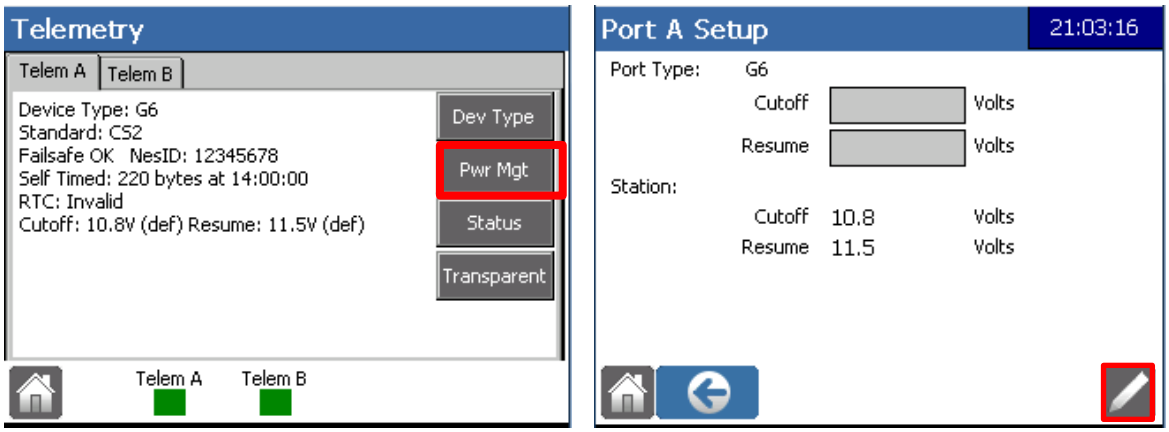


Figure 2-3: Power Management Setup Screen

2.3 STATUS

The **Telemetry Status** screen provides detailed status information on the transmitter and allows for its configuration. From the Telemetry Screen, tap the **Status** button.

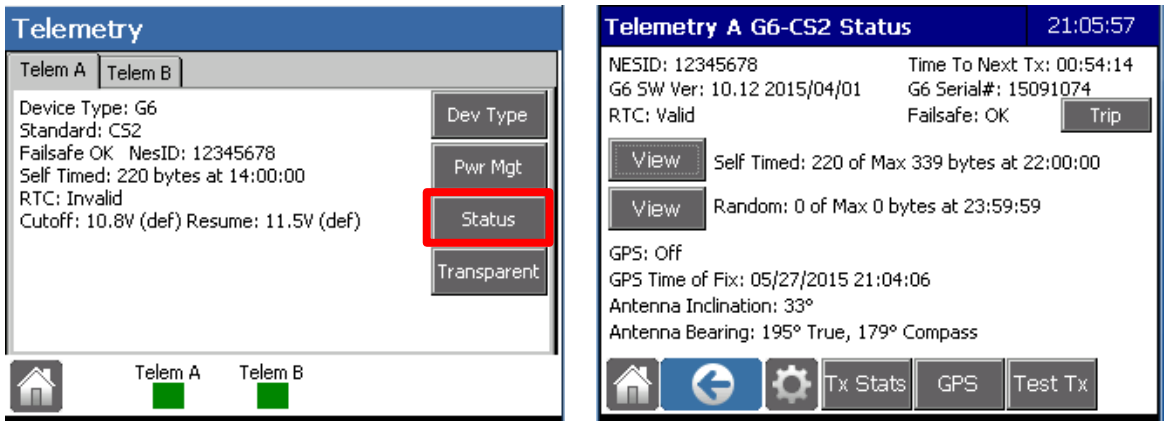


Figure 2-4: Telemetry – Status screen

The transmitter's operational information, physical parameters, and deployment information are provided.

Operational Information

NESID	The transmitter's current NESID identifier
Time to Next Tx	Countdown timer to the next transmitter transmission
RTC	State of the transmitter's real time clock
Failsafe	State of the transmitter's failsafe circuit
Self-Timed	The number of bytes queued in the Self Timed Transmit buffer for the next timed transmission. Additionally, **VIEW** displays the contents of the Self Timed Transmit buffer.
Random	The number of bytes queued in the Random Transmit buffer for the next random transmission. Additionally, **VIEW** displays the contents of the Random Transmit buffer.

Physical Parameters

Transmitter SW Ver	The transmitter's firmware version
Transmitter Serial #	The transmitter's serial number

Deployment Information

GPS	Status of the transmitter's internal GPS unit
Antenna Inclination	Inclination to be used for antenna mounting [5]
Antenna Bearing	True north and compass bearing to be used for antenna mounting[5]

2.3.1 VIEW

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

2.3.2 FAILSAFE TRIP/CLEAR

The Failsafe status is indicated in the upper right hand corner of the screen. To the right of the status is a Trip/Clear button. When the failsafe status is **OK**, this button is labeled **Trip**; when the failsafe status is **TRIPPED** or unknown, the button is labeled **Clear**.

[5] Inclination to be used for aiming antenna if EIRP reported by the ground station is < 37 dBm at 300 BPS or < 43 dBm at 1200 BPS.
A Yagi antenna, or EON antenna operating at 1200 BPS, will normally need to be aimed at the satellite. An EON antenna operating at 300 BPS can usually be mounted vertically.
For more details on aiming an EON2 antenna, refer to "700-AN-128 Technical Bulletin EON2 Antenna Installation" available on the FTS support site:
https://s3.amazonaws.com/Product_Technical_Bulletin/700-AN-128.pdf

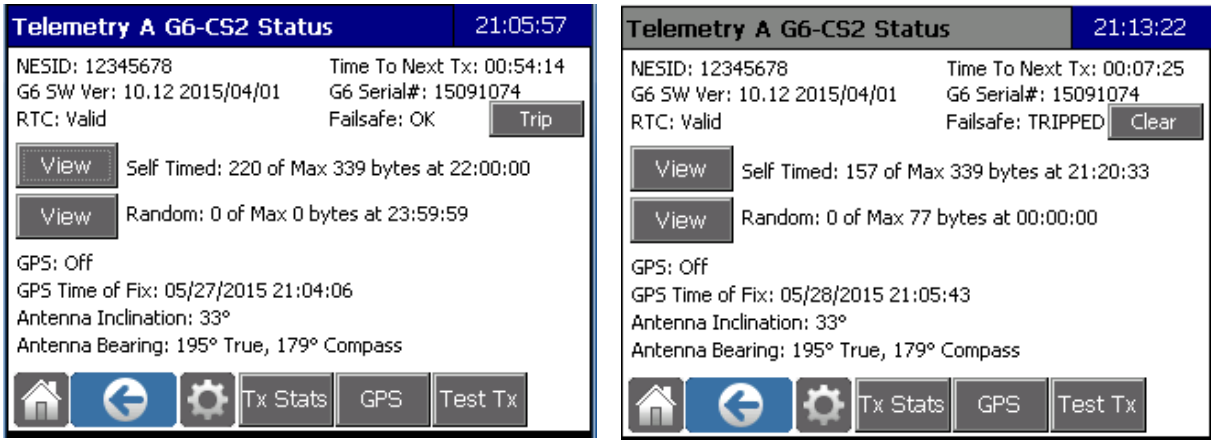


Figure 2-5: Failsafe OK/TRIPPED

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

The Setup, Tx Status, GPS and Test Tx functions are explained in their individual chapters.

2.4 TRANSPARENT MODE

The transparent mode is entered from **Telemetry>Transparent**.

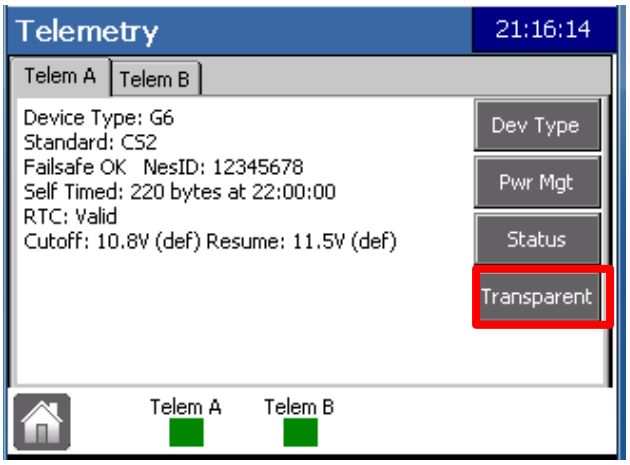


Figure 2-6: Transparent Mode

The Transparent mode allows access to the transmitter remotely for ease of testing and running diagnostics using FTS standard ASCII command protocols found in the FTS publication, "700-G6-CMND-ASCII, G6 ASCII Command Protocol"[6].

> WARNING! Inadvertent changes made to the transmitter while in the transparent mode could be irreversible and seriously compromise the transmitter's performance or even render it inoperable.

[6] This document is valid for both G5 and G6 transmitters

Normally, users will have no need to enter the transparent mode, but may be directed to do so by FTS staff for troubleshooting. Users should not attempt to enter transparent mode without first consulting with and obtaining direction from FTS Technical Support.

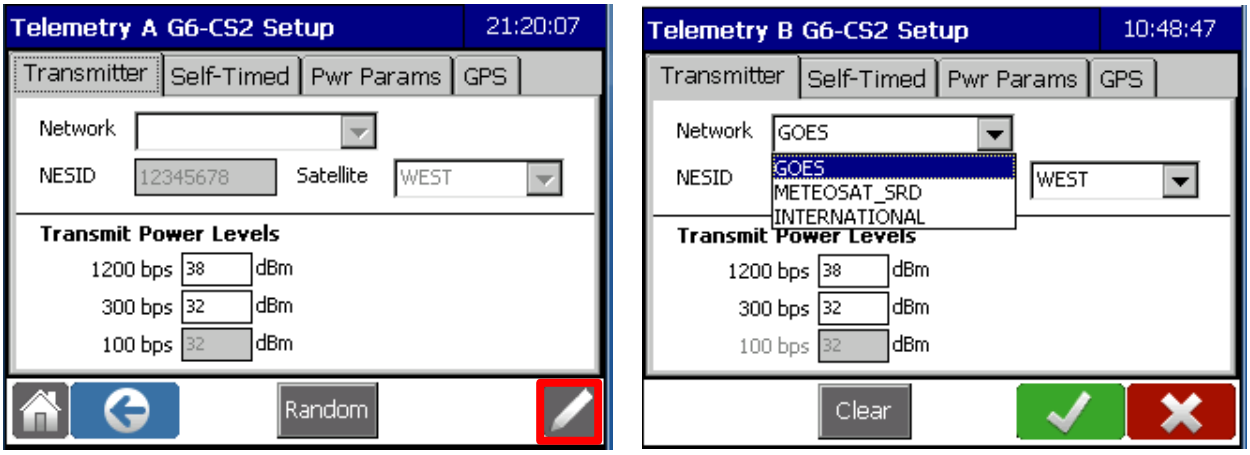
> IMPORTANT! Changes made to the transmitter while in the Transparent mode should be for diagnostic (read only) purposes and NOT to configure the transmitter. Any changes made to the transmitter's configuration while in transparent mode, will be overwritten by the Configuration.xml file approximately 2 minutes prior to transmission.

Chapter 3 SETUP

Select **Telemetry>Telemetry A*** **>Status>Setup**. The **Setup** button on the **Telemetry Status** screen displays the **Setup** screen (Figure 3-1) which enables the user to set the appropriate transmitter parameters. Select **Edit** to input the fields. Once Edit is selected, you can remain in that mode to move between the **Setup** tabs and make changes. When done, selecting OK in any tab will save the changes made in all **Setup** tabs, or you can chose to select OK on each tab after changes are input.

* or Telemetry B if that is the port to which an external transmitter is attached

3.1 TRANSMITTER TAB



View Mode Edit Mode

Figure 3-1: G6 Setup - Transmitter tab and edit mode showing Clear button

Transmit parameters are provided by the United States National Oceanic and Atmospheric Administration (NOAA), or the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), depending on your area of operations. These parameters allow the user to retrieve data from a remote site using the associated agency's Data Collection System (DCS). The following parameters are specified on this tab and can be amended by pressing **Edit**:

Network: This drop down menu is used to select the satellite network on which the Datalogger will be transmitting. The choices for G6 are GOES[7], METEOSAT_SRD, and INTERNATIONAL. For G5, GOES is the only option and cannot be edited.

NESID: Enter the unique hexadecimal alpha-numeric identifier assigned by NOAA/EUMETSAT.[8]

[7] Geostationary Operational Environmental Satellite system operated by NOAA

[8] The NOAA uses the term NESID (National Environmental Satellite Identification). The equivalent EUMETSAT term is DCPID (Data Collection Platform Identification) or DCP Address. This document and the Datalogger use NESID for both satellite systems.

Satellite: Use this drop down menu to select the satellite with which the Datalogger will be communicating. The choices are West, East, and Central.

3.1.1 G6 TRANSMIT POWER LEVELS

You can set the **Transmit Power Levels** for each available data rate. Only those data rates available for the selected Network will be editable.

Power levels will differ dependent on the GOES antenna that is used and a variety of other factors (antenna cable length, geographical location of the transmitter, and topographical features etc.) and should be in accordance with DCPRS Effective Isotropic Radiated Power (EIRP)[9]. Refer to your antenna's specifications and operating manual.

The G6 is capable of transmitting in the following ranges:

	100 bps	**300 bps**	**1200 bps**
Transmit Power Levels (dBm)	26 - 40.5	26-38.5	26-38.5

NOTE: If a power level higher than the maximum is input, the transmitter will use the maximum power indicated for the specified bit rate.

The EIRP (effective isotropic radiated power) is as follows:

$$EIRP = Tx\ Power\ (dBm) + Antenna\ Gain\ (dBi) - Cable\ loss\ (dB)$$

Clear Button: When in edit mode, a **Clear** button will appear on the bottom of the screen (Figure 3-3). Pressing the button will set all G6 parameters back to the default settings. This includes the message format. If you press **Clear**, a warning screen will be displayed and you will be prompted if you wish to continue.

Random Button: If transmitting in Time Ordered, WSC, Pseudo Binary or USGS-PB message, transmit parameters for random transmissions can be configured from the Transmitter tab by pressing the Random button on the bottom of the screen. Details of setting up random transmissions are found in Chapter 4 for each relevant message type.

[9] NOAA: GOES Data Collection Platform Radio Set (DCPRS) CERTIFICATION STANDARDS, NOAA/NESDIS, June 2009; http://www.noaasis.noaa.gov/DCS/docs/DCPR_CS2_final_June09.pdf; Section 4.1.1.
EUMETSAT: TD-16 – Meteosat Data Collection and Distribution Service v2, 19 November 2013; Section 5.1.4

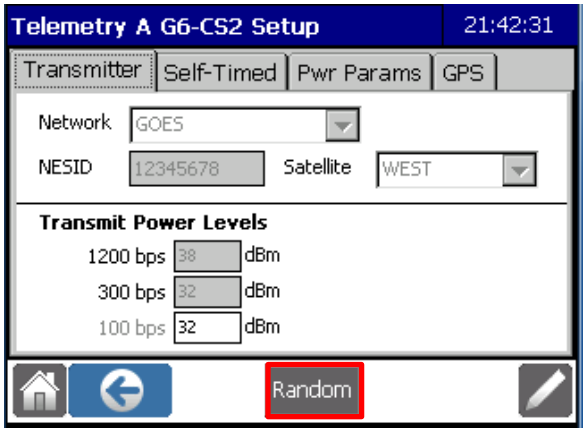


Figure 3-2: Telemetry G6 Setup – Transmitter - Random Setup Screen

3.1.2 G5 TRANSMIT POWER LEVELS

Transmit Power Levels are also displayed here for both the CS-1 and CS-2 standards. **Transmit Power Levels** for each available data rate can be set with a CS2 standard G5; however, they are fixed for a CS-1.

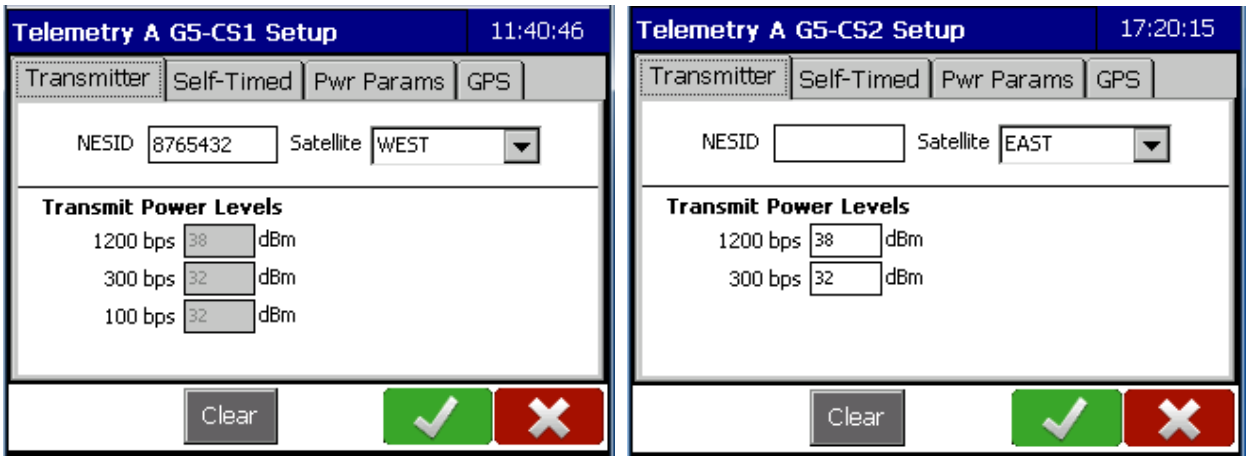


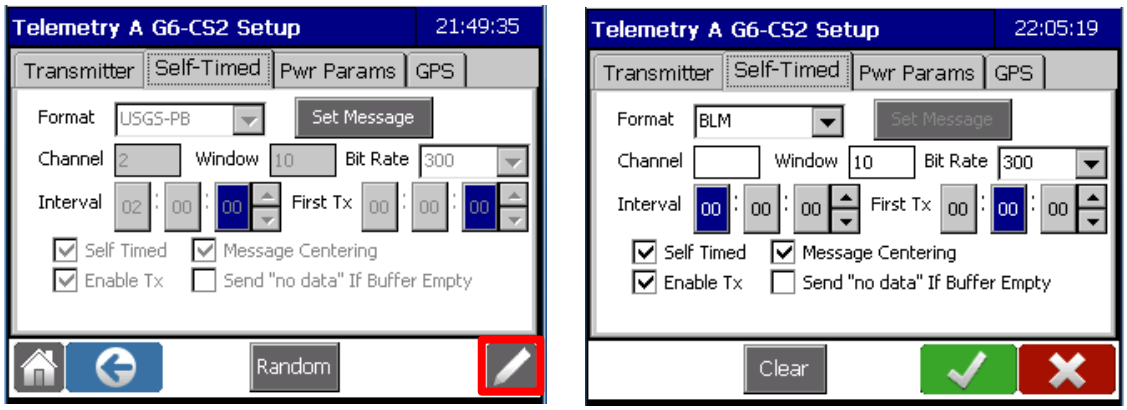
Figure 3-3: G5 Transmit Power Levels

The ranges of acceptable Transmit Power Levels for a CS2 G5 are as follows:

	300 bps	**1200 bps**
Transmit Power Levels (dBm)	26-38.5	26-38.5

3.2 SELF-TIMED TAB

Select **Telemetry>Telemetry A>Status>Setup>Self-Timed>Edit**. This screen displays the message format and transmit parameter details (Figure 3-4). Transmit parameters (Channel, Window, Bit Rate, Interval and First Tx) are provided by the NOAA/EUMETSAT and allow users to retrieve data from remote sites using the GOES/Meteosat Data Collection System (DCS).



View Mode Edit Mode

Figure 3-4 : G6 Setup - Self-Timed tab

Message format, transmit parameters, and other message determiners are entered from the **Edit** mode. Note that all formats except BLM have the option for random transmissions by selecting the Random button on the bottom of the screen (Figure 3-4).

Clear Button: When in edit mode, a **Clear** button appears on the bottom of the screen (Figure 3-4). Pressing the button will set all G6 parameters back to the default settings. This includes the message format. If you press **Clear**, a warning screen will be displayed and you will be prompted if you wish to continue.

Random Button: If transmitting in Time Ordered, WSC, Pseudo Binary or USGS-PB message, transmit parameters for random transmissions can be configured from the Transmitter tab by pressing the Random button on the bottom of the screen. Details of setting up random transmissions are found in the Time Ordered, WSC, Pseudo Binary and or USGS-PB Random Transmission sections of Chapter 4.

Message Formats: There are five message format types in the **Format** drop down menu: BLM, Time Ordered, WSC, Pseudo Binary, and USGS-PB. Chapter 4 has a detailed explanation of each message format.

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

Pseudo Binary	a bit packed modified ASCII transmission format; allows for GOES random transmissions
USGS-PB	format specified by the United States Geological Survey; a bit packed modified ASCII transmission format; allows for GOES random transmissions

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

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

Transmit Parameters: Input your assigned Transmit Parameters in the following fields:

Channel	: Your assigned PRIME CHANNEL
Window	: Your assigned TRANSMIT (XMT) WINDOW
Bit Rate	: Your assigned platform baud rate
Interval	: Your assigned PERIOD (how often transmissions will be made)
First Tx	: Your assigned FIRST TRANSMISSION time

Self Timed Checkbox: Note that the **Self-Timed** checkbox must remain selected when using BLM message format. Time Ordered, WSC, Pseudo Binary, or USGS-PB messages can be self-timed, self-timed and random, or just random. Ensure the Self-timed checkbox is selected accordingly. It should be deselected if only Random transmissions are desired.

Enable Transmission Checkbox: The **Enable Transmission** box must be selected for the G6 to transmit. The user can disable transmissions by deselecting the **Enable Transmission** checkbox. If the transmission is disabled, all functions in the Datalogger occur in normal preparation for a transmission; however, no data is transmitted.

Message Centering Checkbox: If selected, the **Message Centering** checkbox causes the G6 to transmit its data centered in the middle of its transmission window instead of transmitting at the start of its transmission time. Message Centering is selected by default and it is recommended to maintain this setting. Message centering takes into account the full length of the message and then places it in the middle of the window. This helps avoid message collisions due to a neighboring or rogue message going over its 10 second window (Figure 3-5).

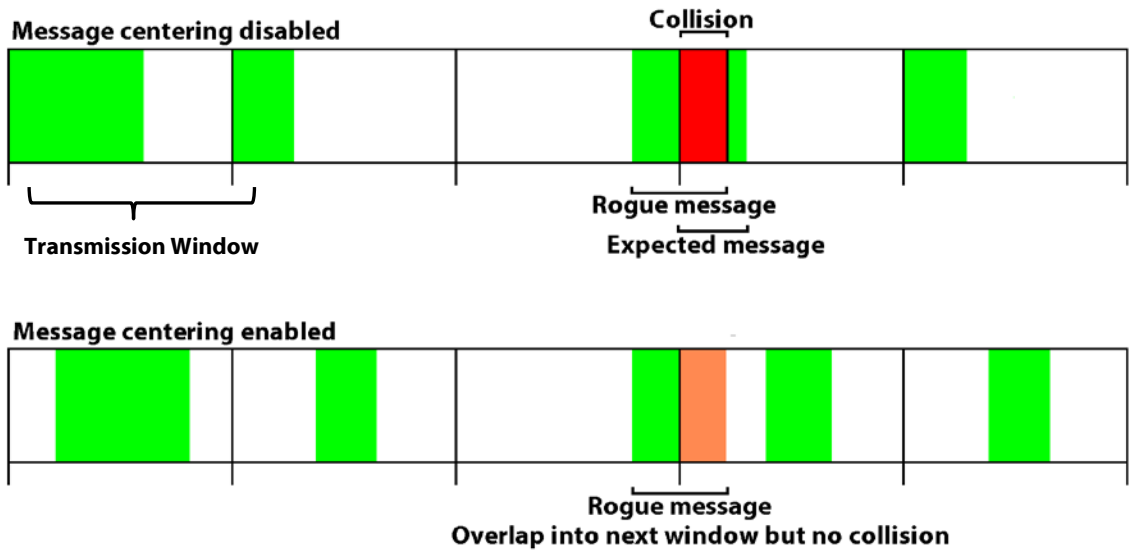


Figure 3-5: Message centering

Send "no data" If Buffer Empty Checkbox: If selected, the **Send "no data" If Buffer Empty** checkbox causes the G6 to transmit a message of "NO DATA AVAILABLE FOR TRANSMISSION" at its transmission time if the Datalogger has not provided the G6 transmitter with data. This feature ensures that a transmission occurs at every transmit interval and can provide valuable troubleshooting information (confirms that a transmission would have been successful had there been data provided). It is recommended that this feature be enabled; however the user should verify that this type of message is compatible with any transmission reception software being used to download data.

3.3 POWER PARAMETERS TAB

Select **Telemetry>Telemetry A>Status>Setup>Pwr Params.** The data points defined on the **Pwr Params** tab appear as internal sensors in the Datalogger. **Forward Power**, **Reflected Power**, **SWR** (Standing Wave Ratio), and **Power Supply During Tx** are parameters updated by the G6 transmitter after each transmission (Figure 3-6).

The default name for each parameter is shown. They may be changed from the edit mode if desired.

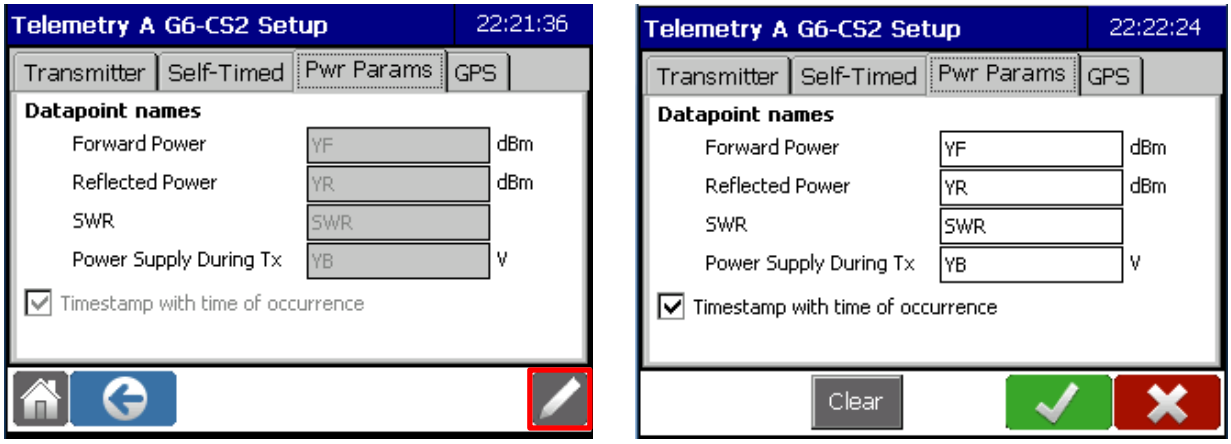


Figure 3-6: G6 Setup - Pwr Params tab

Forward Power: Forward Power is a measurement (units of dBm) of the G6 transmitter's RF output power during the last transmission.

Reflected Power: Reflected Power is a measurement (units of dBm) of the RF power reflected back to the G6 transmitter from the antenna connection during the last transmission.

SWR: Standing Wave Ratio (**SWR**) is a calculation based on the forward and reflected power (see formula below). SWR is a measure of impedance mismatch between the output of the G6 transmitter and the connected antenna. An SWR of 1 indicates an ideal match and signifies that maximum RF power is transferred to the antenna. SWR values greater than 1 indicate an impedance mismatch between the G6 transmitter and the connected antenna. Typically SWR values of less than 1.5 are acceptable. An SWR of 1.5 indicates that 4% of the transmitter power is being reflected from the antenna. SWR is defined as:

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

where:

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

Conversions:

$$P(dbm) = 10\log\frac{P(W)}{1mW} \qquad P(W) = 1mW * InverseLog\frac{P(dbm)}{10}$$

Power Supply During Tx: Power Supply During Tx is a measurement (units of Volts) of the G6's supply voltage made by the G6 during a GOES transmission. Essentially **Power Supply During Tx** is a measurement of battery voltage under load (the G6 draws approximately 2.6 Amps during transmission).

Timestamp with time of occurrence Checkbox: If selected, the **Timestamp with time of occurrence** checkbox records the parameters with the time the G6 transmission occurred. If the checkbox is not selected, then the parameters are not associated with a transmission time but will be time stamped with the selected log at transmit time.

Clear Button: When in edit mode, a **Clear** button will appear on the bottom of the screen. Pressing the button will set all G6 parameters back to the default settings. This includes the message format. If you press **Clear** , a warning screen will be displayed and you will be prompted if you wish to continue.

Random Button: If transmitting in Time Ordered, WSC, Pseudo Binary, or USGS-PB message formats, transmit parameters for random transmissions can be configured from the Pwr Params tab by pressing the Random button on the bottom of the screen. Details of setting up random transmissions are found in Chapter 4.

3.4 GPS TAB

Normally, the Datalogger will update its GPS fix once every 24 hours; however, should more frequent fixing intervals be required, this can be done by using the GPS tab. This feature is particularly useful in drift calculations.

Select **Telemetry>Telemetry A>Status>Setup>GPS>Edit.**

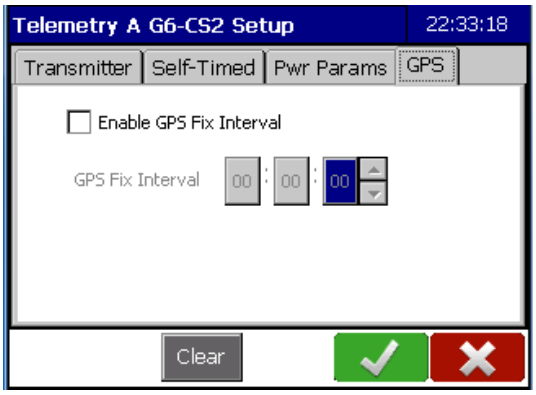


Figure 3-7: GPS Tab – Setting GPS Fixing Interval

Enable GPS Fix Interval Checkbox: To set a GPS fix interval, check the **Enable GPS Fix interval** box. Individually select the hh:mm:ss boxes and use the **Up** and **Down** arrows to set the desired fix interval frequency. Select **OK.** The **Lat** and **Long** variables will automatically be updated in the Current Conditions Screen (see Axiom Configuration Reference) making them available to be logged as data points for use in any processes or calculations.

Clear Button: Selecting **Clear** will return the GPS fix interval to once every 24 hours.

Chapter 4 MESSAGE FORMATS

Messages can be transmitted in five different formats:

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

Select **Telemetry>Telemetry A>Status>Setup>Self-Timed>Edit.** Use the **Format** drop-down menu to select the format of the transmitted message. This screen is the same for all message formats and is used to input the Transmit Parameters. Setting each message format will be detailed in the sections following setting transmit parameters.

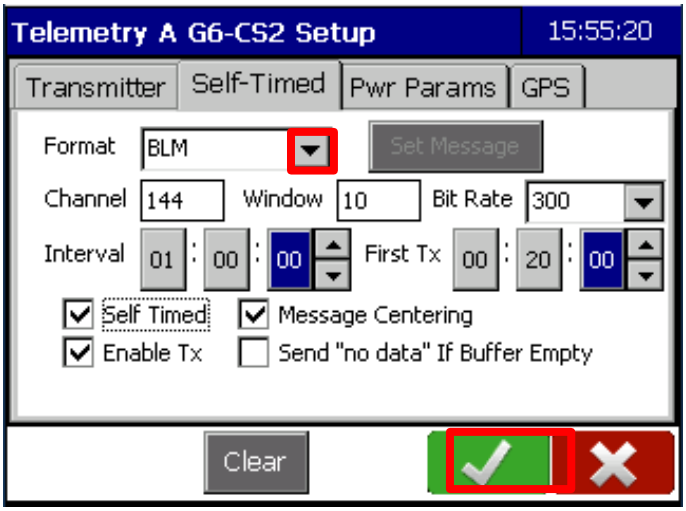


Figure 4-1: Self-Timed tab - message formats

4.1 SETTING TRANSMIT PARAMETERS

A detailed explanation of transmit parameters is contained in Chapter 3. Input your NOAA/EUMETSAT assigned Transmit Parameters in the following fields:

Channel	: Your prime channel.
Window	: Your transmit window in seconds.
Bit Rate	: Your platform baud rate.
Interval	: Your assigned transmit interval, or period (how often transmissions will be made). It is in hh:mm:ss format and the valid range is from 5 minutes to 1 day (24:00:00).
First Tx	: Your first transmission time. It is in hh:mm:ss format and the valid range is from 5 minutes (00:05:00) to 1 day (24:00:00).

Self Timed Checkbox: This is selected by default. It must be checked for a self-timed message to be transmitted.

Enable Transmission Checkbox: This is selected by default. It must be checked for a transmission to be made. If the transmission is disabled, all functions in the Datalogger occur in normal preparation for a transmission; however, no data is transmitted.

Message Centering Checkbox: This is selected by default and is the recommended option to prevent message collisions.

Send "no data" If Buffer Empty Checkbox: If selected, "NO DATA AVAILABLE FOR TRANSMISSION" will be sent if the Datalogger has not provided the transmitter with data. This feature can provide valuable troubleshooting information by confirming that a transmission would have been successful had there been data provided. It is recommended that this feature be enabled; however, the user should verify that this type of message is compatible with any transmission reception software being used to download data.

Clear Button: When in edit mode, a **Clear** button will appear on the bottom of the screen. Pressing the button will set all the transmitter parameters back to the default settings. This includes the message format. If you press **Clear**, a warning screen will be displayed and you will be prompted if you wish to continue

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

IMPORTANT! The message should always be set after the message **Format Type** has changed!

4.2 BLM MESSAGE FORMAT

BLM message format is an ASCII format commonly used in fire weather applications. From the Telemetry Setup screen, select **Edit**. Use the **Format** drop down menu to select **BLM** and fill in the transmit parameters. When done, press **OK**. Press the **Set Message** button to bring up the BLM Message screen and select **Edit**.

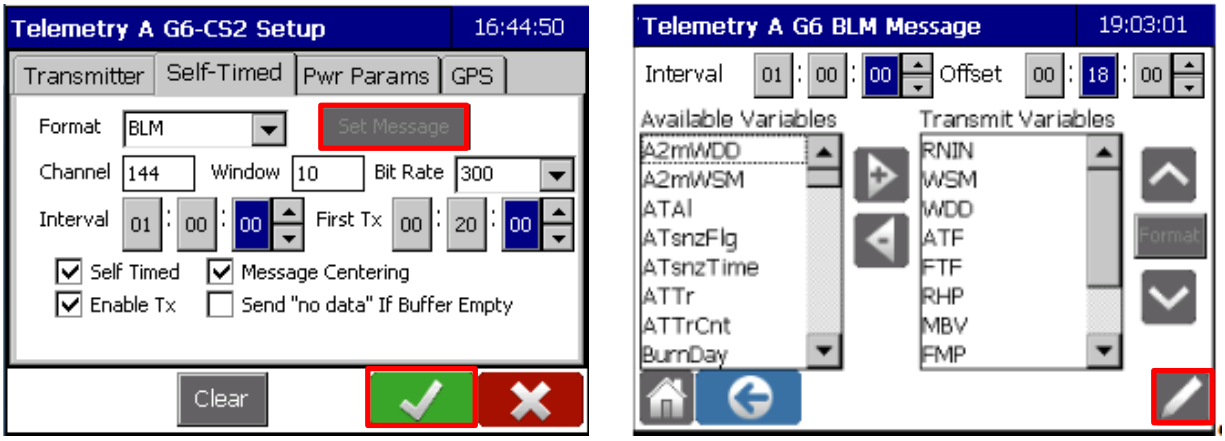


Figure 4-2: BLM Message format screen

Input the Variable Interval and Offset times.

Interval: This is the variable interval time and is how often the variable data from the sensor(s) is written to the transmit buffer. It is in hh:mm:ss format.

Offset: This is an optional field and is the actual time of when the variable data is sent to the transmit buffer. This is most often used to ensure the most recent data is sent to the buffer just prior to the transmission (typically two minutes prior to the first transmit time to provide time for calculations etc. to be made prior to transmission).

Example: The First Transmission time is 00:20:00 (twenty minutes after the hour). A variable interval of 1:00:00 with an Offset of 00:18:00 means data will be sent to the transmit buffer every hour at 18 minutes after the hour (i.e.: at 09:18), two minutes prior to the transmission.

4.2.1 SELECTING BLM TRANSMIT VARIABLES

The list of Available Variables is displayed in the left-hand column, and the transmit variables are displayed in the right-hand column. To build the list of Transmit Variables, press on a variable and use the **Move Left** or **Move Right** arrow to move it between the columns.

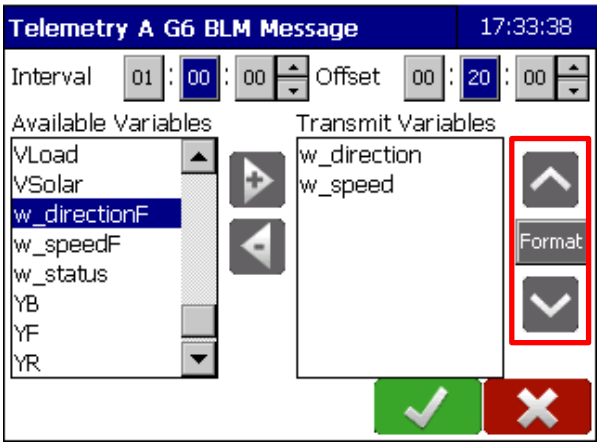


Figure 4-3: Transmit Variable Selection

Format String: Once a variable is selected to be added to the Transmit Variables column, a **"Variable Name" Properties** prompt will appear with a **Format String** field. The Format String will define the precision (the number of decimal places) to which the variable value will be measured. The maximum number is four decimal places.

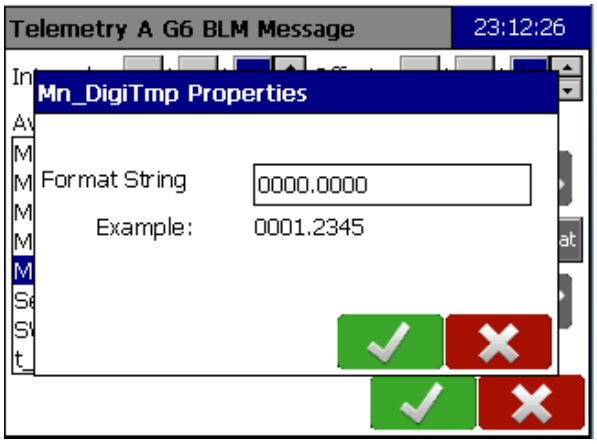


Figure 4-4: Variable Properties - Format String screen

To amend the **Format String** press on the field box and use the keyboard to delete zeroes as required. The default **Format String** is the maximum number of four decimal places.

Once in the Transmit Variable column, the precision of variables can be amended from **Edit** mode. Select the variable name and press the **Format** button (see Figure 4-5). The **"Variable Name" Properties** screen will be displayed (Figure 4-4). Amend the **Format String** as in the previous paragraph.

4.2.2 ADJUSTING BLM TRANSMIT VARIABLES ORDER

Transmit Variables will be transmitted in descending order. The variable order can be rearranged when in the **Edit** mode. Select a Transmit Variable and move it to its desired position using the **Up** and **Down** arrows.

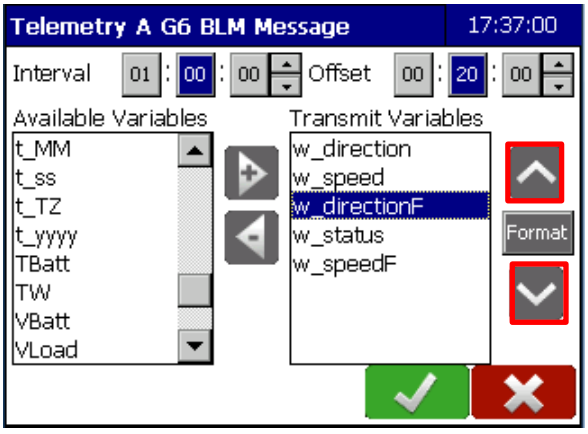


Figure 4-5: Adjusting Transmit Variables Order

4.2.3 BLM SINGLE SAMPLE EXAMPLE

An example of an hourly BLM message transmission which only has one data sample is shown below.

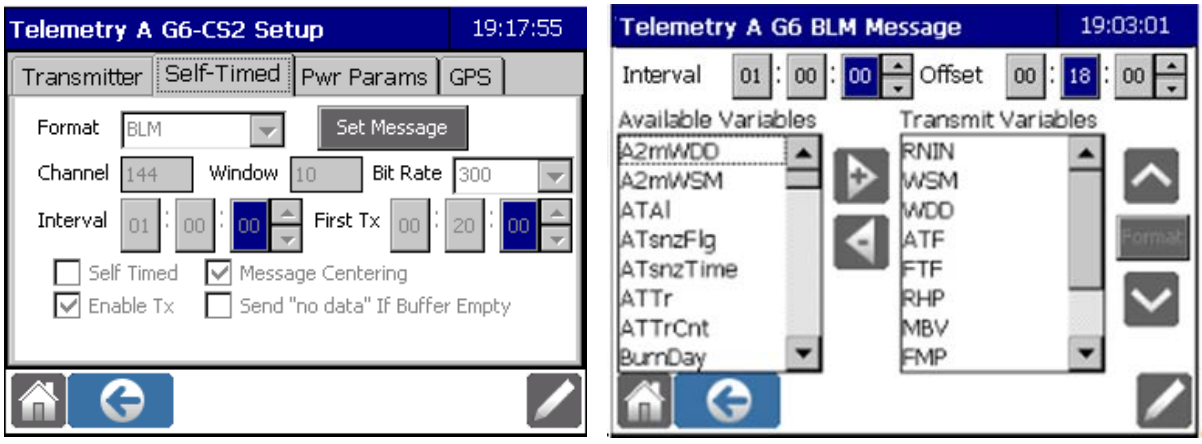


Figure 4-6: Example Message Setup

Message Timing

Parameter	Value	Meaning
Message Interval	01:00:00	Message is transmitted every hour…
First TX	00:20:0	… at 20 minutes after the top of the hour

Transmit Variables Information

Parameter	Value	Meaning
Message Interval	01:00:00	Message is transmitted every hour…
First TX	00:20:0	… at 20 minutes after the top of the hour

Transmit Variables

Transmit Variable	Meaning	Format string
RNIN	Rainfall	00.00
WSM	Wind Speed	000
WDD	Wind Direction	000
ATF	Air Temperature	000
FTF	Fuel Stick Temperature	000
RHP	Relative Humidity	000
MBV	Main Battery Voltage	00.0
FMP	Fuel Stick Moisture	000.0
WDDP	Peak Wind Direction	000
WSMP	Peak Wind Speed	000
SR	Solar Radiation	00000

Transmission

Transmit Variable	Meaning	Format string
RNIN	Rainfall	00.00
WSM	Wind Speed	000
WDD	Wind Direction	000
ATF	Air Temperature	000
FTF	Fuel Stick Temperature	000
RHP	Relative Humidity	000
MBV	Main Battery Voltage	00.0
FMP	Fuel Stick Moisture	000.0
WDDP	Peak Wind Direction	000
WSMP	Peak Wind Speed	000
SR	Solar Radiation	00000

4.2.4 BLM MULTIPLE SAMPLE EXAMPLE

An example of an hourly BLM message transmission with multiple samples is shown below.

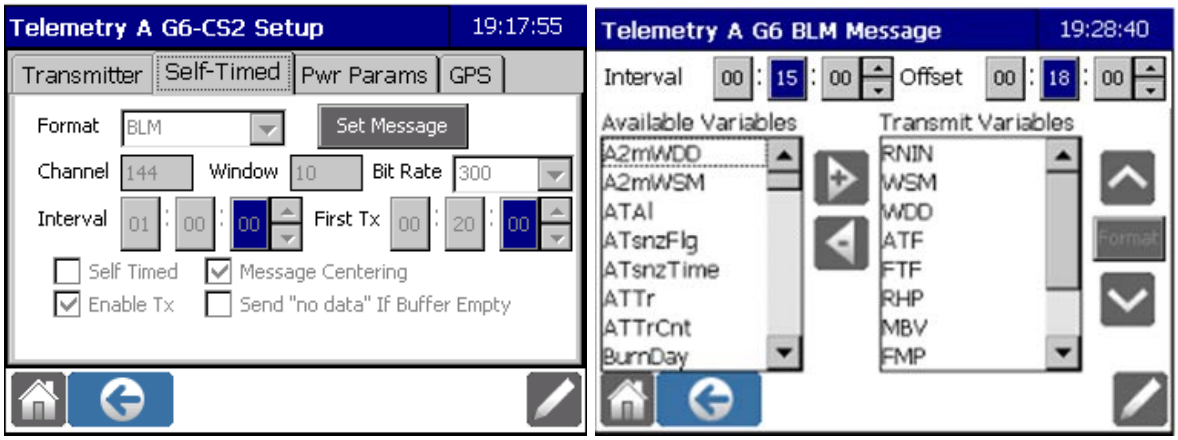


Figure 4-7: BLM Multiple Sample Example

Message Timing

Parameter	Value	Meaning
Message Interval	01:00:00	Message is transmitted every hour…
First Tx	00:20:00	… at 20 minutes after the top of the hour

Transmit Variables Information

Parameter	Value	Meaning
Variable Interval	00:15:00	Variable data is sent to the buffer every 15 minutes…
Variable Offset	00:18:00	…based on the offset time of 18 minutes after the top of the hour (00:18:00, 00:33:00, 00:48:00, 01:03:00 etc.).

Transmit Variable	Meaning	Format string
RNIN	Rainfall	00.00
WSM	Wind Speed	000
WDD	Wind Direction	000
ATF	Air Temperature	000
FTF	Fuel Stick Temperature	000
RHP	Relative Humidity	000
MBV	Main Battery Voltage	00.0
FMP	Fuel Stick Moisture	000.0
WDDP	Peak Wind Direction	000
WSMP	Peak Wind Speed	000
SR	Solar Radiation	00000

GOES Transmission

Value	Meaning
001044E409132142033G43+0NN195EUB00220	GOES Header
00.41 00.41 00.41 00.41	Rainfall
002 001 002 001	Wind Speed
091 138 221 245	Wind Direction
050 050 049 049	Air Temperature
050 050 050 049	Fuel Stick Temperature
081 083 083 084	Relative Humidity
13.4 13.4 13.4 13.4	Main Battery Voltage
009.9 010.1 010.1 010.1	Fuel Stick Moisture
092 077 100 267	Peak Wind Direction
005 004 005 008	Peak Wind Speed
00153 00087 00063 00030	Solar Radiation

4.3 TIME ORDERED MESSAGE FORMAT

Time Ordered message format is an ASCII format used to transmit time-stamped data. Time Ordered format allows for the transmission of only Self Timed messages, only Random messages, or a combination of Self Timed and Random messages.

From the Telemetry Setup screen, select **Edit**. Use the **Format** drop down menu to select **Time Ordered** and fill in the transmit parameters. When done, press **OK**.

Press the **Set Message** button to bring up the Time-Ordered Message screen.

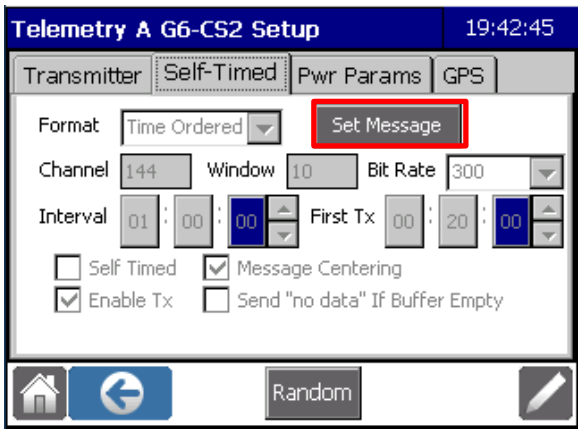
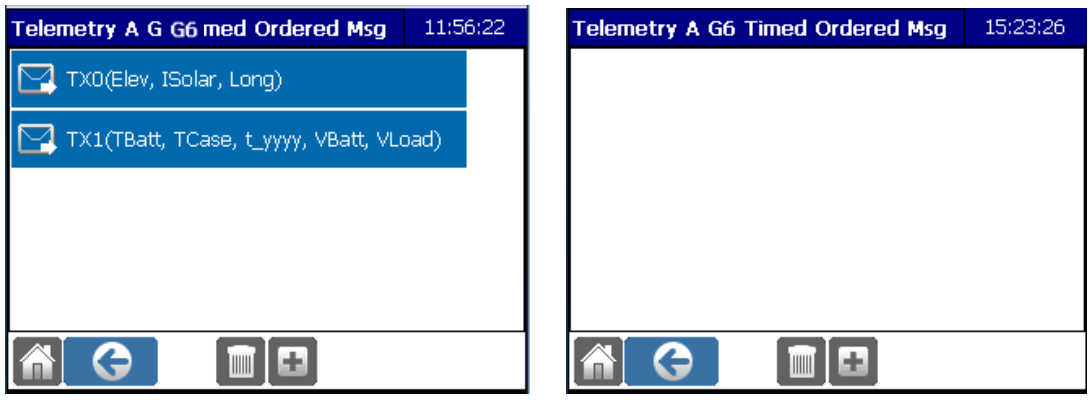


Figure 4-8: Set Message Button

4.3.1 DEFINING TIME-ORDERED SENSOR SETS

Time Ordered messages are configured by defining sensor sets. A sensor set is a group of data points transmitted in a defined ordered. Multiple sensor sets can be defined for Time Ordered transmission (up to 100 unique sensor sets – numbers 0 to 99). Each sensor set transmission includes the Sensor Set's ID number followed by a time-stamp and then the defined data.

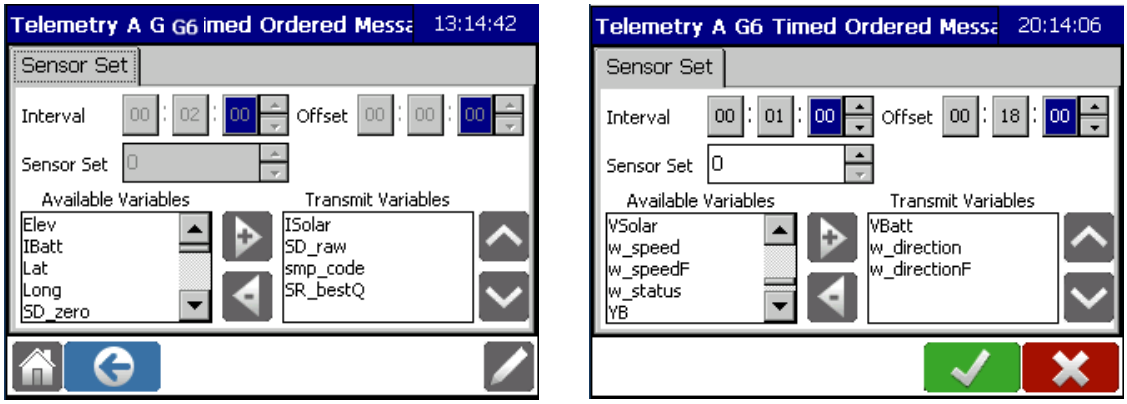
If there are already sensor sets defined they will appear as blue message bars on the screen. If there are no data sets defined, the screen will be blank (Figure 4-9).



Defined Sensor Sets No Defined Sensor Sets

Figure 4-9: Sensor Sets

To edit existing data sets, press on the blue message bar then select **Edit**. In order to define new data sets select the **Add** button to display the **Time Ordered** screen. For new data sets the Sensor Set tab is automatically displayed in **Edit** mode. For existing sensor sets, you must select **Edit (**Figure 4-10).



Editing Existing Sensor Sets Editing New Sensor Sets

Figure 4-10: Defining Sensor Sets

Interval: This is the Sensor Set interval time and is how often the sensor set data is written to the transmit buffer. It is in hh:mm:ss format.

Offset: This is an optional field and is the actual time of when the sensor set data is sent to the transmit buffer. This is most often used to ensure the most recent data is sent to the buffer just

prior to the transmission (typically two minutes prior to the first transmit time to provide time for calculations etc. to be made prior to transmission).

Example: The First Transmission time is 00:20:00 (twenty minutes after the hour). A sensor set interval of 1:00:00 with an Offset of 00:18:00 means data will be sent to the transmit buffer every hour at 18 minutes after the hour (e.g.: at 09:18), two minutes prior to the transmission.

Note: Sensor Sets need to be written to the transmit buffer at least two minutes prior to the transmit time in order for them to be included in the transmission

Sensor Set: Set the unique identifying number for the **Sensor Set** using the **Up** and **Down** arrows. Sensor Set numbers from 0-99 are valid.

4.3.1.1 *Selecting Sensor Set Variables*

Each Sensor Set is assigned a number of variables. The list of Available Variables is displayed in the left-hand column, and the transmit variables are displayed in the right-hand column. To build the list of Transmit Variables, press on a variable and use the **Move Left** or **Move Right** arrow to move it between the columns.

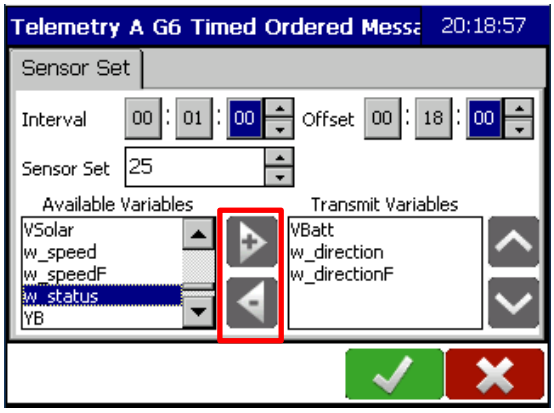


Figure 4-11: Building Sensor Sets

Transmit Variables will be transmitted in descending order. Variables can be rearranged in the Transmit Variable column by selecting a variable and moving it using the **Up** and **Down** arrows.

Once all variables have been selected and arranged for the sensor set, select **OK.** Sensor sets will be displayed in the **Telemetry A Time Ordered Msg** screen. Continue to add sensor sets in the same manner. Note that variables can be used in more than one sensor set.

Figure 4-12: Time Ordered Message Sensor Sets

Sensor sets can be deleted by pressing the Delete button and then selecting the sensor set to be deleted.

4.3.2 TIME-ORDERED RANDOM TRANSMISSION SETUP

Random transmission setup is available for Time Ordered formats. A random message will be sent when pre-determined conditions are met. In order to send random transmissions, random channel parameters must be provided by NOAA/EUMETSAT.

> **NOTE:** Random transmissions have a maximum message size of 78 bytes. Data which exceeds this limit will be truncated.

From the **Setup** screen, tap **Random** to display the **Random Setup** screen (see Figure 4-13) from which you can configure transmit parameters for random transmissions.

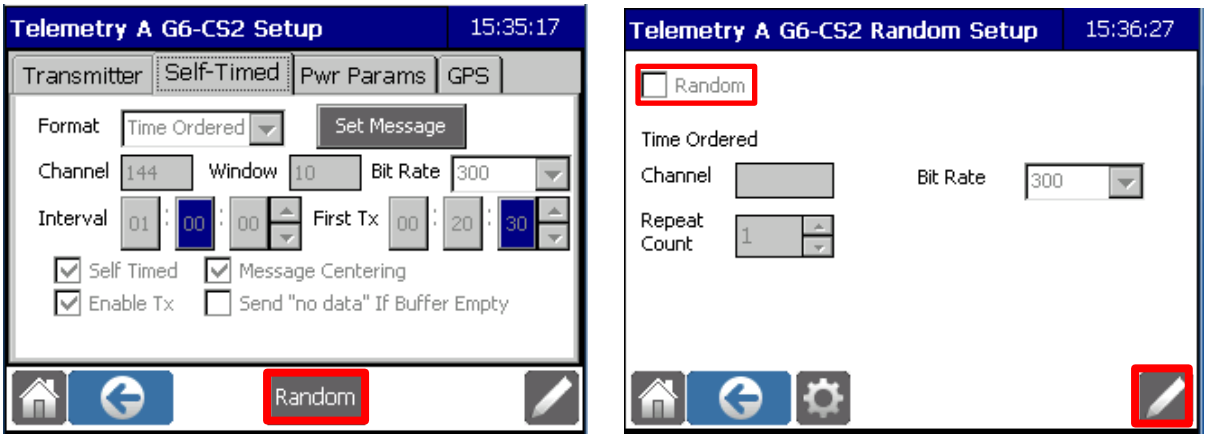


Figure 4-13: Random transmission setup

Select **Edit** and check the **Random** checkbox to enable random transmissions.

Channel: Input your assigned random channel.

Bit Rate: Input your assigned Bit Rate.

Repeat Count: Random Transmissions can be re-sent in subsequent transmission windows up to a maximum of 5 transmissions. Each Repeat Count transmission will be identical to the preceding one. After the last repeat count transmission, the next message will be updated with the latest variable data and then this information will be sent in accordance with the assigned Repeat Count.

The default setting is one (1) which means the message will only be sent once with no repeat.

Press **OK**.

4.3.2.1 *Configuring Time-Ordered Random Transmissions Messages*

To configure the Random message, select **Setup** (see Figure 4-14), and then press the **Add** button**.** The **Time Ordered Message** screen will be displayed with two tabs: **Sensor Set** and **Condition**.

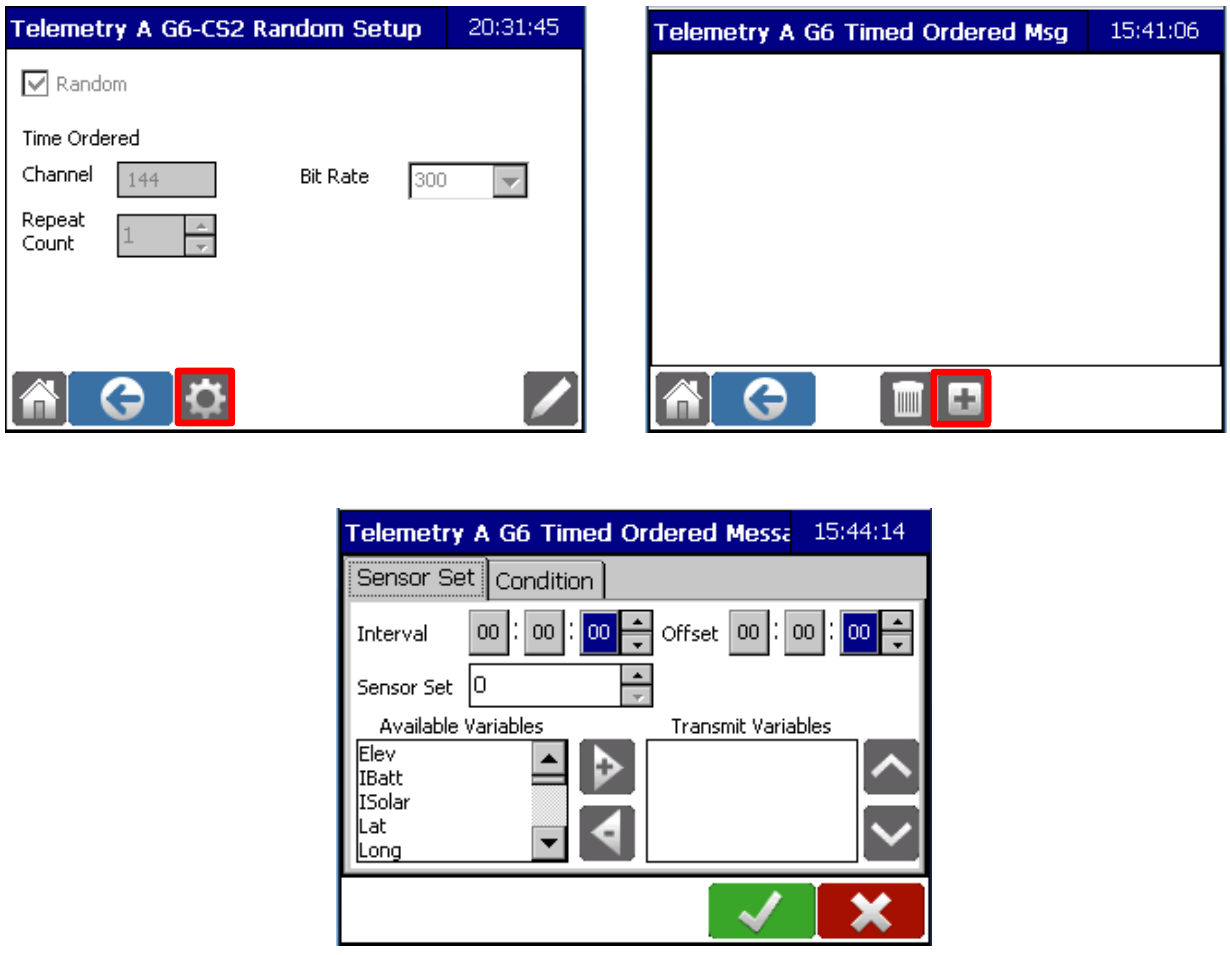


Figure 4-14: Time Ordered random transmission message screen

4.3.2.1.1 Defining Random Transmission Sensor Sets

Similar to self-timed messages Time Ordered message, random messages are also configured by defining sensor sets (multiple sensor sets are also allowed for random transmissions). Refer to Section 4.3.1.1 for details on how to define a sensor set.

4.3.2.1.2 Defining Conditions

A random message is prepared for transmission when the defined condition is met. Press on the **Condition Tab**. Select the condition using the **Condition Type** radial button (Figure 4-15).

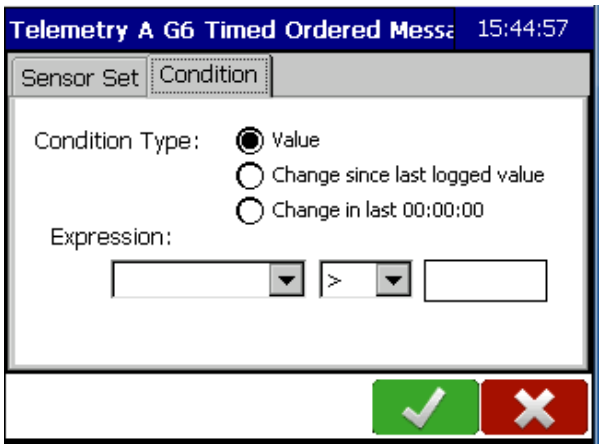


Figure 4-15: time ordered random transmission setup

In the **Expression** fields, select the desired variable by using the drop down menu in the first **Expression** box. Select the mathematical expression in the second box, and then input the desired value in the last box. See Figure 4-16.

> **Change in last 00:00:00:** The time indicated will be the time of the sensor set interval input in the Sensor Set tab. If the interval was set at 30 minutes the radial button condition will read **"Change in last 00:30:00".**

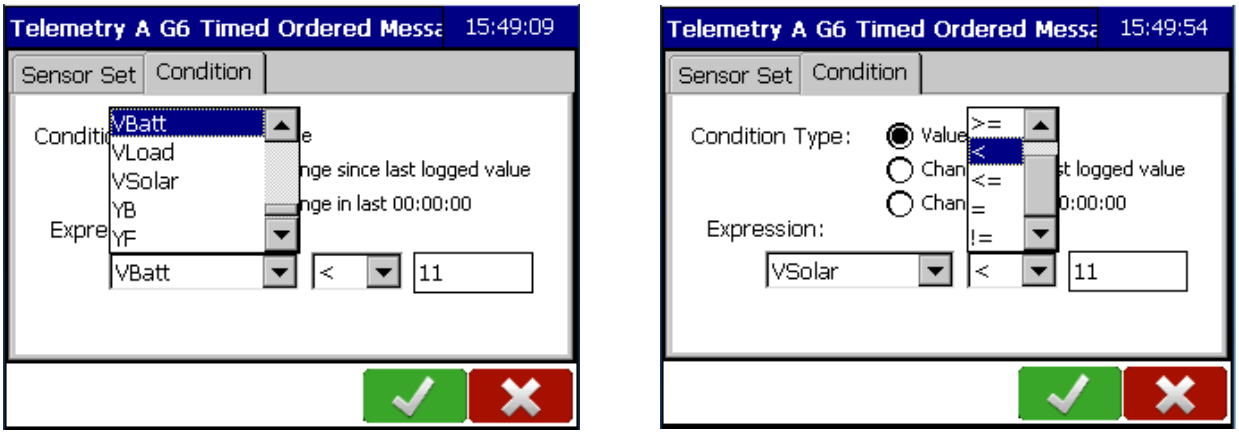


Figure 4-16: Random Message - Defining the Condition

4.3.3 TIME ORDERED EXAMPLE

An example of a Time Ordered message transmission is shown below. Sensor Set 0 has an interval of 00:10:00 (10 minutes), and Sensor Set 4 has an interval of 01:00:00 (1 hour).

GOES Transmission

Value	Meaning
001044E409130003031G34+1NN196WUB00342	GOES Header
0 16:30:00 0.67,4.7,206.4,78.3,77.0,30,13.3,7.4,199.9,5.5,2	Sensor set 0, 16:30 data
0 16:40:00 0.67,5.1,201.1,78.4,77.1,30,13.4,7.4,199.7,5.4,3	Sensor set 0, 16:40 data
0 16:50:00 0.67,4.5,209.3,78.4,77.1,30,13.4,7.4,202.7,5.8,2	Sensor set 0, 16:50 data
0 17:00:00 0.67,4.9,203.7,78.4,77.2,30,13.3,7.4,198.4,5.4,2	Sensor set 0, 17:00 data
4 17:00:00 13.2,19.4	Sensor set 4, 17:00 data
0 17:10:00 0.67,4.9,203.7,78.4,77.2,30,13.3,7.4,199.9,5.4,2	Sensor set 0, 17:10 data
0 17:20:00 0.67,4.5,205.5,78.4,77.2,30,13.3,7.4,199.9,5.4,2	Sensor set 0, 17:20 data

Note that the transmission time is 00:30:31 UTC (the GOES Header is always in UTC) whereas the transmitted data is in local time (16:30) as the Datalogger is set to PDT. Also note that the Datalogger's 17:30 data was not included in this transmission as the data was not available at the required two minutes prior to the transmit time.

4.4 WSC MESSAGE FORMAT

WSC message format is an ASCII format used by the Water Survey of Canada. WSC is a self-contained format with parameter names and timing embedded in the message[10]. WSC format allows for the transmission of only Self Timed messages, only Random messages, or a combination of Self Timed and Random messages.

Select **Telemetry>Telemetry A>Status>Setup>Self-Timed>Edit.** Select WSC from the **Format** drop down menu and fill in the transmit parameters. When done, press **OK**.

Press the **Set Message** button to bring up the WSC Message screen.

[10] Refer to Environment Canada's Operational Specifications for Environmental Data Acquisition System (EDAS) Logger, Annex A of KM055-045105/B, appendix A, page 15 for more details.

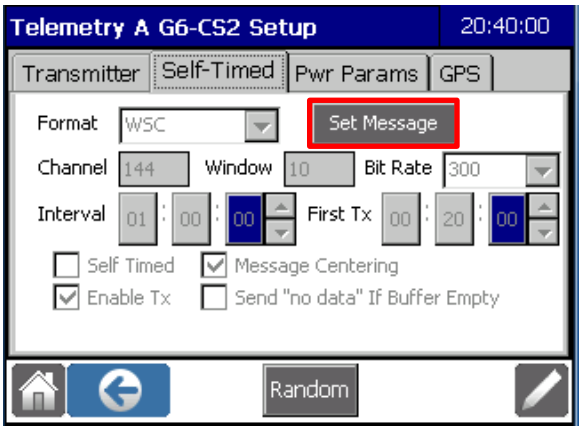
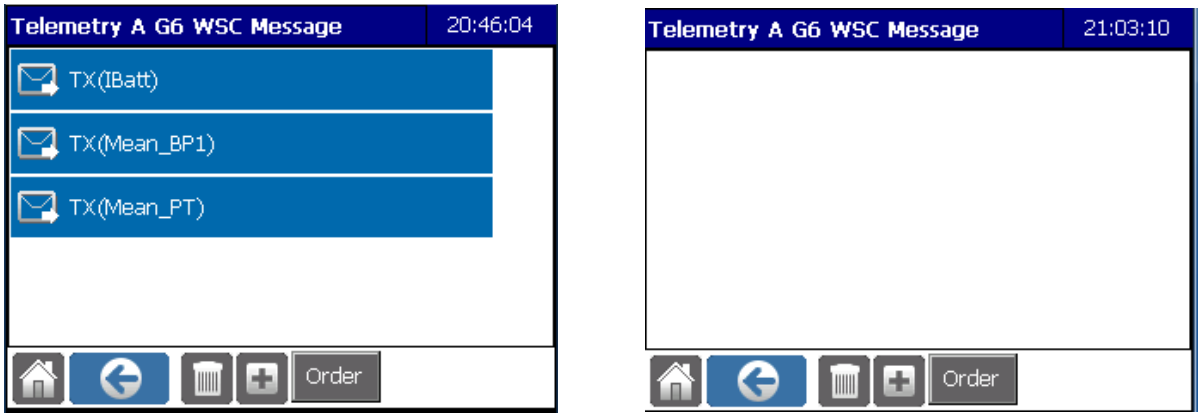


Figure 4-17: WSC message format0

4.4.1 WSC SELF-TIMED MESSAGE CONFIGURATION

From the WSC Setup screen select **Set Message** (see Figure 4-17) then select the **Add** button. The message is configured by selecting individual input variables.

If there are already input variables defined they will appear as blue message bars on the screen. If there are no input variables defined, the screen will be blank.



Input Variables Defined

No Input Variables Defined

Figure 4-18: Input Variables

To edit existing Input Variables, press on the blue message bar then select **Edit**. In order to define new Input Variables, select the **Add** button to display the **WSC Message** screen. For new data sets the Sensor Set tab is automatically displayed in **Edit** mode. For existing sensor sets, you must select **Edit**.

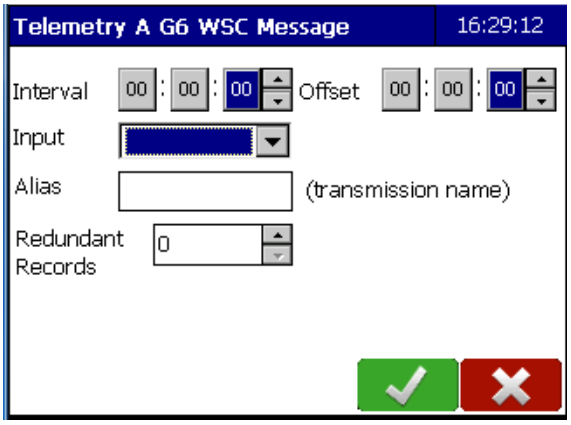


Figure 4-19: WSC message setup

Interval: This is the Input Variable interval time and is how often the Input Variable data is written to the transmit buffer. It is in hh:mm:ss format.

Offset: This is an optional field and is the actual time of when the Input Variable data is sent to the transmit buffer. This is most often used to ensure the most recent data is sent to the buffer just prior to the transmission (typically two minutes prior to the first transmit time to provide time for calculations etc. to be made prior to transmission).

Example: The First Transmission time is 00:20:00 (twenty minutes after the hour). An Input Variable interval of 1:00:00 with an Offset of 00:18:00 means data will be sent to the transmit buffer every hour at 18 minutes after the hour (i.e.: at 09:18), two minutes prior to the transmission.

Note: Input Variables need to be written to the transmit buffer at least two minutes prior to the transmit time in order for them to be included in the transmission

Input: The **Input** drop-down menu displays all available variables configured in the Datalogger. Scroll through the list and select the desired Input Variable for transmission.

Alias: The **Alias** textbox provides the option to enter a name which will be used as the Input Variable's name in the transmission to differentiate it from the assigned variable name in the data logger. Leave the Alias textbox blank if no alias is desired.

An example of when an alias would be used is when a user wishes to transmit data maximum and minimums using the same name as the original data point (i.e. transmit minimum stage, HGmin, as a stage measurement, HG).

Redundant Records: This option specifies the number of times the Input Variable's data is to be transmitted. Zero means no re-transmission so only the original data will be received. One (1) means 1 redundant record so a second copy of the data will be re-transmitted at the next transmission, etc.

After each variable is added, the **Telemetry A WSC Message** screen will be displayed listing the variables in the order they were added. Individual variables can be edited by selecting the blue message bar to display the WSC Message screen seen in Figure 4-20. To delete a variable, select the **Delete** button, then press the variable you wish to delete.

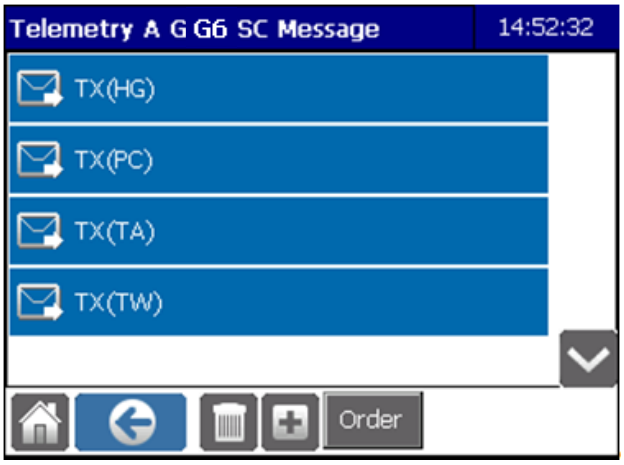


Figure 4-20: WSC message variables

4.4.1.1 *Variable Transmit Order*

Selecting **Telemetry>Telemetry A>Status>Setup>Self-Timed>Set Message** will bring you the **Telemetry A WSC Message** screen which displays the list of selected variables for transmission. Variables will be transmitted in descending order. The variable order can be rearranged by using the **Order** button on the bottom of the **WSC Message** screen.

Select **Edit** then select the variable you wish to move. Use the **Up** and **Down** icons to move the Input Variable's position in the displayed list. Select **OK.**

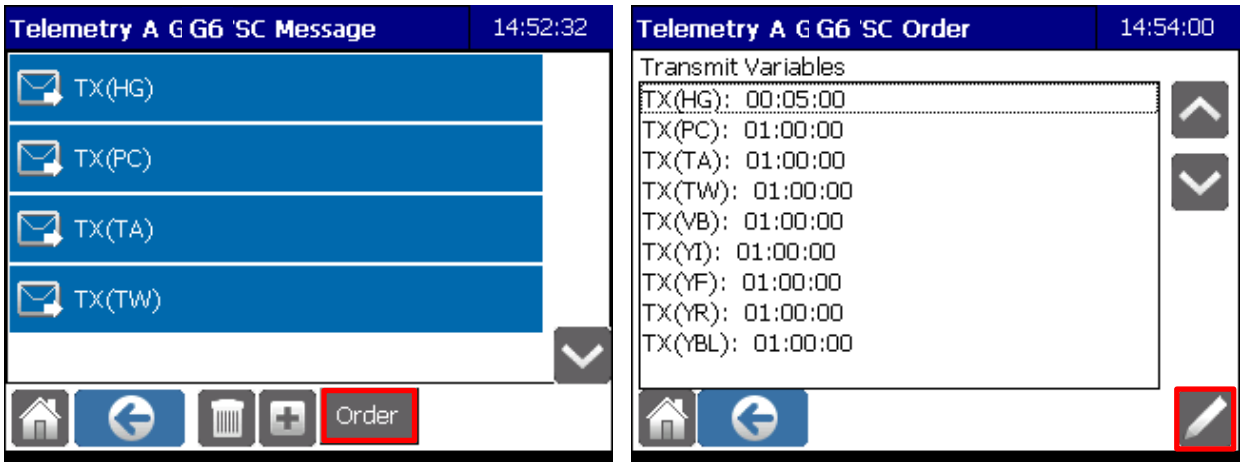


Figure 4-21: WSC message order

4.4.1.2 *WSC Self-Timed Message Example*

An example of a WSC message transmission is shown below.

Message Timing

Parameter	Value	Meaning
Message Interval	01:00:00	Message is transmitted every hour…
First TX	00:45:00	starting at 15 minutes after the top of the hour.

Input Variables Information

Parameter	Meaning	Notes
VB	Battery Voltage	sampled every 30 minutes from the top of the hour zero redundant records
HG	Stage	sampled every five minutes from the top of the hour six redundant records

GOES Transmission

00102172091271845 00G34+0NN195EUB00101 :VB 15 #30 13.2 :HG 05 #05 5.379 5.925 6.472 7.019 7.565 8.112 8.659 9.206 9.753 9.800 9.846 9.994

Notes:

1. 00102172091271845 00G34+0NN195EUB00101 = GOES header. Note the transmission time is 18:45:20 UTC (the GOES Header is always in UTC)
2. VB 15 #30 13.2 = Battery Voltage parameter (VB) was sampled 15 minutes prior to transmission (15) on a 30 minute interval (#30), so the value of VB at 18:30:00 UTC was 13.2 Volts.
3. HG 05 #05 5.379 5.925 6.472 7.019 7.565 8.112 8.659 9.206 9.753 9.800 9.846 9.994 = Stage parameter (HG) was sampled five minutes prior to transmission (05) on a 5 minute interval (#05), so the values of HG are:

HG value	Time	Note
5.379	18:40:00 UTC	
5.925	18:35:00 UTC	
6.472	18:30:00 UTC	
7.019	18:25:00 UTC	
7.565	18:20:00 UTC	
8.112	18:15:00 UTC	
8.659	18:10:00 UTC	this is redundant record 1
9.206	18:05:00 UTC	this is redundant record 2
9.753	18:0:00 UTC	this is redundant record 3
9.800	17:55:00 UTC	this is redundant record 4
9.846	17:50:00 UTC	this is redundant record 5
9.994	17:45:00 UTC	this is redundant record 6

4.4.2 WSC RANDOM TRANSMISSION SETUP

Random transmission setup is available for WSC formats. A random message will be sent when pre-determined conditions are met. . In order to send random transmissions, random channel parameters must be provided by NOAA/EUMETSAT.

> **NOTE:** Random transmissions have a maximum message size of 78 bytes. Data which exceeds this limit will be truncated.

From the **Setup** screen, tap **Random** to display the **Random Setup** screen (see Figure 4-22) from which you can configure transmit parameters for random transmissions.

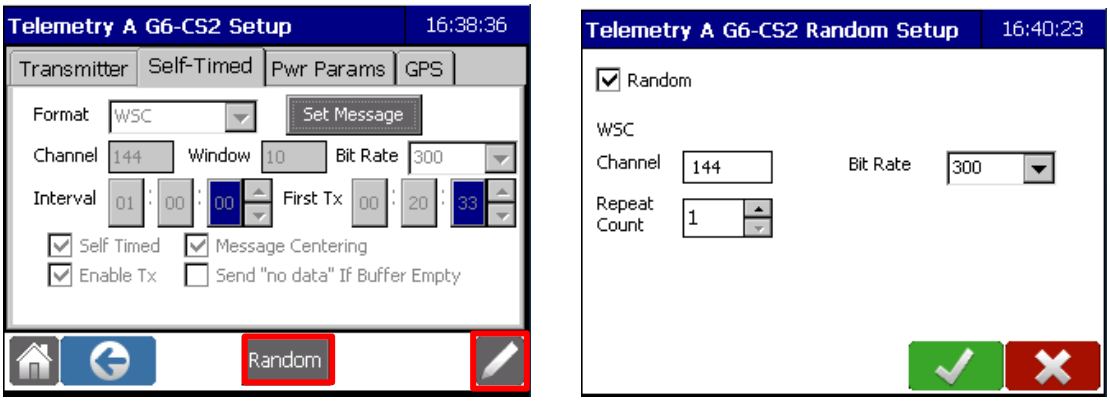


Figure 4-22: Setting up WSC Random Transmissions

Select **Edit** and check the **Random** checkbox to enable random transmissions.

Channel: Input your assigned random channel.

Bit Rate: Input your assigned Bit Rate.

Repeat Count: Random Transmissions can be re-sent in subsequent transmission windows up to a maximum of 5 transmissions. Each **Repeat Count** transmission will be identical to the preceding one. After the last repeat count transmission, the next message will be updated with the latest variable data and then this information will be sent in accordance with the assigned **Repeat Count**.

The default setting is one (1) which means the message will only be sent once with no repeats.

Select **OK** when completed to display the **WSC Random Setup** screen.

4.4.2.1 *WSC Random Transmission Configuration*

From the **Telemetry A Random Setup** screen (**Telemetry>Telemetry A>Status>Setup>WSC>Random),** select the **Setup** cog and then **Edit**.

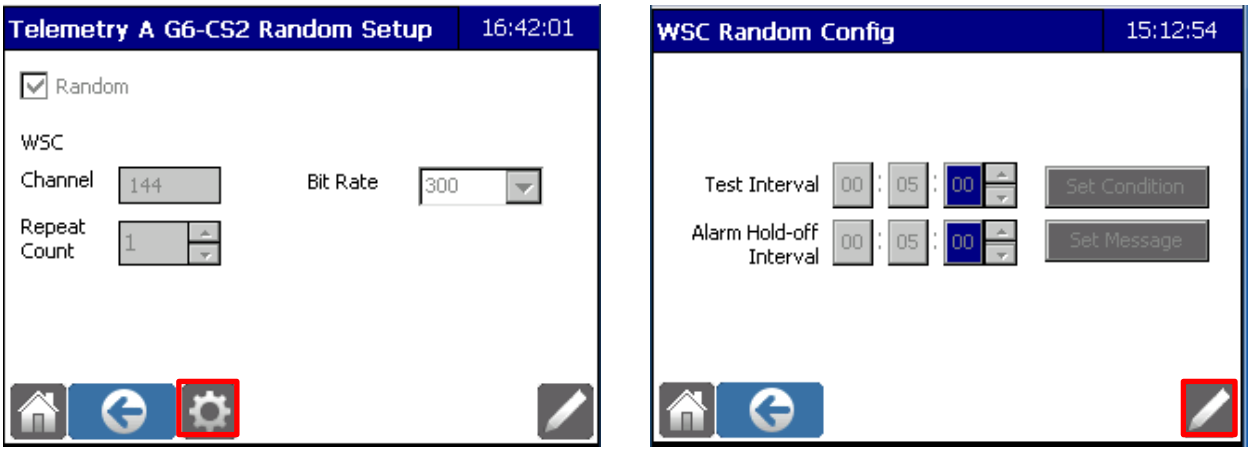


Figure 4-23: WSC Random Configuration screen

Enter **Test Interval** and **Alarm Hold-off Interval** values.

Test Interval: how often a sample will be taken to compare to the set conditions. If it meets the conditions, a random transmission will be made.

Alarm Hold-off Interval: Once a test interval sample has triggered a random transmission, if subsequent test samples also meet the conditions, you can delay another random transmission by the input time period.

4.4.2.1.1 WSC Random Configuration Set Condition

A random message is prepared for transmission when the defined condition is met. On the WSC Random Config screen (Figure 4-24) select **Edit** and then press on the **Set Condition** button.

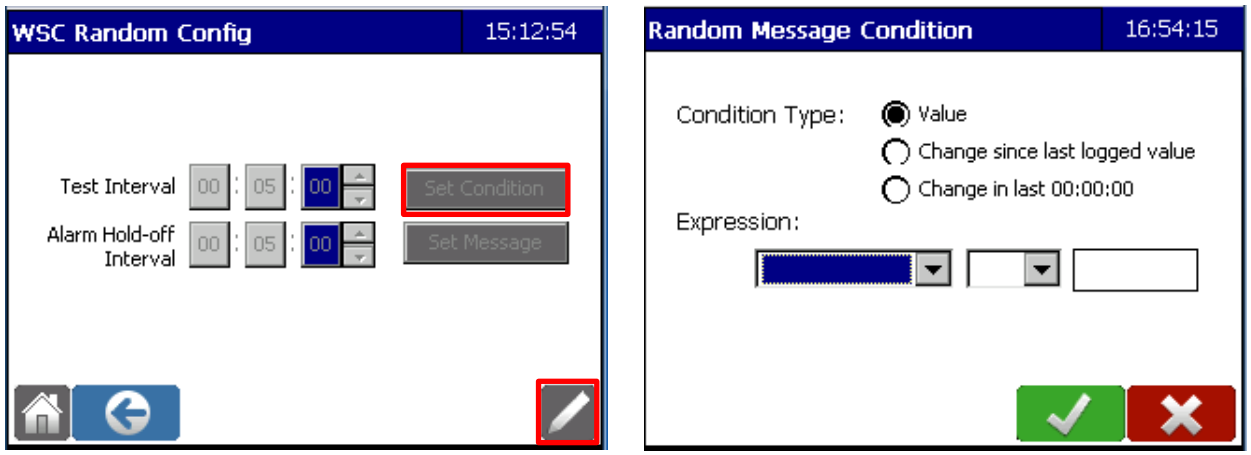


Figure 4-24: time ordered random transmission setup

Select the Condition Type using radial buttons.

Change in last 00:00:00: The time indicated will be the time of the test interval. If the test interval was set at 30 minutes the radial button condition will read **"Change in last 00:30:00".**

In the **Expression** fields, select the desired variable by using the drop down menu in the first **Expression** box. Select the mathematical expression in the second box, and then input the desired value in the last box by pressing on the box and using the keyboard. See Figure 4-25.

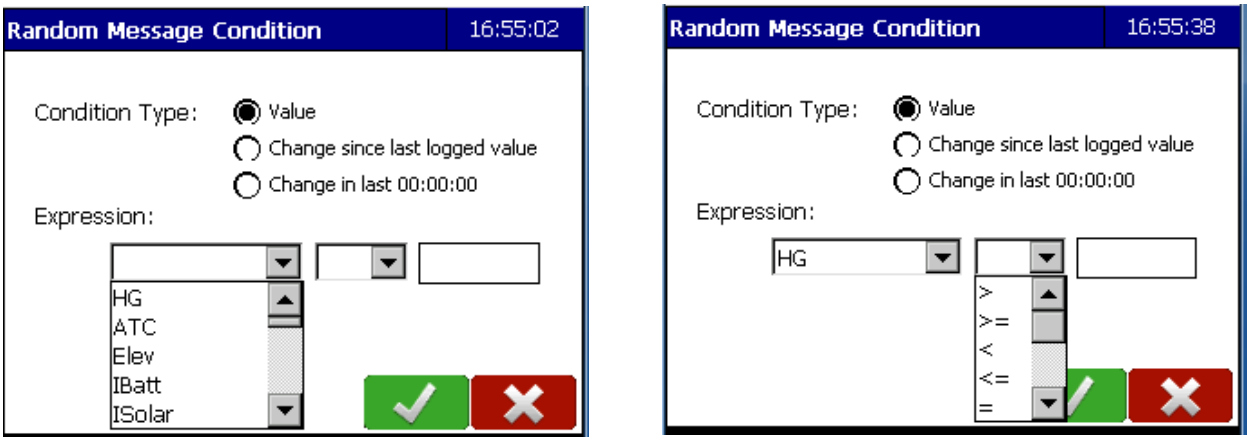


Figure 4-25: Random Message - Defining the Condition

IMPORTANT! Random transmissions are time stamped with the time of transmission (which is random) and not the time of occurrence of the condition being met. To maintain timing integrity it is recommended that, during data collection, you give your randomly transmitted variables a different name to separate them from your timed variables by using the **Alias** feature shown in the following section.

4.5 PSEUDO-BINARY MESSAGE FORMATS

Pseudo Binary message format is a bit packed modified ASCII transmission format. Pseudo Binary format allows for the transmission of only Self Timed messages, only Random messages, or a combination of Self Timed and Random messages.

Select **Telemetry>Telemetry A>Status>Setup>Self-Timed>Edit**. Select Pseudo Binary using the drop down menu in the **Format** field and fill in the transmit parameters. When done, press **OK**.

Press the **Set Message** button to bring up the Time-Ordered Message screen.

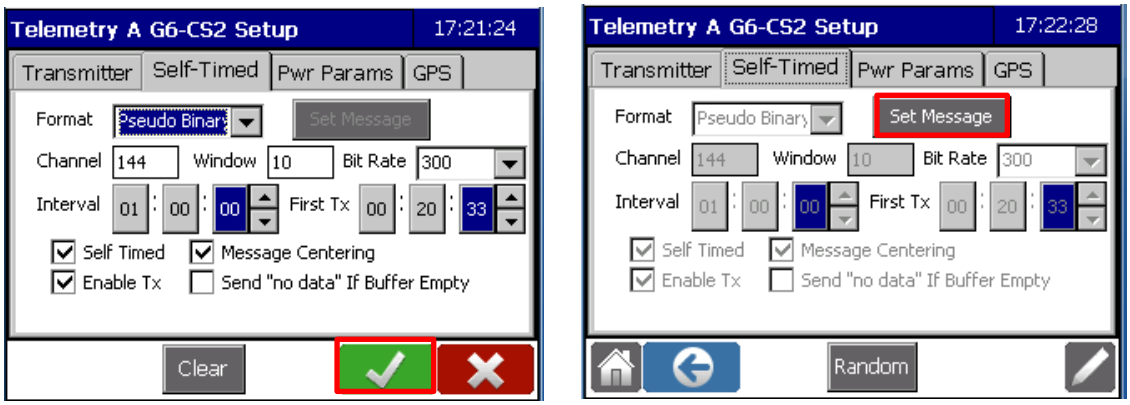


Figure 4-26: Pseudo Binary message format - Set message0

4.5.1 DEFINING DATA SETS

Pseudo Binary messages are configured by defining data sets. A data set is a group of data points transmitted in a defined ordered. Multiple data sets can be defined for Pseudo Binary transmission (up to 64 unique data sets – numbers 0 to 63). Each data set transmission includes the Data Set's Format ID number followed by the defined data.

If there are already Data Sets defined they will appear as blue message bars on the screen. If there are no data sets defined, the screen will be blank (Figure 4-27).

Figure 4-27: Adding Data Sets

To edit existing data sets, press on the blue message bar then select **Edit**. In order to define new data sets, select the **Add** button to display the **Time Ordered** screen. For new data sets the Sensor Set tab is automatically displayed in **Edit** mode. For existing sensor sets, you must select **Edit**.

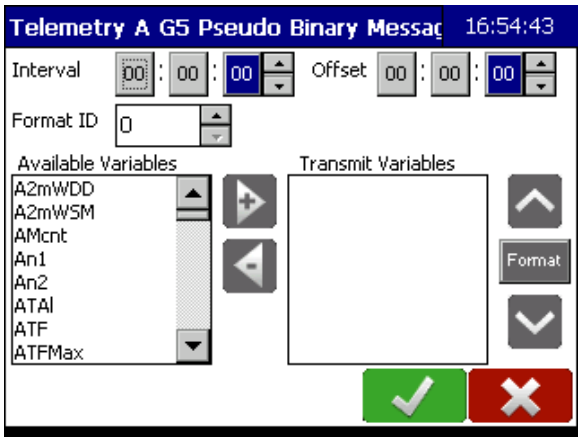


Figure 4-28: Defining Data Sets

Interval: This is the Data Set interval and is used to specify how often the selected data sets are written to the transmit buffer. It is in hh:mm:ss format.

Offset: This is an optional field and is the actual time of when the Data Set data is sent to the transmit buffer. This is most often used to ensure the most recent data is sent to the buffer just prior to the

transmission (typically two minutes prior to the first transmit time to provide time for calculations etc. to be made prior to transmission).

Example: The First Transmission time is 00:20:00 (twenty minutes after the hour). A Data Set interval of 1:00:00 with an Offset of 00:18:00 means data will be sent to the transmit buffer every hour at 18 minutes after the hour (i.e.: at 09:18), two minutes prior to the transmission.

Note: Data Sets need to be written to the transmit buffer at least two minutes prior to the transmit time in order for them to be included in the transmission.

Format ID: Each Data Set is given a unique identifying number from 0-63. Select the number for the Data Set by using the **Up** and **Down** arrows.

Selecting Data Set Variables: Select the variables you wish to include in the **Data Set** by moving them between the **Available Variables** column and the **Transmit Variables** column. Select the desired variable, and use the **Move Left** or **Move Right** arrow accordingly.

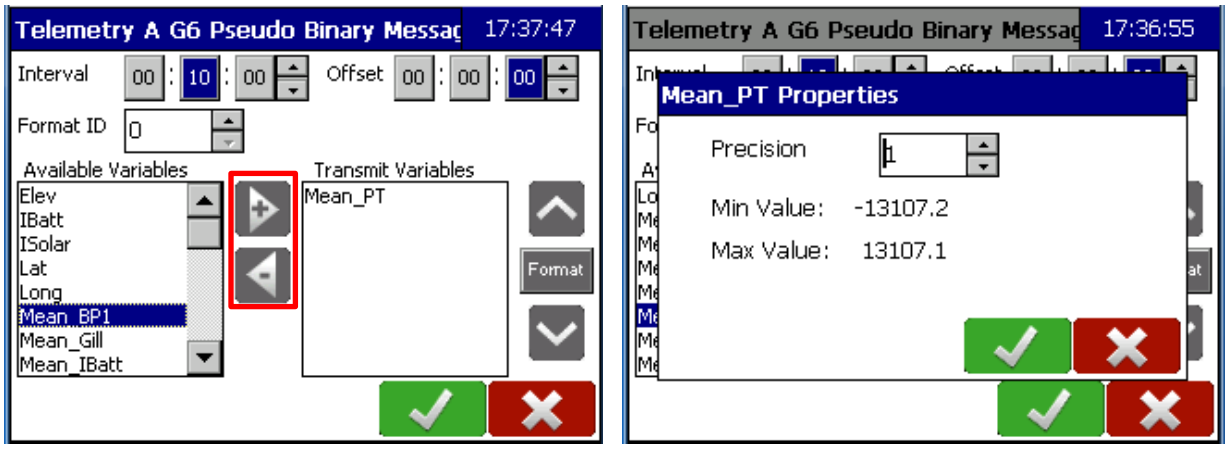


Figure 4-29: Pseudo Binary message format setup

A **"Variable Name" Properties** screen will appear. Input the desired precision (number of decimal places) of the variable value. The minimum and maximum value that can be encoded in pseudo binary format will be displayed. Select **OK**.

The variables in the data set will be transmitted in the order they appear in the Transmit Variables column. To adjust the order, select the desired variable and move it within the column by using the **Up** and **Down** arrows.

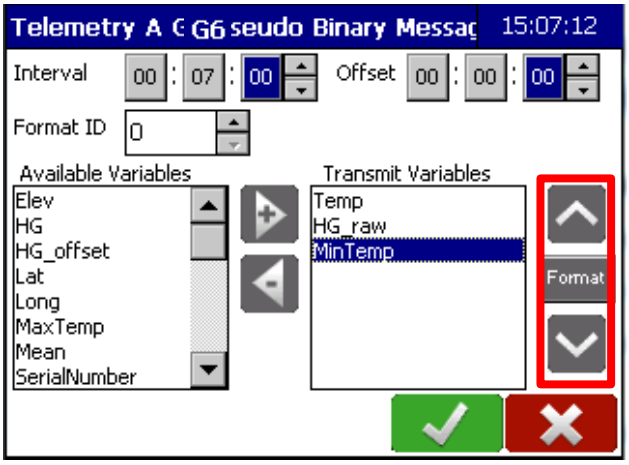


Figure 4-30: Transmit Variables

A Transmitted Variable's precision can be changed when in the **Edit** mode. Select the variable to be changed then press the **Format** button. The **"Variable Name" Properties** screen will appear and precision can be adjusted.

Once all variables have been selected and arranged for the data set, select **OK.** Defined data sets will be displayed in the **Telemetry A Time Ordered Msg** screen. Continue to add data sets in the same manner. Data sets can be deleted by pressing on the Delete button and then selecting the data set to delete.

Figure 4-31: Defined Data Sets

4.5.2 REDUNDANT COPIES

The content of Pseudo Binary messages can be configured to be repeated in subsequent transmissions. Transmitting redundant copies is useful if any data is garbled or lost during a transmission so that it is more likely to receive a complete data transfer.

A transmission which has one redundant record consists of the most recent data (as defined in the data set) followed by the data from the previously transmitted data set. A transmission which has two redundant records consists of the most recent data followed by the data from the two previously transmitted data sets, etc.

To receive redundant copies, from the Self-Timed Tab select **Set Message>Setup.** The **GoesMsgPseudoBinaryConfigForm** is displayed.

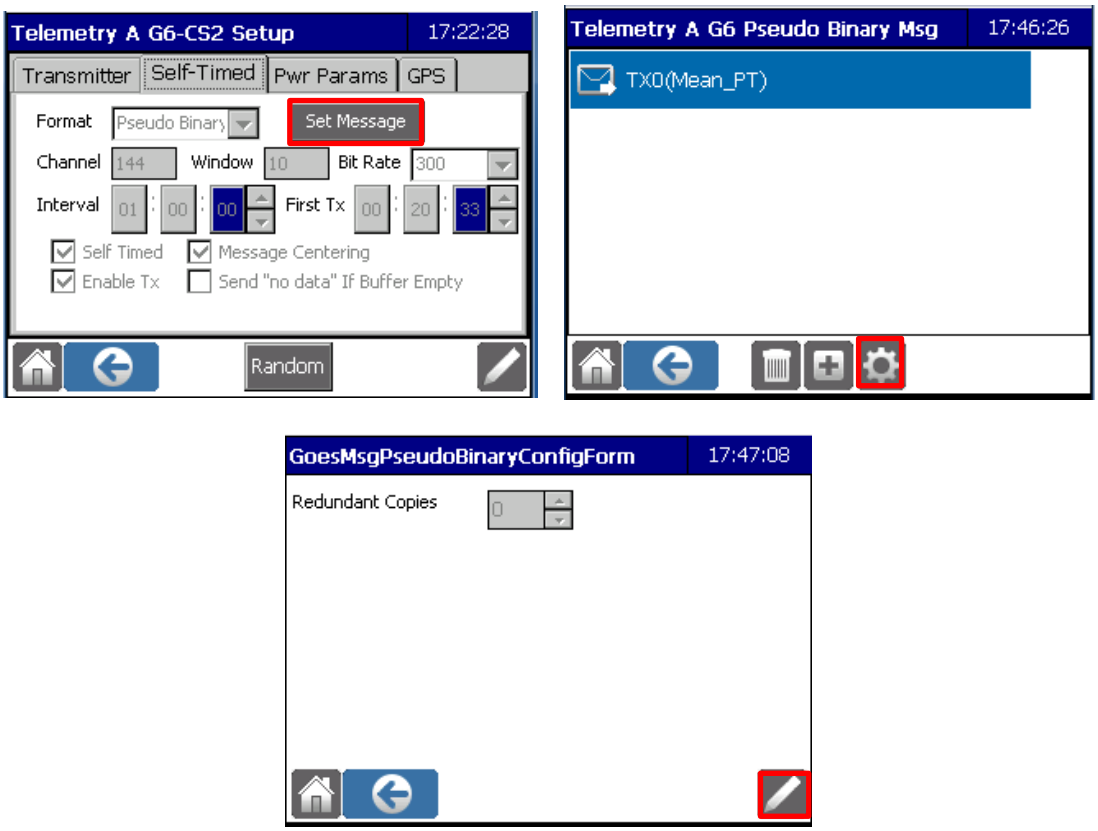


Figure 4-32: GOES Message Pseudo Binary Redundant Copies

Select **Edit** then use the arrows to toggle the desired number.

4.5.3 PSEUDO-BINARY RANDOM TRANSMISSION SETUP

Random transmission setup is available for Pseudo Binary formats. A random message will be sent when pre-determined conditions are met. Random channel parameters are provided by NOAA/EUMETSAT.

> **NOTE:** Random transmissions have a maximum message size of 78 bytes. Data which exceeds this limit will be truncated.

From the **Setup** screen, tap **Random** to display the **Random Setup** screen (see Figure 4-33) from which you can configure transmit parameters for random transmissions.

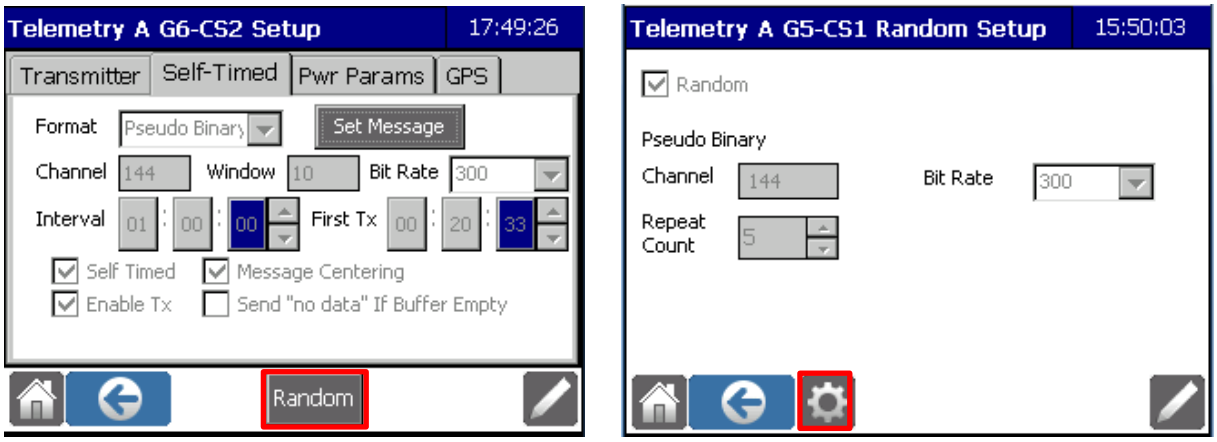


Figure 4-33: Pseudo Binary Random Transmission Setup

Select **Edit** and check the **Random** checkbox to enable random transmissions

Channel: Input your assigned random channel.

Bit Rate: Input your assigned Bit Rate.

Repeat Count: Random Transmissions can be re-sent in subsequent transmission windows up to a maximum of 5 transmissions. Each Repeat Count transmission will be identical to the preceding one. After the last repeat count transmission, the next message will be updated with the latest variable data and then this information will be sent in accordance with the assigned Repeat Count.

The default setting is one (1) which means the message will only be sent once with no repeat.

Press **OK**.

4.5.3.1 *Configuring Pseudo-Binary Random Transmission Data Sets*

Pseudo binary random transmission data sets are defined in the same manner as for Pseudo Binary self-timed messages. From the **Telemetry A Random Setup** screen (Figure 4-33), select the **Setup** cog then press the **Add** button to display the variables list (Figure 4-34).

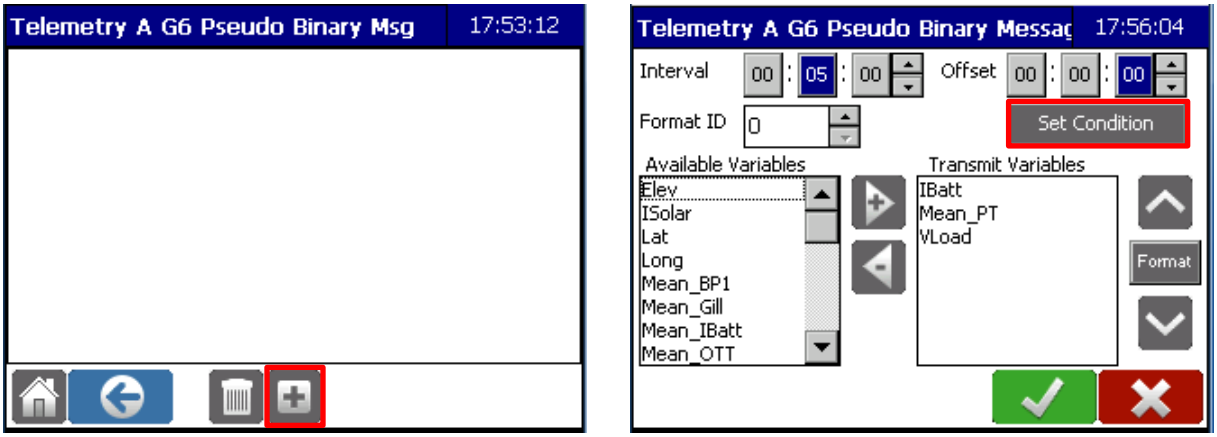


Figure 4-34: Defining Random Transmission data sets

Pseudo Binary Random Transmission Data Sets are defined in the same manner as self-timed Data Sets (refer to Section 4.5.1).

Once all desired variables are displayed in the Transmit Variables column, a condition for the data set must be set. Select the **Set Condition** button.

4.5.3.2 *Pseudo-Binary Random Transmission Conditions*

A random message is prepared for transmission when the defined condition is met. To define the conditions, press the **Set Condition** button (see Figure 4-35).

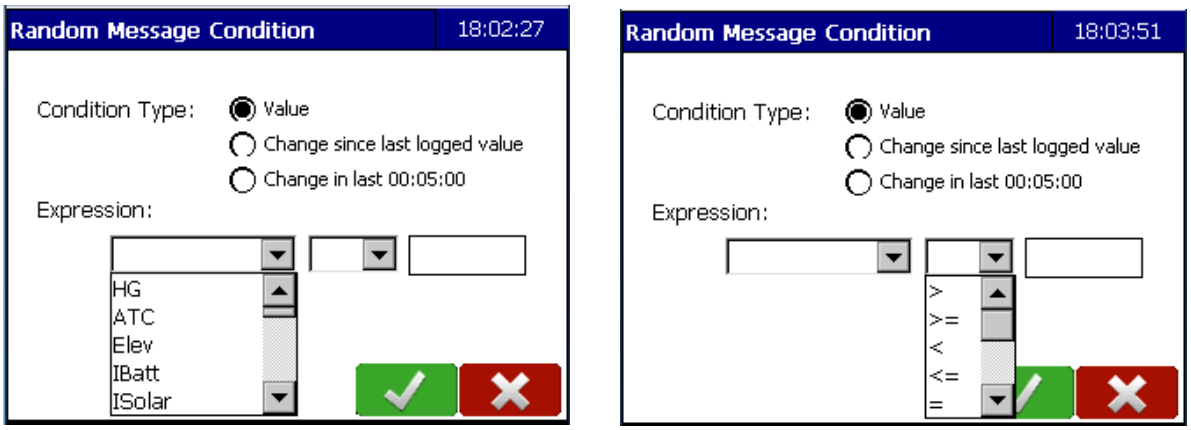


Figure 4-35: Pseudo Binary Random Transmission – Setting Conditions

Select the Condition Type using radial buttons.

> **Change in last 00:00:00:** The time indicated will be the time of the random Data Set interval. If the interval was set at 5 minutes the radial button condition will read **"Change in last 00:05:00".**

In the **Expression** fields, select the desired variable by using the drop down menu in the first **Expression** box. Select the mathematical expression in the second box, and then input the desired value in the last box by pressing on the box and using the keyboard.

4.5.4 PSEUDO BINARY EXAMPLE

An example of a Pseudo Binary message transmission follows:

GOES Transmission:

123456881402220472OG38+0NN195EXE00039`@@W□@@XjA@`□@MJ@@YU@@Z@A@aW@MTB@BE///

123456881402220472OG38+0NN195EXE00039`	: GOES Header
@@W□@@XjA@`□@MJ@@YU@@Z@A@aW@MTB@BE///	: Data

NOTE: pseudo binary transmissions require a software decode tool to extract the data from the transmission. It is possible to manually decode the data, but it is a complex procedure and not recommended.

The parameters for the above transmission are as follows:

Format ID	Variable name (s)	Offset	Interval	Precision
0	Stg	0	15 mins	3
1	Tair, Twtr	0	30 mins	2,2
2	Battery, Func	0	60 mins	1,0

The values downloaded by the data logger over the last hour are as follows:

DateTime	Stg (m)	Tair (C)	Twtr (C)	VB (V)	Func (psi)
2014/01/22 19:15:00	1.535				
2014/01/22 19:30:00	1.578	21.11	8.42		
2014/01/22 19:45:00	1.621				
2014/01/22 20:00:00	1.664	21.35	8.52	13.3	-99999

The message is decoded as follows:

The message to be decoded starts after the end of the GOES header. The GOES header always ends in the flag word which in this example is " ` ". See Chapter 7 for GOES header decoding.

Following the flag word will be a single data set or series of data sets, depending on Datalogger configuration. Each data set consists of a format ID bit followed by 3 bits for each transmitted variable value.

Data Set		Data Set		Data Set		Data Set		…….
ID	Data	ID	Data	ID	Data	ID	Data	…….

IMPORTANT! Decoding ASCII values is **CASE SENSITIVE**!

The example transmission will be broken up as follows:

Data Set 0		Data Set 0		Data Set 1			Data Set 0		Data Set 0		Data Set 1			Data Set 2		
@	@W□	@	@Xj	A	@`□	@MJ	@	@YU	@	@Z@	A	@aW	@MT	B	@BE	///

Data sets have been identified by translating the format ID from ASCII to Hex, Hex to Binary, dropping the leading two bits and then translating from Binary to Decimal. Once the data set has been identified the format ID bit can be ignored during decoding.

Example of decoding a data set ID: ASCII @ → Hex 0x40 → Binary 01000000 → Binary 000000 → Decimal 0

Based on your dataset you will know how many (and which) parameters to decode as well as their order and individual range. In this example data set 0 has one variable following the format ID and data sets 1 and 2 have two variables following the format ID.

Decoding variables from transmission:

Given our data logger configuration we expect the transmission string to come in with the following timing/precision:

Data Set 0	Data Set 0	Data Set 1		Data Set 0
@W□	@Xj	@`□	@MJ	@YU
t=XX:15:00	t=XX:30:00	t=XX:30:00	t=XX:30:00	t=XX:45:00
Precision 3	Precision 3	Precision 2	Precision 2	Precision 3

Data Set 0	Data Set 1		Data Set 2	
@Z@	@aW	@MT	@BE	///
t=XX:00:00	t=XX:00:00	t=XX:00:00	t=XX:00:00	t=XX:00:00
Precision 3	Precision 2	Precision 2	Precision 1	Precision 1

Decoding variable data is similar to decoding the data set ID's except that you are decoding 3 bits of data at a time.

The first variable is decoded in detail below:

ASCII value of first variable: @W□

Translate ASCII to Hex: 0x40, 0x57, 0x7F

Translate Hex to Binary: 01000000, 01010111, 01111111

Discard first two bits of each Binary number and combine each value into one long string and discard leading zeroes: 0000000 10111111111 → 10111111111

Translate Binary to Decimal then apply precision: 1535 → 1.535 = Stg @ 19:15:00

Decoding remaining variables:

ASCII @Xj → Hex 0x40, 0x58, 0x6A → Binary 01000000, 01011000, 01101010 → drop first two bits and create string 0000000 11000101010 → Decimal 1578 → Apply precision = 1.578 Stg @19:30:00

ASCII @`□ → Hex 0x40, 0x60, 0x7F→ Binary 01000000, 01100000, 01111111 → drop first two bits and create string 000000100000111111 → Decimal 2111→ Apply precision = 21.11 Tair @ 19:30:00

ASCII @MJ → Hex 0x40, 0x4D, 0x4A→ Binary 01000000, 01001101, 01001010→ drop first two bits and create string 000000001101001010 → Decimal 842→ Apply precision = 8.42 Twtr @ 19:30:00

ASCII @YU → Hex 0x40, 0x59, 0x55→ Binary 01000000, 01011001, 01010101 → drop first two bits and create string 0000000011001010101→ Decimal 1621 → Apply precision = 1.621 Stg @ 19:45:00

ASCII @Z@→ Hex 0x40, 0x5A, 0x40 → Binary 01000000, 01011010, 01000000→ drop first two bits and create string 0000000011010000000 → Decimal 1664 → Apply precision = 1.664 Stg @ 20:00:00

ASCII @aW → Hex 0x40, 0x61, 0x57→ Binary 01000000, 01100001, 01010111 → drop first two bits and create string 000000100001010111→ Decimal 2135 → Apply precision =21.35 Tair @ 20:00:00

ASCII @MT → Hex 0x40, 0x4D, 0x54→ Binary 01000000, 01001101, 01010100 → drop first two bits and create string 000000001101010100→ Decimal 852 → Apply precision = 8.52 Twtr @ 20:00:00

ASCII @BE → Hex 0x40, 0x42, 0x45 → Binary 01000000, 01000010, 01000101 → drop first two bits and create string 0000000000010000101 → Decimal 133 → Apply precision = 13.3 Battery @ 20:00:00

ASCII ///→ represents an error which is logged in the Datalogger as -99999 or blank

4.6 USGS – PB MESSAGE FORMAT

The USGS-PB is a custom Pseudo Binary message format used by the United States Geological Survey. It is a bit packed modified ASCII transmission format which allows for the transmission of only Self Timed messages, only Random messages, or a combination of Self Timed and Random messages. The last byte of data in a self-timed transmission will always be the battery voltage during the last transmission.

Select **Telemetry>Telemetry A> Status>Setup>Self-Timed>Edit**. Use the **Format** drop down menu to select **USGS-PB** and fill in the transmit parameters. When done, press **OK**.

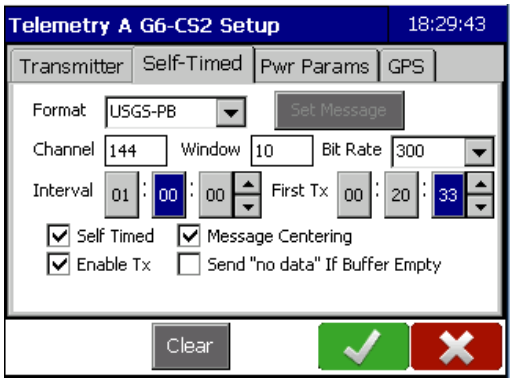
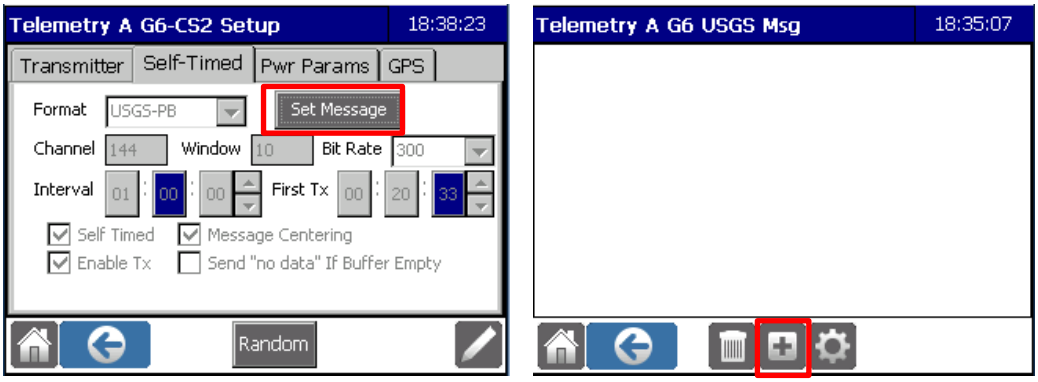


Figure 4-36: Telemetry Setup – USGS-PB Message Format

4.6.1 CONFIGURING THE USGS-PB MESSAGE

Press the **Set Message> Add** to bring up the USGS Message screen.



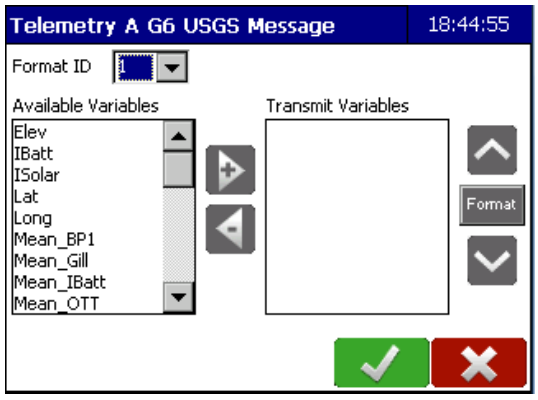


Figure 4-37: USGS-PB message setup

Format ID: Because this format only allows the transmission of a single message, Format ID must be set to 1.

Selecting Transmission Variables: Select the variables you wish to include in the transmission by moving them between the **Available Variable** column and the **Transmit Variables** column. Select the desired variable, and use the **Move Left** or **Move Right** arrow accordingly.

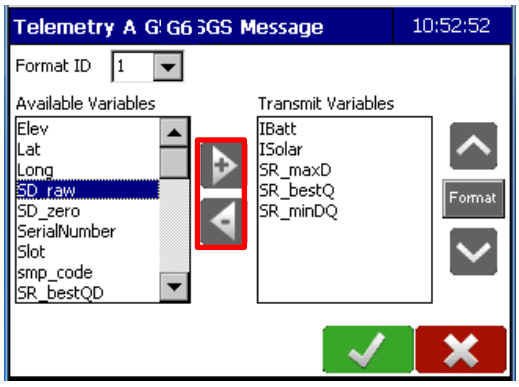


Figure 4-38: USGS-PB message variable selection

When a variable is selected to move from the **Available Variable** column to the **Transmit Variables** column, a **"Variable Name" Properties** box will appear.

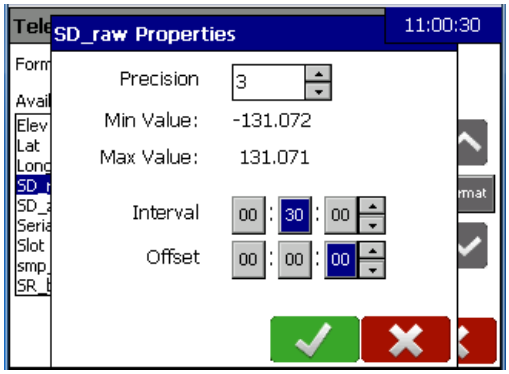


Figure 4-39: Variable Properties

Input the desired precision (number of decimal places) of the variable value. The minimum and maximum value that can be encoded in pseudo binary format will be displayed.

Interval: This is the variable interval time and is how often the variable data is written to the transmit buffer. It is in hh:mm:ss format.

Offset: This is an optional field and is the actual time of when the variable data is sent to the transmit buffer. This is most often used to ensure the most recent data is sent to the buffer just prior to the transmission (typically two minutes prior to the first transmit time to provide time for calculations etc. to be made prior to transmission).

Example: The First Transmission time is 00:20:00 (twenty minutes after the hour). A variable interval of 1:00:00 with an Offset of 00:18:00 means the variable data will be sent to the

transmit buffer every hour at 18 minutes after the hour (i.e.: at 09:18), two minutes prior to the transmission.

> Note: Transmit Variables need to be written to the transmit buffer at least two minutes prior to the transmit time in order for them to be included in the transmission

Transmit Variables will be transmitted in descending order. Variables can be rearranged in the Transmit Variable column by selecting a variable and moving it using the **Up** and **Down** arrows.

The Precision, Interval and Offset of a variable in the Transmit Variables column can be changed by selecting the variable and then pressing the Format button to bring up the **Variable Properties** screen (see Figures 4-38 and 4-39).

Once all variables have been selected and arranged for the sensor set, select **OK.** The **USGS Msg** screen will indicate a message is configured for transmission (Figure 4-40). A Configured message can be edited by selecting it to bring up the **USGS Msg** screen (Figure 4-37) and making changes following the preceding steps.

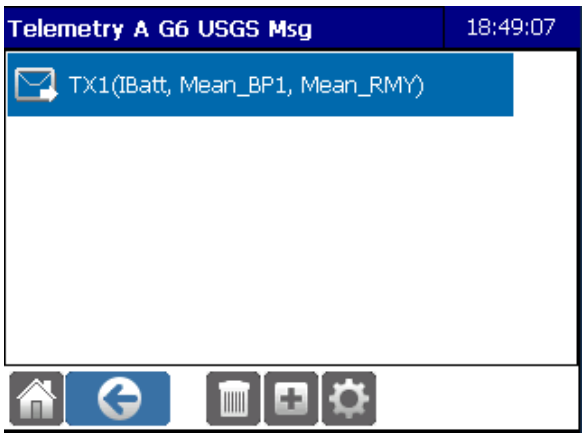


Figure 4-40: USGS Message screen showing configured message

To delete the message, select the Delete button, and then press on the blue message bar.

4.6.1.1 *Redundant Copies*

The content of Pseudo Binary messages can be configured to be repeated in subsequent transmissions. Transmitting redundant copies is useful if any data is garbled or lost during a transmission so that it is more likely to receive a complete data transfer.

A transmission which has one redundant record consists of the most recent data (as defined in the data set) followed by the data from the previously transmitted data set. A transmission which has two redundant records consists of the most recent data followed by the data from the two previously transmitted data sets, etc.

From the **Telemetry A USGS Msg** screen (**Telemetry>Telemetry A> Status>Setup>Self-Timed>Set Message),** select the **Setup** cog. Input the desired number of redundant copies, **OK.**

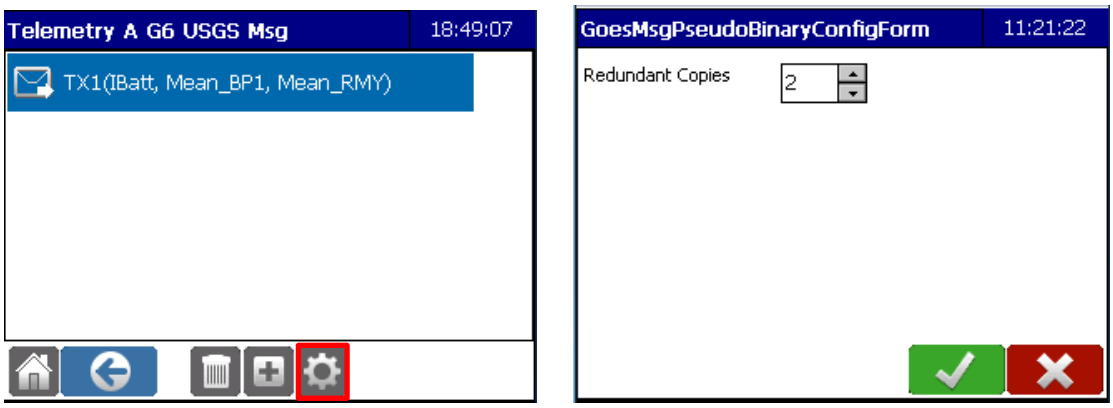


Figure 4-41: Setting Redundant Copies

4.6.2 USGS-PG RANDOM MESSAGE SETUP

Random transmission setup is available for USGS-PB formats. A random message will be sent when pre-determined conditions are met. Random channel parameters are provided by NOAA/EUMETSAT.

> **NOTE:** Random transmissions have a maximum message size of 78 bytes. Data which exceeds this limit will be truncated.

From the **Setup** screen, tap **Random** to display the **Random Setup** screen (see Figure 4-42) from which you can configure transmit parameters for GOES random transmissions.

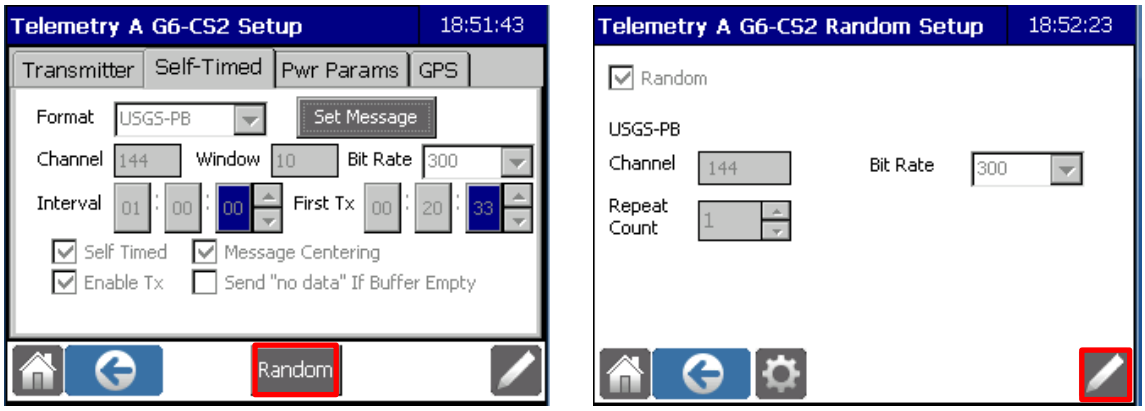


Figure 4-42: USGS-PB Random Message Setup screen

Select **Edit** and check the **Random** checkbox to enable random transmissions.

Channel: Input your assigned random channel.

Bit Rate: Input your assigned Bit Rate.

Repeat Count: Random Transmissions can be re-sent in subsequent transmission windows up to a maximum of 5 transmissions. Each Repeat Count transmission will be identical to the preceding

one. After the last repeat count transmission, the next message will be updated with the latest variable data and then this information will be sent in accordance with the assigned Repeat Count.

The default setting is one (1) which means the message will only be sent once with no repeat.

Press **OK**.

4.6.2.1 *Configuring USGS-PB Random Transmission Messages*

To configure a Random message, select the **Setup** cog  (Figure 4-43), then the **Add** button on the subsequent screen to display the following screen.

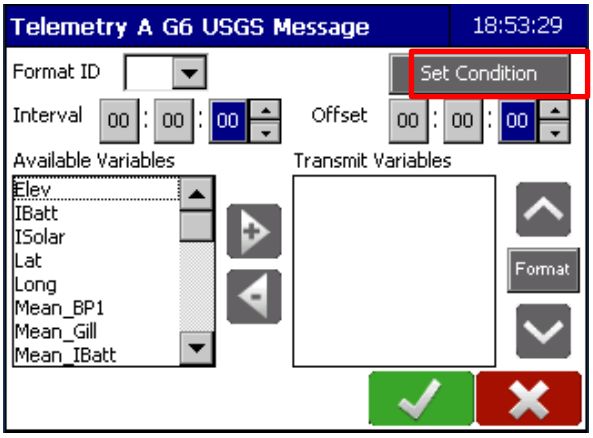


Figure 4-43: USGS-PB Random Message Variable screen

Format ID: This is the unique identifier assigned to the list of transmit variables that will be built. It is possible to configure 14 different random transmissions using **Format ID** numbers 2 through 9 and letters A through F.

Interval: This is how often the Transmit Variable data is written to the transmit buffer. It is in hh:mm:ss format.

Offset: This is an optional field and is the actual time of when the Transmit Variable data is sent to the transmit buffer. This is most often used to ensure the most recent data is sent to the buffer just prior to the transmission (typically two minutes prior to the first transmit time to provide time for calculations etc. to be made prior to transmission).

Example: The First Transmission time is 00:20:00 (twenty minutes after the hour). A variable interval of 1:00:00 with an Offset of 00:18:00 means the variable data will be sent to the transmit buffer every hour at 18 minutes after the hour (i.e.: at 09:18), two minutes prior to the transmission.

Note: Transmit Variables need to be written to the transmit buffer at least two minutes prior to the transmit time in order for them to be included in the transmission.

Transmit Variables: Transmit Variables are configured in the same manner as USGS-PB Self-Timed messages. See Section 4.6.1 Figure 4-38 for details.

4.6.2.2 *USGS-PB Random Transmission – Set Condition*

Once the **Transmit Variables** have been selected, press on the **Set Condition** button to bring up the **Random Message Condition** screen.

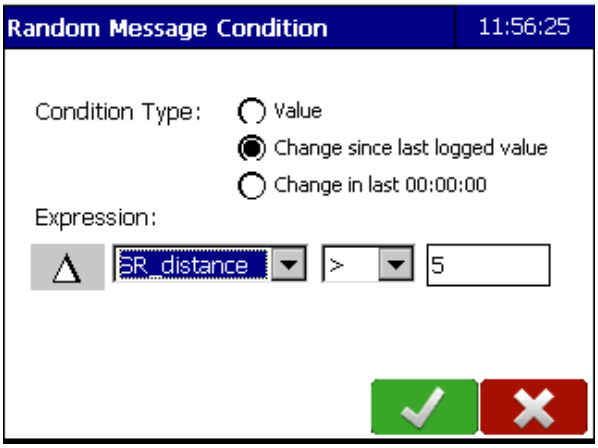


Figure 4-44: Random Message Condition screen

Select the Condition Type by using the radial buttons.

Change in last 00:00:00: The time indicated will be the time of the interval input in the previous screen. If the interval was set at 30 minutes the radial button condition will read **"Change in last 00:30:00".**

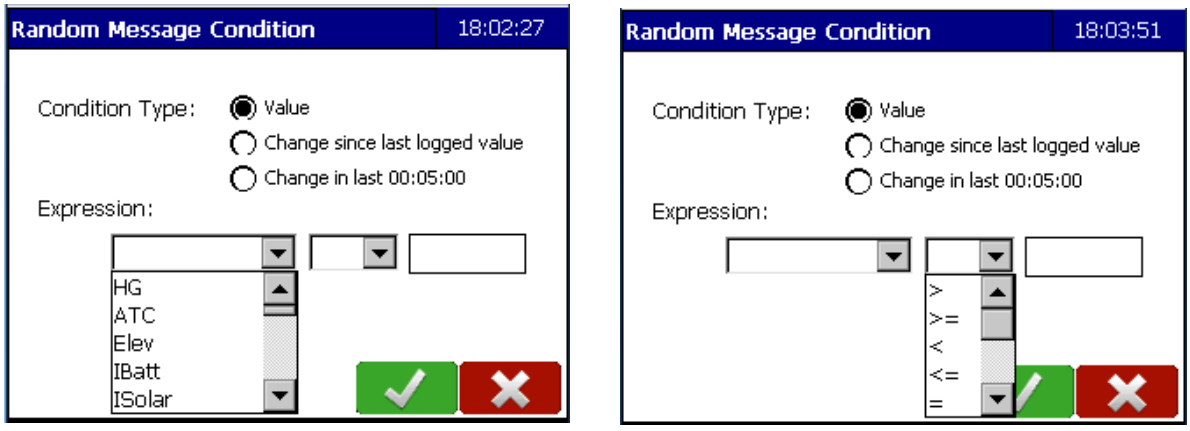


Figure 4-45

In the **Expression** fields, select the desired variable by using the drop down menu in the first **Expression** box. Select the mathematical expression in the second box, and then input the desired value in the last box. Select **OK**.

Chapter 5 TRANSMIT STATISTICS

Select **Telemetry>Telemetry A>Status>Tx Stats**. This displays the **Stats Log** screen which displays the success/fail statistics of the most recent transmissions. The **View Details** button enables the user to look at the individual transmission reports from the transmitter. Approximately 500 transmission reports can be stored in the circular telemetry log file. Once the log file is full, the Datalogger begins to overwrite the oldest stored transmission reports.

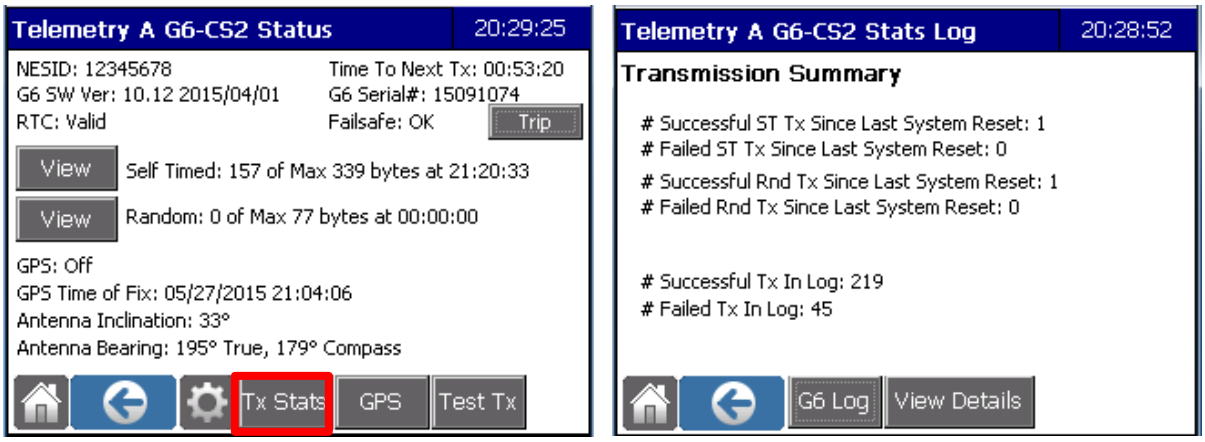


Figure 5-1: Tx-Stats

5.1 G5/G6 LOG

The G5/G6 Log button will display the audit log which details in yyyy:mm:dd HH:mm:ss format significant events for aid in troubleshooting. The **Save** button writes the audit log file to a USB memory stick inserted in the USB Host portal of the Datalogger under the station name's data folder.

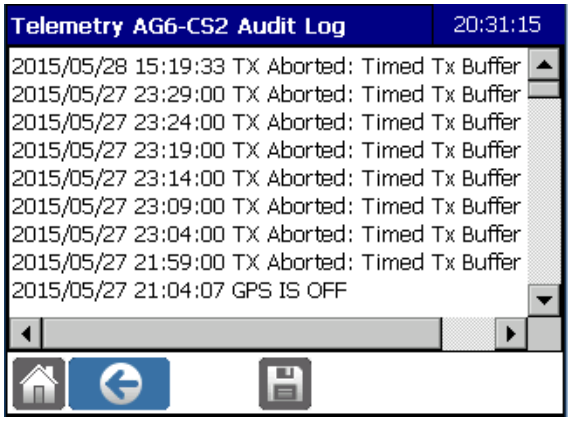


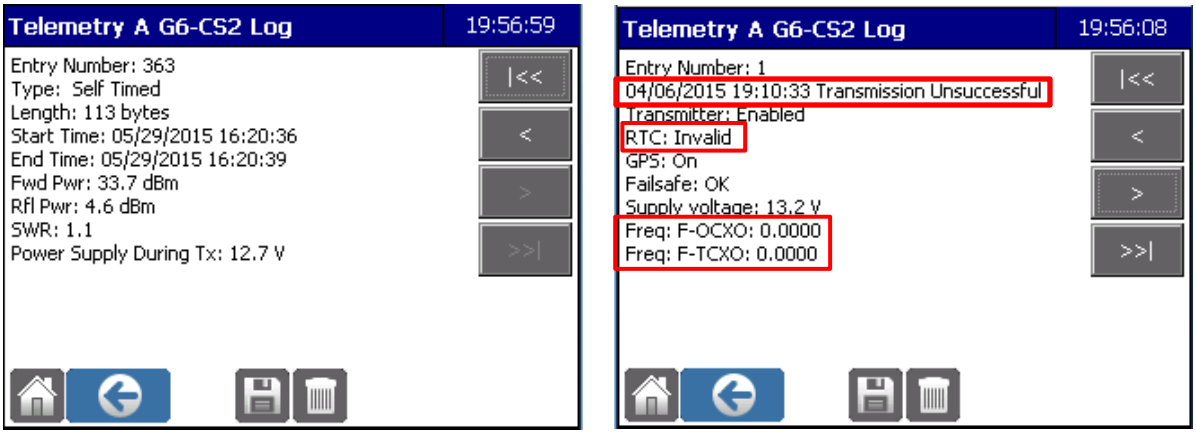
Figure 5-2: G6 Log

5.2 VIEW DETAILS

Tap the **View Details** button (see Figure 5-1) for transmission details.

Example transmission reports are shown in Figure 5-2. The log entry shown on the left is typical of a successful transmission while the log entry shown on the right is that of a failed transmission.

The failed transmission is caused by the GPS not having a full synchronization (see Chapter 6). The RTC (real time clock) shows Invalid and the OCXO and TCXO entries are zero (ie. not calibrated). The combination of these three variables tells us that the GPS synchronization cycle, which is necessary for timed transmissions, was not fully completed.



Successful Transmission Failed Transmission

Figure 5-3: G6 Tx Log examples

The **First** |<< , **Last** >>| , **Previous** < , and **Next** > buttons are used to navigate through the log entries. The **Save** button writes the telemetry log file to the USB memory stick inserted into the Datalogger Axiom F6Data Logger\<station name>\Data folder. The **Delete** button erases all entries in the telemetry file and resets the entry number counter.

Parameters displayed in the transmission reports are different for successful and unsuccessful transmissions. An explanation for each parameter follows.

5.2.1 TELEMETRY LOG PARAMETERS

Successful Transmission Report	
Entry Number	a unique entry number which is reset when the log is cleared.
Type	the type of transmission (self-timed or random)
Length	the number of bytes transmitted
Start Time	the transmission start time
End Time	the transmission end time
Fwd Pwr	the power delivered to the antenna during transmission as measured by the transmitter
Rfl Pwr	the power reflected from the antenna during transmission as measured by the transmitter
SWR	the calculated Standing Wave Ratio
Power Supply During Tx	the transmitter's power supply voltage during the transmission

Successful Transmission Report	
Entry Number	a unique entry number which is reset when the log is cleared.
Type	the type of transmission (self-timed or random)
Length	the number of bytes transmitted
Start Time	the transmission start time
End Time	the transmission end time
Fwd Pwr	the power delivered to the antenna during transmission as measured by the transmitter
Rfl Pwr	the power reflected from the antenna during transmission as measured by the transmitter
SWR	the calculated Standing Wave Ratio
Power Supply During Tx	the transmitter's power supply voltage during the transmission

Troubleshooting tip: Even if the GPS is synchronized (GPS sync), both oscillators need to be calibrated in order to have a successful transmission. See table above for expected frequencies.

Chapter 6 GPS

The **GPS** button on the **Status** screen displays the **GPS** screen which enables the user to view information from the transmitter's internal GPS receiver. For the most part, the transmitter's GPS receiver is turned off. The GPS receiver is only powered on once per day to resynchronize the transmitter (note that, due to the accurate timing in the transmitter, it can continue to operate for approximately 28 days without receiving a GPS resynchronization). The GPS receiver is turned on when the **GPS** screen is displayed. The GPS requires several seconds to update its status. The GPS remains on until the user exits the screen or the Datalogger timeout is exceeded (about 20 minutes for full timeout – after 10 minutes the screen powers down and after 20 minutes the screen returns to the homepage).

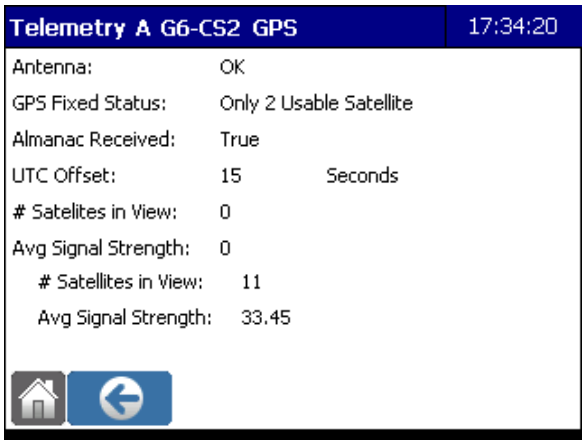


Figure 6-1: G6 GPS status

GPS Parameters

Antenna	GPS antenna connection status (OK, Disconnected, or Shorted).
GPS Fix Status	GPS receiver state information.
Almanac Received	True or false indicating whether or not the GPS has received almanac information.
UTC Offset	Displays the time offset between UTC and GPS time. This time difference is automatically accounted for when synchronizing the transmitter and the Datalogger to UTC time.
# Satellites in View	Displays the number of satellites from which the GPS is receiving information.
Avg Signal Strength	The average signal strength from the # Satellites in View.

6.1 GPS SYNCHRONIZATION

When an Axiom with an internal transmitter or an attached G6 is powered up, the transmitter will attempt to acquire a GPS fix in order to synchronize to Universal Coordinated Time (UTC) and provide 3-dimensional position information (Latitude, Longitude, and Elevation). The transmitter requires a GPS antenna in order to acquire the time and position synchronization and will not transmit until synchronization is complete.

The first GPS fix after power up will be acquired within 5 minutes (GPS position available); however, UTC time synchronization can take as long as 20 minutes. During the first 20 minutes, if the transmitter could not synchronize to UTC time, the G6 will switch off the GPS module for 1 minute and then will restart the synchronization cycle. This process continues until the transmitter synchronizes to UTC time.

Once the transmitter is synchronized to UTC time (full Almanac received) the OCXO (oven controlled crystal oscillator) is measured and used to calibrate the TCXO (temperature compensated crystal oscillator). This process can take up to 5 minutes. This is the final step required before successful timed transmissions can commence.

After the first synchronization is successful, the transmitter will attempt a single resynchronization to UTC time every 24 hours to correct its time drift. The transmitter is capable of operating for 28 days without a time resynchronization. After 28 days, if a time resynchronization is not achieved, the transmitter will disable transmissions until a successful time synchronization occurs. However, it will continue to attempt time resynchronization every 24 hours and, if successful, will re-enable transmissions.

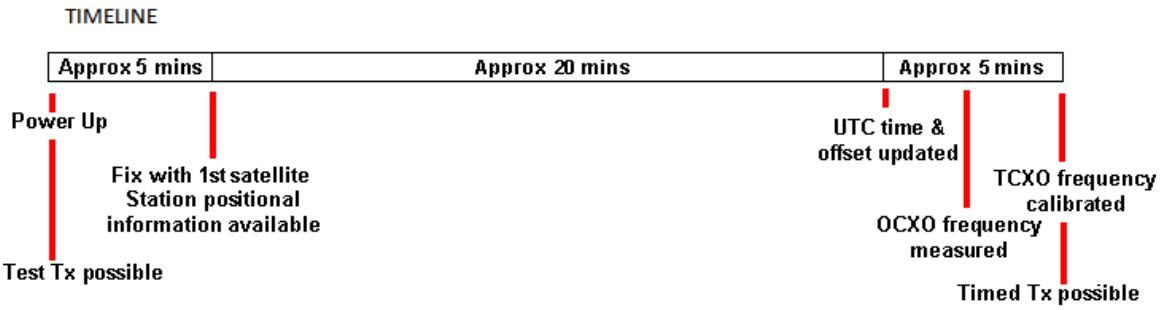


Figure 6-2: GPS Full Synchronization

Chapter 7 TEST TRANSMISSION

The **Test Tx** button on the **Status** screen displays the **TRANSMITTER Test Tx** screen which is used to trigger a test transmission. The user can select the test type (RF Carrier or Fixed message), NESID, Bit Rate (100, 3000 or 1200 baud), and the DCS channel number.

> IMPORTANT! A GOES test transmission will default to the user's random channel. If it is unavailable or one has not been assigned, the transmission will default to channel 195 (for East satellites) or 196 (for West Satellites).

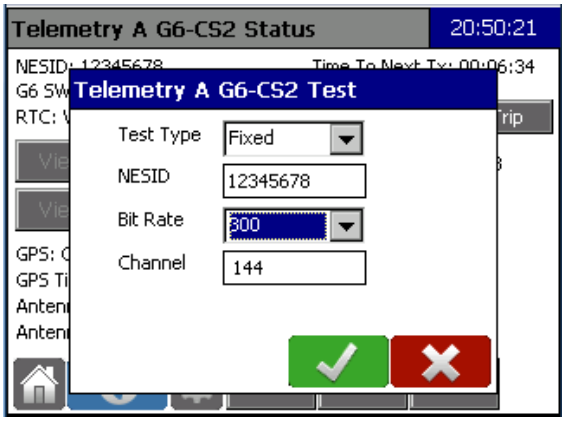


Figure 7-1: G6 test Tx

GPS synchronization and oscillator calibrations are not required in order to perform a test transmission. It is important to limit test transmissions unless on an approved channel in order to avoid having the test transmission collide with another station's scheduled message.

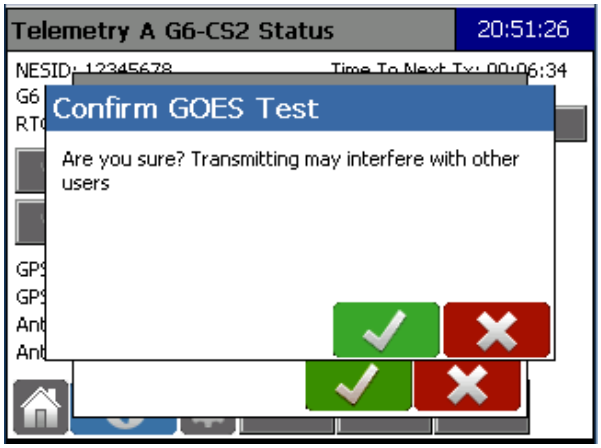


Figure 7-2: Test Transmission confirmation prompt

A test transmission report (Figure 7-3) is displayed once the test transmission has completed. It displays the same parameters as a successful transmission Telemetry Log less the "Entry Number" and "Length" lines.

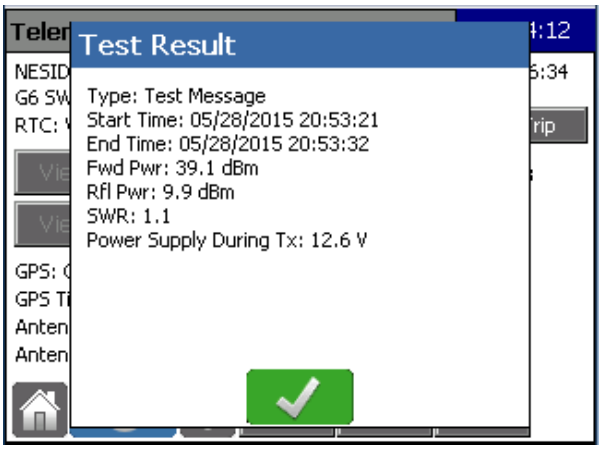


Figure 7-3: Test Transmission Result Screen

7.1 SAMPLE FIXED MESSAGE TEST TRANSMISSION

The following is a sample of a fixed message test transmission downloaded from Wallops Island Command and Data Acquisition Station. The message consists of a header (added by the GOES/Meteosat Data Collection System) and message data from the test transmission.

001014E809124191542G47-0NN195EFF00396
Operator Initiated Test Transmission:
Operator Initiated Test Transmission:
Operator Initiated Test Transmission:
Operator Initiated Test Transmission:
Operator Initiated Test Transmission:
Operator Initiated Test Transmission:

7.2 GOES DCS HEADER DECODING

The header from the previous fixed message test transmission sample is decoded in the following table.

Code	Meaning
001014E8 09 124 19 15 42 G 47 -0 N N 195 E FF 00396□	Full header
001014E8	DCP Address (NESDIS ID)
09	Year
124	Day of Year
19	Hour
15	Minute
42	Second
G	Message Code (see table below)
47	Signal Strength, 33 to 57 dBm (normal is 44 to 49)
-0	Frequency Offset in Hz
N	Modulation Index (N = normal, L = low, H = high)
N	Data Quality (N = normal, F = fair, P = poor)
195	Channel Number
E	Satellite (West, East)
FF	Uplink Carrier Status
00396	Number of Data Characters
□	Flag word, 8 bits (see table below)

Message Codes

G	good message
?	message received with parity errors
W	message received on wrong channel
D	message received on multiple channels (duplicate)
A	message received with address errors (correctable)
T	message received early or late (time error)
U	unexpected message received (>2 min early or late of assigned time)
M	Scheduled message is missing
N	PDT is incomplete

Flag Word Definition

	Bit #	Meaning
LSB	1	undefined
	2	clock update since last transmission (1 = update, 0 = not)
	3	Data Compression (1 = on, 0 = off); future enhancement
	4	Reed Solomon (1 = on, 0 = off); future enhancement
	5	undefined
	6 & 7	ASCII = 10, Pseudo binary = 11, Binary = 01 (bit 6 / bit 7)
MSB	8	odd parity for ASCII formatted data

PART 3

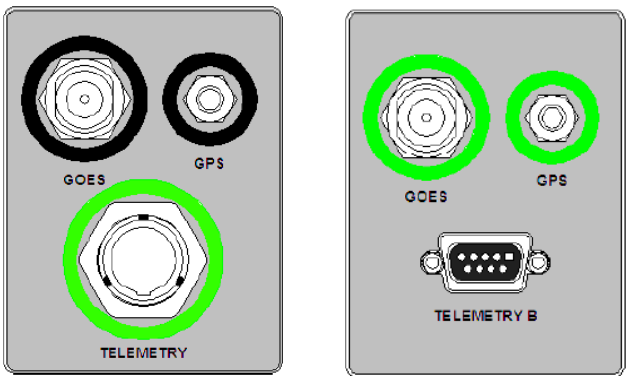
OTHER TELEMETRY DEVICE TYPES

Chapter 8 DEVICE TYPES

8.1 SELECTING DEVICE TYPES

Axiom Dataloggers have a variety of models with a selection of telemetry ports.

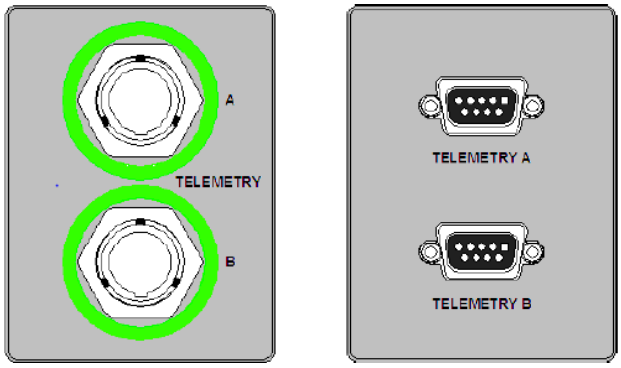
Some models have a built-in transmitter, with either one external telemetry port for attaching an additional telemetry device. This port can be either the FTS military-style connector or a DB9 connector:



FTS military-style connector DB9 Connector

Figure 8-1: Dataloggers with internal transmitters and single external telemetry port.

Other models have two external telemetry ports, either the FTS military-style connectors or DB9 connectors.



FTS military-style connectors DB9 Connectors

Figure 8-2: Dual external telemetry ports

For Datalogger models with an internal transmitter, Telemetry A is automatically assigned. Telemetry B will be assigned to the telemetry device attached to the port. For Dataloggers with dual external telemetry ports, Telemetry A or B is assigned to the device connected to the associated port.

8.2 TELEMETRY TAB

The Telemetry Tab will have slight differences depending on the attached telemetry device. However, they will all have the Dev Type button, the Pwr Mgt button (with the exception of DB9 devices), and the Status button.

To configure the Datalogger for the attached device, select the appropriate Telemetry Tab (A or B), then select the Dev Type (Device Type) button. There are 11 selections which can be made from the drop down menu.

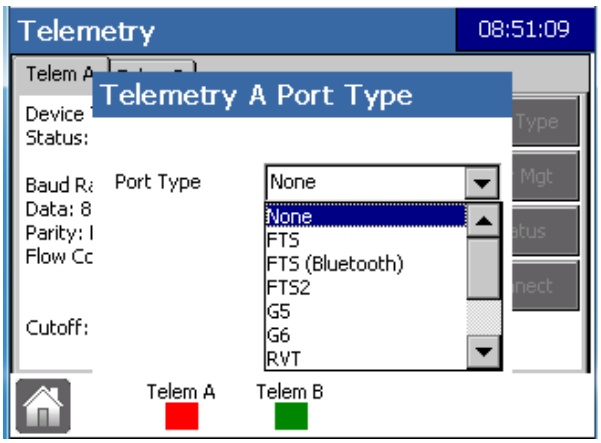


Figure 8-3: Device Type Menu

None	disables the Telemetry port
FTS	for use with telemetry devices which use FTS protocols (ie: modems)
FTS (Bluetooth)	for use with the FTS WRLS-AXIOM-PC wireless Bluetooth 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

Table 8-1: Device Type descriptions

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 Bluetooth device

FTS2: This is an extended version of FTS protocols which are specific to and should only be used with the FTS Ubicom Transmitter. There are two options from which to select:

Ubicom – this is the option which should be selected by most customers

UbicomDoD - specific to Ubicoms operated by the U.S. Department of Defense.

G5: The G5 device type is specific to and should only be used with the FTS G5 GOES Transmitter.

G6: The G6 device type is specific to and should only be used with the FTS G6 GOES Transmitter. G6 status information reported on the **Telemetry** screen includes:

NesID	the G6's current NESDIS identification number
Failsafe	the state of the G6's failsafe circuit
Timed Tx Info	the number of bytes to be sent at the next timed transmission time
RTC	the status of the G6's real time clock
Standard	the standard (CS1 or CS2) that the G6 implements
Cut-off/Resume	the station power management cut-off and resume voltages

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

Refer to the RVT Operating Manual for detailed RVT configuration and information.

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 Operator's Manual for detailed configuration instructions and instructions to build alerts and messages.

DB9/DB9-P: The DB9/DB9-P device type is for simple serial communication. The port settings are user configurable and are explained in Chapter 9.

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

8.2.1 TELEMETRY STATUS INDICATORS

The telemetry status indicators are found at the bottom of the Telemetry screen and are colour coded as follows:

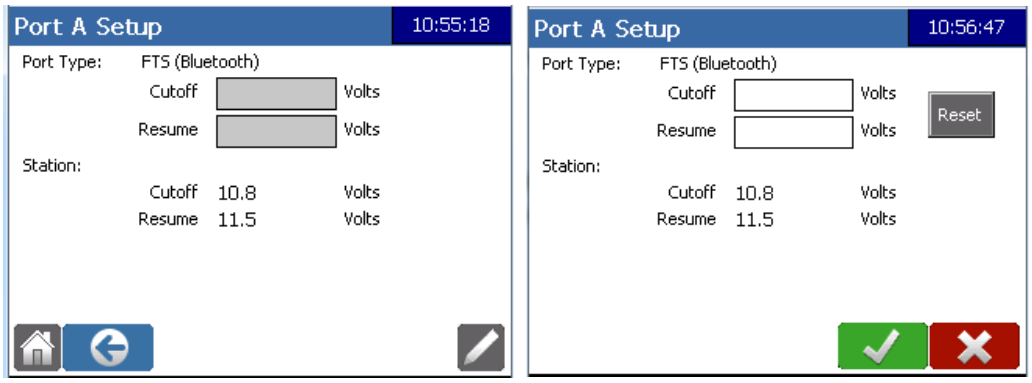
Colour		Meaning
Black	Telem B	Port not in use
Red	Telem A	Port configured for use with a device but not powered (in power save mode).
Green	Telem A	Power supplied to the port

For WRLS-AXIOM-PC telemetry: In addition to the above status indicators, the WRLS-AXIOM-PC will display the following indicators

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

8.3 POWER MANAGEMENT

The Power Management (Pwr Mgt) button permits the power supply to be regulated by setting Cutoff and Resume parameters in order to conserve batteries and allow them time to recharge (usually when in use with solar panels).



View Mode Edit Mode

Figure 8-4: Power Management screen

If you wish to adjust those parameters, select **Edit,** tap on the field you wish to adjust and input the desired value on the displayed keyboard. Select **OK**. The reset button will return the Cutoff and Resume values to the default settings.

Some devices will have a Power Cycling Option.

Refer to the Operator's Manual for the attached telemetry device for a detailed explanation of power management specific to the device.

8.4 STATUS (CONFIGURING DEVICE TYPES)

Devices are configured using the Status button. Some may then require selecting the Setup Cog.

The following Chapters provide guidance on configuring:

- FTS (Bluetooth) – the WRLS-AXIOM-PC device;
- DB9 devices; and
- Ubicom.

For all other devices, refer to the applicable Operator's Manual for configuration specifics.

Chapter 9 SETTING UP WRLS-AXIOM-PC (FTS BLUETOOTH)

The WRLS-AXIOM- PC permits wireless connectivity between an Axiom Datalogger and a PC operating within 100 m direct line of site of each other. In order for connectivity to be realised, the PC must be running AutoCaller or a terminal emulation program (such as TeraTerm) and have the PC Bluetooth module inserted into the communication port.

> NOTE: The Datalogger must be operating with AS version 3.7.3 or higher to operate with the WRLS-AXIOM-PC.

9.1 TELEMETRY STATUS INDICATOR

When operating with the WRLS–AXIOM-PC, the Telemetry Status Indicator colours, both on the Home page and on the Telemetry screens will indicate the state of the device.

COLOUR	STATUS INDICATOR (TELEMETRY SCREEN)	STATUS INDICATOR (HOME SCREEN)*	MEANING
Red			In power saving mode. Disconnected.
Green			Power supplied to the port (when transitioning between power saving mode and connection attempts)
Blue			Ready to connect to PC.
Blue with W			Waiting. Has established connectivity and waiting for commands.
Blue with A			Active. Actively transmitting/receiving information.

*Note: In this example the WRLS-AXIOM-PC is connected at Telemetry port A, the status of which is indicated by the left half of the indicator. The right half indicates the status of Telemetry port B.

9.2 CONFIGURING THE DATALOGGER WITH THE WRLS-AXIOM-PC

1) Connect the WRLS-AXIOM-PC to a telemetry port on the Datalogger. Ensure it is firmly seated Note which Port it is (Telemetry A or B).

2) From the Datalogger's **Home** page, select the Telemetry icon, then the **Dev Type** button. Select **FTS (Bluetooth)** from the drop down menu, **OK**.

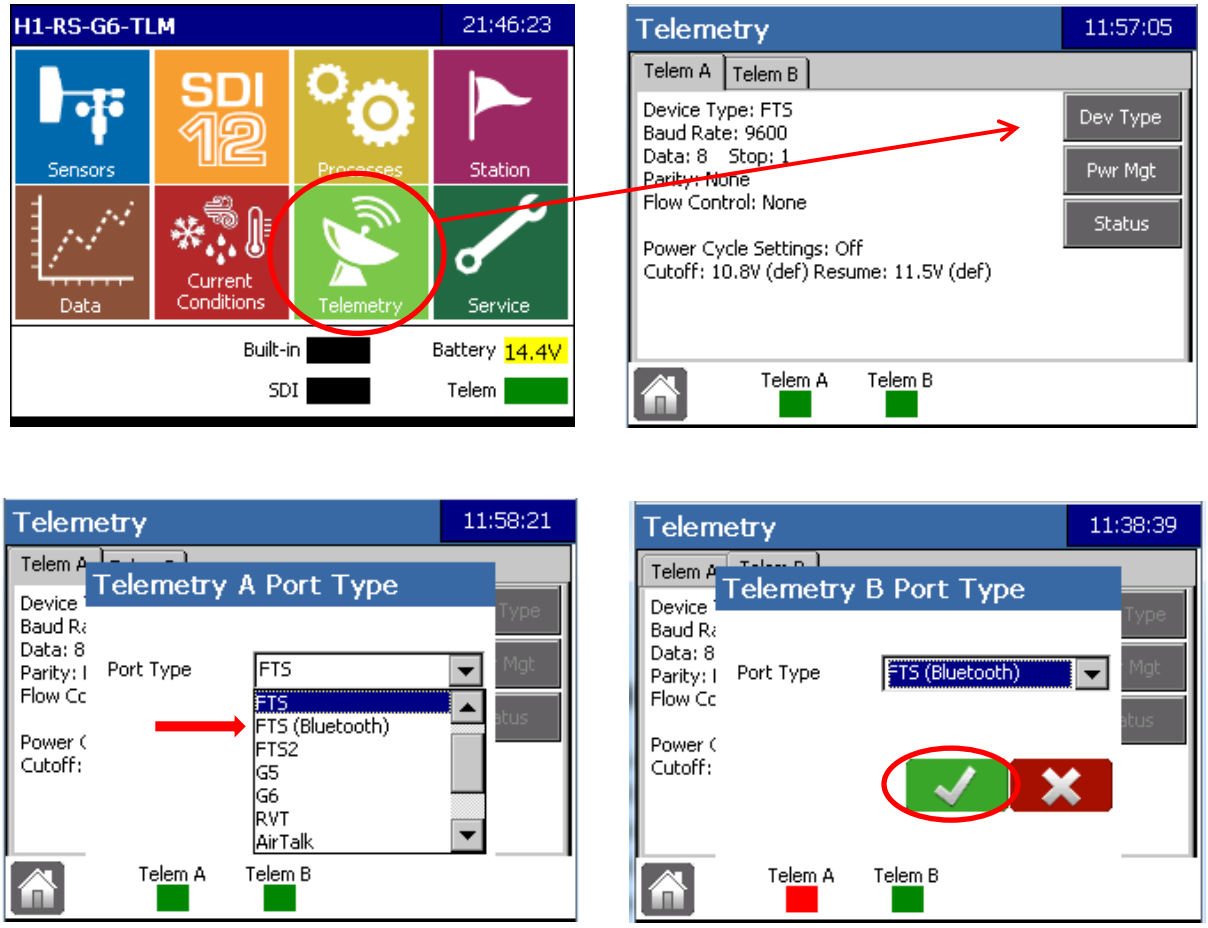


Figure 9-1: Selecting the Device Type

3) Note the Telem status indicator turns blue, indicating that the device is waiting to wirelessly connect to the PC. Select the **Status** button to display the **Port Settings** screen.

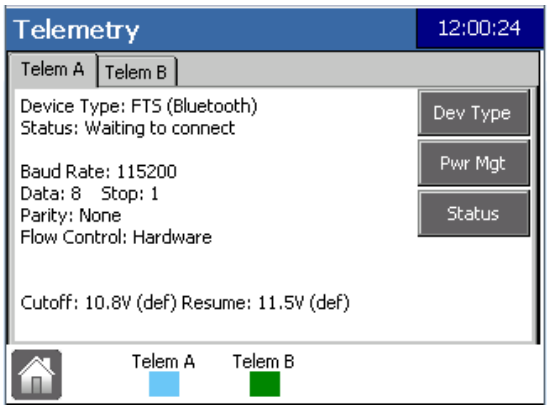


Figure 9-2:

4) Enter the following Port settings then select **OK.**

Baud Rate	Data Bits	Stop Bits	Parity	Flow Control
115200	8	1	None	Hardware

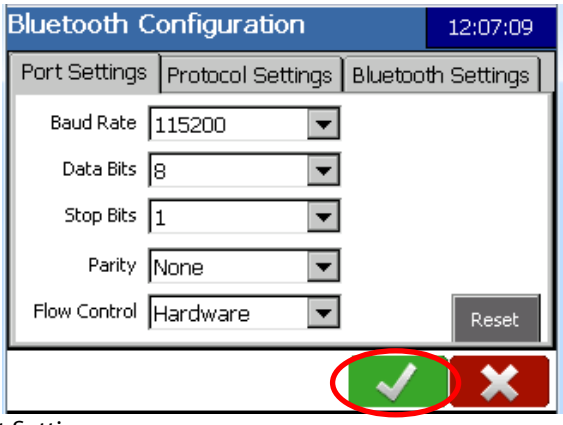


Figure 9-3: Bluetooth Port Settings

The WRLS-AXIOM-PC device is now configured with the Datalogger. The Protocol and Bluetooth settings may be customized for individual needs or left in the default configurations.

To operate with AutoCaller, the Station must be configured through AutoCaller to communicate with the WRLS-AXIOM-PC device. Refer to the AutoCaller/AutoCaller+ Manual or the WRLS-AXIOM-PC Quick start Guide for details.

9.2.1 PROTOCOL SETTINGS TAB

The Protocol Settings tab controls the timings used for communication between the device and the Datalogger. Figure 8-4 shows the default settings. These settings can be edited if desired.

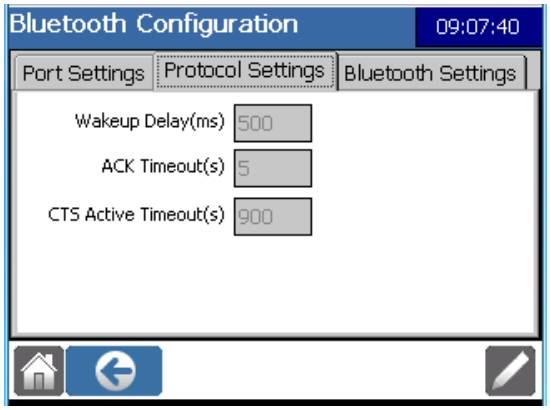


Figure 9-4: Default Protocol Settings

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.

9.2.2 BLUETOOTH SETTINGS TAB

The Bluetooth Settings tab is used to set the Connection and Activity Timeouts.

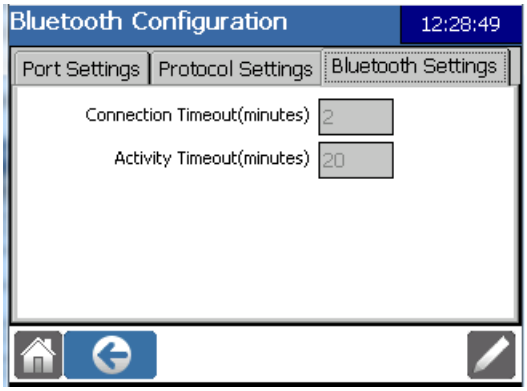


Figure 9-5: Bluetooth Settings tab

Connection Timeout: The Datalogger will wait to connect to the PC Bluetooth module via the WRLS-AXIOM-PC for the input number of minutes. If connectivity is not established within that time, the Telemetry Status indicator will turn Red and the Connectivity button will be present. Connectivity attempts will restart by selecting the Connectivity button.

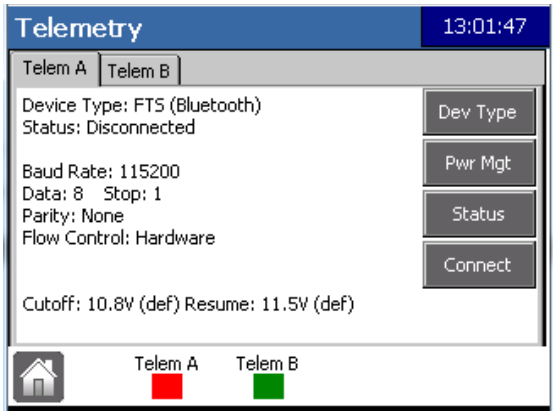


Figure 9-6: Connection Timeout

Activity Timeout: Once connectivity has been established, if there is no communication activity between the WRLS-AXIOM-PC and the PC Bluetooth module for the input time period, the WRLS-AXIOM-PC will enter its power saving, deep-sleep mode. Connectivity can be established by selecting the **Connect** button.

9.3 CONNECTING TO A PC

Ensure the PC Bluetooth module is inserted into the appropriate communications port on the PC (the same Comm Port which was used when configuring the station with Bluetooth communications through AutoCaller). Ensure the WRLS-AXIOM-PC device is inserted into the Datalogger.

From the **Home** page select **Telemetry** and open the **Telemetry** tab (either A or B) which corresponds to the Telemetry port to which the WRLX-AXIOM-PC is attached. It should indicate **FTS (Bluetooth)** as the Device Type. Select the **Connect** button. You will see the Telem status indicator change from red to blue.

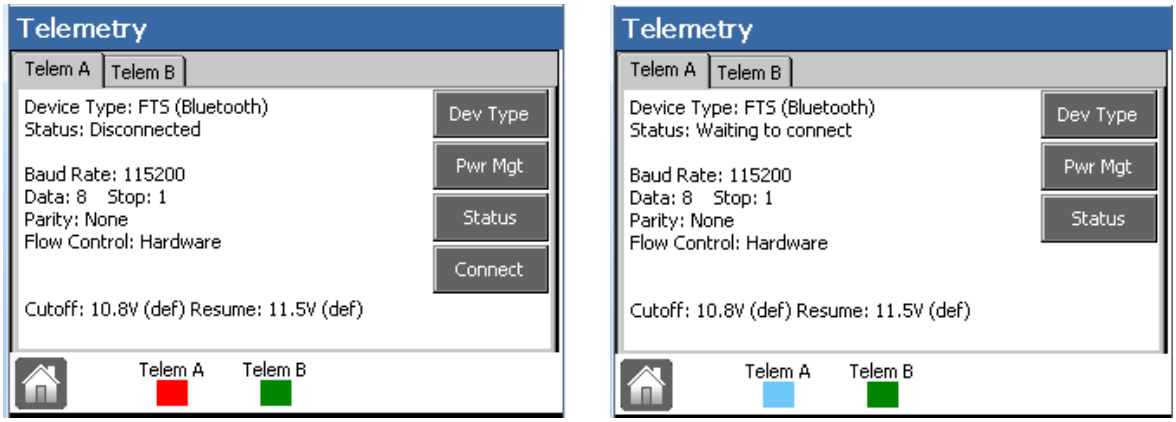


Figure 9-7: FTS (Bluetooth) Telemetry Status Indicators

Establish connectivity through AutoCaller either through transparent mode (**Stations>Utilities>SDI Transparent**) or sending a request/command using the AutoCaller menu items. The Telemetry Status Indicator will be blue and have a W (for Waiting) or A (Active) superimposed once connectivity is established.

Chapter 10 SETTING UP DB9/DB9-P COMMUNICATIONS

From the telemetry panel to which the DB9/DB9-P is attached, select the Status button to display the Serial Port Configuration screen. Note that DB9 device type will not display a Power Management button as power is not supplied through the DB9 connector. Additionally, 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.

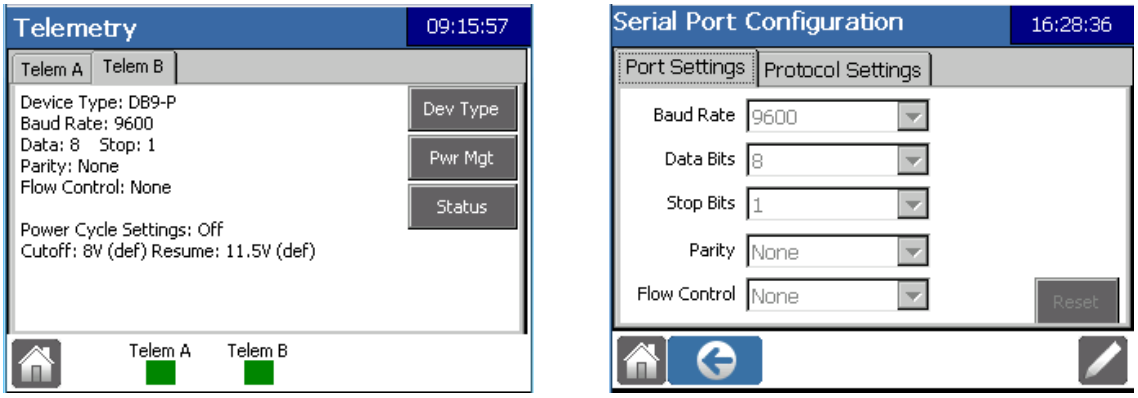


Figure 10-1: DB9 Serial Port Configuration

Default ports settings are 9600 baud with 1 stop bit, no parity, 8 data bits and no flow control. The Port status

10.1 PORT SETTINGS TAB

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

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: sets the serial port parameters to their default values as shown in Figure 9-1.

10.2 PROTOCOL SETTINGS TAB

The protocol settings can be configured by using the Edit icon and adjusting the default settings.

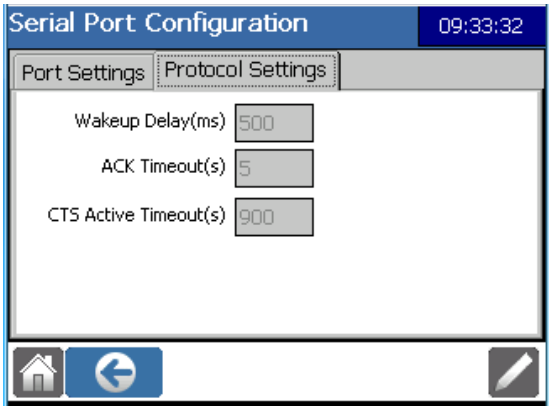


Figure 10-2: Protocol Settings Tab

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 11 SETTING UP UBICOM COMMUNICATIONS

To select Ubicom as a telemetry device, from Telemetry select the **Telem A or B** tab (the port to which the Ubicom is attached) and then **Dev Type**. Use the **Port Type** drop down menu to scroll to **FTS2** and then select **Ubicom** or **Ubicom DoD**, OK.

> IMPORTANT! **Ubicom DoD** is specific for use with Ubicom hardware operated by the U.S. Department of Defense (DoD). This interface will not work if selected for Ubicoms not operated by the DoD.

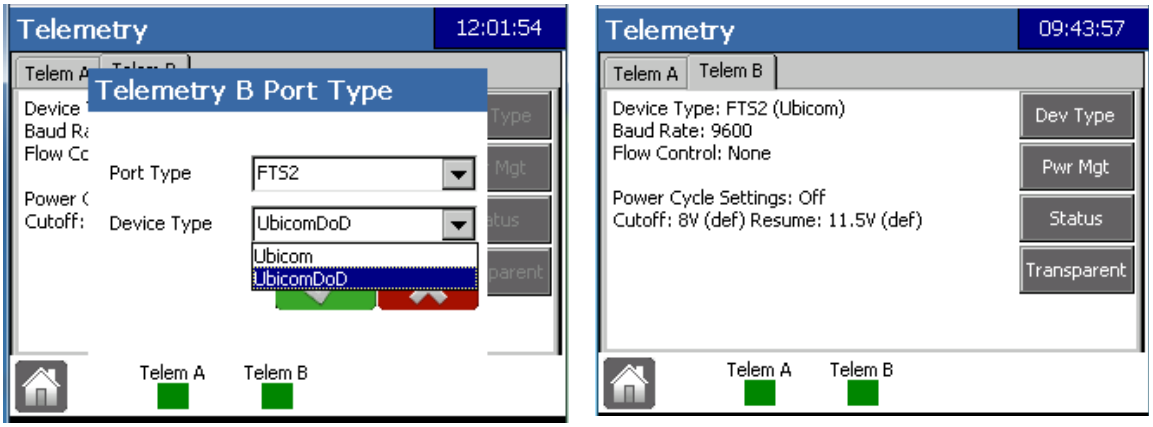


Figure 11-1: Selecting Ubicom

11.1 POWER MANAGEMENT

The Power Management (Pwr Mgt) button is used to regulate the power supply by setting Cutoff and Resume parameters in order to conserve batteries and allow them time to recharge (usually when in use with solar panels). The default Cutoff and Resume power levels are 10.8 volts and 11.5 volts respectively.

If you wish to adjust those parameters, select **Edit,** tap on the field you wish to adjust and input the desired value on the displayed keyboard. Select **OK**.

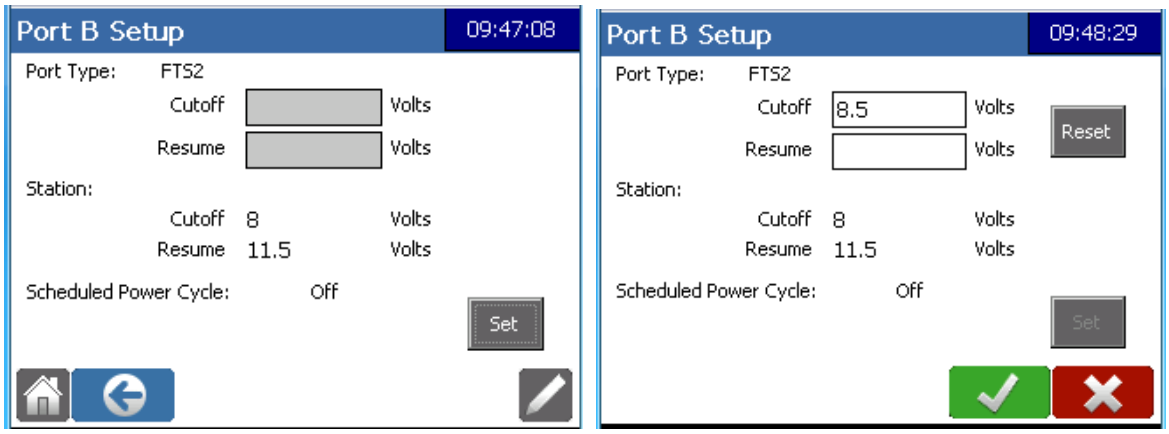


Figure 11-2: Power Management

Reset: Selecting this button, then OK, resets the default power management parameters.

Scheduled Power Cycle: You can set a schedule for power cycling the Ubicom. To do so, press the Set button (see Figure 10-2), then check the **Enabled** box.

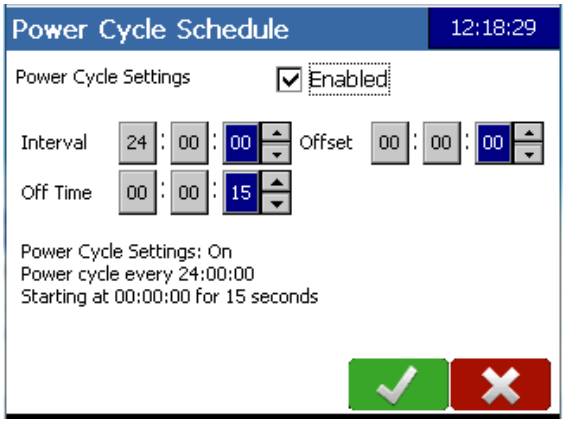


Figure 11-3: Enable Power Cycling

The default settings are shown in Figure 10-3. These can be customized as desired. Select **OK** when done.

11.2 UBICOM STATUS

Pressing the Status will display four tabs which report the status of the Ubicom, Iridium and Cellular communication information, and GPS Fix information. Each of the tabs has a Setup, Refresh, Save and Log feature at the bottom of the screen.

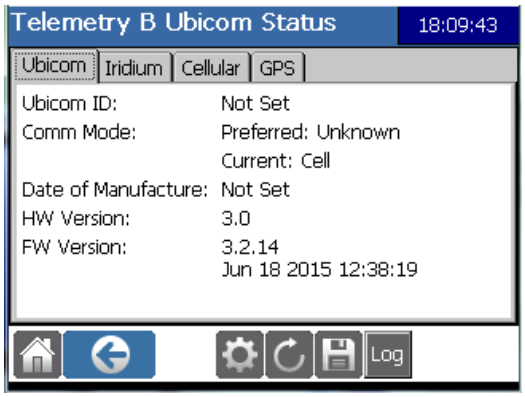


Figure 11-4: Ubicom Status Screen

Setup Cog: This will display Port and Protocol settings. These can be edited**.**

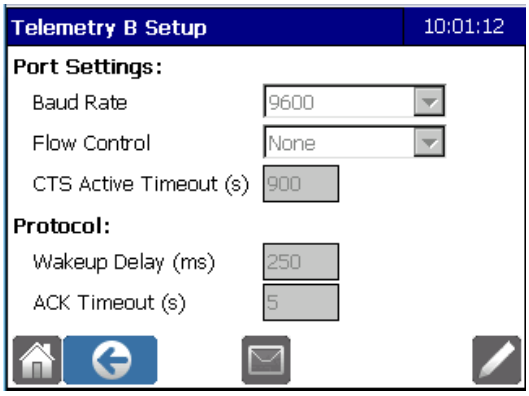


Figure 11-5: Ubicom Setup

Refresh: Will refresh the screen with current settings and conditions and update if any changes were made.

Save: Will save the Status of the Ubicom to a USB stick inserted in the Datalogger's USB port. The file will be saved to the Station's file and named Ubicom Status followed by the date-time stamp.

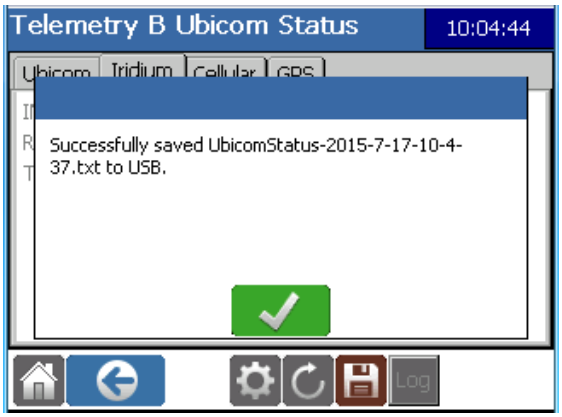


Figure 11-6: Saving Ubicom Status

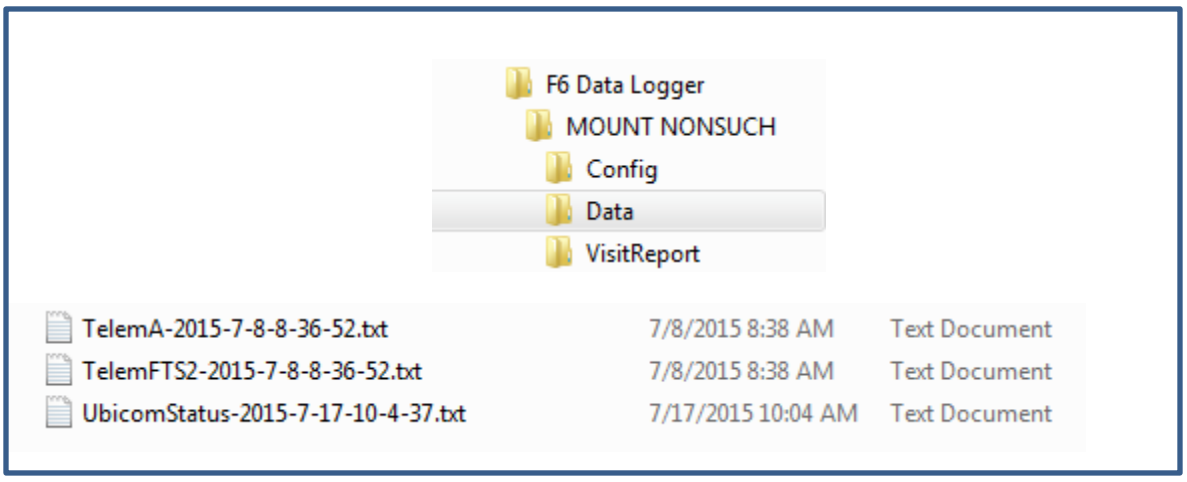


Figure 11-7Ubicom File Structure Example

Log: Pressing on the Log button to display the Ubicom Audit Log.

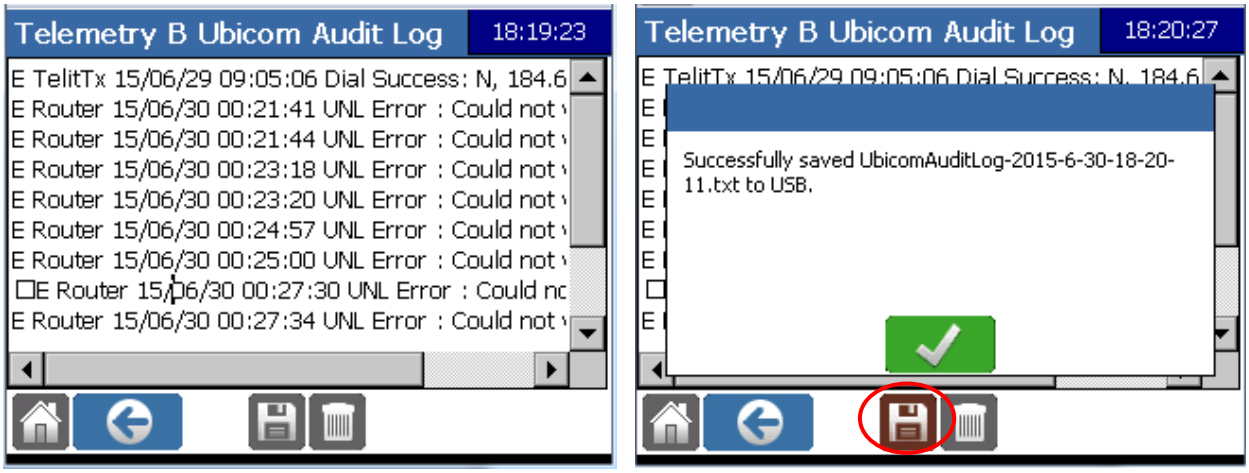


Figure 11-8: Audit Log

To save the Audit Log, insert a USB device and select Save.

To delete the Audit Log, select the Delete button. A confirmation prompt will appear.

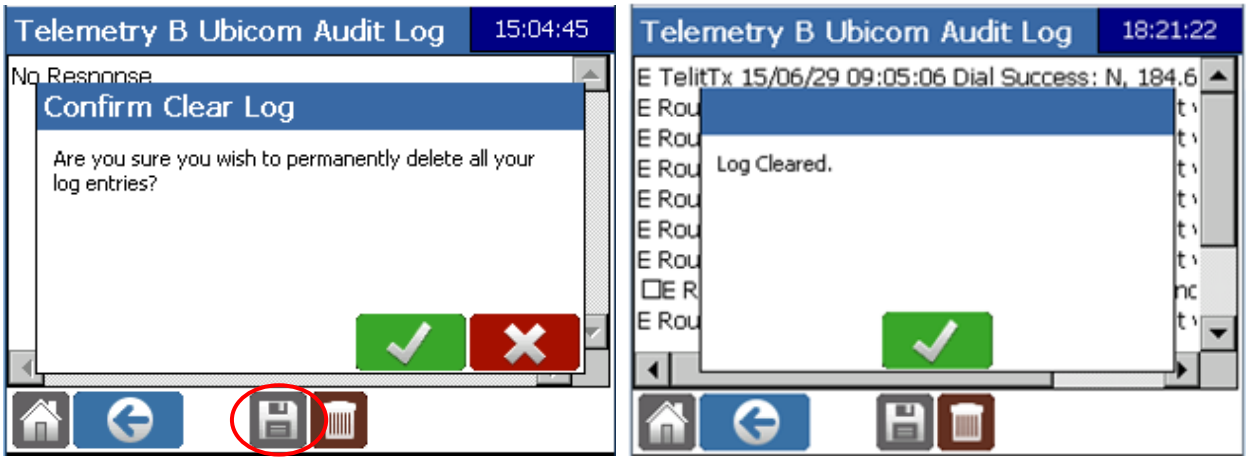


Figure 11-9: Deleting the Audit Log

11.3 UBICOM PUSH MESSAGE

Ubicom can be setup to push messages on a schedule or when certain conditions are met. From the Ubicom Setup screen select the envelope icon, then the Add button.

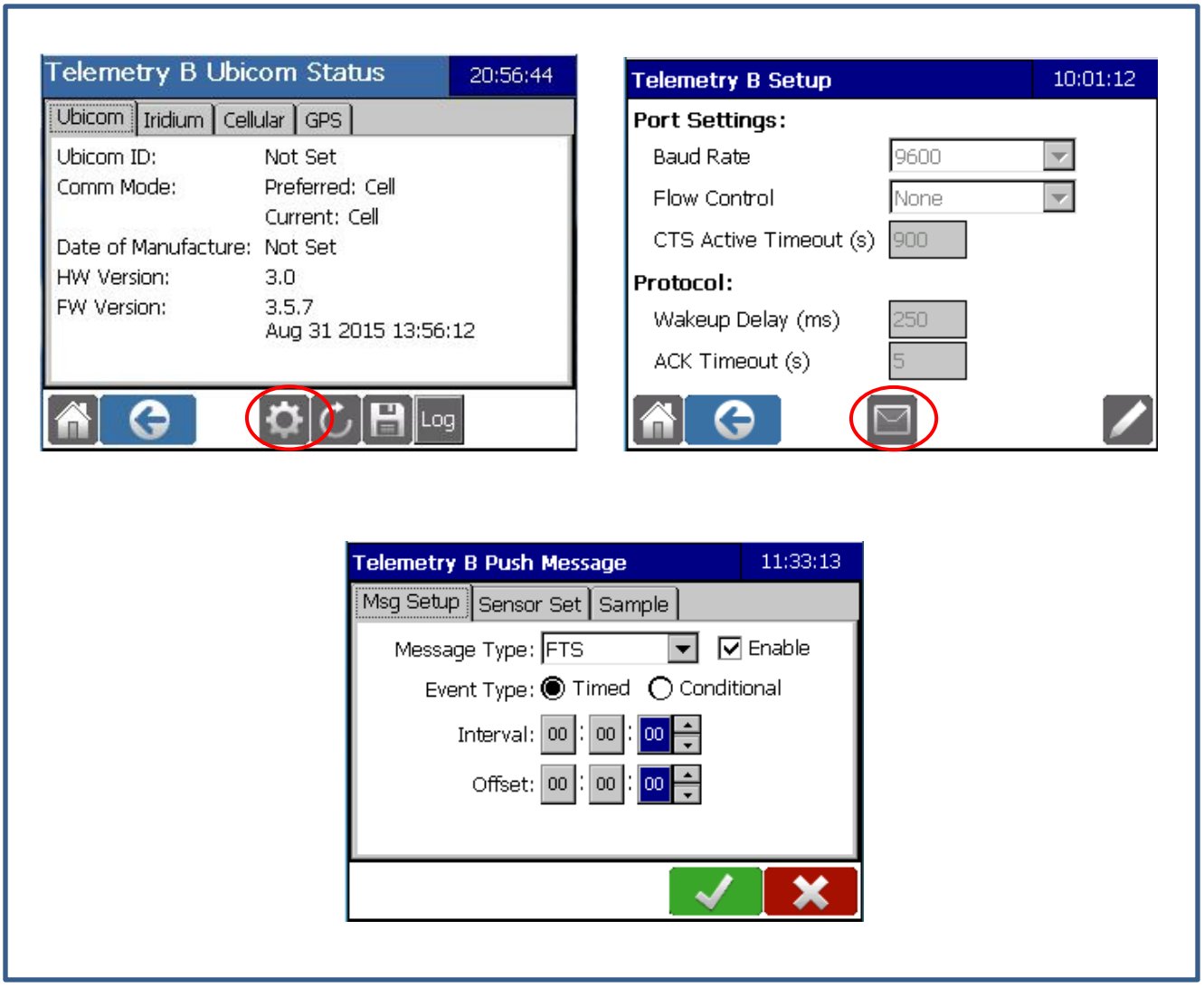


Figure 11-10: Ubicom Push Message

11.3.1 MSG SETUP TAB

Event Type: Use the radio button to select **Timed** or **Conditional**. A Timed message will be sent on a schedule, a conditional message will be sent when certain conditions are met.

Interval - Timed: This is how often the message will be sent.

Offset - Timed: Transmissions will take place in accordance with the Interval, referenced from the offset time.

> Example: A message with an interval of 1:00:00 and an offset of 00:15:00 will send a message every hour at 00:15:00, 01:15:00, 02:15:00 etc.

Interval -Conditional: This is how often the condition is checked. Message will be sent if the condition is met.

Offset - Timed: This will be the time after midnight the condition is checked.

Example: A message with an interval of 1:00:00 and an offset of 00:15:00 will send a message every hour at 00:15:00, 01:15:00, 02:15:00 etc.

11.3.2 SENSOR SET TAB

Sensor Set: Build a list of variables you wish to include in the message by selecting the desired variables and using the arrows to shift them to the Selected Variables column.

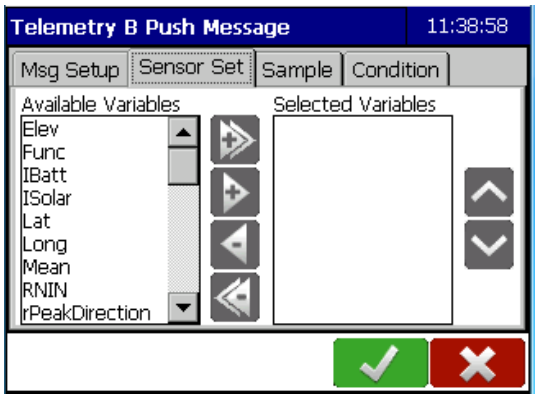


Figure 11-11: Building a Sensor Set

Selected Variables will be transmitted in descending order. Variables can be rearranged in the Transmit Variable column by selecting a variable and moving it using the **Up** and **Down** arrows.

11.3.3 SAMPLE TAB

This is used to determine the data to be included in the message.

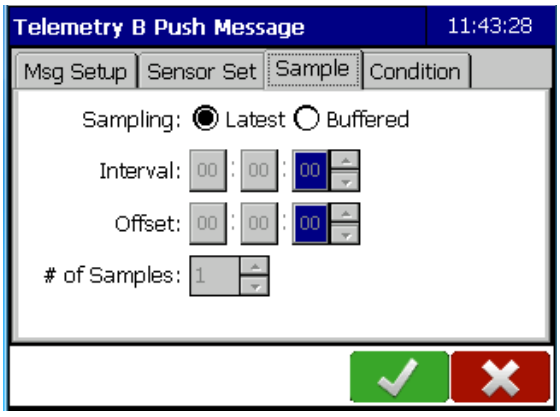


Figure 11-12: Sample Tab

Latest: Selecting Latest will include the latest data logged.

Buffered: Selecting Buffered enables the user to set an Interval and Offset time for when samples are taken as well as the number of samples to be taken. The data from the buffered sample(s) will be included in the push message.

11.3.4 CONDITIONAL TAB

If the conditional radio button is selected in the Message Setup (see Figure 10-10), a Condition tab will appear and must be filled in.

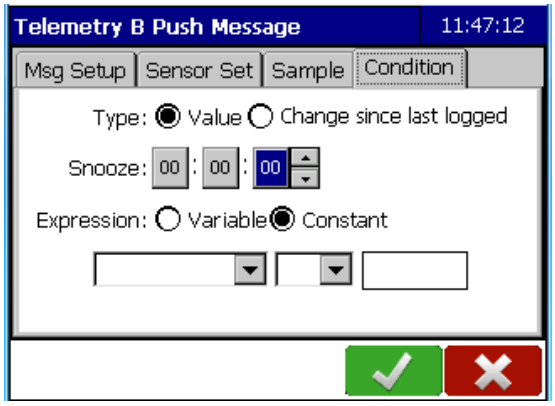


Figure 11-13: Condition Tab

Condition Type: Select the type of condition to be defined.

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

Snooze: If the condition is met, the condition will not be checked again until after the elapsed time set in the snooze feature and in accordance with the schedule (interval and offset) input in the Msg Setup screen.

11.3.4.1 ***Expression - Variable:***

1) Use the drop down menu to select the variable upon which the condition rests.

2) Use the drop down menu to select the mathematical operator. Valid operators are:

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

3) Use the drop down menu to select the comparing variable

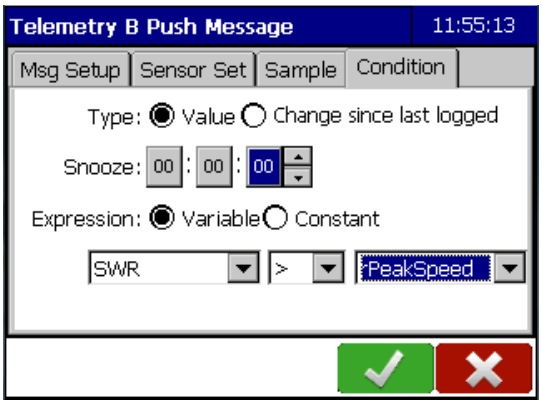


Figure 11-14: Value Example

11.3.4.2 ***Expression - Constant***

1) Use the drop down menu to select the variable upon which the condition rests.

2) Use the drop down menu to select the mathematical operator. Valid operators are:

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

3) Input the desired value.

Once all Conditional Logging fields have been filled in, select **OK**.

11.4 UBICOM TRANSPARENT MODE

To communicate directly with the Ubicom using the AT Commands, it is necessary to enter the transparent mode. Select **Telemetry>Telem A or B** (the port to which the Ubicom is attached**)>Transparent Button.**

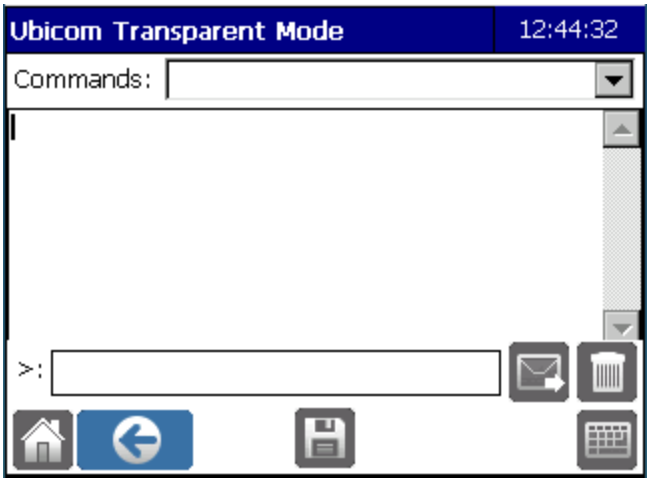


Figure 11-15: Ubicom Transparent Mode

Use the drop down menu to select the desired command or select the Keyboard icon and type in the command. The Envelope icon will send the command. The delete icon will clear the **>:** field.

AT COMMANDS:

AT Command	Meaning
&V	Get current configuration at current access level.
?	List all commands at current access level.
+CAPN	Get/set cell network APN. The default is "internet". For some cell network, the specific APN is required. Please contact the carrier.
+CIMEI	Get the cell device IMEI.
+CIMSI	Returns the International Mobile Subscriber Identity.
+CMBXIA	Set/get the interval of mailbox check when messages are found during the power on period (set by +CONTME). The time unit in seconds. This is for fast response. Once any message is found, the mailbox check interval is switched to this short value.
+CMBXII	Set/get the interval of mailbox check when no messages are found during the power on period or longer (Set by +CONTME). The time unit in seconds. This is for power saving. The factory default is 300 seconds (5 minutes). The range is 10 – 99999 seconds
+CONTIME	Set/get cell on time in seconds. N: 10 – 9999 seconds The factory default is 300 seconds (5 minutes).
+CSQ	Gets the current signal strength indicator. This will be either iridium, cell RSSI depending on currently active communication device.
+CTPWOFF	Enable cell power down control • +CTPWOFF=Y: Enable cell power down. The power on time is controlled by the +CONTIME setting. • +CTPWOFF=N: Disable cell power down. The cell is powered all

AT Command	Meaning
	time.
+RAL	Read audit log displays all the logs available in audit log when there is no condition applied. Logs can also by sorted out by setting the condition by startdate, enddate, starttime, and endtime loglevel
+SIMID	Read the SIM card ID (ISCCID). It applies for cell GSM modules.
+TS	Gets a traffic summary since the last reset. Number of Iridium messages received and transmitted, Number of cellular messages received and transmitted Number of LOS messages received and transmitted.
+V	Gets Ubicom serial number, date of manufacture, hardware version number, firmware version number and, firmware release date.
COMPRI	This returns the active communication device This can be set to cell or iridium based on availability: • +COMPRI=Cell • +COMPRI=Iridium
DATE	Gets the current date in YY/MM/DD format
ELED	Enables or disables* LED operation (default x=1, non-volatile) ELED[=x] x=0: LEDs are disabled x=1: LEDs are enabled *LED flash at startup and triggered by FLED command still function when LEDs are disabled
ELEV	Gets current elevation in meters.
FLED	Flash all LEDs.
GPS	Turn GPS on and off and reports current status. If there is no GPS fix, the response is "GPS NOT READY".
GPSUPDATEINTERVAL	The Interval time in which the real time clock on the board needs to be updated by the GPS module. Input in hours (1-24)
IRSN	Gets the IMEI number of the Iridium.
LAT	Gets current latitude in decimal degrees.
LONG	Gets current longitude in decimal degrees.
TIME	Gets the current time as HH:MM:SS in 24 hour format. Time zone is always UTC.
TOF	Time of GPS fix.

DOCUMENT REVISION HISTORY

Revision	Date	Description
1	1 Feb 2016	This document merged and replaces 700-Axiom –G6 Telem Rev 3 and 700-Axiom G5 Telemetry Reference Rev 5. It is valid for both G5/G6 GOES transmitters. Updated to AS 3.4.0.18.
2	29 Sep 2016	Updated for AS 3.7.3.22. Added FTS (Bluetooth)Telemetry
3	14 Jun 2017	Updated for AS 3.7.4.3. Added Ubicom DoD Device Type information
4	18 Oct 2017	Corrected WSC self-timed message example. Updated redundant transmission information.
5	9 Apr 2018	Added antenna aiming information on p.10