FTS

ubicom

Ubicom Transceiver

Operating Manual and Installation Guide

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Chapter 1 OVERVIEW

1.1 GENERAL DESCRIPTION

Ubicom is two-way communications for remote environmental monitoring stations. It is comprised of a hardware transceiver and a web-based portal for management of stations, communications, data and users.

This manual is relevant for the following Ubicom transceivers

UC-TXCVR-IR-CEL	Ubicom transceiver iridium or cellular (3G networks)
UC-TXCVR-CELL	Ubicom transceiver cellular for 3G networks
UC-TXCVR-IR-CELL2	Ubicom transceiver iridium or cellular (4G networks)
UC-TXCVR-CELL2	Ubicom transceiver cellular for 4G networks

1.2 REGULATORY INFORMATION

FC	**Electromagnetic Interference (EMI) – United States and Canada** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. This equipment may be operated in the USA and Canada.
(logo)	Australia This device complies with ACMA regulatory arrangements and may be operated in Australia

1.3 TELEMETRY SERVICE

1.3.1 IRIDIUM SERVICE

If your Ubicom transceiver includes Iridium service capability, it contains a Short Burst Data (SBD) Iridium module and a communications controller. The Iridium module communicates over the Iridium satellite network to the Iridium gateway then through the internet to the web-based Ubicom portal. The Ubicom transceiver sends Mobile Originated SBD (MO-SBD) messages to the portal and receives Mobile Terminated SBD (MT-SBD) messages from the portal.

The maximum length of a MO-SBD message is 340 bytes. The maximum length of a MT-SBD message is 270 bytes. The Ubicom transceiver in conjunction with the Ubicom portal can accommodate messages of length up to approximately 20K bytes in length which are broken into the smaller SBD messages before being transmitted, and re-assembled upon reaching the destination.

1.3.2 CELLULAR SERVICE

If your Ubicom transceiver contains cellular service capability, it has a GSM, CDMA, HSPA, or LTE-M cellular module to communicate over the network.

The internal modem for the UC-TXCVR-IR-CELL2 and UC-TXCVR-CELL2 (4G versions) is factory-set to operate on one of four regional networks: World Wide (default), Verizon, At&T, or Telstra (Australia). Ensure you inform your salesperson at time of ordering which network you desire.

Chapter 2 INSTALLATION

2.1 MOUNTING LOCATION CONSIDERATIONS

The Iridium antenna integrated into the Ubicom transceiver is a helix coil type that is optimized for omni-directional horizon-to-45 degree operation. This provides maximum satellite coverage. For optimum performance the transceiver should be mounted so that it has a clear view of the horizon below 45 degrees (vertically) for as much of a complete 360 degree view (horizontally) as possible.

If your station location is in a steep sided canyon or in heavy tree cover it may be more appropriate to use an external Iridium antenna with a vertically inclined beam pattern—contact your reseller for information.
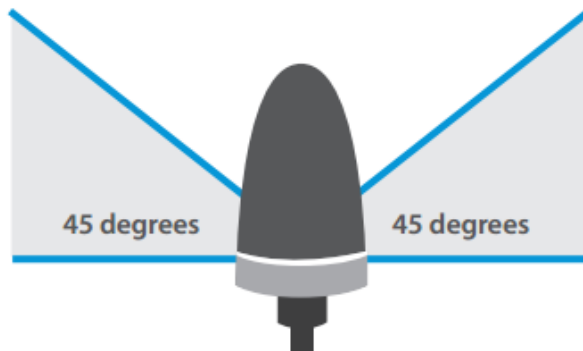
IMPORTANT!

Mount the transceiver such that the LEDs are easily visible.

2.2 TOOLS

To install the Ubicom, the following tools are required:

Wrench (11mm or 7/16")

Flat + Philips screwdrivers

Cable ties (as required))

Hex wrench (4mm or 5/32"),
(only if installing surface mount kit)

2.3 ASSEMBLY COMPONENTS

Your Ubicom assembly kit will be customized in accordance with the type of system you have (FTS Axiom Datalogger, legacy FTS Datalogger, or non-FTS data logger). The following sections will detail the components and connection instructions for each type of assembly.

2.3.1 AXIOM DATALOGGERS WITH DUAL TELEMETRY PORTS

These Dataloggers have a built in GOES transmitter and an additional telemetry port, or two telemetry ports, one of which can be used for the Ubicom.

Ubicom Transceiver

Surface mounting flange kit (optional)

Ubicom cable (bayonet)

(2) U-bolts (different sizes c/w nuts, washers and lock washers

Mounting arm (may have optional flange)

Optional flange
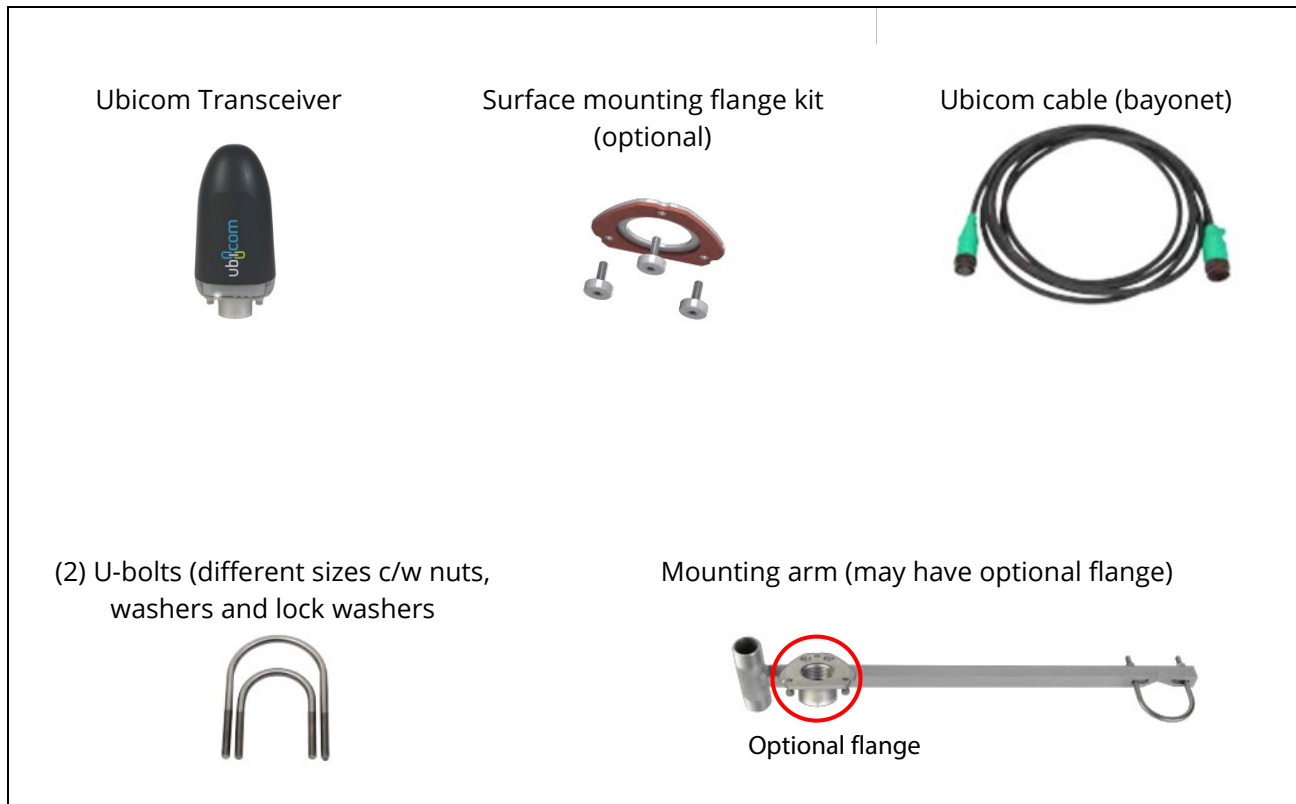
2.4 TRANSCEIVER MOUNTING

2.4.1 MOUNTING ARM

|		
1) The Ubicom transceiver comes with a mounting flange suitable for direct installation on a customer supplied standard one inch National Pipe Thread (NPT) pipe end. .		
2) Alternatively, the supplied mounting arm can be installed on a convenient upright using the U-bolt supplied. If the mounting arm has the optional mounting flange, screw the flange onto the 1" National Pipe Thread (NPT).		
3) Feed the Ubicom cable connector through the 1"pipe and connect to the transceiver (the connector is "keyed" so twist until you feel it align with the slots, then push to insert, then twist the outside locking ring). 	4) Screw the flange to the base of the transceiver. 	

2.4.2 ENCLOSURE TOP MOUNTING

To mount the Ubicom transceiver onto a flat surface such as the top of an enclosure it is necessary to drill the surface to accommodate the three mounting screws plus the connector.

Use the drilling template provided below. Dimensions in mm
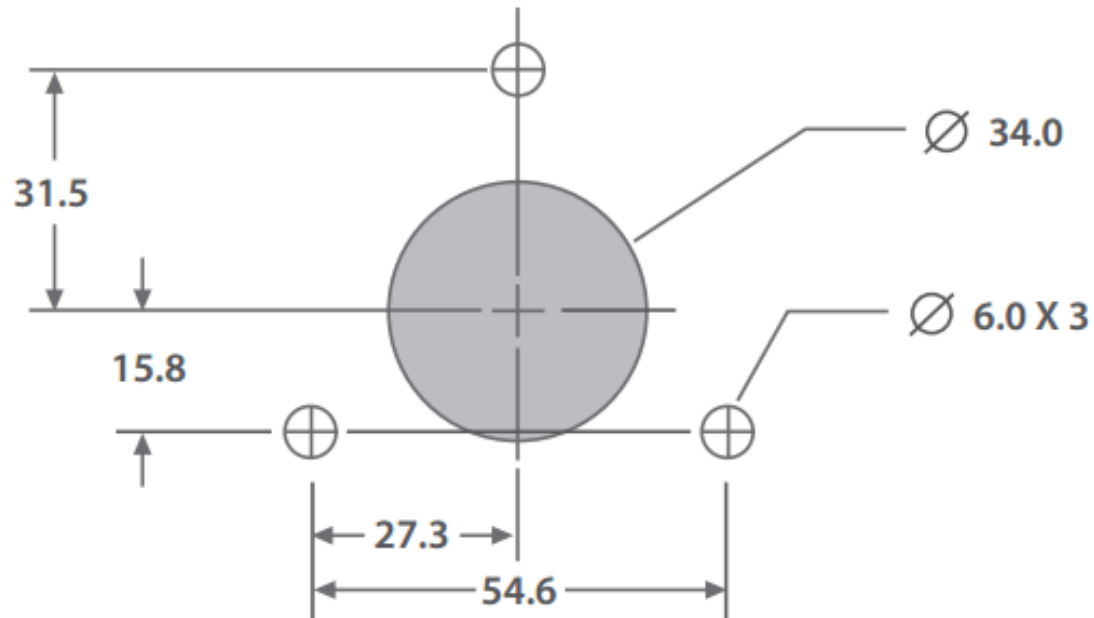
1) Insert the surface mount gasket plate between the transceiver and enclosure top surface. Secure transceiver with the provided thumb screws, tighten with hex wrench. If the enclosure panel thickness is greater than 3mm, longer screws should be used (M5 or #10-32 thread, 9mm + panel thickness long).

2) Connect the Ubicom cable to the transceiver from the underside of the surface.

2.5   SIM CARD INSERTION/REPLACEMENT

SIM card insertion/replacement should be done in a dry, clean environment. When manipulating the SIM card sleeve, take care not to apply pressure to or touch any of the internal electronics

1) First, remove the Ubicom cover by unscrewing the three screws using a 3/32" Hex key

2) Open the SIM card sleeve. Note: Older versions (3G) of the Ubicom have a single SIM card sleeve. Newer versions (4G) have a dual SIM card sleeve.

a) Single sleeve version: Unlock the SIM card by gently sliding the SIM card holder sleeve down.

b) Double sleeve version: Unlock the SIM card by gently sliding the lower SIM card holder sleeve to the right.

IMPORTANT! SIM card must be placed in the <u>LOWER</u> sleeve for the Ubicom to function.

3) Gently remove the SIM card and replace with the desired SIM card.

NOTE: In the single sleeve version, the SIM card slides in and out. In the double sleeve version, the SIM card has to be carefully placed and aligned within the holder.

Single Sleeve   Double sleeve

4) Lock SIM card in place by gently closing the SIM card holder and sliding it into the locked position.

5) Replace the cover by tightening the cover screws hand tight. Inspect the gasket ensuring it is correctly seated and that there are no gaps or bulges. If so, remove the cover, and then replace so that it is properly seated on the gasket.

> WARNING! Any damage to a unit caused by failure to properly seal the Ubicom cover with the base after loosening or removing the cover screws VOIDS the warranty.

Chapter 3   AXIOM DATALOGGER CONNECTION

The Ubicom antenna cable can be connected directly to a Telemetry port on an Axiom Datalogger, allowing direct connection to the transceiver and providing power cycling capability. All power, telemetry and Datalogger power control signals are included in this connection.
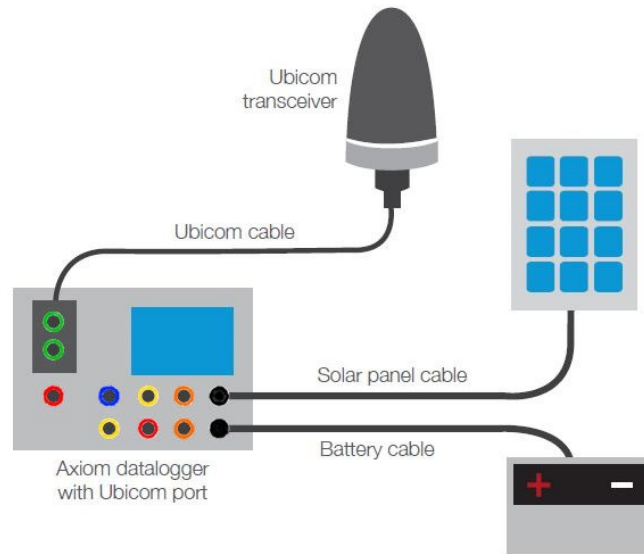
3.1 CONFIGURING THE TELEMETRY PORT FOR UBICOM

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.** If configuring for units operated by the U.S. Department of Defense (DoD), select **UbicomDoD** and refer to section 3.1.1
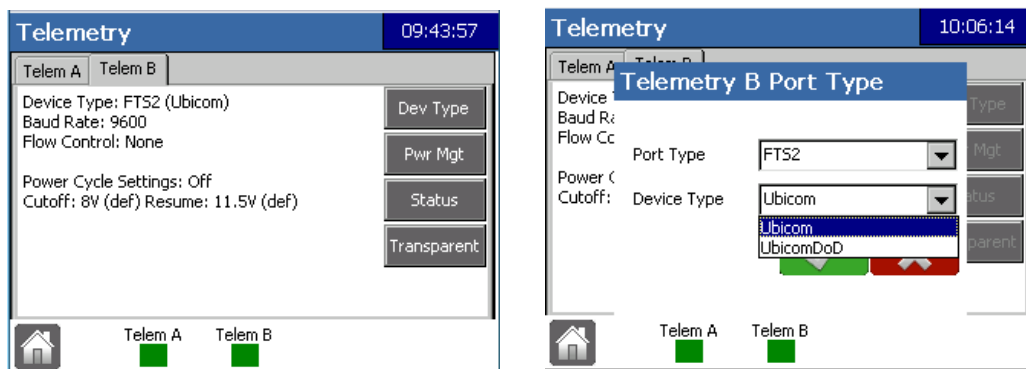

Figure 3-1: Selecting Ubicom

To determine the primary communication mode (Iridium or Cellular) select the Status button (see Figure 3-1) and the desired communication tab (Iridium or Cellular). Select the appropriate "Use" button.
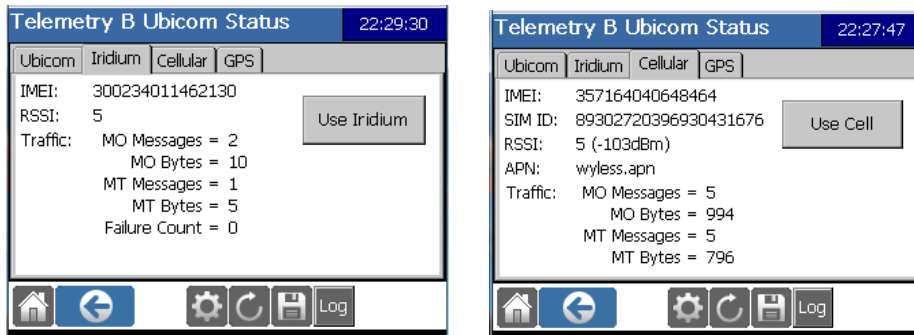
Figure 3-2: Ubicom Status Tabs

> IMPORTANT! When switching from Iridium to Cell using the Datalogger's Telemetry screen, the Ubicom LEDs can enter a state which does not reflect the actual communication mode in effect. Refer to section 4.1 (f).

3.1.1 UBICOM SETTINGS FOR DOD CONFIGURATION

> 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.

For the Ubicom to be used with DoD, the following settings must be used:

	Setting	Refer to:	Comment
Telemetry:	Port Type: FTS2 Device Type: UbicomDoD	Section 3.1	Customer set
Push Message	Message Type: CSV	Section 3.4	Customer set
HDLC mode	0	Table 3-1 (below) and Section 3.5	Set at factory.

Normally, the Ubicom will be configured for DoD before it leaves the factory. However, the following AT Commands can be used for trouble shooting.

Table 3-1: AT Commands for DoD use

AT Command	Meaning	Comment
HDLC_MODE	Get HDLC mode If 0 then the Ubicom is in DoD mode	Use this command to confirm the unit is in DoD mode. If 0 is not returned use +HDLCOFF to set to DoD mode.
+HDLCOFF	Sets HDLC mode to DoD (PIFC=RAW and HDLC_MODE=0)	Use this command to set the unit to DoD mode

3.1.2   PORT AND PROTOCOL SETTINGS

If you wish to change the default port settings, select the Setup Cog on the bottom of the Ubicom Status Screen.

3.2   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**.
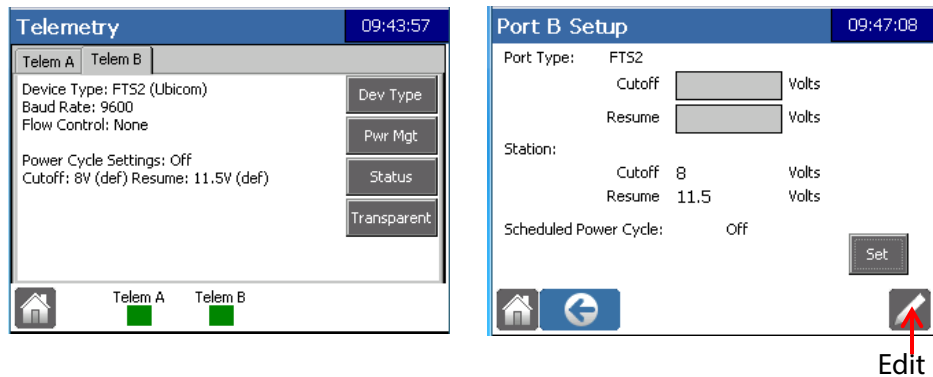

Figure 3-3: Power Management

> **Reset:** This button appears if there are customized Cutoff and Resume power levels entered. Selecting this button, then OK, resets to 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 3-3), then check the **Enabled** box. The default settings (shown in Figure 3-4) can be customized as desired. Select **OK** when done.
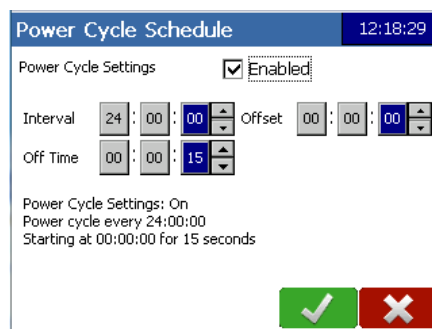

Figure 3-4: Enable Power Cycling

3.3 UBICOM STATUS

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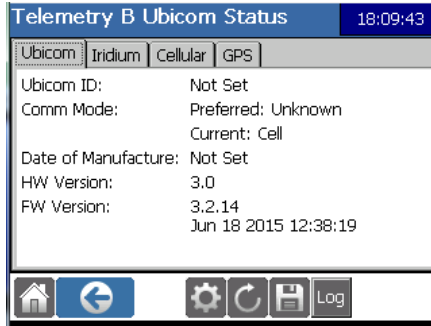

Figure 3-5: Ubicom Status Screen

Setup Cog: Select this to view and edit Port and Protocol settings.

Refresh: Refreshes the screen with current settings and conditions

Save: Saves 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.
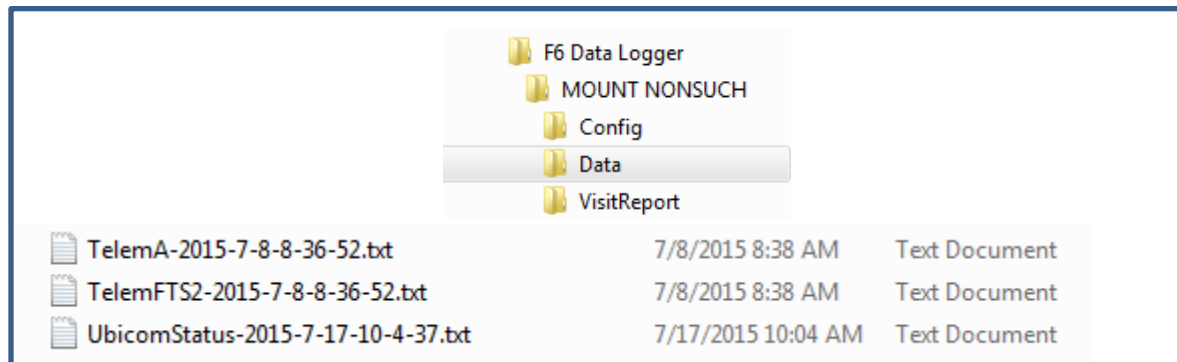

Figure 3-6: Ubicom File Structure Example

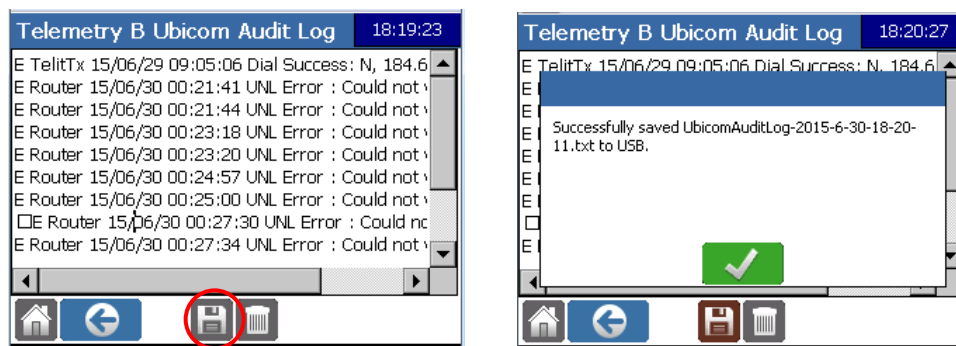**Log:** Press on the Log button to display the Ubicom Audit Log.

Figure 3-7: 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.
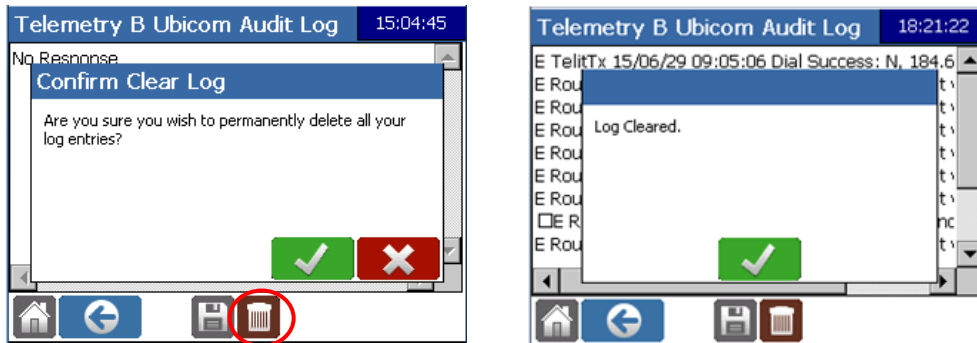

Figure 3-8: Deleting the Audit Log

3.4   UBICOM PUSH MESSAGE

Ubicom can be setup to push messages on a schedule or when certain conditions are met. Select Telemetry> Telem A/B> Status>Setup Cog> Envelope, and then the Add button.
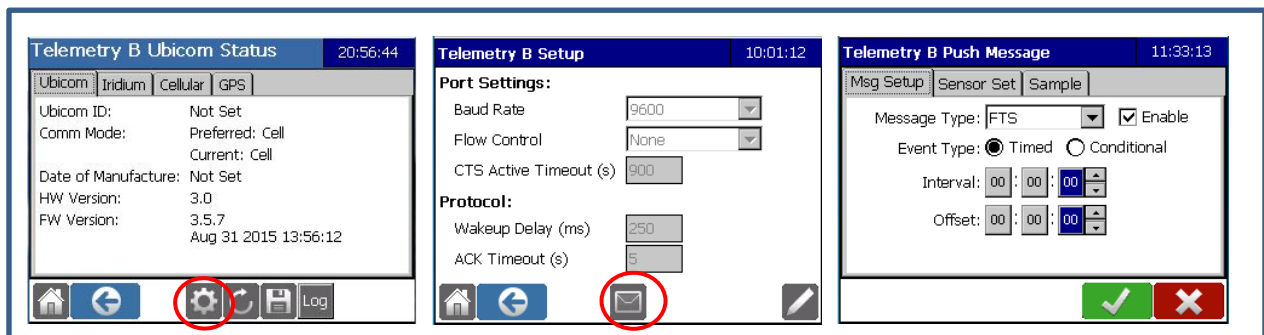

Figure 3-9: Ubicom Push Message

3.4.1   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 fifteen minutes after the hour (e.g. 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 minute referenced on the interval at which the condition is checked.

Example: A condition with an interval of 1:00:00 and an offset of 00:15:00 will check the conditions at fifteen minutes after the hour (e.g. 90:15:00, 10:15:00, 11:15:00 etc.).

3.4.2   SENSOR SET TAB

The sensor set tab is used to select the variables to be included in the message. Select the desired variables and use the arrows to shift them to the Selected Variables column. The double arrow icons will move all variables between the columns.
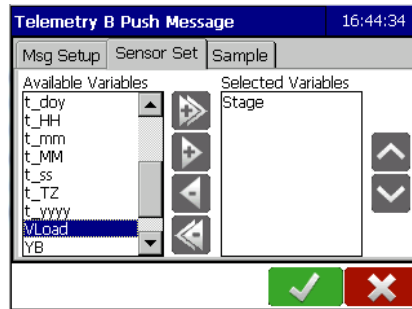

Figure 3-10: Building a Sensor Set

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.

3.4.3   SAMPLE TAB

This is used to determine the data to be included in the message.
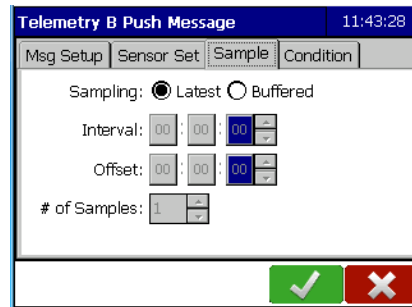
Figure 3-11: Sample Tab

Latest: Selecting Latest will include the latest data logged.

Buffered: 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.

3.4.4   CONDITIONAL TAB

If the conditional radio button is selected in the Message Setup (see Figure 3-11), a Condition tab will appear and must be filled in.
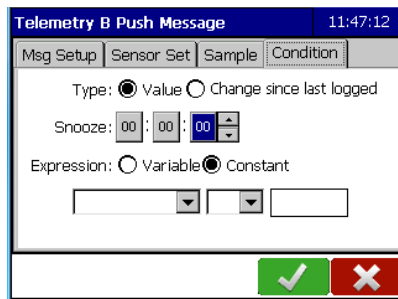
Figure 3-12: Condition Tab

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.

3.4.4.1 *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

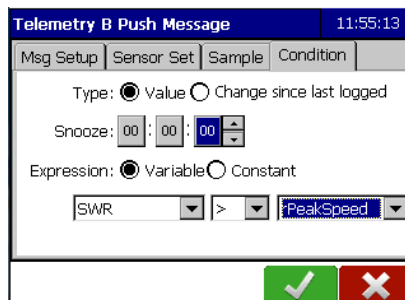3)   Use the drop down menu to select the comparing variable

Figure 3-13: Value Example

3.4.4.2 *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**.

3.5 UBICOM TRANSPARENT MODE

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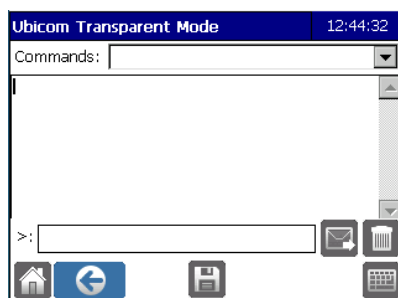

Figure 3-14: Ubicom Transparent Mode

Use the drop down menu to select the desired command or select the Keyboard icon and type in the AT command (see Appendix A for a list of the AT Commands). The Envelope icon will send the command. The delete icon will clear the **>:** field.

Chapter 4   LED INDICATOR OPERATION

Confirmation of a successful installation as well as diagnosis of any problems fixable at the site is accomplished using the integrated LED array at the bottom of the transceiver. There are four LEDS which indicate different conditions with different patterns of flashing
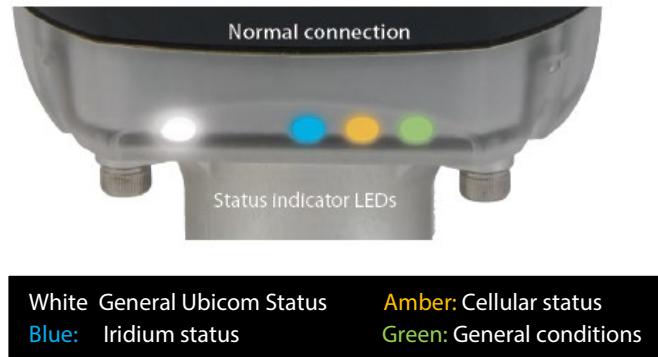
Figure 4-1: LED indicators

Normal operation is indicated by a continuous slow pulse of the WHITE LED and a single flash of one or more coloured LEDs.

4.1   GENERAL CONDITIONS

a)   **Ubicom not connected or no power.**

Ensure Ubicom cable and the power cable are both connected
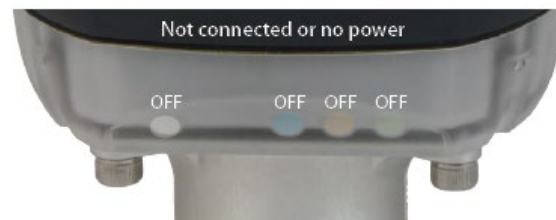
b)   **Transceiver start up.**

This sequence happens when power is first supplied to the transceiver.

c)   **Ubicom transceiver operating normally**.

The slow pulse pattern is independent of patterns for the other LEDs and will normally be seen in combination with them.
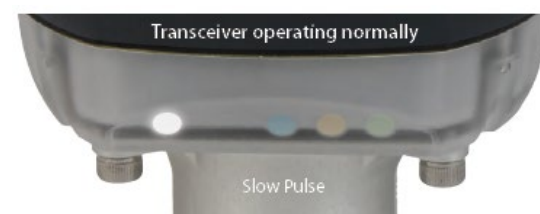
GENERAL CONDITIONS (Continued)

d) Hardware fault.

The transceiver has malfunctioned and must be replaced.
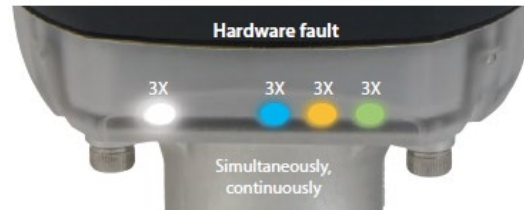
e) "LED Flash" AT command received.

This AT command can be sent from a remote software system or connected datalogger to aid in diagnosing connection. Details of AT commands are found at Appendix A.
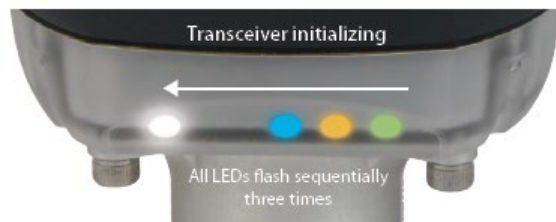

f) LEDs do not reflect communication mode

The LEDs can temporarily enter this state when switching between Iridium and cellular using the Axiom Datalogger telemetry screen. Cellular communication is functional but the LEDs do not indicate the actual state.

Power cycle the Ubicom.
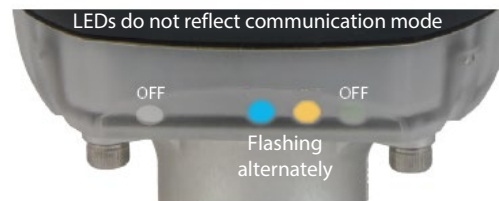
4.2   IRIDIUM TELEMETRY CONDITIONS

Iridium satellite connected.

A single flash indicates normal operation.

No satellite/poor reception.

The problem may be temporary, until a satellite comes into view. If the condition persists, relocate the transceiver as per section 2.1.

Network problem.

The problem is most likely temporary. If it persists, contact FTS.

Component fault.

This indicates a problem with the Iridium module. The Ubicom transceiver will need to be replaced.

4.3 CELLULAR TELEMETRY CONDITIONS

Connected to cellular service

A single flash indicates normal operation.

No cellular service.

This sequence may occur initially after power-up as Ubicom attempts to log on to the cellular network. If the condition persists, try to relocate the transceiver to improve signal reception.

Network problem.

This sequence may occur when the transceiver is within cell coverage but it is unable to communicate with its gateway, either because of incorrect settings on the transceiver or a problem with the cellular carrier. If this condition persists, contact FTS Support.
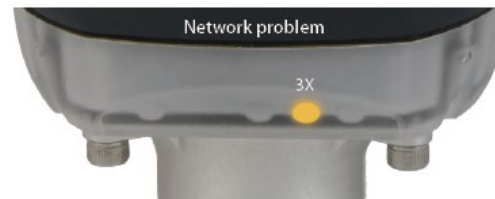
Component fault.

This indicates a problem with the cellular module. The Ubicom transceiver will need to be replaced.

Appendix A TECHNICAL SPECIFICATIONS

A.1 COMMON

MECHANICAL	
Height:	189 mm (7.45")
Diameter at widest point:	90 mm (3.55")
Weight:	Iridium version: 376 g (0.83 lbs)
	Cellular version: 374 g (0.82 lbs)
	Hybrid version: 403 g (0.89 lbs)
Case material:	Lexan™ polycarbonate
Cable length:	5 m (16.4'), 50' max
Cable jacket:	Polyurethane
Mounting:	Surface mount, or 1" NPT with supplied flange
Connector interface:	Waterproof, military-style bayonet connector
Status LEDs:	4 coloured LEDs, visible from up to 9m (30ft),
Mechanical vibration rating:	MIL-STD-167-1 Type 1
Power relays:	4 in total for power cycling up to 4 12V devices.
	Military-style connection module uses all relays for
	Axiom datalogger

ENVIRONMENTAL	
Operating temperature range:	-40°C to +60°C (Iridium version)
	-30°C to +60°C (Cellular and hybrid versions)
Operating humidity range:	0% to 100% RH
Storage temperature range:	-40°C to +85°C
Storage humidity range:	0% to 100% RH
Dust and water ingress:	IP66

POWER	
Input voltage:	9 - 16VDC

DATA I/O	
Message size:	6-250 bytes typically, no maximum
Serial protocols:	AT commands, PPP, SLIP, UDP/IP, TCP/IP
Serial interface:	RS-232
RS-232 data rate:	1,200 bps to 115.2 kbps

GPS	
Acquisition time:	Hot 1 sec; cold < 35 sec
Accuracy:	2.5 m (Horizontal CEP)
Sensitivity:	Acquisition: -147 dBm
	Tracking: -159 dBm

MISCELLANEOUS	
Certification:	FCC, Industry Canada, CE Mark
No. of antennas:	1 (iridium version), 2 (hybrid and cellular versions)

A.2   IRIDIUM

GENERAL	
Coverage:	Global
Satellite service provider:	Iridium
Typical latency:	<15 sec
RF parameters	
Input/output impedance:	50 ohms
Duplexing method:	TDD
Multiplexing method:	TDMA/FDMA
Oscillator stability:	±1.5 ppm
Maximum transmit power:	1.6 W
FCC ID:	Q639602
Industry Canada ID:	4629A-9602
POWER CONSUMPTION	
Avg. current consumption - send:	250 mA
Avg. current consumption - receive:	28 mA
Sleep mode (cannot send/receive):	< 5 mA
ANTENNA	
Radiation pattern:	Hemispherical
Polarization:	Right hand circular
VSWR:	Less than 1.5:1
Gain (dB):	3 dBi
Impedence:	50 ohms

A.3 CELLULAR – FOR 3G NETWORKS

GENERAL	
Technology:	HSPA penta-band
Bands:	GSM quad-band: 850/900/1800/1900 MHz UMTS/HSPA penta-band: 850/900/1700/2100 MHz
RF PARAMETERS	
Transmit power:	Class 4 (2W, 33dBm) @ GSM 850/900 Class 1 (1W, 30dBm) @ GSM 1800/1900 Class 3 (0.25W, 24 dBm) @ UMTS Class E2 (0.5W, 27 dBm) @ EDGE 850/900 Class E2 (0.4W, 26 dBm) @ EDGE
Input/output impedance:	50 ohms
FCC ID:	RI7HE910
Industry Canada ID:	5131A-HE910
POWER CONSUMPTION	
Avg. current consumption - send:	250 mA
Avg. current consumption - receive:	20 mA
Sleep mode (cannot send/receive):	< 5 mA
ANTENNA	
Radiation pattern:	Linear vertical
Efficiency:	> 50% across all bands
Return loss:	> 8 dB across all bands
OTHER	
SIM interface:	Standard 3V SIM receptacle
Throughput:	HSPA: 21 Mbps download, 5.7 Mbps upload

A.4 CELLULAR2 – FOR 4G NETWORKS

GENERAL	
Technology:	LTE Cat-M1
Bands:	LTE (4G) Bands: B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B27, B28, B66, B71, B85 GSM (2G) Bands: B2, B3, B5, B9
RF PARAMETERS	
Transmit power:	Class 3 - 23 dBm
Input/output impedance:	50 ohms
FCC ID:	RI7ME910G1WW
POWER CONSUMPTION	
Avg. current consumption - send:	250 mA
Avg. current consumption - receive:	20 mA
Sleep mode (cannot send/receive):	< 5 mA
ANTENNA	
Polarization:	Linear Vertical
Efficiency:	> 50% across all bands
Return loss:	> 7 dB across all bands
OTHER	
SIM interface:	1.8V or 3.0 3FF micro
Throughput:	LTE- Downlink up to 588 kbps, Uplink up to 1Mbps

DOCUMENT REVISION HISTORY

Revision	Date	Description
1	03 Jul 2018	Updated and replaces 700-Ubicom-Install. Rev 0.32 of AT Commands. Incorporates UB–296 (SIM card replacement), UB-301(DoD mode), UB- 306 (LED update).-
2	25 Oct 2022	Added information about the 4G version (PM-408)